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Active Learning and its Outcomes: A Case Study from the Education Reform Project in Thailand

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Success in terms of life and career requires 21st century skills. Curriculum reform in education requires enhancing student competencies and an application of learning strategies and skills to drive the achievement of national policy. Active learning plays an important role to enhance student learning. This qualitative research, conducted in Thailand, aimed to achieve three objectives: (a) to understand learning management with active learning; (b) to study the learning outcomes of students after participating in the active learning classroom; and (c) to identify the guidelines for active learning management. The case study approach was used in this research. Fourteen primary and secondary schools in the north of Thailand participated in the project of the "Education Reform Lab and the Coaching Lab". School directors, teachers, and students were among the three groups of key informants. Data collection was conducted using in-depth interviews, story-telling and observations, and content analysis was done to analyze the data. The results revealed the following: (a) active learning classrooms could operate using problem-based learning, project-based learning, and scaffolding; (b) the students were able to achieve three learning outcomes: motivation, attitude, and skills; and (c) the learner analysis and the knowledge to utilize active learning techniques were among the best practices for teachers. The practical implications of the findings and some issues covering the social and cultural contexts were proposed. The further studies should be needed to expand to other regions in Thailand were also discussed.

Keywords: active learning, learning management, Thailand's educational reform lab, coaching

Many students in Thailand have still not attained the expected foundation skills in education, as evidenced by the results of national examinations and international assessments (OECD, 2016). Drop-out rates remain high at the secondary school level, which leaves too many young people exposed to the harsh realities of the labor market without the necessary skills to thrive (Delaney, 2019). Education is an important factor in developing people to have the qualifications society needs. Therefore, education must try to make the role consistent with complex and rapid social changes. A student-centered approach is one of the highest priority projects and one which aimed to elevate student achievement, to develop 21st century skills, as well as encourage students to be good Thai citizens with morals and ethics. Furthermore, area-based educational reform guidelines, such as educational institutes, educational service areas, local government and the provincial administration can be considered important targets in terms

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of operations and consistent with time restrictions and enabling determination of the quantity and quality scopes. In order to assess achievement, the Office of the Basic Education Commission, Thailand, which is responsible for promoting and managing basic education in the country, proposed new teaching and support methods including mentoring, coaching and peer coaching (Cordingley & Buckler, 2012), along with a development mechanism to give on-the-job training to educational professionals. These methods are different from more traditional ones. Moreover, these new systems must connect with the school records of learners by using - *after action review* process in a team meeting, continually and regularly. These teams should comprise of a coach and a teacher (a team based on grade level or a team based on subject choice, etc.). These suggested innovations of learning management played a vital role in the management system of education reform in Thailand. The educational management system reforms have the potential to unlock problems and obstacles found in schools, by motivating teachers to be more effective by adjusting their own working and teaching schedules, adjusting curriculums, adjusting resource usage in an appropriate manner, etc. (Leat, Lofthouse, & Towler, 2012).

The mentoring and coaching systems used by teachers and teaching methods aimed to develop learners with active teaching with a focus on learning skills and other necessary skills for students, such as life and working skills, learning and innovation skills, and information and technology skills. Therefore, learning among all subject groups are based on active learning, which means that "learning by doing and thinking" should include the 21st century skills. Project-based learning is an approach based on projects or activities that allow students to practice their working skills according to the Deming's cycle of PDCA (Plan, Do, Check, Act) applied in problem-solving and information technology media skills. Furthermore, problem-based learning can help students to develop their 21st century skills by emphasizing inspiration building in learning by practicing and team learning. In this process, students think, act, and solve problems and giving presentations independently. Consequently, teachers must teach students to obtain diversified knowledge and allow them opportunities to practice their skills for authentic learning, which is also known as active learning. However, teachers are still the most important people in the classroom, because the quality of the learners depends on the quality of the teachers (Samkoset, 2010).

This research was a part of the project that aimed to foster a student-centered approach in Thai Education reform by applying mentoring and coaching techniques into the system of learning management. The ultimate goal of the project was to improve student's learning outcomes in term of cognition, emotion and the 21st century skills. This paper aimed to, 1) describe the active learning management process of teachers who participated in the learning reform project, 2) to understand outcomes of the active learning management process, and 3) summarize the practice guidelines of the active learning management process to enhance 21st century skills.

