

# THE STUDY OF ADOPTING PROBLEM BASED LEARNING IN NORMAL SCALE CLASS COURSE DESIGN

## ABSTRACT

This study adopts the Problem Based Learning (PBL) for pre-service teachers in teacher education program. The reasons to adopt PBL are the class scale is not a small class, the contents are too many to teach, and the technologies are ready to be used in classroom. This study used an intermediary, movie, for scenario to student to define the problems and to search for information in order to report their findings. Since this is not a required course, more than ten people took this course. Therefore, adopting PBL, the groups using, in the normal scale class in higher education is another modification. The purposes of this study are to evaluate this adopting PBL processing and to find the chance to improve the PBL course design. The methodology of this study is the text mining with KeyGraph technology. Thirty seven pre-service teachers' feedbacks are analyzed. The feedbacks were from those students who finished three cycles of the PBL processing. Two of the cycles of the PBL processing are the students learning educational special topics by themselves. The last cycle of PBL processing is to train the pre-service teachers how to run the PBL course in the future. The results indicate that the important factor is "discussion" and rare and important factor is "movie" (intermediary) for adopting PBL course.

## KEYWORDS

Problem based learning, Educational issues, Instructional design, Teacher education, Learner center, Higher education

## 1. INTRODUCTION

Educational reform is not a new topic in education area. Nowadays, the technologies, ubiquitous learning, global education, and collaborated learning are the main topics over the world in educational system not only in K-12 but also in higher education. In other words, the educational reform is from teacher center to student center. All these topics emphasize in helping student to learn and to cooperate. Therefore, many teaching methods are provided which are different from the traditional teaching, such as, lecturing or systematic teaching. Most of these new methods emphasize learning instead of teaching. Problem based learning (PBL) is one of the powerful learning methods during this educational reform period. PBL includes the collaborated learning and technologies learning for student center. Therefore, PBL becomes a popular learning method in course design, especially in higher education.

Some study in PBL focus on to examine the issues involved in designing appropriate problems or scenarios and also design appropriate projects for students (Dobson & Tomkinson, 2012). Some study adopts the PBL in addressing the disengagement of apprentices with the existing assembly-style electronic laboratory program (Monks, 2010). Some study uses PBL courses to assessment the student outcome with elaborated learning theory (Kuruganti, Needham, & Zundel, 2012). According to these studies, PBL is widely used in courses to help students to learn. O'Neill, G., & Hung, W. (2010) even use hybrid PBL teaching method in their course. Therefore, the PBL learning method is used as well as is adopted in different courses. Those studies modify the PBL for their own purposes in their courses. At the same reason, this study adopts the PBL in a normal scale class learning in higher education system. Usually, the PBL is applied to small class learning. However, many classes in higher education are not a small class. As a result, this study modified the PBL strategies in a teacher education course in higher education for pre-service teacher.

Since Freidman (2005) proposed "the world is flat", we noticed that people connected to each other with technologies in societies, economics and other many fields. Nowadays, we are in a global world. To be a global citizen, there are many issues need to be learn, such as green environment, care for the disadvantaged people, etc. At the same situation, there are many important issues in education area, such as gender equality, care about the remote disadvantage school-district, educational justice, teaching theories and methods, classroom management, etc. It is very difficult to cover all the educational issues in one pre-service teacher

course. Therefore, the PBL method seems one of the possible choices for teacher to design a course to cover all these issues. In addition, hoping the PBL can also increase the students' learning motivation. Moreover, the students can lean by themselves and find the interesting issues by themselves. Hence, this study applies the PBL method to design an educational special topics course for pre-service teacher in teacher education curriculum.

Nowadays, the technologies, for example, laptop, iPad, mobile phone, are very popular in our lives. It is possible to use these technologies in the class during the students' discussing period.

Based on these reason, this study adopts PBL in normal scale class in higher education to discuss many educational issues with technologies. The other difference between the PBL and adopting PBL in this study is that the PBL uses the real scenario but the adopting PBL in this study uses movie as intermediary for writing scenario. The purpose of this study is to evaluate the effects of using adopting PBL in educational special topic course design since the PBL method is the first time to be tried on in this course. Although many studies talk about the advantages and disadvantages, different setting may have different results. The evaluation is the students' feedbacks when they finished this course. This study looks for not only the students' opinions but also the chance to improve the course activities for the next time. The data analysis is the text mining with KeyGraph for students' feedbacks. In other words, this study using adopting PBL strategies, find the import and rare-and-important factors for the educational special topics course in teacher education program for pre-service teachers.

## **2. RELATED LITERATURE**

The aim of this study is to evaluate the effects in using adopting PBL in educational special topics course in order to find the important and rare-and-important factors. The evaluation is to know how the students feel about the course as well as to find a chance to help the instructor to design the course for the future. Therefore, the PBL and text mining with KeyGrpah technology are described here.

