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An Empirical Study of Problem-based Learning of English in China

Xinning Cui

B.A., Capital Normal University, awarded 2012

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Submitted in Partial Fulfillment of the

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At the

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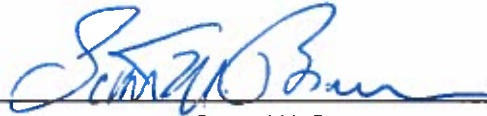
Masters of Arts Thesis

An Empirical Study of Problem-based Learning of English in China

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An Empirical Study of Problem-based Learning of English in China

Abstract

The purpose of this study was to examine the impact of problem-based learning on 9th grader Chinese students' performance on writing, speaking and self-efficacy in learning English. Of particular interest to this study was the comparison of problem-based learning with the traditional Chinese learning method for improving students' performance on English language writing and speaking, and in addition, students' self-efficacy towards English learning. An empirical experiment was conducted in Qingdao No.2 high school in Shandong province, China. Both quantitative and qualitative methods were used. The findings show that students using the problem-based learning method tend to have stronger self-efficacy in English learning than students using traditional English learning methods. In addition, students have demonstrated positive attitudes toward problem-based learning in English learning. However, students' writing and speaking performances (both language performance and higher-order thinking skills in writing and speaking) through problem-based learning were not significantly improved when compared to students adopting the traditional English learning method.

Keywords: Problem-based learning, English language learning in China, self-efficacy for English writing and speaking, higher-order thinking skills

Chapter 1

Introduction

Problem-based Learning (PBL) was first introduced by Barrows (1980) in medical education instruction in the mid 1950's and later spread to other fields, specifically business and social studies. PBL was identified by Barrows and Kelson (1995) as including both curriculum approaches and the students' processes of learning. The curriculum approach consisted of carefully selected and designed problems and demands from the learner acquisition of critical knowledge, problem solving performance, self-directed learning strategies and team participation skills.

The process replicates the commonly used systemic approach to resolving problems and meeting challenges that are encountered in life and career (Barrows & Kelson, 1995). In other words, the value of implementing PBL is not only to accumulate and develop students' competence in problem solving, but also to give students the opportunity to work collaboratively in groups and solve problems that represent realistic complexity students may encounter in applying knowledge and processes to other domains.

Schmidt (1983) recommended PBL in the area of Cognition Information Processing System and stated that PBL provides context for subsequent retrieval and appropriate use of new information. PBL also creates principle conditions needed in cognitive information processing, including activation of prior knowledge, similarity of contexts in which information is learned and later applied, and opportunities to elaborate on information that is learned during the problem-solving process. Research shows that knowledge is much more likely to be remembered or recalled in the context in which it was originally learned (Baddeley & Godden, 1975).

PBL and Second Language Learning

PBL was introduced into the field of second language education about 20 years ago as a way to reflect the principles of student-centered teaching (Fauzia, 2013). Students work together in a group and manage to solve a problem in the target language with moderate assistance from the teacher. Guidance and support provided by the teacher will decrease as the students get more comfortable and cognitively ready to use the target language, particularly in an applicable manner, i.e. solving a real problem. Thus the teacher is no longer the only one that practices target language themselves throughout the lesson. It is of critical importance that teachers give only assistance that leads students in the right direction in the process of solving a problem while leaving enough challenge to make them to cope collaboratively with their peers. Just as Dewey (1902) proposed, as teachers, “we must take our stand with the child and our departure from him. It is he and not the subject-matter which determines both quality and quantity of learning” (p.13-14).

Researchers have demonstrated that “many SL/FL students, especially Asian learners, are passive in language classrooms and choose not to use the target language most of the time, especially when responding to teachers” (Cortazzi & Jin, 1996; Jackson, 1999, 2001, 2002; Li, 1998; Sato, 1990; Tsui, 1996; Zou, 2004, retrieved from Liu, 2005, p. 1). This unwillingness to communicate in the target language turns them into reticent language learners. Further, empirical studies have shown that communicating in a second language is related to “a willingness to engage in L2 communication, motivation for language learning, the opportunity for contact, and the perception of competence, language anxiety, personality, intellect, the social context, and other variables” (Liu, 2005, p. 1). According to Barrows and Tamblyn (1980) and Engel (1997), regardless of the discipline, PBL can promote student creative and higher order thinking,

leadership, team collaboration and, more importantly, students' effective communicative skills. PBL provides the perfect milieu for students to practice their speaking in the target language through group discussion, and by doing so, it has a great potential to boost confidence of students' English speaking. After students have experienced it, they can accomplish so much using the target language and are highly likely to develop a belief in their oral English performance and many other facets in English learning. The more confidence they develop, the more motivated will they be. And ultimately, as they acquire enthusiasm and confidence in English learning, their language performance will improve, which will lead to more time spent on practicing the target language.

