

# **N**ovice Teacher's Learning Through a Project-Based Learning Class

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## **Abstract**

*This study aims to observe all circumstances in an actual Project-Based Learning (PBL) class, particularly to reflect on what the teacher learned through the PBL class. The subject, who is also the researcher, works as a teacher at Darunsikkhalai School for Innovative Learning (DSIL). The study was conducted when she was working as a teacher/facilitator at DSIL for 3 years. The instrument used in this study was a 12-week diary of the teacher. After finishing class, the teacher recorded her teaching performance, feelings, attitudes, challenges and successes in her diary to observe and reflect on her teaching. The findings show that the teacher faced some challenges and achieved some successes in the PBL class. The challenges that she had encountered could raise her awareness in teaching and running the project. This study may shed some light on and raise awareness of the researcher and other novice teachers in schools which adopt PBL as the learning and teaching approach.*

**Keywords:** novice teacher, project-based learning, constructionism, facilitator, diary, reflection, reflective teacher

## **1. Introduction**

In the modern world and globalization era, access to unlimited information and knowledge has increasingly become an unavoidable part of human life. Due to this circumstance, the Ministry of Education led by the Office of the Education Council (OEC) in co-operation with scholars, academics and personnel responsible for education has reformed Thai education to fully develop Thai people in all aspects as proclaimed in the provisions of the National Education Act of B.E.2542 (1999)(OEC, 2008). According to the National Education Act of B.E.2542 (1999), learners were to focus on the aspects of

self-learning, self-development and learning process. Also, the Act aims at enabling learners to develop themselves at their own pace and to the best of their potentiality.

Darunsikkhalai for Innovative Learning School (Darunsikkhalai School or DSIL) is one of the schools which responded to the enactment of the 1999 National Education Act. According to the history of the school, it was established by King Mongku's University of Technology Thonburi (KMUTT) in collaboration with Suksapattana Foundation, Thaicom Foundation, and the Future of Learning Group at Media Laboratory of Massachusetts Institute of Technology (MIT) in November 2000. Since 2000, the school has been fully using Constructionism introduced by Seymour Papert and Learning Organization Culture by Peter Senge (DSIL School, 2011). The school has also adopted Project-based Learning (PBL) as a teaching and learning approach. Students are encouraged to learn by doing and creating their project collaboratively with their peers; meanwhile, they are supported by teachers acting as facilitators.

According to Papert, he introduces 'constructionism' as a cognitive learning theory (Tangdhanakanond et al., 2006) which believes that humans generate knowledge and meaning from an interaction between their experiences and their ideas. According to Han and Bhattacharya (2011), through constructionism, knowledge can be constructed in the mind of learners; also, learners learn well and can create their best when they are actively engaged in building objects and sharing ideas with other people. Chinsiraprapa (2007, cited in Buapetch, 2009) also states that constructionism is a learner-centeredness learning through practical doing to encourage learners to construct knowledge themselves, to develop their learning process in life skills, to use technology, to motivate learners to plan and think, to work systematically and collaboratively and to solve problems themselves. It is hoped that by the end of the process, learners can depend on themselves and sustainable life-long learning will be fostered.

According to constructionism, the teaching-learning approach has been helping students to construct knowledge by integrating related content and using technology as a tool in a project-based learning class. The PBL class at the DSIL School is taught and run as one subject for students. All related subject matters such as Science, Math, Thai, and English which follow the curriculum of the Ministry of Education are integrated into the topics in the PBL class that each group of students chooses in order to link to and combine their interest with what basic and in-depth knowledge the students should learn and know in each level. Students spend 13 hours approximately each week. When learning in the PBL class, learners can construct knowledge themselves and learn with other students as a team. Learners are trained to get used to life-long learning and being global citizens as well. Also, it is believed that better learning is not from teachers, but from self-constructing knowledge instead.

To promote learning and teaching approach as stated above, teachers need to adjust themselves, change their roles, attitudes and behaviours in order to fully support learners' development and environment. This situation challenges a novice teacher who is insufficient in educational background, educational theory or teaching experiences. As a result, the researcher working as a teacher at this school wanted to investigate what she had learned from the PBL class as she was quite new to teaching employing constructionism and PBL principles. Therefore, this research was conducted to find out the answer to the question: *What does a teacher learn through PBL class reflection?*

## 2. Literature Review

In order to respond to the changing world, an education focusing on the PBL method has been attempting to place the emphasis on learners and the environment to *live* and *learn* (Buck Institute, 2003). Since PBL has been widely used in education, many educators, scholars and researchers have been interested in PBL, defining what PBL is and applying the approach to teaching and learning in classrooms.