Literature Review

Active learning has received more attention in the past several years. In Thailand, it has been a popular concept over the last few decades. According to the vision of education policy in Thailand the objectives are to develop a learning society by focusing on increasing educational opportunities and promoting active learning behavior in students (Ministry of Education, 2008). The main shift of learning is changing the focus from the teacher and delivery

of course content to the student and active engagement with the material. Students are therefore actively involved while listening to formal presentations in the classroom. Most important, to be actively involved, students must engage in such higher-order thinking tasks as analysis, synthesis, and evaluation (Hyun, Ediger, & Lee. 2017). This section aims to review the definition of active learning, techniques implemented in active learning, and its outcome.

Definition of Active Learning

Active learning is a learning approach in which students participate in learning responsibilities and students are active in every steps of the learning process. Also, the involvement of students in the learning process allows them to focus on building creative knowledge and skills such as analytical thinking, problem solving and meta-cognitive activities that develop thinking (Niemi & Nevgi, 2014). This type of learning requires students to do meaningful learning activities and think about what they are doing. These kinds of activities can include case study, cooperative learning, debates, drama, role playing and simulation, and peer teaching (Bonwell & Eison, 1991). This approach encourages a *Life Long Learning* process and help students with their cognitive skills and soft skills (Demirci, 2017). These soft skills encourage critical thinking, problem-solving and task based learning skills in an active learning environment. Some of the key themes identified in active learning were: (a) students are involved in more than listening; (b) students are involved in higher-order thinking (analysis, synthesis, and evaluation); (c) students are engaged in activities (reading, discussing, or writing), and (d) greater emphasis is placed on exploration of their own attitudes and values (Bonwell & Eison, 1991).

Techniques used in Active Learning

All active learning techniques are intended to help learners make relevant connections among course materials and transforming course materials from opaque language or ideas into something learners can integrate into their own long-term memory and knowledge bank. The activities are intended to help learners achieve these objectives and encourage students to acquire the mentioned skills. Three common techniques used in active learning are discussed.

1) Project-Based Learning (PjBL)- refers to a learning approach based on making projects or activities so that students can practice working skills, according to the Deming cycle (PDCA-plan, do, check, act), problem-solving and information technology media skills. The major characteristics of the learning process were as follows: (a) students are at the center of their learning; (b) learning occurs within a small group of learners; (c) teachers act as facilitators, advisors or guides; (d) problems are used to encourage the learning process; (e) the problems detected in the learning process are ambiguous or unclear, i.e. a question may have more than one answer, known as an ill-structured problem; (f) learners solve problems by independently searching for new information, or self-directed learning; and (g) the abilities and progress of the students were measured in terms of real situations and judged by how well they could operate or an authentic assessment.There have been several studies that supported the advantages of PBL.

At the primary school level, Karaçalli and Korur (2014) conducted a quasi-experimental study in Turkey with fourth-grade science students and found a statistically significant effect in terms of academic achievement and the retention of knowledge among PBL students. Another quasi-experimental study carried out in the United States (Hsu, Van Dyke, Chen, & Smith,

2015) explored the development of argumentation skills and the construction of science knowledge in a graph-oriented computer assisted in the PBL environment. A significant difference in terms of scientific knowledge, counterarguments and rebuttal skills were found in favor of the treatment conditions.

At the secondary school level, Al-Balushi and Al-Aamri (2014) conducted a quasi-experimental study with sixty-two eleventh grade female students in Oman that explored the effect of environmental science projects on the environmental knowledge and attitudes of the students towards science. These two classes were randomly assigned into an experimental group and a control group. The findings were positive, with the experimental group significantly outperforming the control group in the Environmental Knowledge Test and the Science Attitudes Survey. In another study, ten to eleven years old students in a qualitative study by Chan Lin (2008) in Taiwan developed skills in synthesizing and elaborating knowledge and in engaging in scientific exploratory tasks with the use of technology.

