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An Investigation of Collaborative Ubiquitous Learning in Promoting Socio-Cultural Knowledge and Skills in 21st Century: Integrating History, Geography, Architecture, Science and Culture Study

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Abstract: This paper attempts to investigate the effects of the collaborative ubiquitous learning approach in promoting socio-cultural knowledge. The content used in this study was associated with history, geography, architecture, science and culture study of the Rattanakosin period; moreover, these chronological events were represented in a story timeline. Besides, the learning activities were designed to support such learning environment and incorporating 21st-century skills. These processes required students' efforts to work in groups to experience the actual sites on a field trip in order to inquire the socio-cultural knowledge. The students received and responded to the missions on their mobile devices. After the actual implementation of the proposed learning method, it was found that the students could reach the high level of the learning achievements from the proposed learning activities, implying that they could apply the integrated knowledge of several subjects to form the historical story. Furthermore, the high-achieving students could perform more advanced 21st-century skills than the other groups on their works. Moreover, the finding of this study could bring more applications of ubiquitous learning to promote integrated learning contents with collaborative knowledge construction.

Keywords: Story-based learning, ubiquitous learning, social study, 21st century skills, constructionism, collaborative knowledge construction

1. Introduction

Nowadays, story-based learning is considered as the interesting concept for teaching and learning which many educational institutes popularized to use this concept as the main concept for learning, especially the curriculum that collaborates each science area in order to discuss in the form of knowledge story. For the concept of story-based learning applied, the subject is set as the core' s inevitably be History. Generally, History is a part of Social studies. Social studies are the integrated study of the social sciences, humanities, and history. Within the school program, social studies provides coordinated, systematic study drawing upon such disciplines as anthropology, archaeology, economics, geography, history, jurisprudence, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and natural sciences (Story-Based learning, 2016). In addition to learning memorization, students could discuss their knowledge not only in the form of memorization but also in the form of critical thinking. Hence, history is considered as science that suited to be the core science which collaborates other subjects in the form of story-based learning.

For the social studies situation of existing learning, the form of teaching mostly based on the lecture, especially in the classroom which students quietly attended in class. Due to lecturing in

class, teacher normally encouraged students to participate in the classroom. For instance, the teacher encouraged students to analyze the historical incident by persuading them to explain the historical result, while lecturing, students could freely use a mobile phone for searching data that they want. From the classroom's situation mentioned, teacher attempted to inject the systematic thinking, the cognitive process of studying and understanding systems of every kind. Nevertheless, in this present class, learning is not enough for skills needed in the 21st century era; therefore, the self-learning using the device in the form of the field trip is necessary to consort with the skill of learning and innovation skill, and digital literacy skill too. In addition to regular classroom, a field trip is another form of learning that support that students to participate with place, people, and environment (DeWitt & Storksdieck, 2008).

Even though mobile learning's not considered as the newest form of learning but it was popularized among students. Owing to it's convenient to search any data from Website, mobile learning was gradually an important role in education inevitably. In the past decade, teachers gradually change from the lecture-based learning to mobile learning through the mission that allocated to each group instead of lecturing from the lecturing even in the field trip. From the field trip using device, most students reacted feedback positively in many aspects. Nevertheless, mobile learning in field is still be advantage as following; First, it is convenient to search data from many credible website. Second, it is an active learning so students can participate with the real context. Last, it is an opportunity for students to think and analyze data online in order that they could segregate both unbelievable and credible data from Internet and others channel (Laru, Järvelä, & Clariana, 2012).

Skills needed in 21st Century is considered as the renounced latest trend of education and human resource's performance in nowadays. Its objectives aim to construct students and personnel to be accepted not only in workplace, but also enjoyably live in 21st Century (Pellegrino & Hilton, 2012). Hence, skills needed in 21st Century considered as a significant concept for develop students and personnel in the present and future time. Students could collaborate knowledge in the term of interdisciplinary. For example, Communication skill used in the interview's mission because students had to interview peoples in the field, such as, guide, monk or even tourist. Collaboration skill normally used in every mission because it's group work. Creativity skill also used in ordered to make Video clip, and drawing. For the critical thinking skill, all students used this skill in every question inevitably.