PBL is a system of teaching to involve students in their own learning in terms of knowledge and skills through questioning and making products (The Buck Institute for Education, 2003). Grant (2002) defines PBL as an approach to learner-centred learning which gives learners opportunity to explore topics in-depth. PBL is an approach that is learner-driven to create and ask questions as learners are by nature curious to know. They are helped and guided by teachers so that they can plan and organize themselves before working (Bell, 2010).

Besides, Baran and Maskan (2010) suggest that when learners learn in class, focusing on teachers' teaching process and students' learning process is an important key in PBL. Also, they stated that students are expected to be the centre of the learning and to understand the process of learning, instead of just obtaining content. As a result, the role of teachers should be changed from teaching to facilitating learners to understand the learning process and achieve goals. Moreover, it was stated that PBL is derived from challenging questions and inquiry developed by learners that cannot be answered in a traditional classroom; as a result, learners are put in a PBL classroom to answer these questions, solve problems, make decisions and investigate knowledge or topics (Bell, 2010).

Ribe and Vidal (1993, p. 9) state that an objective in doing project work in a language class is like an activity-based learning which is engaging and aims at fun. They also suggest 10 steps in running project work as follows: 1) creating a good class atmosphere, 2) getting the class interested, 3) selecting topic, 4) creating a general outline of the project, 5) doing basic research around the topic, 6) reporting to the class, 7) processing feedback, 8) putting it all together, 9) presenting the project and 10) assessing and

evaluating the project. From the steps in running project work, each student has his/her own way of learning; however, the teacher still needs to limit and control his/her learning to support each student to develop and discover new things. Besides, the duties of teachers in project works are to be initiators, providers of language explanations and corrections, promoters of group co-operation in an appropriate atmosphere, helpers, consultants and evaluators/co-evaluators. Similarly, Fried-Booth (1986) mentions that the steps of doing a project, covering 3 stages as follows: 1) classroom planning—students work collaboratively with the teacher to discuss the content and scope of the project, 2) carrying out the project—students follow whatever tasks they have planned in a naturally integrated way and 3) reviewing and monitoring the work—both during and after the project, the teacher and students have discussion and feedback sessions. According to Ribe, Vidal and Fried-Booth's steps of doing a project, some steps are used in the PBL class at the DSIL school such as creating a good class atmosphere by using interesting activities, doing basic research of the topic by both teachers and students, processing feedback, running activities in the project effectively and successfully and providing students more opportunities to experience and learn about their interests.

Although PBL is still in the developmental stage, it is a good model to increase benefits in academic achievement. That is, PBL improves the quality of learning skills and leads to higher-level cognitive and mind development through students' involvement in solving challenging problems, self-management, complex processes and procedures such as planning and communicating. Besides, there are some particular benefits of PBL such as provide learners more motivation, connect learning at school with learners' reality, be exposed to social and communication skills and problem-solving skills and allow learners to use their strengths and diverse approaches to learning (Railsback, 2002).

Not only do students learn and develop their learning ability through a PBL class, but also teachers, especially novice teachers, who work and help students as teachers/facilitators in classrooms, can learn from their teaching performance in class. Supporting this view, Richards and Lockhart (1996) suggest many approaches to classroom investigation in which teachers can develop a deeper understanding of teaching in a classroom through writing journals, lesson reports, surveys and questionnaires, audio or video recording of lessons and action research to observe and reflect on events and occurrences. Richards and Farrel (2005) state that 'reflective practice' is based on the assumption that teachers learn from experience through focused reflection. However, there are some differences in learning through teaching in class between experienced and novice teachers. One difference is that experienced teachers know better than novice teachers in terms of a typical classroom with expected problems and solutions because novice teachers are less familiar with many things such as subject matters, teaching strategies and teaching contexts. According to inexperienced teachers, there are always more problems or challenges occurring in class for them; therefore, they should learn

from the problems and challenges they encountered in class so that they could reflect on their experiences and improve themselves for the next class.

To develop teachers' experience, for both experienced and novice teachers, in a traditional or PBL class, Richards and Farrel (2005) mention that keeping a diary or writing journal as a reflective practice can be a tool for observing, exploring and clarifying their own thinking, feeling and attitude during a class in different ways such as in a notebook or computer, etc. By doing so, both experienced and novice teachers can learn from the diary/journal to reflect on their teaching performance. Through this, experienced and novice teachers can become more aware of teaching which can lead to a better understanding and more exploring whereby they can gain additional experience in teaching processes.

