

2014-01-01

Enlivening EFL Discussion Classrooms with a Problem-based Learning Approach

Tanisaya Jiriyasin

Follow this and additional works at: <https://digital.car.chula.ac.th/pasaa>



Part of the [Reading and Language Commons](#)

Recommended Citation

Jiriyasin, Tanisaya (2014) "Enlivening EFL Discussion Classrooms with a Problem-based Learning Approach," *PASAA*: Vol. 47, Article 5.

DOI: 10.58837/CHULA.PASAA.47.1.5

Available at: <https://digital.car.chula.ac.th/pasaa/vol47/iss1/5>

This Original Article is brought to you for free and open access by the Chulalongkorn Journal Online (CUJO) at Chula Digital Collections. It has been accepted for inclusion in PASAA by an authorized editor of Chula Digital Collections. For more information, please contact ChulaDC@car.chula.ac.th.

**ENLIVENING EFL DISCUSSION CLASSROOMS WITH
A PROBLEM-BASED LEARNING APPROACH**

Tanisaya Jiriyasin

The University of the Thai Chamber of Commerce, Thailand

Email: tanisaya_jir@utcc.ac.th

Abstract

This is a semester-long experimental study aimed at investigating the effects of a PBL (Problem-based Learning) approach on the English oral language performances of English major students in one of the private universities in Bangkok. For the purpose of the study, a systematic PBL model for English language classrooms was implemented. Furthermore, the subjects' opinions towards learning with the PBL approach were also explored through the use of questionnaires and interviews. The findings showed that the mean scores of the posttest were significantly higher than those of the pretest. Their English oral performances were more fluent and accurate. Moreover, they used varied sentence structures in addition to simple sentences. Additionally, the subjects' opinions towards learning with the PBL approach were discussed.

Keywords: problem-based learning approach, English oral language performances, PBL model, students' opinions

Introduction

Problem-based learning (PBL) approach has recently played a significant role as a teaching approach that enhances the cognitive and metacognitive knowledge of the students. It is an approach that

engages students in “learning how to learn while they also learn language and content” (Mathews-Aydinli, 2007, p. 1). Within the PBL approach, problems served as the context for new learning. Students were presented with an open-ended or ill-structured problem to work alone or in a group to work out for a solution. The main characteristics of an open-ended or ill-structured problem are that there was no right way to solve it, there may be no single right answer to it, and students need to find more information to help them solve the problem (Stepien, Gallagher, & Workman, 1993). The aim of PBL is for students to acquire knowledge and problem-solving skills through problem analysis and resolution.

PBL can positively support language instruction from the Constructivist perspective because language learners develop their understanding of target language conventions through involvement in the kinds of language activity found in real life, not by “learning lists of rules” (Abdullah, 1998, p. 1). According to Lee and Carrington (2005), there are plenty of advantages to using PBL in ESL classrooms. PBL could increase the amount of language input, promote authentic and contextualized language use, shift the students’ attention from using accurate forms to represent meaning, increase opportunities to negotiate meaning, and enhance overall communicative competence respectively. In other words, language learners will use the target language to present information, discuss it, and share their ideas with others after exploring for the solutions to the problem. This meta-level discussion is a vital means of “generating a skill transfer” (Wadhwa, 2005, p. 143). It means that learners will pull together isolated knowledge, skills, and experiences into a holistic in-depth understanding through discussion with their peers. They are required to have social interactions with others in a problem-centered environment. On the other hand, these social interactions provide them with opportunities to test and defend their own understanding, as well as enrich and expand their knowledge by examining the views of others (Igo, Moor, Ramsey, & Richettes, 2008). As a result, it is believed that PBL can improve the students’ English

language oral performance and their discussion skills in addition to their problem-solving skills.

Despite the evidence that PBL promotes cognitive and metacognitive learning (De Grave, Boshuizen, & Schmidt, 1996; De Grave, Schmidt, & Boshuizen, 2001; Mathews-Aydinli, 2007; Yeung, Au-Yeung, Chin, Mok, & Lai, 2003; Yew, & Schmidt, 2009), little is known about how it affects the English language learning of Thai speakers, particularly, in the tertiary level, and what their opinions are towards learning through PBL approach. Therefore, this study seeks to investigate the effects of the PBL approach on the English oral language performances of Thai university students. The investigation was based on the three aspects of language learning which were fluency, accuracy, and complexity. In other words, the investigation was based on the smooth flow of the participants' speech productions, the accurateness of their sentence structures, and a variety of sentence structures used in their talk. Additionally, the study will explore the participants' opinions towards learning with a PBL approach.