According to the phenomenon of learning social studies, therefore, the collaborative ubiquitous learning is adopted as an efficient learning form in this study, called CULS. The concept of CULS encouraged students to be active learners more than the old field trip because all students mostly participated in their own groups. They were assigned any tasks to every member. So peer anticipated them to do their task as good as possible. In addition to the advantage of CULS, the activities that assigned to students were greatly developed for learning efficiency. Moreover, these developed activities help students to promote the socio-cultural knowledge and skills in 21st Century by integrating certain stories from History, Geography, Architecture, Science and Culture Study.

2. Related Study

2.1. Ubiquitous Learning and Social Study

Ubiquitous learning is considered to be both pervasive and persistent, allowing students to access education conveniently, calmly and seamlessly. Ubiquitous learning has the potential to revolutionize education and remove many of the physical constraints of traditional learning (Yahya, Ahmad, 2010). Moreover, the integration of adaptive learning with ubiquitous computing and u-learning may offer great innovation in the delivery of education, allowing for personalization and customization to students needs. According to Ogata and Yano (2004), there are six essential components of ubiquitous learning are the following: First is Permanency: Learners never lose their work unless it is purposefully deleted. In addition, all the learning processes are recorded continuously every day. Second is Accessibility: Learners have access to their documents, data, or videos from anywhere. That information is provided based on their

requests. Therefore, the learning involved is self-directed. The third is Immediacy: Wherever learners are, they can get any information immediately. Thus, learners can solve problems quickly. Otherwise, the learner can record the questions and look for the answer later. Fourth is Interactivity: Learners can interact with experts, teachers, or peers in the form of synchronous or asynchronous communication. Hence, the experts are more reachable, and the knowledge becomes more available. Fifth is Situating of instructional activities: The learning could be embedded in our daily life. The problems encountered as well as the knowledge required are all presented in their natural and authentic forms. This helps learners notice the features of problem situations that make particular actions relevant, and the last is Adaptability: Learners can get the right information at the right place with the right way.

There are many research studies on ubiquitous learning in the past decade. Hwang, Hung, Chen, and Liu (2014) developed an advanced ubiquitous learning to develop students' competent in field ubiquitous learning. Shih, Kuo, and Liu (2012) found that the u-learning model is conductive to the improvement of students' mathematics achievements. For others, u-learning aspect, Hung (2016) have attempted to develop learning environments that combine real-world contexts and digital-world resources to provide students with direct experiences of the real world with sufficient learning support. Wu, Hwang, and Tsai (2013) also supported the idea that context-aware ubiquitous learning is such an approach that enables students to learn from the real world with support from the learning system using technologies. Finally, ubiquitous learning is quietly effective to improve and also enhance learning skill both in the context of the real world and digital world.

Ubiquitous learning rapidly popularized among education's sector. Social studies are considered as the subject that slightly changes comparing with science because it recognized as the knowledge that students learned from the historical period, politics, social, and economical change. So the social studies theory' s quietly certain. Applying ubiquitous learning to social studies class is necessary for students to oppose to any opportunity to exchange and construct knowledge (Hover, Berson, Bolick, & Swan, 2004). Moreover, u-learning could also become a means for micro-managing school districts, teachers, students, and curricula too. In addition, ubiquitous learning had an important role to develop social studies curriculum which affects each sector which involves with social studies curriculum construction realize the effect of ubiquitous learning in the future.

2.2. The 21st Century Skills

21st-century skills are the form of higher-order skills, abilities, and learning dispositions that have been identified as being required for success in 21st-century society and workplaces by educators, business leaders, academics, and governmental agencies. According to rapidly change phenomenon, many sectors realized that there are skills required for students to master in preparation for success in the 21st century. Hence, many of these skills are also associated with deeper learning, which is based on mastering skills such as analytic reasoning, complex problem solving, and teamwork (Pellegrino & Hilton, 2012).

Nowadays, many educational institutes widely adapted their curriculum and teacher professional development in ordered to consort with 21st-century skill. According to Bell (2010), the teacher encouraged students to construct knowledge in the form of the project-based learning; as a result, students could increase the critical thinking and collaboration skill as they engage in the project. In addition, problem-based learning (PBL) was another concept learning for a 21st-century skill that students should concern. Gwee (2009) applied PBL as learning system design for the education of healthcare by taking the demonstrative situation in class. In this case, the problem is considered as a stimulus for learning. Thus PBL can contribute to the improvement.