According to Buapetch's study (2009), there are 5 characteristics of teachers in a PBL class as follows:

- 1) teachers provide students space and opportunities to participate and plan in learning;
- 2) teachers love students and are generous and kind;
- 3) teachers are friendly and open-minded;
- 4) teachers encourage students to express themselves freely and also listen to them;
- 5) teachers are creative in thinking and creating various and interesting activities.

The 5 characteristics above are all significant in a PBL class; however, providing students space and opportunities seems the most important because if teachers give students chances to participate in class freely, it means that teachers are friendly and open-minded and listen to them so that students feel free to express their ideas which leads to creative activities in class from students.

To prepare qualified and suitable teachers for a PBL class, Buapetch (ibid) suggests criteria when choosing teachers as follows: 1) teacher's experience, and not academic results, 2) personality (patience and calmness) and 3) life-long learner and being ready for development all the time. Although some qualified teachers are accepted to work in a PBL class, they also need to be trained and educated before teaching in order to help students during learning in the PBL class. Teachers need to prepare themselves sufficiently before teaching a PBL class in terms of planning, setting goals, and managing class. They also need to continuously develop themselves during teaching and working with students in class and also reflect on themselves after finishing the project.

### **3. Purpose of the study**

Based on the theoretical background reviewed above, the purpose of this study is, therefore, to observe and see the events in a real classroom situation that a teacher faces in a PBL class and to reflect on what the teacher learns from her own teaching performance through the PBL class.

### **4. Methodology**

#### ***4.1 Subject***

In order to achieve the purpose of the study and to get data from the real situation in a PBL class, the researcher working as a DSIL teacher was the subject in this study. The subject's educational background was in Social Sciences, more specifically Anthropology. Before she became a teacher at DSIL School, she had no experience in teaching in any school. This means that she was very new to teaching as a teacher in a school employing the PBL approach. However, the researcher in her role as a teacher in this study had some limitations, for example, she could not find solutions for students immediately or improve herself in that term because of some challenges such as subject matter knowledge in science resulting from her social science educational background. By the time that she conducted this study, she had been working at DSIL School for 3 years. Throughout this period, she had experienced supervision of students for 12 projects ranging from general to science related topics.

In running each project, there is normally one English native speaker (ENS) whose responsibility is to integrate English into the project holistically. Also, an ENS has to work with a Thai teacher to ensure that running a PBL class is successful.

#### ***4.2 Instrument***

A teacher's diary was used as a main tool for the subject to reflect on what was going on in her PBL class. The diary was written by the subject after finishing the PBL class every day, Monday-Friday. There are a total of 12 weeks per trimester for a total of 60 diary entries. Her reflections in the diary included challenges, successes and awareness in running activities in the PBL class.

#### ***4.3 Data collection***

For collecting data, the subject recorded what she encountered and how she felt during the class in her diary after the class throughout the 12 weeks. The diary was divided into 3 phases to match the school's PBL steps. Phase I covers Week 1 which is the planning period between teachers and students. Phase II covers Weeks 2-11 which is the experiential learning of the students and Phase III covers Week 12 which is an exhibition day.

#### **4.4 Data analysis**

The raw data from the teacher's 12-week diary was analyzed in order to answer how the teacher learned and developed herself through the PBL class. The teacher's reflections were grouped based on challenges or problems and successes of teaching. The data was presented based on:

- Phase 1: Planning
- Phase 2: Experiential learning
- Phase 3: Exhibition's Day and Choosing New Project

Below are key words and phrases that helped the researcher categorize challenges and successes from the diary.

- Challenges : *not confident, not know..., not sure, not have self-confidence, lost confidence, degraded..., depressed, not good..., worried, serious, stressful, afraid of, not familiar..., got stuck, tense, far from background, uncomfortable, feel bad and sad, not skilful, hard*
- Successes : *going well, well, fun, feel relaxed, successful, I liked...., good*

#### **5. Results**

From the three phases, the researcher has found that there were both challenges and successes in her PBL class. As the finding shows in Phase 1, the challenges that the teacher mentioned in her diaries were asking and eliciting, PBL classroom management, subject matter knowledge and teacher's language. In terms of successes, two aspects were mentioned in the diaries i.e. lesson plan, and materials and activities.