Problem-based learning (PBL) approach

A Problem-based learning (PBL) was originated from the reforms in medical education at McMaster University in the mid 1960s. It derived from the theory that learning was a process in which the learners actively constructed knowledge (Gejselaers, 1996). In PBL instruction, learning is primarily constructed by students who have been presented with a problem. The problem, by itself, engages students in learning because as soon as they are presented with a problem, they have to brainstorm among their peers to identify the problem statement and generate learning issues for their own self-directed learning. Then they will come back to their groups to share the knowledge that they have learned and discuss it together to search for possible solutions to the problem.

According to Duch (2001) and Igo, Moor, Ramsey, and Richettes (2008), PBL instruction is driven by challenging and open-ended or ill-structured problems which mean that there is no right or

wrong answer to those problems, but there are reasonable solutions based on the application of learners' knowledge and information. The important characteristics of a good PBL problem can be summarized to be as follows: (a) it must first motivate students to probe for deeper understanding and relate the subject matter to the real world as much as possible; (b) it required students to take responsibilities of their learning in order to find the solutions; (c) it requires cooperative learning and group discussion to synthesize what they have learned or known to come up with a solution; (d) it should be incorporated with the content objectives of the course, connecting new knowledge to concepts in other courses and/or disciplines.

PBL model

Mathews-Aydinli (2007) has suggested four main steps in implementing problem-based learning: (1) introducing learners to the problem, (2) exploring what learners do and do not know about the problem, (3) generating possible solutions to the problem, and (4) considering the consequences of each solution and selecting the most viable solution.

Both Woods (1995) and Wadhwa (2005) agree that learners cannot improve language or academic skill simply by sitting in a PBL class. Learning involves tasks such as the understanding of a teacher's role, the preparing of opened or ill-structured problems where there is no right or wrong answer, the collaborating, and the encouraging self-directed learning. In the case of language learning, the process skills such as discussion, self-directed learning, and problem-solving should be emphasized in parallel with the English performances of the learners.

The PBL model has been implemented in this study in line with the above mentioned criteria. The process consists of six stages: (a) Lead-in Activities, (b) Meeting the Problem, (c) Problem Analysis & Learning Issues, (d) Discovery & Reporting, (e) Solution Presentation & Reflection, and (f) Overview, Integration & Evaluation. In the Lead-in Activities Stage, teachers introduce some lead-in activities, related to the theme of the problem, which can be listening or reading

activities, and review difficult vocabulary. After giving the students an open-ended/ ill-structured problem in the next stage, teachers should make sure that students understand the problem and then divide learners into small groups. In Problem Analysis & Learning Issues Stage, there are small group discussions to identify the problem statement and learning issues. In the Discovery & Reporting Stage, students in each small group will share some of their discovered information, and their peers will help gather the solution and prepare a presentation to the class. In the next stage, each group will present their solution to the class. After that, there will be a whole class discussion and reflection. In the final Stage, students will reflect on what they have learned and criticize themselves. While the students are moving from each stage, the teachers will act as facilitators to support their language and provide feedback on their language use. Additionally, there are scaffolding strategies for the learners to make progress and encourage them to be the self-directed learners, such as vocabulary introduction. To illustrate the process of the PBL approach used in this study, a model has been provided in Figure 1.