To be a good learner and staff in the 21st Century, technology is considered as a significant tool that enhances skill need in this century inevitably. Mobile-learning is another concept of education that everyone should concern, especially in social studies subject, using mobile technology attracted students participate in learning. Charitonos (2011) studied the potential of social and mobile technologies to support and enhance visitor's learning experience in museum, the result showed social and mobile technologies have an impact on the social dynamics; it is anchored in sociocultural perspectives of learning as meaning-making, with a focus on mediating

artefacts in the development of understanding. Like Shih, Chuang, and Hwang (2010), mobile-learning was the learning's concept that be effective in the field trip.

Therefore, applying m-learning in social studies' field is so necessary that educational institute should adapt this concept in their curriculum because it's not only increase learning performance, but also popularized among learner too.

2.3. Interdisciplinary Learning and Collaborative Knowledge Construction

Interdisciplinary learning is the integrating of multidisciplinary knowledge across a central program theme which helps learners to develop more advanced epistemological beliefs, improved critical thinking and metacognitive skills, and an understanding of the relevant among perspectives derived from various disciplines (Ivanitskaya, Clark, Montgomery, & Primeau, 2002). Moreover, the Interdisciplinary study is a process of answering a question, solving a problem, or addressing a topic that is a single discipline could not be dealt with because of its' complexity, and the goal of integrating the learner's insights to construct a more deep understanding of knowledge (Repko, 2008).

Nowadays, many research studies try to implement interdisciplinary learning in different aspects. Kinniburgh and Byrd (2008) integrated mathematics, reading and social studies activities that engages and inspires students while covering the content and standards of three subject areas. Bogan, King-Mckenzie, and Bantwini (2012) used Bogan Differentiated Instruction Model (BDIM) to integrate reading, science, and social studies to enhance inquiry, problem-solving, interest, critical thinking skills, and learning. This model combined major teaching concepts to develop interdisciplinary learning. However, Interdisciplinary curricula are time-consuming and use collaborative team work to invent that seems like a hard and disadvantage, but finally, the interdisciplinary approached inhibits many preferred skills that are needed by future colleges and employers. The use of interdisciplinary techniques helped students and their teachers improving in critical thinking, communication, creativity, pedagogy, and essential (Jones, 2009).

Collaborative Knowledge Construction is the discussions centered on the team on jointly solving a problem or carrying out a mission which helps to construct new knowledge. This method requires the use and adaptation of existing knowledge, so the groups produce and create the contexts of involved in joint problem-solving (Linehan & Mccarthy, 2001; Tscholl & Dowell, 2010). Fischer, Bruhn, Gräsel, and Mandl (2002) investigates that collaborative knowledge construction could be fostered by supporting students with visualization tools. Oehl and Pfister (2010) studied about E-Collaborative Knowledge Construction which can develop the learning discourse and support collaborative knowledge construction. Baloian and Zurita (2012) practiced a system called MCKC to supporting collaborative face-to-face tacit knowledge construction and sharing in ubiquitous scenarios.

Therefore, the interdisciplinary learning including history, geography, architecture, science and cultural study which is supported story-based learning curriculum is considered in this study. This interdisciplinary project aims to help students construct their knowledge by using collaborative knowledge construction.

3. Description of Story-Based Ubiquitous Learning in Promoting Social Study

History is the facts of all event happened in the pastime. Understanding the past makes us understand human thinking even more so that we can use the story in the past as an experience. Both from the mistake side, the successful side. It leads to the historical study process in ordered to obtain the knowledge and answers that reflect the facts of the pastime. It is necessary to use credible evidence to analyze and connect to the form of stories, such as evidence from a geographic location, Art and architecture, and cultures (education, religion, beliefs, customs, etc.)

Story-based learning is based on the concept of collaborating historical events in the form of stories. So it is necessary that a teaching course that learning or understanding content of knowledge originated from the recognition of knowledge in the form of story-based learning, which consorts with timeline's history. Hence it is necessary for students to understand and memorize any content in the form of a story. (Learning in the form of story memorization could

make students understand and memorize knowledge) Nevertheless, comprehending knowledge's content, students must understand history's truth as the core including geography, science, architecture and art, culture's knowledge too, as shown in Figure 1.