In Phase 2, as it took 11 weeks for this phase, the number of occurrences of challenges and successes that the teacher mentioned in her diary was more than the number in Phase 1. In this phase, the teacher frequently referred to challenges more than successes. For challenges, these aspects were found: learning aims, lesson plan, asking and eliciting, PBL classroom management, subject matter knowledge, teacher's language, teacher's expectation, and materials and activities. Subject matter knowledge seemed to be the feature that caused severe problems because it was reported in her diaries five times. On the contrary, the successes mentioned in this phase were PBL classroom management and material and activities. From the number of times that she mentioned in her diaries, PBL classroom management and material and activities seemed to be the aspects that she expressed satisfaction with herself frequently.

In Phase 3, there was only one instance of a challenge mentioned, PBL classroom management, and there was not any success found.

In order to elaborate on the findings, the excerpts from the diaries will be shown and discussed as follows:

## 5.1 Challenges

### 5.1.1 Learning aims

According to the variety of learning topics based on the focus of the projects in the PBL class as planned in the first week, there were many hands-on activities supporting the learning topics. Thus, informing the students about the topics and purpose before starting each activity in a classroom is important. However, if the teacher failed to explain the aims or purposes of doing the activities, it could affect the students' understanding in doing activities and the students' learning outcome. The steps might go in the opposite directions of what the teacher expected.

*The result of what the students did and what I had expected about Lego organizing were different. I think it was because I did not tell them the exact purpose of organizing Lego before running the activity and I did not communicate clearly to them what I would like them to do, so they were confused and did their work based on their understanding.*

*(Diary: Phase 2\_Week 2)*

### 5.1.2 Lesson plan

Normally, the lesson plan is planned by teachers and students and set as weekly plans in the first week. The plan will include topics and activities that the students are going to learn in class. Although the lesson plan is set at the beginning of the project, it may be cancelled or changed to other plans or moved to other weeks because of several factors such as students' delay in working, the school's activities and etc. From the diary, these factors affected the smoothness in running the activities.

*I felt unsuccessful and confused in planning because the student who was the leader of the game today was absent and the rest of the students in the group could not lead the game. Also, there were many plans today that teachers would like students to do. Finally, I decided to let them play jigsaw puzzle and integrate the knowledge from last week and today together.*

*(Diary: Phase 2\_Week 5)*

*...actually we had planned to learn about Lego Programming and how to program the Lego today, but we had to switch the topic 'Astronomy' up to this week because the specialist in Lego could not come and teach the students this week.*

*(Diary: Phase 2\_Week 6)*

### 5.1.3 Asking and eliciting

To enhance students-directed learning in the PBL class, asking students questions and explaining clearly when needed are the main teaching strategies of teachers in the PBL class at DSIL School. Asking and eliciting encourage students to be more involved in thinking, creating, learning and doing activities. Also, what and how the teachers ask are the techniques that motivate the students to be interested in what they are learning and to get more knowledge themselves. Below is the example involving an unsuccessful question used by the teacher when questioning.

*...from the reflection session, the students rarely spoke I don't know why. Maybe, it was because of my questions making them confused. I felt I spoke a lot in this session.*

*(Diary: Phase 1\_Week 1)*

### 5.1.4 PBL classroom management

To deal with managing a PBL classroom, there are three related factors which should be of concern to the teachers. They are 'time', 'grouping' and 'the students' discipline'. During learning and doing activities in a PBL class, there might be problems with limited time, interacting with different discipline/behavior of students and grouping of students. These are the challenges that the teachers have to be concerned with in order to run the classroom activities successfully and to improve the students' discipline/behavior. Below were some situations of PBL classroom management which the teacher could not manage while teaching.

#### a. Students' discipline

Due to flexibility and freedom in the PBL class, it was hard for the teacher to manage the student's differences and interests. This confused her, and also it affected her performance in balancing the students' freedom, discipline and responsibility as shown in her diary below.

*According to the way of learning in DSIL style, it often confused me and I did not know how to balance and make the students in the class understand and realize "freedom", "discipline" and "responsibility" properly. I think that it is very hard for me to let them realize and understand those things because the students are not mature enough and they still would like to play and do what they want and like to do such as ignoring homework, playing and eating in the class etc.*

*(Diary: Phase 1\_Week 5)*

### *b. Time*

Time was very important when the students were working and doing activities in class. Sometimes they faced special problems during working so they had to fix the problems by re-thinking and working again on their work.

Sometimes they needed to discuss in groups to fix problems which took time to find the solution. This affected the amount of time spent in class and other activities which had been planned. However, it was good that they had a reflection session to discuss among themselves and they also learned from some mistakes.