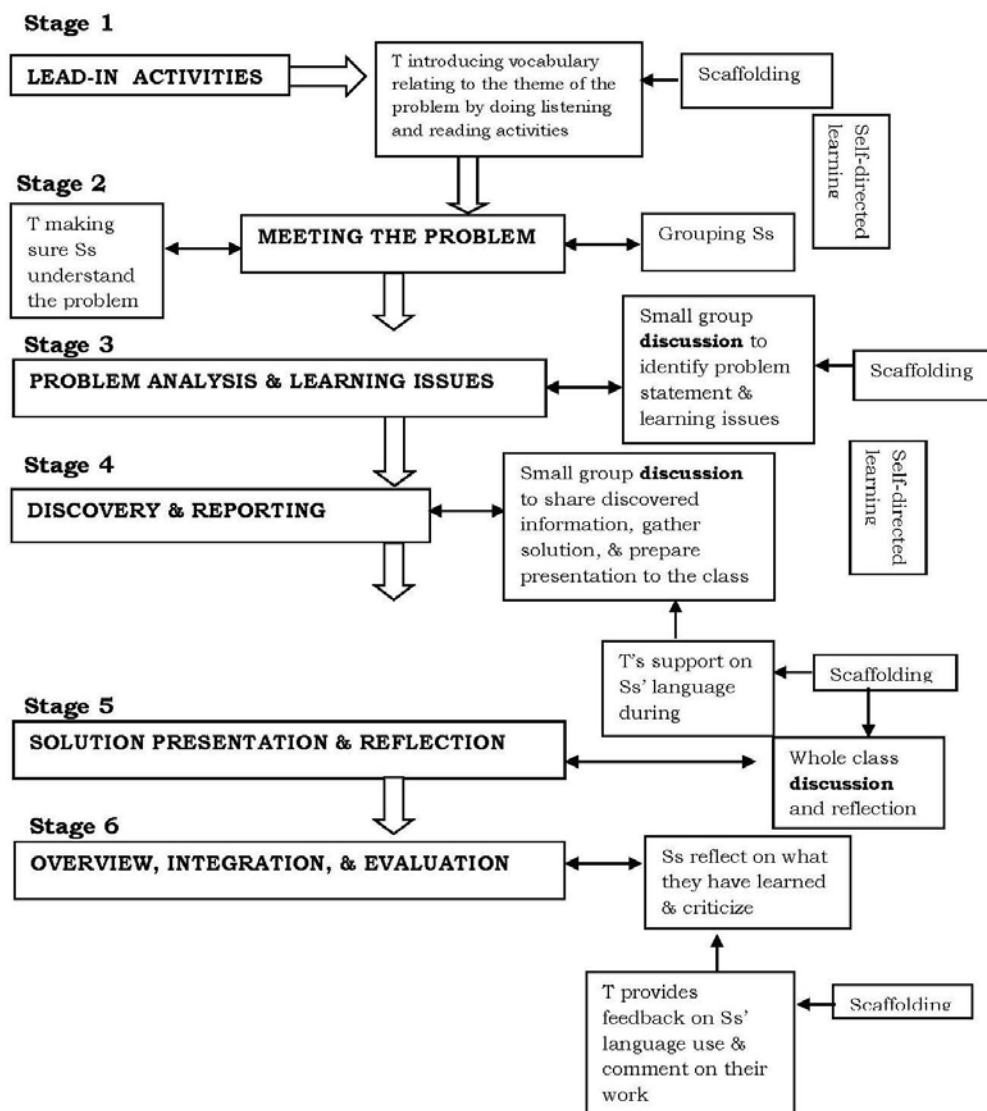


Figure 1: Problem-based learning approach model

Research questions

The studies examined as backgrounds for the current study reveal that PBL increases retention of knowledge, enhances intrinsic interest in subject matter, promotes self-directed learning skills, and encourages social interaction (Norman and De Grave, Schmidt, & Boshuizen, 2001; Schmidt, 1992; Van Boxtel, Van der Linden, & Kanselaar, 2000). Because the quality of English teaching and learning for Thai students' development currently emphasizes the

innovative instructional approaches or methods, the following research questions were addressed in the current study:

1. What are the effects of PBL approach on the English oral performances of the subjects under this study?
2. What are the subjects' opinions towards learning with the PBL approach?

Methods and procedures

In the current study, the One-Group Pre-test/Post-test Design is used to investigate the effects of the independent variables (i.e. a PBL approach with 2 ill-structured problems) on dependent variables (i.e. the subjects' English oral performances and their opinions).