### **2.1 Problem Based Learning**

Problem based learning (PBL) was found in McMaster medical school in Canada. Neufeld and Barrows (1974) proposed a "McMaster philosophy" term for interpretation the PBL. In Benson (2012) study, he reviewed the literature which was some for PBL and some against PBL. He gave his experience in using PBL in university and concluded that there were no academic or logistical grounds that support the use of PBL, but that it might still be regarded as a worthwhile exercise.

#### **2.1.1 PBL in curriculum design**

Since the PBL was implemented in medical school, many other courses were tried on to design for their own courses. Carrera, Tellez, and D'Ottavio (2003) implemented the PBL in medical course and indicated that schools in developing countries should consider whether a PBL curriculum is even appropriate for them. Also, considering the available research on curricular innovations such as PBL and the particular situations of their countries may help schools anywhere avoid wrong decisions about what curricula to implement. Etherington (2011) used PBL as a new pedagogy in an intermediate composition course. He indicated that PBL made the course easier to implement the social and collaborative aspects of writing as well as PBL allowed students to apply what they were learning in the classroom to contexts beyond the classroom in an immediate and relevant way. Kumar and Refaei (2013) used PBL as a new pedagogy in an intermediate composition course. They suggested that knowledge was co-created through social interactions that students learned important lessons through interactions with their peers.

#### **2.1.2 PBL assessment**

We notice that PBL are implemented in various courses from literature review. Some studies are interested in assessment in PBL courses. Sockalingam, Rotgans, & Schmidt (2012) tried to build up a questionnaire for assessment the quality of PBL effects. Razzak (2012) focused on the effect of PBL strategies in class and

used the observation, monitoring of students' performance, and students' personal reflections and group presentations were utilized as the main assessment instruments. Tosun and Taskesenligil (2013) designed the quasi experimental study that was carried out through non-equivalent control and comparison group pre-post-test design to examine the effect in PBL course. McDonald (2013) used two questionnaires to evaluate the faculty training course and found out that participants expressed satisfaction in a number of areas like clear delivery by workshop facilitator; capturing their interest; gaining knowledge; and obtaining useful handouts.

This study verified the PBL strategies in educational special topics course and use students' feedbacks as the assessment instrument.

## 2.2 Text mining with KeyGraphy technology

Weiss, Induskhya, Zhang, and Damerau (2010) indicated that data mining technology would find out the pattern in a structured data base but not in non-structured or semi-structured data base. Relatedly, Hearst (1999) pointed out that data mining would not satisfy the human needs of pursuing information and knowledge. Fortunately, text mining was created to apply language and statistics to analyze text data in order to attain new information as described by Grimes (2005). Therefore, text mining became one of the important issues.

Ohsawa, Benson, and Yachida (1998) proposed the KeyGraph technology as a kind of data visualization tool in order to discover chances. The KeyGraph technology brought the text mining research into a new era. Montero and Araki (2005) showed that a text could be divided into some different subgroups and that there was an association to each subgroup. Some phases would be connected to each other but some were not. At the same time, Sakakithara and Ohsawa (2005) sorted out different subgroups and used the KeyGraph format to present these subgroups. They also defined the high frequency element as a "black node", and the number of baskets which contain two elements and the high frequency co-occurrence as a "black link". In this model, the KeyGraph technology becomes a very powerful tool in many areas. Oshawa (2002) pointed out the value of KeyGraph technology as an extractor of causalities from an event - sequence, and as a words abstractor from a document. Moreover, the main point of the KeyGraph technology provided some chances which would reverse the bad situation into a better one, especially in a feeble industry.

Wang, Hong, Sung, and Hsu (2006) applied this method to explore the validity of KeyGraph. This paper discussed the detailed algorithm for the KeyGraph used in ARCS which was a well-designed questionnaire. The processing were constructing a weighted (directed graph) and identifying the rare but structurally important nodes according to the support rate, confident rate, and correction. In addition, this paper examined the results with ANOVA for each part of ARCS. The results indicated that although the statistics data showed no significant difference, the KeyGraph technology provided more information. Hsu and other educators also applied the KeyGraph technology in education settings. The results pointed out that the learners' scenario maps would tell more information than the traditional statistics results. Hsu, Hong, Wang, Chiu, and Chang (2009), also applied the KeyGraph technology to exploring the learners' thinking and tried to find the chances in instructional activities.

What are chances? According to chance discovery theory, the definition of chances is the rare but important events or factors (McBurney & Ohsawa, 2003; Ohsawa & Tsumoto, 2006). However, Watts (1999) emphasizes the importance of linking. Hsu (2005) has been applying chance discovery model to education especially in class activities. The findings were novel and would provide teachers with chances to design the activities from different points of view. The model we proposed would help instructional designers evaluate the course development as well as find chances to improve the quality of e-learning courses (Hsu, 2011). The data were analyzed in text format and represented in a chance building map.