*I think I had the problem with managing time for discussion part today because we spent too much time on discussing and explaining ...this affected the time to do other activities in the classroom.*

*(Diary: Phase 2\_Week 4)*

### *c. Subject matter knowledge*

Integrating academic knowledge such as science, mathematics, social studies, English, and so forth, into a project is one part of a PBL class. Due to the limited background knowledge of the teacher, the challenge of the teacher in preparing for subject matter knowledge was mentioned in the diary almost every week. This is because she did not have enough in-depth knowledge in these fields. However, the teacher had to integrate science and mathematics into students' learning. This caused a lot of difficulties for the teacher from the beginning of the project. Also, this challenge caused many negative affective factors such as boredom, demotivation, self-confidence, degradation, worry, seriousness, confusion, discomfort and etc. as shown in the following diary excerpts.

*I did not have much self-confidence like I had two years ago. I've lost my confidence gradually. I felt like I was degraded by doing unfamiliar work in a PBL class because I had to work on what I am not good at, like in science area.*

*(Diary: Phase 1\_Week 1)*

*Before the class, I had thought that the learning atmosphere in PBL class today would be relaxed because we had only one hour. In contrast, it was so tense because of the content today. The content today was about 'gears', types of Lego gears and how real gears work. I did not have much background knowledge about this topic. I was a bit worried about the knowledge of 'gears' which is very far from my interest and background.*

*(Diary: Phase 2\_Week 4)*

*I felt uncomfortable when I could not help students as much as they wanted because Lego and programming were new things for me and I knew about them too little to help students, .... There was a student who had a problem with 'momentum' and asked me about that, but I could not explain to her because I did not know what it was. This made me feel bad and I lost face. From this problem, I do not know how to make myself understand some topics which are not my background, how to explain to the students to understand and how to digest the difficult topics to the students or make it easier to understand for the students.*

*(Diary: Phase 2\_Week 8)*

The challenge in subject matter knowledge also affected the teacher's limitation in helping and giving suggestions to the students. This also prevented the students from gaining sufficient knowledge and benefiting from learning from the teacher who did not have science background knowledge.

*During building Lego, although there were many problems occurring with RCX, Lego pieces and programming, I could help the students with just a few problems because I was not skillful at Lego and programming. Sometimes it was hard to me to learn new things in a limited time in order to teach the students and some topics were hard to understand; it may take time to learn about some specific subject matters.*

*(Diary: Phase 2\_Week 7)*

*I understood programming very little and not in depth. If the students faced the problems, I don't think I could help them to solve the problems. I think it is a weakness of mine, as facilitator, who is not skillful in what the students are interested in....*

*(Diary: Phase 2\_Week 8)*

*...the students reflected to the group that I could not help them in terms of Lego and programming as much as the expert did and I made them not get anything new like they had expected. This made me feel sad,....*

*(Diary: Phase 2\_Week 8)*

#### *d. Teacher's language*

Since the teacher had an educational background in social sciences and insufficient and limited background in science, she could use English limitedly when teaching Lego, physics and programming. This affected her speed and frequency in speaking English,

using science words and confidence. Besides, the teacher could not guide the students effectively and could not provide useful content to the students as reported in her diary below.

*These made me feel depressed. The rule of speaking English in a PBL class made me worried and serious because I think that I might not be able to speak English all the time in the class especially when I had to speak English in the situation that I was not familiar with such as science field. I got stuck many times in what I wanted to say in my head.*

*(Diary: Phase 1\_Week 1)*

*Whenever I had to speak English especially for the topics that I was not good at, my speaking was always slow because many times I had to think in Thai first and then translate into English. Thus, in the PBL situation, I felt not confident and I didn't know what English words/vocabularies I should use. During the class today, I rarely spoke English.*

*(Diary: Phase 1\_Week 1)*

*While I was doing activity with the students, I was trying to speak English with them, but sometimes I was not sure about some words in English, so I just talked to students with the basic conversations which were related to working and learning process that I knew.*

*(Diary: Phase 1\_Week 1)*

#### e. Teacher's expectations

According to the learning style in a PBL class, there are many requirements teachers expected students to meet such as using learning skills efficiently, having self-discipline, understanding basic subject matter knowledge, using presentation skills successfully, and so forth. As a result, the teacher also has many expectations on the students' learning. This made the teacher often have worries while the students were learning and working in the class. However, from the teacher's diary, it showed that the teacher highly expected the students in their presentation skills to show their ability to other students what they had learned in the project. The teacher was disappointed with their presentations on weeks 6 and 7 because they did not do well as expected. Her expectations affected her feelings resulting in disappointment, unhappiness, seriousness, tension, and worry.