Subjects

The subjects were 40 students purposively selected according to the following criteria from 98 third- and fourth-year English majors who attended the Discussion Techniques course in the first semester of 2009 in the Faculty of Humanities, University of the Thai Chamber of Commerce. When the semester began, all the students taking this course were requested to take the Pre-tests. Then the sample selection was conducted using the following criteria: 1) they had already taken 30 credits of required English courses to make sure they have enough English competency, 2) they were English majors studying in the third or fourth year, 3) they attended this course, and 4) there were mixed levels of English oral proficiency scores among these subjects considering from the Pre-test scores. After that, all these 40 subjects were randomly assigned into 8 groups consisting of 5 members per group. Each group was comprised of 2 Low, 2 Medium, 1 High score achievers in order to promote the scaffolding among the learners.

Preparation before the main study

The preparation was taken regarding the development of teaching materials and lesson plans, and other necessary instruments.

Development of teaching materials and lesson plans

Before developing the teaching materials and lesson plans, the needs assessment of the discussion topics was conducted through questionnaires with some English majors who shared the same characteristics as those of the subjects in order to find out what topics or themes they are interested in. The questionnaire was validated for the content validity by three experts who had more than 5 years of experience in teaching English. Its content validity value was high at 0.84. It was found that there were 3 most preferred topics which were *friends* and *fashion* (both equally popular), and *environment* respectively.

The development of the teaching materials and lesson plans was then based on 2 thematic contents of friends and the environment. The lead-in activities and learning resources that were related to these topics were prepared. The IOC index value of the content validity of these teaching materials and lesson plans was high at .78.

Development of research instruments

There were four research instruments developed in this study: ill-structured or open-ended problems, English Oral Performance Test (EPT) and Band Scales, Questionnaire for Students' Opinions, and Interview Questionnaire.

1. Ill-structured problems. There were 2 ill-structured problems developed under the topics of Uniforms & Peers Pressure and Global Warming. These problems were validated by 3 experts for the content validity. The IOC index values of these 2 problems were high at .78 and .67 respectively.

2. EPT and Band Scales. The EPT was developed to be used as both a Pre-test and Post-test of the study. Its Band Scales were modified from the Oral Proficiency Band Scales of Jiriyasin (2006). There were 3 test types in EPT: interview, opinion expression, and open-ended problem. The Band Scales were the scales of different levels of language ability (from 0 – 5) on 3 language dimensions which were fluency, accuracy, and complexity. In this study, fluency refers to the general smoothness of the students' English oral language

performances whereas accuracy means the grammatically correct use of English and complexity is a variety of sentence structures being used in the speech production. The content validity of IOC for both EPT and its Band Scales were high at .78. Regarding their construct validity, all the experts agreed that the language ability and speech ability constructs of the test were clearly and unambiguously defined for the purpose of the test, the test tasks together with the scoring procedures reflected the construct definitions, and the scores obtained from the test could determine the test-takers' language abilities.

3. Questionnaire for Students' Opinions. This form consisted of 4 open-ended questions asking for the subjects' opinions towards learning and practicing their English via PBL. It was written in both English and Thai languages. The value of IOC for its content validity was high at 1.00.

4. Interview Questionnaire. The Questionnaire was comprised of 2 semi-structured questions. The value of content validity using the IOC was high at 1.00.

Procedure

After revising some of the instruments from the experts' comments and from the pilot study, the procedures of the data collection are as follows:

Protecting the subjects' rights

All of the 98 students who took this course, including the subjects, were given the consent forms together with the explanatory letters on the first day of class. The study's description, purpose, duration, a statement of students' confidentiality protection, the name of the contact person who was responsible for the study, and a list of benefits gained from this study were provided. All of them signed and returned the consent forms.

Conducting Pre-tests

The EPT was used to pretest all the students who attended the course at the beginning of the semester to enable the researcher to know their English proficiency and arranged them into groups of mixed abilities with 2 Low, 2 Medium, and 1 High score achievers.

Having the Questionnaires for Students' Opinions filled in

By the end of the semester, all the subjects were asked to express their opinions by completing the Questionnaires for Students' Opinions in class. They had an option of writing in Thai or English.

Interviewing

Some of the subjects were randomly selected to be interviewed in class towards the end of the semester. The interviews were in English. However, they were allowed to speak Thai if they wanted to.

Conducting Post-tests

The Post-test was the same test as the Pre-test. However, each part of the test was reshuffled to avoid the students' retention of memory. Only the post-test data of 40 subjects were rated.