In this study we took students' feedbacks as an instrument to evaluate the adopting PBL course effect. The KeyGraph was the tool to find the indicators to improve the course for the future design course.

## 3. METHOD

The aim of this study is to evaluate the effect of the adopting PBL implementation in educational special topics course for pre-service teacher in teacher education program. In order to assessment the PBL effect, the text mining with KeyGrapy technology is used. The research setting, participants, and procedure are described bellows.

### 3.1 Setting

The educational special topics course is not a require course in teacher education program. Therefore, forty two pre-service teachers took this course. This is a normal scale class (around 40-70) in the university. This course opens only in autumn semester for two credits which means two hours per week for class. Only one instructor runs this course, no teaching assistant. This course is expected to cover the educational issues as many as possible. The objective of this course is to understand the education issues in educational system for the fresh pre-service teachers. This course is open for the pre-service teachers only.

### 3.2 Participants

The pre-service teachers who are the students in the university and they have to pass three examines in order to get in the program. Therefore, the students who are in teacher education program are diversity from undergraduate students and graduate students, and contain from different department students, such as, Chinese school, Social Science school, Science school, and Foreign Language school, etc. Forty two pre-service teachers took this course. They all attended the adopting PBL activities. However, there were only thirty seven students who wrote their feedbacks after the courses in time. Therefore, only thirty seven feedbacks were collected. So, the participants in this study were thirty seven pre-service teachers although forty two students were registered. Ten participants were male and twenty seven were female. Sixteen participants were from Chinese School, seven were from Social Science School, Six were from Science School, and eight were from Foreign Language School. The distribution of the participants is described in table 1.

Table 1. The distribution of participants

Gander	Number
male	10
Female	27
Total	37
School	Number
Chinese	16
Social Science	7
Science	6
Foreign Language	8
Total	37

### 3.3 Procedure

The study adopt the PBL in normal scale class, the procedure is in figure 1.

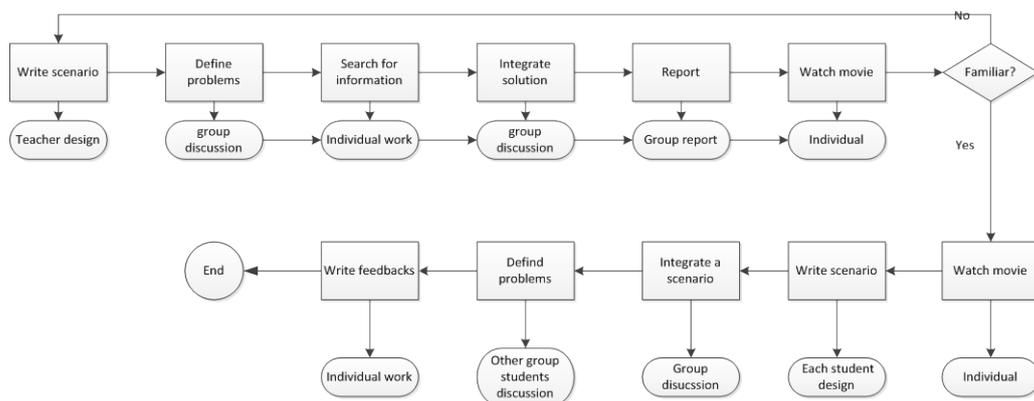


Fig 1. The research procedure

- **Write scenario**  
First, the instructor wrote a scenario from a movie, school of life, for the pre-service teachers to discuss.
- **Define problems**  
The pre-service teachers were divided into four groups. During the class discussing time, each group used iPad, laptop, and mobile phone in order to define the problems. At the end of class, each group had to select four problems which were they all agreed and interested.
- **Search for information**  
The assignment for the pre-service teachers was to search for information for the possible answer.
- **Integrate solution**  
Then, the second class period, the students also used the technologies (iPad, laptop, mobile phone) with their possible answers to discuss what would be the appropriate answer for the problems. They needed to integrate the answers in order to prepare for their group report.
- **Report**  
Then at the third class period, each group reported their results.
- **Watch movie**  
After the students finished the adopting PBL activities, the instructor showed the movie for them to watch. The PBL processing took four periods of classes.
- **Second cycle of PBL strategies**  
In order to let the students familiar with the PBL processing, the second PBL cycle was taken again. The instructor wrote another scenario from a movie, no on less, for the pre-service teachers to discuss.
- **Revise the PBL strategies**  
Finishing the second cycle of PBL processing, the instructor made different processing of PBL for students. Since the students were pre-service teachers, they needed to be trained to write scenario for their students in the future.
- **Watch movie**  
Therefore, at the first step of the PBL processing, the instructor showed the movie, the free writer, for students to watch.
- **Write scenario**  
The assignment was asked each student to write a scenario according to the educational issues. The reason is to train they know how to write scenario to guide their students in the future.
- **Integrate a scenario**  
In the second class period, students brought their scenarios for discussion in the group and decided one appropriated scenario to put in the discussion board at the open cyber classroom platform.
- **Define problems**  
Then, the other group read the scenario to produce four problems as they did before.
- **Write feedbacks**  
At the end of these two kinds of PBL processing, students were asked to write feedbacks and upload to the open cyber classroom.