*I told them the condition that they could not put any word or sentence in the PowerPoint slide; they could instead only put in pictures because I would like them to explain what they have learned and understood from their understanding.*

*(Diary: Phase 2\_Week 6)*

*From the students' presentation, I had too much expectation again with their presentation because I think they still were not as good as I had expected.*

*(Diary: Phase 2\_Week 7)*

On the Exhibition's Day, which was held at the end of the term, the teacher had much more expectation and much stress regarding the students' work and preparation. Her expectation also affected her feelings especially in Weeks 9-11 because the students did not pay attention to preparation.

*...it was the time to practice but the students still seemed not to be able to finish especially the invention group. I thought over and over again why I was so serious and stressful when they were working. I might over-expect the students to do everything perfectly without playing all the time.*

*(Diary: Phase 2\_Week 9)*

*During the students' preparation for Exhibition, I was sometimes worried and tired. I was afraid of the result and also the comments from the parents.*

*(Diary: Phase 2\_Week 11)*

## **5.2 Successes**

Not only were challenges found in the teacher's PBL class, but successes could also be found. When the successes occurred, happiness was there as well. However, it seems like successes were fewer than challenges. Some successes were related to the same aspects mentioned as challenges above.

### **5.2.1 Lesson plan**

As found and mentioned in the challenges, preparing and having a good lesson plan in class since the first week of the project could bring successes to running a PBL classroom in many aspects especially in materials and activities set by the teacher. From the diary, the teacher learned from her previous experience that she should start the project at the beginning of the term with fun activities to get the students ready for learning. As a

result, the teacher and students had a good start on the lesson because of her experience and also she had planned well with her colleagues in the first week to start the project with fun activities. With this technique, the students felt relaxed and had fun with learning in the PBL class.

*The plan today was going well because my colleagues and I intended not to start the content in week 1. From my experience in the previous project, I was quite hurried to start the contents of study in week 1, but in this project we started from the fun things and the overview of the project which made students feel relaxed.*

*(Diary: Phase 1\_Week 1)*

#### *5.2.2 PBL classroom management*

To deal with PBL classroom management in terms of time management, grouping the students and improving the students' discipline properly, the teacher needed to monitor many factors in the classroom to find problems occurring when teaching such as grouping students, spending too much time on each activity, etc. Then, the teacher should analyze the roots of the problems and seek proper solutions as soon as possible.

#### *5.2.3 Time*

When the teacher was aware that she had problems with asking questions and she spent an unacceptably longer time in order to get the answers, she tried to solve the problem by using the reflection session to reflect on what they were doing and to encourage students more to answer her questions. This helped the teacher manage time in class better and also the students understood what they were doing.

*After my questions, no one answered me, everyone was quiet. Then I was trying to encourage them to think about answers. Later on, Mind answered me... Then I wrapped up again what they had to do. Now, everyone understood and was at the same page of working on Lego in steps... Now they knew what to do step by step as we were reflecting and they were working well as a team. I think it was successful to have a kind of reflection to think over again on what we were doing and to check whether we were on the same page or not.*

*(Diary: Phase 2\_Week 2)*

#### *5.2.4 Grouping*

Learning in a PBL class, students need to learn and work collaboratively with other students in groups. Thus, the teacher had to group them properly based on activity types,

students' ability and gender to help them have the opportunity to work with other students successfully. From the class, for example, the teacher had success in grouping students when doing an activity by negotiating with the students. This created good atmosphere and the activity could run well and smoothly.

*We divided students into 2 groups; we separated the groups by students' ability including English ability. I like this kind of formation because we were concerned about students' ability.*

*(Diary: Phase 2\_Week 5)*

*...those students still insisted that they did not want to work alone, so we negotiated among us that they could work together. Finally they accepted the teachers' idea and everything about grouping passed well. There was a compromise among the teachers and students during talking. I think it was good.*

*(Diary: Phase 2\_Week 10)*

### *5.2.5 Materials and activities*

Creating relaxed and fun activities by teachers is a very important part in learning in a PBL class in order that the materials and activities could increase students' attention and participation. From the teacher's class, it was obvious that some materials and activities were more successful than the others because the teacher had experience from the previous project about the types of activity that could be fun and make students happy; the students could do and learn through the concrete activities and experiments from a real place and situation. The excerpts from the teacher's diary that show the successes are presented below.