2) Problem-Based Learning (PBL) - refers to the learning that results from the process of working towards the understanding of problem-resolution. The problem is first encountered in the learning process (Barrett, 2017). PBL is a learner-centered pedagogical approach that allows learners to work collaboratively with others as they analyze complex and ill-defined problems. Learners also worked independently to collect information that they could then bring back to the group (Simone, 2014). Teachers must use problems to encourage students to explore knowledge and solve problems. The students could think critically, know how to perform, make good decisions about learning and how to engage in team work. An emphasis was placed on encouraging students to learn by themselves, and to apply their learning skills to help solve problems in their daily lives. The outstanding characteristics of problem-based learning are: (a) challenging students to find solutions to real-world problems and the beginning of knowledge exploration; (b) putting students at the center of their learning; (c) focusing on critical thinking skills; (d) students are divided into small groups for more effective learning; (e) there is integrated knowledge content; and (f) students take charge of the learning process.

3) The Scaffolding technique refers to direct interaction between teachers and students, with the teachers providing assistance through different methods, according to the problems of the students and with the purpose of challenging students to solve problems independently (Wood, Bruner, & Ross, 1976). The factors of facilities, assistance, suggestions and support were provided while the students took time to solve problems or learn something, as the students were in the zone of proximal development. Then, the students have to build knowledge and create understanding to solve problems step-by-step and to adjust their knowledge building and understanding, also known as internalization, in order to acquire new knowledge and improve their literacy. Then, students can direct themselves in learning, increase their self-confidence and acquire more knowledge (O'Connor, McDonald, & Ruggiero, 2014).

The examples of active learning and teaching techniques mentioned above offer the potential to provide students with new way to develop their problem-solving, critical thinking, and communication skills. The activities in active learning also enhance metacognition that promote students to learn skills, acquire knowledge and strategies, and develop attitudes more effectively. Therefore, education for the 21st century requires teaching students show to learn on their own.

Active Learning and Student Outcomes

There is research evidence showing that active learning encourage the students learn more, enjoy the class, and able to retain the information longer when compared to traditional teaching methods. Bonwell and Eison (1991) indicate that active learning leads to better student attitudes and improvements in student thinking and writing. It also indicates that some forms of active learning surpass traditional lectures for retention of material, motivating students for further study and developing thinking skills. Studies by Johnson, Johnson & Smith (1998) found that collaborative and cooperative learning improved academic achievement, quality of interpersonal interactions, self-esteem, perceptions of greater social support, liking among students, student attitudes, and retention in academic programs. Problem based learning produces positive student attitudes (Prince, 2004; Vernon & Blake, 1993; Norman & Schmidt, 2000). Moreover, the evidence also indicates that problem-based-learning enhances long-term retention of knowledge and improves both study habits and student performance (Norman & Schmidt, 2000; Gallagher, 1997). According to Dole et al. (2007) regarding learning results, students who used heuristic techniques to solve problems were able to score higher than students who learned by traditional textbook and lecture-based learning. Similarity, Henard & Roseveare (2012), stated that the use of active participation techniques enabled students to increase their level of achievement.

Based on the literature review, it was found that the learning management techniques support the active learning outcomes of the learners. Understanding the processes of a particular school's context could be applied to schools which have similar contexts.

Methodology

Research Design and Participants

A qualitative case study approach was used in this study. Fourteen primary and secondary schools from Chiang Rai district in the north of Thailand volunteered to participate in this research project as they also were a part of the Education Reform Lab and Coaching Lab that was launched in 2016 by Thai Ministry of Education (Office of the Educational Council, 2015).Chiang Rai district was selected as a setting area because the schools here have highest scores in the Ordinary National Educational Test (O-NET), which is a national level exam for students aimed at quality control of the curriculum. The key informants were divided into two groups; the first group was fourteen school directors and fifty teachers who were willing to learn and willing to cooperate and had experience of educational management at least once per semester. In addition, the key informants in this group were willing to accept the planning and operation of their method of educational management provided by the director of the Provincial Office of Education in the Chiang Rai District of Thailand.The second group were sixty students, who studied in the primary and secondary levels, but also learned with the teachers who were willing to take part in educational reform for at least three months.

Data Collection

Data collection was conducted using in-depth interviews by using key questions as a guideline or scope of the area of interest. Along with this, story-telling method was a useful

tool for helping the researchers collect rich data from key informants by using "Wh" questions to ask for the stories about their experiences, such as what, when, where, and why. The observation was conducted using non-verbal gestures, body language, and behaviors during the interview processes, and was used for verifying the congruence with the verbal content obtained.