The scenarios and problems for each group in discussion board show in figure 2.



Fig. 2 The scenarios and problems in open cyber classroom platform.

### 3.4 Data analysis

This study used the text mining with KeyGraph technology to analyze students' feedbacks. First step was to clean data that was to reduce the students' feedbacks unnecessary words. Then, the N\_Gram was done by the researcher. The frequency of the terms was produced. Then, using the intersection, the thresholds were determined. Finally, the KeyGraph was produced.

## 4. RESULTS

The aim of this study is to evaluate how the pre-service teachers feel about the PBL strategies by actually doing it and practicing it. The results indicated that the most feeling was discussing and the chance was the movie. Figure 2 showed the results.

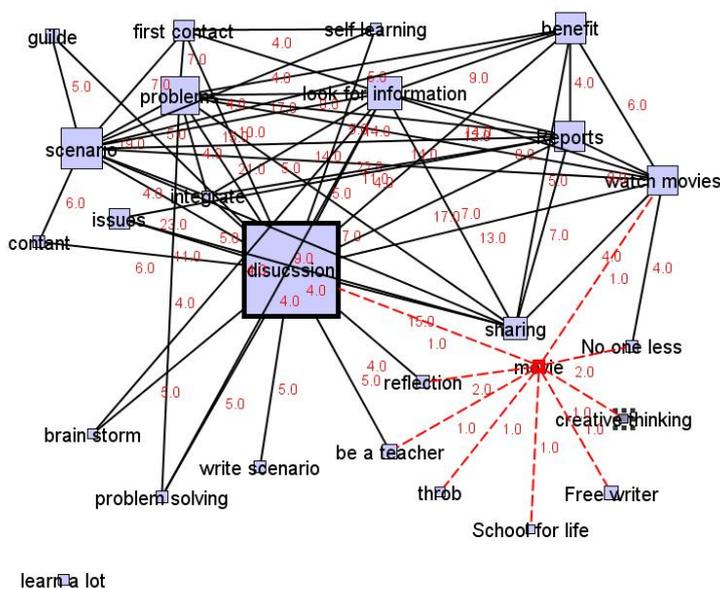


Fig. 2 The KeyGrpahy as the results of the evaluate the PBL processing.

In the figure 2, the adopting PBL processing, that is, reading scenario, defining problems, looking for the answer, presenting the reports, and watching movies is shown. Each step contacts with discussion process. From the discussion process (the black point), that indicates that the pre-service teachers writing scenario, reflecting, sharing, braining storm, and solving problems. The red point is movie which indicates that the chance for the adopting PBL processing. Because of the movie, the PBL activities would concentrate on discussing. The movies made they move and have creative thinking. The red point indicates that the chance for the adopting PBL activities. In other words, how to choose the right movies will make the course better. Movie is the rare and important factor in this adopting PBL course.

## 5. CONCLUSION AND SUGGESTION

This study is adopting PBL in normal scale class by using group discussion. The scenario is not from real case but movies. The purposes of this study are to understand how the pre-service teachers feel about the PBL strategies and to find out the chance that will make the PBL course better. The methodology is text mining with KeyGraph technology. The results indicate that the “discussion” is the core activity for PBL and that the “movie” is the rare and important factor to make the PBL course better. There are two main factors we need pay attention to, one is the important factor (black point) “discussion” and the other is rare and important factor (red point) ”movie”.

From the feedbacks (the KeyGraph map), it indicated that the PBL strategies were the first time experience for students. They felt that PBL was self-learning and they benefit a lot from this course.

### 5.1 Suggestion

According to the results, some suggestions are provided:

- For instructors who are going to practicing the PBL course, the discussion is very important to design within the course.
- For instructional designers, the rare and important factor, such as “movie” in this case, is the effective factor to put in the course, In general, the intermediary needs to be considered carefully for PBL course design.
- For pre-service teachers, the abilities for management of discussion are very important.
- For teacher educators, the teaching methods of discussion and collaborated learning are important.
- For education administrator, the adopting PBL is possible in normal scale class in higher education.
- More research for evaluate the PBL are needed.

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