Data analysis

In order to answer the first research question, the recordings of the subjects' oral performances for both the Pre-tests and Post-tests were rated by the researcher and re-rated by another well-trained rater using the Band Scales. Then the results of the Pre-test total scores were tested for the Assumption of Normality to decide whether a 'parametric' test can be used to compare the mean scores of both the Pre- and Post-tests (Dornyei, 2007). For the last research question, the 'Theorizing' technique of LeCompte and Preissle (1993) was used to analyze the data. Theorizing technique is a cognitive process of discovering or manipulating abstract categories and the relationships among those categories. It was composed of four components which are perceiving every phenomenon and recording it; organizing the collected data and aggregating them into groups;

identifying the linkages of the data; and making speculations or inferences.

Results

The inter-rater reliabilities of the Pre-tests and Post-tests were .991 and .974 respectively. Additionally, the results of the Assumption of Normality testing of the Pre-test scores was not significant at $p = 0.005$ which meant that it did not violate the Assumption of Normality. Therefore, a paired-samples t -test was used to measure the mean scores between the Pre- and Post-tests.

Research Question 1:

Regarding research question 1 which was what effects of PBL approach on the English oral performances of the subjects were, the result from using a paired-samples t -test to analyze the mean of the Pre- and Post-test total scores was demonstrated in Table 1.

	n	Mean	Mean Differences	S.D.	t-value	df	Sig.
Pre-test	40	21.5750	-5.97500	3.03389	-12.456	39	.000***
Post-test		27.5500					

*** $p \leq 0.01$

Table 1: Result of Pre- and Post-tests

The result showed that that was a significant difference between the mean scores of Pre-test ($M=21.5750$, $SD=10.51955$) and those of the Post-tests ($M=27.5500$, $SD=9.18737$; $p=.000***$). The mean of the Pre-test total scores was 21.5750, and it increased to be 27.5500 in the Post-test. The gained mean scores between the two sets of tests were -5.97500 which indicated a significant difference between them.

In order to see which aspect of language learning was most affected by the PBL approach, the score of each aspect namely

fluency, accuracy, and complexity was further analyzed to find the means as shown in Table 2, 3, and 4.

	n	Mean	Mean Difference	S.D.
Pretest on fluency	40	7.1500	-2.475	3.76591
Posttest		9.6250		3.13530

Table 2: Result on fluency aspect

From Table 2, the mean score of the Pre-test on the fluency aspect was 7.150 compared to that of the Post-test which was 9.6250. The difference between the two was -2.475. The subjects showed more fluency when performing their post-tests. They could express themselves more fluently with a few pauses and/or fillers.

Regarding the accuracy aspect as shown in Table 3, it was found that the mean score of the Pre-test on the accuracy aspect was 6.7250 while the Post-test mean score on the same aspect was 8.3500 which showed a difference of -1.625. The subjects used more correct word orders and prepositions. However, the errors of subject-verb agreement and verb forms after modals were sometimes found.

	n	Mean	Mean Difference	S.D.
Pretest on accuracy	40	6.7250	-1.625	3.80949
Posttest		8.3500		3.72483

Table 3: Result on accuracy aspect

For the Table 4 on the complexity aspect, the mean score of Pre-test on this aspect was 7.8000 whereas it was 9.6750 in the Post-test. The difference between the two means was -1.875. It was found that the subjects began using a variety of sentence structures though a few complex sentence structures were detected.

	n	Mean	Mean Difference	S.D.
Pretest on complexity	40	7.8000	-1.875	3.26756
Posttest		9.6750		2.84098

Table 4: Result on complexity aspect

To sum up, the effects that PBL approach has on the subject's English oral language performances were positive in that they could enhance their speaking ability in all the three aspects, particularly, in the fluency aspect. The subjects were able to express themselves more smoothly with a few pauses and/or fillers. They tended to use more compound and simple sentence structures with a few complex structures. Finally, it was found that they used more correct word orders and prepositions though the errors of subject-verb agreement and verb forms after modals were sometimes detected.