Data Analysis

The recorded interviews were transcribed and summarized verbatim. The main ideas were derived using the content analysis. This method involved three main steps: Preparation of data, defining the unit or theme of analysis, developing categories and coding scheme, drawing inferences on the basis of coding or themes, and presentation of results (Denzin & Lincoln, 1994; Krippendorff, 2013).

Results

The results of this research study are divided into three parts according to the research objectives:

Part 1: Active learning process applied by teachers

Part 2: Student Learning Outcomes from the Active Learning Processes applied by Teachers

Part 3: Guidelines for Active Learning Management Process for Teachers to Enhance the 21st Century Skills in students

Part 1: Active Learning Processes applied by Teachers

Some of the active learning processes applied by the teachers, who participated in the learning reform project for developing the student-centered approach, which had a powerful impact upon students' learning, were problem-based learning, project-based learning and the scaffolding technique, as shown in Table 1.

Table1

Active learning processes applied by teachers

Issue	Problem-based learning	Project-based learning	Scaffolding technique
Learning management process	1. Doing tests on knowledge content before starting to learn 2. Providing primary knowledge before starting learning activities 3. Allowing opportunities for students by offering to teach what they would like to learn	1. Teachers provide basic knowledge about projects before starting learning 2. Teachers prepare activities that will encourage the interests of students and the activities must be interesting to draw the attention of students 3. Teachers assign students to divide into groups to	It is not restricted for the teacher in terms of how many procedures they have to follow. An emphasis was placed on setting examples with continual advice. Next, teachers

Table1 *(Continued)*

Issue	Problem-based learning	Project-based learning	Scaffolding technique
	4. Dividing students into groups for doing activities 5. Establishing rules for doing activities together in classrooms 6. Allowing students to do activities independently 7. Having students sum up what they learned from doing activities and presenting their own tasks 8. Assessing outcomes about learning management and based on real-life situations.	explore knowledge by using the team work process 4. Students explore knowledge 5. Teachers assign students to sum up what they learned from these activities by asking students questions that can lead to summarizing what they have learned 6. Teachers allow students to present outcomes about what they learned while teachers design activities or schedule times for students to present what they learned.	reduced their roles in helping until students could successfully perform tasks on their own. Meanwhile, teachers can choose the methods and techniques suitable for the learning of the students.
Subject areas	Math and Thai language	Science and Computer	Foreign language, Math, Thai language, Computer and Science
Required skills	1. Knowledge of what they are teaching 2. Learning outcome assessment	1.Knowledge of what they are teaching 2.Exploration of information literacy skills 3.Skills in giving advice 4. Skills in making instructional media.	1.Student assessment 2. Scaffolding technique strategy.

As seen in table 1, the study found that problem-based learning and project-based learning are learning approaches in which students participate in their learning responsibilities. Students are active in every step of the learning process starting with problem inquiry, collaborative, critical thinking and knowledge sharing. Instructional strategies intended to engage students in an authentic approach to enhance learning. Students are given open-ended projects or problems with more than one approach or answer, intended to simulate professional situations. Students work in cooperative groups for extended periods of time, while the teacher functions as facilitator or coach. The scaffolding technique was employed to support problem-based and project-based learning to better improve learning.

Part 2: Student Learning Outcomes from Active Learning Processes applied by Teachers

The study found that after organizing active learning management, three elements had a positive effect on students' active learning: having motivation towards learning, having a positive attitude during learning, and changing learning behaviors and 21st century skills

Having motivation towards learning

The results of the study regarding the learning outcomes of students were obtained from active learning and revealed that in terms of cognition, the students were more positive about learning and had more motivation for learning. With regard to their learning attitudes, it was reflected in the attention paid to lessons, confident in their expression and happiness with learning. With regard to learning motivation, it was found that students wanted to learn more about the subjects they were competent in and persuaded their friends to like these subjects. Meanwhile, students had motivation in terms of eagerly exploring information about the content that they are interested in.