*.... from the past experience I saw students in many projects decorating the environment around the classroom and the students enjoyed and liked decorating a lot; and also the outcome was very satisfying. So, I decided to let my students in the current project decorate the room.*

*(Diary: Phase 1\_Week 1)*

*The experiment was about riding a bike and a motorbike to see and observe gears' working, speed and force. I could see that all students were very interested in trying to ride a bike. I could see that everyone would like to try the experiment; also they had lots of fun. I could see that riding a motor bike is new and challenging to them.*

*(Diary: Phase 2\_Week 4)*

*Today, we went on a fieldtrip at RCA to study the engine of a go-cart car, and how to control the car. All students were excited and had fun with driving a go-cart car. ...they looked very excited and active to drive. I was very happy and had fun today because the students enjoyed driving and they were interested in the explanation of the expert.*

*(Diary: Phase 2\_Week 6)*

## **6. Discussion**

All challenges and successes reported above showed real situations in the PBL class that the teacher encountered and how she dealt with unsuccessful and successful situations. However, in terms of the challenge, it seemed that the subject matter knowledge and teacher's language caused her many problems and affected her teaching process, managing and teaching motivation in class. These two challenges seemed to be the most demanding for the teacher. In the aspect of successes, materials and activities seemed to be the most successful issues for her while running the PBL class because the students had a chance to participate in and do the concrete and authentic materials and activities both in class and outside the class. Also, they were happy learning the topic that they had chosen. From the results reported above, the following part will be her discussion of what she has learned from her diaries, suggestions for other teachers and schools who want to use PBL.

### ***6.1 Professional development through reflective writing***

As for diary writing, it is a useful, potential and evidential tool for teachers to develop themselves in teaching, especially for novice teachers to manage their class effectively (Lakshmi, 2011). Also, it was meaningful and effective for the researcher that no matter what kinds of situation she faced and whether she could solve the problem, she learned and experienced many points through reflecting on herself through diary writing after each PBL class such as seeing herself clearly in terms of her teaching process, dealing with students and making decisions during teaching to monitor herself regarding what she should and should not do for the next class. In addition, her own diary truly reflected what happened in class, how she dealt with her students, how she felt and what she thought during the class and also what she could and could not do to develop herself.

As reported, there were both problems and successes occurring in class; some problems were not solved immediately such as insufficient subject matter knowledge and teacher language which seemed the most difficult issues for her because she might need more time on difficult topics in order to explain to the students. In contrast, some problems could be solved by her and they could lead to the teacher's self-development in the next class such as teaching strategies in questioning and explaining. However, although the

researcher could not develop herself regarding some problems, they became indicators of her awareness and learning points to be aware of, to consider and to do better for the next project. As for the most important points from the lessons that she had learned from her diaries, she could pass them to the novice teachers at DSIL School who are new to the PBL approach; and also, she could share with teachers in other schools adopting the PBL approach in learning and teaching.

## ***6.2 Suggestions for teachers***

Assessing the researcher's problems, successes, solutions and awareness from being a teacher in a PBL class seemed significant in running a PBL class. Therefore, if the researcher undertakes a new project or there are novice teachers in the school, these are the steps that the novice teachers may follow.

### ***6.2.1 Before the project starts***

To start the project, learning aims and a lesson plan are very important. To be successful in doing so, teachers should take the following steps:

#### ***a. Set a clear goal for the project***

Teachers should know the scope of the project and the subject matter such as science, art, social studies and etc. After that, they should set the project goals clearly for what important knowledge and skills teachers expect students to learn (Railsback, 2002), the objectives and end result of the class (Packard & Race, 2000) and how much the students could learn at their age.

#### ***b. Plan learning topics in detail week by week***

Listing topics by using a mind map may be a good technique to help teachers plan and see the connection of the topics taught in each week. Teachers will have chance to monitor what useful knowledge the students are going to learn under the main topic.

#### ***c. Create meaningful learning activities and contents***

Before the class starts, teachers should spend time preparing materials necessary for performing project activities set in the weekly plan, especially subject contents in which teachers are not skillful. To create hands-on activities, teachers should know and study more from the related resources such as books, textbooks, and websites, so that they can give appropriate structure to students (Packard & Race, 2000). In case of complicated and more difficult knowledge, teachers should invite experts from related fields to teach students. Besides, in terms of integrating science and math, Packard

and Race (2000) also suggest that teachers should focus on investigating activities relating to students' lives because they could connect what they are learning to what they have experienced in their lives.