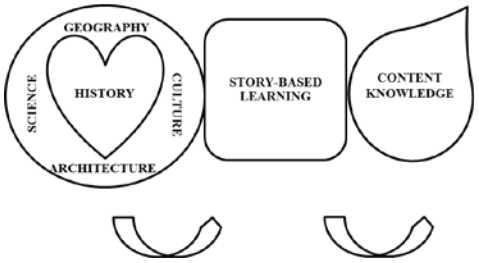

Figure 1. The Concept of Collaborate Historical Events in the Form of Story-Based Learning.

According to the process that history as the core knowledge, cooperatively constructed knowledge content under the concept of Story-based learning. It leads to the active learning's design. Its objectives aimed to encourage students to prove the solution from a mission by themselves (self-learning); moreover, this active learning is considered as "Field Learning" too. Hence self-learning is necessary for students to learn through the real-world experience on the field trip.

In this study, five contents of Rattanakosin period (1782-1910) which are geography, history, science, architecture and art, culture (Figure 1.) are used in the field trip. The contents were mapped with King Rama I-V on four temples of Wat Arun, Wat Pho, Wat Phra Kaew, and Wat Suthat to make a historical story line. Then, teacher designed the questions for starting the collaborative knowledge construction. Finally, a video clip of every question was taken at the real location by the teacher and upload to Youtube. The overall framework of the proposed field learning method; from now on, called CULS, is presented in Figure 2. Moreover, the step-by-step of the CULS activities are described in Table 1.

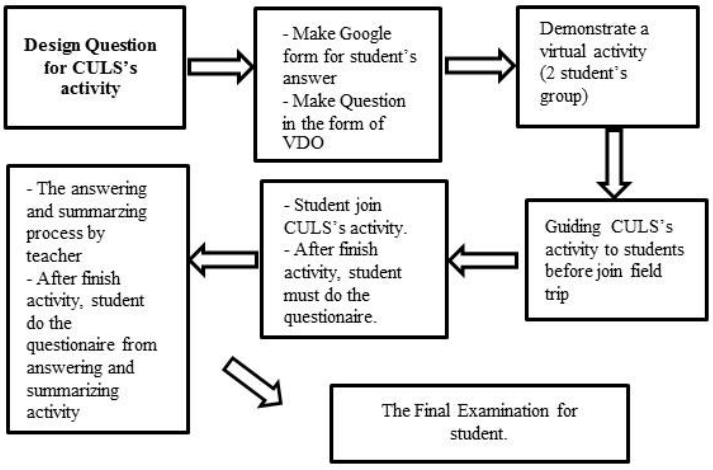

Figure 2. Overall Framework of CULS's Activity.

Table 1: Learning activities.

Phase	Activities	Duration (mins)
Preparation	The teachers introduce the CULS's activity to grade 12th students before joining the field trip. All students are then divided into groups for rotation. After that, the teachers recommend the mobile application used in the activities with the hands-on practice.	60
Field trip	Once arrived the meeting point, the teacher lectured an overview of Rattanakosin history. This can make students eager to learn in the field	20

	activities.	
	Each group then proceeds to visit a temple. The students then trigger the learning activities by taking their devices on QR code shown by the teacher. Once entranced the interactive form, the students will see their learning missions based on the location, starting from watching the video clip from their teachers to get introduced to the background of the location and leading them to the story. Then, the students are required to work on the assignments requiring them to accomplish some missions with peers. At this point, the students can inquire the historical knowledge in association with several subjects according to the received missions. In the meantime, they have to perform many skills to make the missions successfully. After the period of 60 minutes is over, each group rotate to different temples.	240
Debriefing	The first 60 minutes, teacher and students together discuss the correct answer. 60 minutes later, each group presented a historic timeline from the correct answer. This face-to-face activity in the classroom, considered as debriefing session, helped students to not only diminish their misunderstanding, but also forming the socio-cultural knowledge with the teachers' suggestions.	120
	Students took a questionnaire to assess their 21st skill century performance from their responses.	60
	Finally, students took a quiz in EdPuzzle as a summative assessment on their gained knowledge from the entire activities.	30

4. Research Design

4.1. Participants

There were 26 grade 12th students who participated in this research study. All students held the fundamental knowledge of Rattanakosin period, which were taught in a regular class by the same teacher, and have had mobile experiences.