> When the science class comes, we hurry to the class feeling excited about an enjoyable lesson. (Student 2)

> During this class, I really enjoy answering questions. The teachers prepare books and computers and we are trying to fight with other classmates to find the answer. It's great. (Student 3)

> I have realized that students pay attention to the lesson in class. Normally they like to play football, but during my class, the head of the group tells his friends to concentrate on my instructions. They love this way of learning. Once I said, pay attention, otherwise I will go back to teaching in the conventional way I did before. As a result, they focused and told me that my class was excellent. (Teacher 5)

Having a positive attitude during learning

The results of this study on the learning outcomes of students obtained through active learning revealed that the findings on emotions and feelings were found to be both positive and negative. The positive emotions came from liking or enjoying learning, for example; the students preferred attending school, they felt good about exchanging knowledge and experiences with their classmates, the students enjoyed exploring knowledge independently and students were also happy to be accepted by teachers and friends. With regard to negative emotions and feelings, the students that were worried about learning were those with learning disabilities (LDs). The students with learning disabilities were worried about submitting their tasks to meet deadlines and an inability to catch up in class.

> Sometimes I am worried because my friends work hard on this. If I lose my focus, it might be hard to follow them. (Student 1)

> When I am with friends and have a discussion, it is terrific. When I presented our project to the teacher and passed, we forgot everything but the happiness. (Student 4)

> The student with the LD is so slow. I always tell him not to be worried and tell him I am happy as long as you are concentrating. Consequently, he shows more efforts. (Teacher 1)

Changing learning behaviors to achieve 21st century skills

The results of this study were concerned with the outcomes for students, which were obtained through the active learning process and revealed that these students mentioned scheduling their learning, concentrating on learning, the ability to understand the main points of lessons and the development and use of learning techniques. The details of each point are explained further.

Scheduling for learning: students arranged their own schedule with teachers when revising lessons. The smarter students were successful with scheduling their learning times but some students with learning disabilities were less successful and teachers had to tell them and they required more time in terms of teaching and learning.

> I teach my friends who don't understand the lessons well. Teacher always says that if you need to study this way, you have to help one another. The teacher matches me with one who is slower than me to help her study. We spend some time together after school because our houses are close to each other. (Student 5)

> Students can allocate time so well. Some groups needing helps ask for an extra hour to figure out how to improve the project. I am always available to give suggestions. I am so happy to see they love to learn. (Teacher 3)

Focused on learning: teachers noticed that students had more concentration and paid more attention to what they were taught. Students could get many of the main points in lessons, they could summarize and become aware of the importance of the contents. They could tell a story and apply the contents to be used in their daily lives.

> The students pay full attention and can answer questions especially, what are related to their daily routines because they can answer easily. I am so relieved. (Teacher 9)

> The teacher told me to draw a conclusion from the lesson, so we helped one another to finish it. Some issues we could consult the teacher about. Finally, we got 5 stars, so happy. (Student5)

Using a learning technique: students used mind-mapping techniques to summarize what they learned and some learning aids, such as multiplication tables.

> The teacher taught how to make mind-map. At first, I was so confused, but now I just take a look and I understand whatever the teacher has taught. (Student 4)

> I employed multiplication table to help them understand more easily. It helped students to understand more quickly. (Teacher 1)

Self-preparation for tests: in the groups of smarter students, they also gave significance to tests. They grouped their classmates and made a lesson revision together. The students also completed the exercises on the supplementary sheets.

> Before the exam day, we studied together to achieve a high score. We gathered after school because we were hungry at noon, so the evening was the right time because we don't have trouble going back home late. (Student 3)

> I am so happy when seeing that they gather around to practice. Most are top students. (Teacher 2)

The results of the study regarding the outcomes of the students obtained from active learning revealed the outcomes of 21st century skills, as follows:

Learning and innovation skills: students could apply what they learned in their daily lives, such as observing Thai words in public places and searching online for how to spell the words. Some students also picked up the spelling of Thai words from a television program.

> When I can't read some words and want to know suddenly, I will be allowed to use the Internet, surf Google like the teacher taught me. I am happy to find certain words, so I can tell my friends. (Student 2)

> Students told that they spelt after what the T.V. said. Whatever could not be read, they came to me and asked to check Google. (Teacher 2)

Information, media and technology skills: students could search and explore deep content on the internet, such as designing multiplication table worksheets on the computer by themselves and they could make mind maps related to computer lessons.

> I use Google to search for what I want to know, then I ask a teacher again to make sure. I feel proud when the teacher tells me it's right. I boast about it to my friends. (Student 4)

> Students have improved their technological skills dramatically. They designed their own multiplication table on a computer. It was marvelous! (Teacher 4)

Life and career skills: students can apply what they have learned in their daily lives, such as using multiplication tables when buying goods and spelling words from advertising boards with accuracy and fluency.