Additionally, to monitor the improvement of each student's ability, teachers should understand and clearly analyze each student's age, level, learning style and proficiency because each of them has different strengths and weaknesses. When analyzing each student's ability, it is a good idea to use the following five questions as suggested by Railsback (2002) to identify and set the objectives to improve each student:

- What important cognitive skills do I want my student to develop?*
- What social and affective skills do I want my student to develop?*
- What metacognitive skills do I want my student to develop?*
- What types of problems do I want my student to be able to solve?*
- What concepts and principles do I want my student to be able to apply?*

#### *6.2.2 While running the project*

After setting clear goals and designing a good plan of teaching and running activities in class, teachers should follow the goals and plans effectively and actively in class. There are some significant points that teachers should be aware of when running the project in class as follows:

##### *a. Time management*

In a PBL class, there are many activities that students have to do. Especially for the young students, they need enough time to finish their work. Therefore, the school should set the schedule for a PBL class more than one period (50 minutes), so that students could gain optimal benefits from the activities. This suggests that PBL works well if the school provides more time for the PBL class instead of 50-minute periods (The Buck Institute for Education, 2003).

##### *b. Students' discipline*

In term of student's discipline, teachers should know at the beginning of the term which aspects teachers would like each student to improve. Then, at the end of the term, teachers should evaluate students and report to parents about how much each student could improve and if there are any other aspects in which he or she should improve more. Besides, using immediate reflection by talking to students is a good way to help students learn from their mistakes. As a result, students could reconsider what they have done in class, what is right or wrong and what they should learn and improve themselves.

*c. Monitoring and adjusting materials and activities*

Every week, teachers should monitor their teaching process and should be flexible to adjust activities as appropriate.

*6.2.3 After finishing the project*

At the end of the term, teachers should have a meeting among themselves to reflect problems they have faced and report the progress of each student in order to see how much each one could improve. This could be a sharing session in which teachers could learn from each other. It may increase teachers' ability to implement the projects independently in the future.

**6.3 Suggestions for schools using PBL**

For the school administration, suggestions can be made as follows:

*6.3.1 Scaffolding and educating novice teachers*

This should cover the explanation about what PBL and constructionism are, the process of running PBL and what and how to run a PBL class effectively. It is very important for a novice teacher to understand the basic concept of the teaching approach and how to prepare themselves. The school may match an experienced teacher with a novice teacher to work collaboratively in a PBL class in order that the experienced teacher could guide and give advice to the novice teachers bit by bit.

*6.3.2 Providing sufficient time to prepare lesson and materials*

If the school expects teachers to run the class successfully, the school should give teachers enough time to prepare themselves in teaching such as planning and preparing lessons and activities for class. Some inexperienced teachers might need more time to prepare lessons for subjects of which they do not have background knowledge.

*6.3.3 Giving opportunities to teachers to learn from their mistakes in running a PBL class*

The school should encourage teachers to learn from real experiences and mistakes in order that they could develop themselves from what they have learned. Moreover, the school can arrange activities from which teachers can share their learning with their colleagues whether they will succeed or not.

*6.3.4 Giving enough resources to teachers in PBL class*

Integrating various subjects in a PBL class may be a problem for some teachers who are not skilful in some specific knowledge, so giving enough resources in terms of resource persons, books and materials for teachers is necessary in running a PBL class. They may gain more confidence with the support from these resources.

To summarise, it can be seen that to help novice teachers during the adoption and implementation of innovative teaching method, effective scaffolding is very important because it can be used to support teachers' efforts in adopting this approach (Ertmer and Simons, 2015). With this support, it can increase teachers' ability to implement the tasks independently in the future.

## 7. Conclusion

As a novice teacher, who has engaged in using PBL approach, the researcher views that with the lack of experience, novice PBL instructors are likely to encounter difficulties in all aspects of instruction: planning, implementing, and assessing. During this period of frustration, it may be difficult for teachers to find the way out from this maze. Thus, using a reflective method like writing a diary to reflect his/her own teaching is one way to help a teacher get a clearer picture of what he/she is doing. For the researcher, writing a diary is an effective tool to help her learn from her own teaching performance. With this tool, she could reflect on the processes of teaching, challenges and successes of using PBL. When this process, teaching and reflecting, was repeated again and again, the process of transition to PBL is easier. The researcher felt that she was now engaged into PBL implementation. All these issues raise her awareness of teaching because she could monitor her own performance and she could plan what she could do and improve in the next class. Ultimately, it is our hope that the ideas presented here may be useful for other novice teachers who are expected to use PBL in the future. We believe that learning from other teachers' experiences may structure and simplify the PBL process enough to enable teachers to take their first steps without being extremely uncomfortable.

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