Research Question 2:

The data from the Questionnaires for Students' Opinions and interviews were analyzed and categorized under 2 main headings: students' preference and quality of learning. It was found that the majority of the subjects (97.73%) enjoyed practicing their English discussion through this approach.

There were 3 reasons why they enjoyed studying via a PBL approach: support, topics, and instruction method respectively. They felt that there were strong supports from the teacher and peers, and these could help them feel more confidence in expressing their opinions in English. Following are the extracts from the interviews:

"At first, I was very much afraid of this subject. The teacher was very kind, and this made a difficult subject become easier."

“I felt less stressful because when I said something stupid, we all laughed and we helped each other to shape up our ideas.”

They also reported that the topics of discussion were interesting, challenging, and fun. Finally, they thought that learning through a PBL approach was exciting. The way that this class was conducted was different from the other speaking classes that they had taken before. They found that they had more opportunities to express their ideas, and they thought that they also gained new knowledge from their peers. Some of the interview extracts were provided below:

“This class really helped me practice my thinking and speaking skills because learning in other classes, it was more like memorizing dialogues.”

“The fun part of it is that we can’t prepare what to say. The questions from (our) peers were fresh (extemporaneous), so we need to speak impromptu.”

Regarding the quality of learning, the subjects indicated that they could improve their discussion skill through studying via this instructional method. They thought that they became more confident in asking questions and arguing with others in English. Moreover, they learned how to express their opinions, interrupt, agree and disagree politely, and use reasons to convince or persuade others to agree with them. In addition, they informed that they learned more new vocabulary and knowledge from their self-directed learning and discussion with their peers. They also learned how to solve problems systematically, work in a team, be more open-minded to listen to others’ ideas, and become assertive. Following are the extracts from the interviews:

“I think I also practice reading, listening, and summarizing skills because I have to search for the information before discussing with my friends next time.”

“I learned new words from discussing with my friends such as dress code, drought, sewage, and so on.”

In summary, the subjects' opinions towards learning with a PBL approach were constructive. They felt that learning by this instructional method was enjoyable and interesting as the way the class was conducted challenged them to think, explore for more information, and share their ideas with the peers. They reported that their English discussion skills were better. They gained more confidence in expressing their opinions, interrupting people politely, making agreements, and disagreements. They also thought that this approach could help them improve other skills as well such as team-working, listening, and problem-solving skills.

Conclusion

This study not only aimed to investigate the effects of using the PBL approach as an instructional design on the English oral language performances of the undergraduate students, but also to explore the students' opinions towards this approach. It was found that this approach was suitable for ESL/EFL instruction provided that there was a well-prepared and systematic lesson plan. The findings from the results of the Pre- and Post-test scores indicated that the subjects could speak English more fluently and accurately to a certain extent. There were just a few pauses and/or fillers found in their speech, and they used more correct word orders and prepositions. Moreover, they started to use more compounds with a few complex sentences in addition to simple structures. The subjects' English discussion skills were improved because they could express their opinions, interrupt their interlocutors politely in order to show agreements or disagreements, and give reasons to support their ideas or argue with their peers. The subjects reported that they gained new vocabulary

and knowledge in addition to the teamwork and problem-solving skills.

One important implication from this study is the significance of a teachers' role which is not teacher-centered learning, but facilitating, supporting, and scaffolding their students to optimize the quality of learning in PBL. On the other hand, an investigation on the critical thinking process while the students are analyzing the problem with their peers is recommended. Last but not least, it implies that more studies on the elaboration of students' solutions or ideas besides their English proficiency can be further investigated.

Acknowledgements

The author would like to thank the University of the Thai Chamber of Commerce for their research grant of this study. Many thanks go to all the experts who validated and commented on the research instruments of this study. Further thanks go to Anthony Catto who read and edited the manuscripts and the students who participated in this study.

Note:

This article is reprinted with permission from "Enlivening EFL discussion classrooms with a problem-based learning approach" by Tanisaya Jiriyasin (2011), *E-Journal for Researching Teachers*, Vol. 4, Chulalongkorn University Language Institute. Available at <http://www.culi.chula.ac.th/Research/e-Journal/EJournal01.html>

The Author

Tanisaya Jiriyasin is currently an English instructor at the Department of English for Business Communication, School of Humanities, University of the Thai Chamber of Commerce. She got her M.A. in Teaching English as a Second Language Program from Arizona State University and a Ph. D. in English as an International Language (Interdisciplinary) Program from Chulalongkorn University. She is interested in the English language development of Thai

students, especially in the productive skills, through Social-Constructivism Theory. Her research areas include curriculum development, task-based learning and teaching, and problem-based learning approach.