Part 3: Guidelines for Active Learning Management Process for Teachers to Enhance the 21st Century Skills in students

The active learning management process consisted of three steps, as follows:

1. Understanding the background of students. Teachers have to create understanding and to learn about students so that they will be able to choose more appropriate techniques and instructional media that support their teaching and reached the set goals of the students. The

analysis of student background factors included an assessment of the general characteristics of the students and identification of their fundamental ability.

1.1 An analysis of the general characteristics of the students refers to taking the following factors into consideration, including age, gender, grade level, intelligence level, race, culture, religion, etc.

> Hill-tribe students are very shy. When teaching them, teachers have to build rapport to prevent them from missing classes, try to question them, observe their behavior, what they do and what they avoid doing, and encourage them to do something they cannot do in the first place until they are proud of themselves. (Teacher 8)

1.2 The identification of the fundamental ability of students; when teaching a lesson, first of all teachers should consider what kind of knowledge and skills the students have. The psychological factors had an influence on the attention of students and their efforts to learn. The teachers had to take the following into consideration: attitude, motivation and anxiety, so that students were able to learn as expected in the objectives.

> Students have varying skills but the important thing is their attitude towards each subject. Then, teaching that is full of process and has outstanding features, students are allowed to do activities by themselves and finally have pieces of work, their works will clearly represent the outcome. (Teacher 1)

> Teaching starts from an easy to a difficult level, should be adjusted to meet the grade levels of students. (Teacher 10)

2. Employing active learning techniques. Active learning is a process of teaching and learning that focused on variations in practice. Knowledge can be obtained from the direct experience of students who play important roles in exploring knowledge and learning through interaction until they understand the content. Learning activities allow students opportunities to practice by themselves rather than listening to teachers. They can analyze, synthesize and perform assessments in order to apply what they learned in a creative way and developed themselves to their fullest capacity. The use of active learning technique is comprised of preparation of lesson plans on the basis of the active learning method, the learning management process, self-teaching and practice among students, the learning management process to develop the thinking processes of students, using various instructional media in teaching, creating a participatory classroom environment, and creating an environment that supported students in the construction of their own knowledge. The main emphases were as follows:

2.1 Preparation of lesson plans based on the active learning method. The preparation of lesson plans are the preparation of subjects to be taught throughout the semester for creating activity plans, teaching aids, materials and teaching techniques, and measurement and assessment practices consistent with the minor objectives of each learning unit. The active learning method can be implemented with lesson plans or sub-learning units that have appropriate content for the active learning method, such as problem-based learning in Mathematics or using the Scaffolding technique. Student assessment is performed individually to identify which extra lessons may be required. The obtained information will be recorded and adjusted in the lesson plans. Moreover, teachers have to determine which types of instructional media used in the lesson plans will be appropriate for the learning levels of the students.

> It is written in the lesson plans of some learning units that the content can be taught with problem-based learning, such as the mathematics units. (Teacher 11)

> Supporting learning activities are provided with the scaffolding technique. Scaffolding assessment is done individually by recording in the school-record. The individualized educational plan (IEP) is written for students at the Prathomsuksa 2 with disabilities. (Teacher 1)

2.2 The learning management process for student self-teaching and practice. Teachers organize learning management by encouraging students to learn from concrete experience leading to knowledge and understanding of abstract concepts. The emphasis is placed on practice, which can be implemented with groups or individuals. The teaching principle is that teachers have to provide situation for students to have hands-on experiences with learning, encouraging students to reflect on their thoughts and discuss what they have gained from the situation. Such activities can lead students to a better understanding.

> Students are happy to learn science, they enjoy doing and practicing things by themselves, they have more skills. (Teacher 11)

> In teaching that is full of process and has outstanding features, the students are allowed to do activities by themselves and finally have pieces of work, and their works will clearly represent the outcome. (Teacher 4)

2.3 Learning management to develop the thinking process among students. Teachers use teaching techniques to encourage students to ask questions, think systematically, to provide their opinions, to analyze situations and possibilities, continually extend their own thinking, to consider and distinguish between ideas in a well-rounded manner on the basis of connection with existing background knowledge. Furthermore, they allow students to share their opinions and have discussions in the classroom. Teachers also give advice and come to conclusions based on principles. Finally, giving students opportunities to develop their pieces of work and the ability to create new things and teachers may lead them in terms of critical problem-solving and applications in their daily lives.