4.2. Instruments

There were three main instruments used in this study. First, the learning activities in CULS were used as a major instrument. The data used in this study was collected from the answers/works submitted in 12 missions taken at four temple sites (three missions each). Validated by two experienced social studies teachers, All learning activities were designed to assist the students to effectively learn in the field study. Moreover, the teachers have developed the scoring rubric to evaluate these submissions fairly (total score = 100). Second, the summative assessment is used as a quiz to assess the students' socio-cultural knowledge covered in the learning activities. Seven open-ended question items were developed in EdPuzzle to collect the students' understanding towards Rattanakosin history. The evaluation is done based on the scoring rubric (total score = 100). Discrimination and reliability test has been performed and passed the acceptable values. Third, to assess students' 21st skills performed during the CULS activities both from the field-trip and debriefing phases, the questionnaire was adapted from Gallegos and Peeters (2011) with 14 Likert-scale items supplemented with open-ended questions. This instrument was designed to assess following skills: analytical, sketching, communication, collaboration, critical thinking, and presentation. The tool is accepted for reliability with Cronbach's alpha of 0.892, while IOC test was done with multiple experts.

4.3. Procedure

The participants were first divided into five groups (5 people/ group). Every member of each group has their responsibility to help achieve the missions. The procedure used in this research study follows the CULS phases, as presented in Table 1. After all activities were completed, all participants took questionnaire and quiz for 60 and 30 minutes respectively. Figure 3, 4 and 5 show some of the learning activities of the field trip activities, debriefing session in the class, and the summative quiz, respectively.

Figure 3. In-Field Collaborative Ubiquitous Learning Activities.

Figure 4. Story-based Collaborative Knowledge Construction.

Figure 5. Summative Assessment of Socio-Cultural Knowledge.

5. Results

5.1. Learning Achievements

Based on the evaluation results of CULS learning activities, it was found that most groups of students could perform at the high level of the learning achievements (M = 74.75, SD = 7.47), as shown in Table 2. This implies that the students could follow the on-going learning activities effectively upon their collaboration and arrangement. They gained a high level of understanding of the integrated contents of history, geography, architecture, science and culture study of Rattanakosin period.

Moreover, a median-split technique was performed (Med = 75.00) to group their learning achievements into two categories: Low performance (LP) and High performance (HP).

To further investigate the individual students' socio-cultural learning achievements, the results from their quiz were analyzed**.** As shown in Table 3, it was found that those who were in HP group could significantly outperform than those who were in LP group**.** This confirms that their individual understanding of the topic was in the alignment with their collaborative ubiquitous learning achievements**.** Therefore, they could construct their knowledge**.**

Table 2: Results of the in-field group learning performance.

Group	Score (M ± SD)					
	A	B	C	D	Overall	Interpretation
1	85.00	83.75	72.50	81.25	80.63 ± 7.96	Highest
2	72.50	75.00	75.00	78.75	75.31 ± 5.64	High
3	86.25	72.50	71.25	70.00	75.00 ± 9.68	High
4	75.00	71.25	72.50	67.50	71.56 ± 6.79	High
5	67.50	68.75	76.25	72.50	71.25 ± 7.29	High
Average	77.25	74.25	73.50	74.00	74.75 ± 7.47	High

Table 3: Difference of quiz score results.

Group	Score (M ± SD)	U
LP	56.05 ± 22.80	65.00*
HP	59.41 ± 17.87	

*$p < 0.05$

5.2. 21st Century Skills Performance

Based on the questionnaire results, we found that the high performing students could show significantly better performance than those in the other group on analytical, sketching, communication and collaboration, as shown in Table 4. Furthermore, their qualitative responses on such questionnaires were presented in Table 5. It can be implied that the HP students could provide more advanced responses and sophisticated works than those of the other groups.

Table 4: Difference of 21st century skills achievement.