References

- Abdullah, M. H. (1998). *Problem-based learning in language instruction: A constructivist model*. Bloomington, IN: ERIC Clearinghouse on Reading English and Communication. [ED423550]
- De Grave, W. S., Boshuizen, H. P. A., & Schmidt, H. G. (1996). Problem-based learning: Cognitive and metacognitive processes during problem analysis. *Instructional Science*, 24, 321-341. doi:10.1007/BF00118111
- De Grave, W. S., Schmidt, H. G., & Boshuizen, H. P. A. (2001). Effects of problem-based discussion on studying a subsequent text: A randomized trial among first year medical students. *Instructional Science*, 29, 33-44. doi:10.1023/A:1026571615672
- Dornyei, Z. (2007). *Research methods in Applied Linguistics*. China: Oxford University Press.
- Duch, B. J. (2001). Writing problems for deeper understanding. In B. J. Duch, S. E. Groh, & D. E. Allen (Eds.), *The power of problem-based learning: A practical 'how to' for teaching undergraduate courses in any discipline* (pp. 47-53). Virginia: Stylus Publishing.
- Gijsselaers, W. H. (1996). Connecting problem-based practices with educational theory. In L. Wilkerson & W. H. Gijsselaers (Eds.), *Bringing problem-based learning to higher education: Theory and practice* (pp. 13-21). San Francisco: Jossey-Bass Publishers.
- Igo, C., Moor, D. M., Ramsey, J., & Richettes, J. R. (2008). The problem-solving approach. *Techniques*, 83(1), 52-55.
- Jiriyasin, T. (2006). *The effects of narrative task repetition on the English oral language performance of Thai undergraduate students*. (Doctoral dissertation). Chulalongkorn University, Bangkok.

- LeCompte, M. D. & Preissle, J. (1993). *Ethnography and qualitative design in educational research*, (2nd ed.). San Diego: Academic Press.
- Lee, M., & Carrington, A. (2005). Promoting problem-based learning for English as a second language learners [PowerPoint slides]. Retrieved from http://discover.education.purdue.edu/challenge/web_TKB_research/05/TLT/TLT_monica_esl.ppt
- Mathews-Aydinli, J. (2007). *Problem-Based learning and adult English language learners*. Retrieved from http://www.cal.org/caela/esl_resources/briefs/Problem-based.pdf
- Norman, G. R., & Schmidt, H. G. (1992). The psychological basis of problem-based learning: A review of the evidence. *Academic Medicine*, 69, 557-565.
- Stepien, W. J., Gallagher, S. A., & Workman, D. (1993). Problem-Based learning for traditional and interdisciplinary classrooms. *Journal of the Education of the Gifted*, 16(4), 338-357. doi:10.1177/016235329301600402
- Van Boxtel, C., Van der Linden, J., & Kanselaar, G. (2000). Collaborative learning tasks and the elaboration of conceptual knowledge. *Learning and Instruction*, 10, 311-330. Retrieved from [http://dx.doi.org/10.1016/S0959-4752\(00\)00031-1](http://dx.doi.org/10.1016/S0959-4752(00)00031-1)
- Wadhwa, S. (2005). *Teaching and learning through problem solving methods*. New Delhi: Sarup & Sons.
- Woods, D. R. (1995). *Problem-based learning: Helping your students gain the most from PBL*. Canada: Waterdown.
- Yeung, E., Au-Yeung, S., Chin, T., Mok, N., & Lai, P. (2003). Problem design in problem-based learning: Evaluating students' learning and self-directed learning practice. *Innovations in Education and Teaching International*, 40, 237-244. doi:10.1080/1470329032000103762
- Yew, E. H. J., & Schmidt, H. G. (2009). Evidence for constructive, self-regulation, and collaborative processes in problem-based learning. *Advances in Health Science Education*, 14, 251-273. doi:10.1007/s10459-008-9105-7