> My teaching technique is encouraging students to have a thinking process and to let them practice in real situations so often that they can understand the process. (Teacher 4)

> Start with giving advice and allowing them to think from topics they use to make their projects. A project is a significant process to reflect on what happens. This technique can be suitable for application. (Teacher 9)

2.4 The use of varying instructional media in teaching active learning management requires instructional media and innovative technology. The media must be clear and stimulate students to create a mental picture or an idea of something. These types of media can be obtained from the local cultures based on the context of the area to increase learning interest and allowing the interaction and participation of the students in terms of instructional media and group arrangements.

> Students will be enthusiastic and happy if media and games are used in teaching. They enjoy learning by playing. (Teacher 7)

2.5 Creating a participatory classroom environment. Participation is the creation of an interaction between teachers and students or among the students themselves. In the first place, teachers have to understand the characteristics of the students to organize learning management that suits them and to construct learning by student participation in learning management. The aspects of body of knowledge, interaction and collaboration were used by the students to help rather than in competition with one another. When the content did not cover all of the aspects, teachers will add more knowledge.

> We start applying this technique for use. Students communicate and discuss with us more, they can give their opinions, they can speak.... talk to us about something that they do not understand regarding the content. Teachers also understand students more. It simply looks like having more understanding between each other. (Teacher 10)

2.6 The creation of environments to support students in constructing their own knowledge. Learning management allows students to perform activities, to explore knowledge independently will help to develop systematic learning in the cognitive domain. It is suitable for development at the level of creating understanding and applications in real-life situations as well as analysis. The students will develop a mental picture or idea of something and bring to connect with things in their real world context and leading to further development and creative ideas accordingly.

3. Reflection during the learning management process. The *After Action Review* (AAR) was conducted regularly after the learning management techniques at all levels of the school once work is completed. A revision is made together between teachers and the teachers who provide teaching, teachers and students, and principals or school directors and teachers to find out whether or not all of the activities reached set goal or not. It is an exchange approach to identify the good points or values to be preserved and the weaknesses or pitfalls that need improvement and the solutions for future performance.

> AAR is conducted between teachers and teachers, teachers and students, in many activities concerning the sufficiency economy. Students are assigned to make projects and conduct AAR together in *Prathomsuksa* (Primary grades) 4-6 levels. (Teacher 1).

> Knowledge obtained from an exchange approach, AAR is introduced by Teacher Ting and applied in the school for an improvement. (Teacher 4).

> AAR is conducted between students and students, students and teachers, and teachers and teachers. For example, what we can see from Thai language subject, there are different types of students in school as they are classified individually. When we face new problems, sometimes by talking with students we cannot get all the information, but when students talk to each other, more information can be obtained as they talk to each other in many aspects. When we know the problems, we can apply it to use in teaching methods. (Teacher 6).

Discussion

Based on the results, the discussion was divided into three parts according to the research's objectives.

Active Learning Management of Teachers who Participate in the Learning Reform Project

The active learning includes problem-based learning, project-based learning, and the scaffolding technique. The results showed that Problem-based learning starts from problems that the students experience and content related to the lesson. Therefore, teachers have to adjust their learning management plans to attract the interests of the students. Students are able to pursue and persist in critical thinking, group interactions and collaborative learning. This finding was consistent with Makmee (2011) who found that PBL promoted critical and creative thinking. Students can participate in learning, practice more and practice self-management

Project-based learning enhanced students' knowledge by working in groups. Project process management refers to the written and the tangible activity outcomes obtained. It is consistent with the research of Yoelao, Kasemnet and Janesawang (2014), who claimed that project-based learning was learning management based on teachers who act as encouragers to identify the interests of their students for use in activities concerning independent searching for knowledge by the students themselves. The students can obtain more knowledge from practicing through management of the project process and the activity outcomes were tangible.