Skill	Score (M ± SD)		U
	Low performance (LP)	High performance (HP)	
Analytical (ALT)	3.50 ± 0.53	4.00 ± 0.55	40.00*
Sketching (SKT)	3.00 ± 1.15	3.43 ± 0.85	53.50*
Communication (CMN)	3.30 ± 1.16	3.93 ± 1.00	47.50*
Collaboration (CLT)	3.58 ± 0.88	4.05 ± 0.78	813.00**
Critical thinking (CTC)	3.80 ± 0.63	3.93 ± 0.73	63.00
Presentation (PST)	4.00 ± 0.82	3.79 ± 0.80	102.50

*$p < 0.05$, **$p < 0.01$

Table 5: Qualitative responses on 21st century skills.

Low performance (LP)	High performance (HP)
Analytical (ALT)	
1. Because Wat Arun in the past were very high architectural building compared to the surrounding area. It is also a temple located near the river, so it has beautiful elements. 2. The Hindu-Brahmin Belief of Cosmology. Wat Arun is liken as Mount Meru, which is like the center of the universe. Phra Chan and Phra Sun Pier are liken as the moon and the sun, surrounding Mount Meru is the center of the universe.	Thai society respected to the belief of Tripoom (Three World). Tripoom are replicated in the architecture of the temple. Each location in temple absolutely reflected to the belief of Tripoom. For example, the gate of the prang is liken as the gate of the universe. The vast yard is liken as the Si Tandon sea, the sea surround Mount Meruu. In the middle of the sea there is a mountain, which is Prang (Wat Arun Pagoda).
Sketching (SKT)	
	
Communication (CMN)	
Thailand and Cambodia related each other in various aspect. Both in the context of arts, culture, or even politics. Thus they inevitably exchanged in culture. The Temple of the Emerald Buddha was influenced by Angkor Wat. Including to Ramayana and other arts. Both Thailand and Cambodia are influenced by India.	Angkor Wat. In Thailand, this concept has been adopted in the Rama I period. He has the belief that the king is the goddess, comparable to Rama in the Ramayana. This literature has been taken as a mural painting in the Angkor Wat in Wat Phra kaew. Because in the reign of King Rama IV wanted to move Angkor Wat to Siam Kingdom but it's impossible. So his majesty directed to make a model in Wat Phrakaew instead.

To further understand the relations among those measured 21st-century skills in CULS, the correlation test was performed on each pair of skills. It was found that there was significant relationship between ALT and CMN/CTC/PST, SKT and CMN/PST, CMN and CLT/PST, and CLT and PST. This means that those who are good at communication can give a presentation, for example.

Table 6: Pearson's correlation efficiency between 21st century skills.

Skill	ALT	SKT	CMN	CLT	CTC	PST
ALT	1.00					
SKT	0.31	1.00				
CMN	0.63*	0.71*	1.00			
CLT	0.24	0.12	0.82**	1.00		
CTC	0.89**	0.32	0.18	0.34	1.00	
PST	0.66*	0.74*	0.86**	0.73*	0.37	1.00

*$p < 0.05$, **$p < 0.01$

6. Conclusions

This study conducted an investigation on the effects of collaborative ubiquitous learning in promoting socio-cultural knowledge and skills in the 21st century based on the novel in-field learning approach, CULS. Taking Rattanakosin period as the learning topic in CULS, the learning activities were developed accordingly in focusing the collaborative knowledge construction among

peers in the group in acquiring the knowledge in the actual contexts, in this study four temples. This study report several findings. First, every student could catch the socio-cultural knowledge in accordance with the performance of their groups. Second, the high performing students could outperform 21st-century skills than the others, e.g., collaboration, communication, and analytical skills. Lastly, those who were good at presentation hold several skills needed in the 21st century. The findings of this research could be taken into consideration in further design collaborative ubiquitous learning activities.

However, the current study has some limitations that should be resolved and improved. First, the number of participants in this study was relatively small; therefore more number of participants across different contexts and background would be challenged to study for further generalization of this proposed approach. Second, other integrated contents could be applicable with this approach, such as sciences and languages; thereby a serious attention on learning activities could be altered accordingly. Finally, for the intensive use of this approach, a development of native mobile application could be considered, not only for user-friendly aspect but also for learning analytics purpose.

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