The scaffolding technique assisted and supported students' learning through demonstration, encouraging questions, and feedback. The amount of assistance will be lowered while students gradually increase their abilities when performing their tasks. It is consistent with the work of Rosenshine and Guenther (1992) who claimed that the goal of assistance is focused on allowing students to perform their tasks independently and successfully and the teachers then decrease their assistance accordingly. Findings from reseach related to scaffolding revealed that teachers played an important role at the beginning of the course, helping the students to become accustomed to the online learning process, encouraging them to express their ideas and explaining the lesson (Wansaman & Laohawiriyanon, 2016)

Student Outcomes Obtained from Active Learning Processes applied by Teachers

Based on this finding, it showed that there were both positive and negative emotions. Positive feelings can be expressed by their enjoyment, their preference to learn and to feel good exchanging their knowledge, interacting with classmates, enjoyed exploring knowledge independently and were students happy to be accepted by their teachers and classmates. Similarly, the findings presented of Mohammad (2017) indicated that students had positive feelings about PBL, such as that it can help them to acquire new knowledge. Baysal (2017) concluded that PBL can arouse positive feelings in students. With regard to negative feelings and emotions, students can express the feelings of anxiety about learning. In particular, students with learning disabilities may worry about submitting their homework on time and being unable to catch up with their lessons. For example, in the use of a guided project-based instructional approach synthesized and described by Bayer (2016), students often had a negative perception of statistics and as indicated by reports, there were high levels of apprehension and anxiety, negative attitudes, a lack of motivation, a lack of interest and a lack of understanding when it came to practical importance.

Moreover, it was found that the students expressed this through scheduling for learning, learning concentration, getting the main points of the contents of the lesson, using mind mapping techniques to create a knowledge summary, and using learning aids such as

multiplication tables or preparing themselves for a test.It was also consistent with medical literature, in particular by O'Donoghue, McMahon, Doody, Smith, & Cusack (2011)who claimed that PBL students displayed deeper learning behaviors, such as conceptualization and reflection, leading to the enhanced development of lifelong learning skills; and (4) 21st century skills. Similarly to the research conducted by Dole, Bloom, & Doss (2017) found that the PBL experience allowed students to collaborate in a real-world context, promoting readiness for the future and in terms of 21st century skills, helping students to become "career and college ready".In addition, these outcomes were consistent with the aspects of active learning described by Ketpichainarong (2014; Maneechot, 1997) who found that active learning improved analytical thinking, problem solving, student achievement and allowed students to demonstrate better learning behavior.

Guidelines for Active Learning Management Process for Teachers to enhance the 21st Century Skills in students

Based on the findings, good practice in active learning can be summarized in the following two aspects: (a) the identification of students background and ability; and (b) the preparation of lesson plans with the active learning method. This was consistent with the findings of Leelajaraskul (2000), who stated that promoting a positive learning environment can encourage students to practice how to help each other and a positive attitude towards learning. Furthermore, the researcher used various active learning activities during the organization of learning management by asking questions and immediately providing feedback to students. It can encourage students to be enthusiastic and to not feel bored. This was consistent with a research study conducted by Johnson, Johnson, and Smith (1991) claiming that teaching can change a learning atmosphere and allowing interactions between teachers and students, such as asking questions or group discussions among students. Additionally, the outcomes of good practice are comprised of learning and innovation skills that determine the readiness of students entering the working world, which is even more complicated these days. These skills include creativity and critical thinking innovation, problem-solving, communication and collaboration, information, media and technology skills. Since today information and news are transmitted through media by various types of technology, students should possess critical thinking skills and perform different tasks by using a wide range of knowledge, such as knowledge about information, media, technology and life and career skills. In order to work successfully in the modern world, students have to develop the following life skills: flexibility and adjustment orientation, creativity and being oneself, social skills, cross-cultural skills, being builder and manufacturer, credibility, as well as leadership and responsibility.

Recommendations

It is recommended that the teachers in other schools in similar contexts in Thailand could applied the guideline of active learning management process by following three steps: understanding the students' background, employing active learning techniques, reflection during the learning management, in order to enhance the 21st century skills for students.

This study was limited to the context of northern part of Thailand where the teaching and learning is different from other regions. It is recommended that future studies should be expanded to other regions so as to comprehensively cover different social and cultural contexts in order to synthesize coaching and mentoring models for learning management in schools in

each area. This could include being able to compare the differences, and develop good practice guidelines for active learning management among teachers. A comparison could be made between participating and non-participating schools in the learning reform project applying the student-centered approach to enhance the 21st century skills.

Future researchers could use varied research designs, especially participatory action research, in order to obtain valuable insights from other stakeholders.

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