Despite its efficiency, empirical research on PBL second and foreign language education has been limited (Beckett, 2006). This is especially true in China. A literature review on Problem-based Learning in China from 2005 to 2015 shows that most of the application of PBL is in the field of medicine (Cao, 2007; Wang, 2006; Yuan, et al., 2008), and others are looking at PBL as a theoretical teaching method (Huang, 2005; Liu, 2006). Very few empirical experiments on PBL have been conducted in K-12 English learning classrooms (Yan, 2010). PBL is still in its infancy in China in the domain of English language learning. The purpose of this study is to carry out an experimental study on PBL in high school English learning classrooms in Shandong, China and investigate the potential effect of PBL on students' learning in a classroom setting in Qingdao No.2 High School. Additionally, the goal is to provide a contribution to the research on PBL in the field of English language learning for high school Chinese educators.

The research was conducted in Qingdao No.2 High School in Shandong, China with students in their first year of high school. The school is in its experimental transaction period in moving towards PBL, and only a small portion of classes will experience PBL. Roughly, two

equivalent classes, were selected by the school to participate in the study. The two selected 10th grade classes were randomly assigned by the school as PBL/experimental group and Normal Educational Practice (NEP) (i.e. Normal Educational Practice) group/control group. The reason that 10th graders were chosen as the experimental participants was that students in their first year of high school are believed to be more motivated and engaged in their academic learning compared to second-year and third-year students. Additionally, they have less pressure to excel on the national common core test and college entrance exams compared to the second- and third-year students. It is important to note that there are three years of high school in China, and students in their last year are typically focused with preparation for their graduate exams and the high stakes of the college entrance exam, which leaves them no time for an educational experiment like this.

The PBL curriculum in this study is composed of three problems: Qingdao Beer Festival, Air pollution and Chinese college entrance exam reform, i.e., GAOKAO. The three problems were carried out as three individual PBL units. In the instruction of PBL, problem selection is of critical importance, and the three problems selected in this study were designed to be current, realistic, ill-structured and relevant to their life.

In the process of PBL, “the problem situation is presented to the student in the same way it would present in reality” (Barrows & Tamblyn, 1980, p.18). Problems are ill-structured and there is no single right solution to a problem. Often a problem requires interdisciplinary knowledge, higher-order thinking and reasoning just like the ones students would encounter in real life. In unit 3, students would need to generate their knowledge from geography, chemistry, English, and history to look at the issue of air pollution in China, from all perspectives so that they were able to examine it in a fairly complete picture. Students were highly motivated and strived to try out

possible solutions to the problem partly because the problem is connected to their life and the solutions to it have impacted their own lives. Just as Delisle (1997) illustrated, “Students make a greater attempt to understand and remember when they see connections between the materials they study and their own lives” (p. 8).

In the first unit of The Qingdao Beer Festival, students were asked to design a Qingdao Beer Festival brochure in English for foreign visitors. Students were challenged to come up with applicable suggestions and solutions for GAOKAO reform in a report in unit 2. In the last unit, students needed to synthesize a valid resolution for improving the air condition in China from the point of view of a citizen and make a poster representing it. In each unit, students worked in groups of five, and they read and interpreted each problem in class as a whole, and they further initiated discussions in their group within class. Some discussions were conducted online at www.classchatter.com in the form of threaded discussions, due to time restrictions in a class period. In the end, students presented their outcomes in front of the class, and some reflection and discussions of their work were recorded regarding the relation of their solution to the problem, their experience working collaboratively in a group and so forth.

Teachers were trained in PBL techniques to provide proper scaffolding to the class at the beginning of unit 1. Although compared with other subjects, such as math or science, which demand an extensive amount of pre-existing knowledge and higher order thinking from the students, this English learning PBL package put less cognitive load on the students. However, teachers still needed to prepare the students with sets of techniques to cope with the problems arising and equip them for the vocabulary demands of each topic instead of, as Greening (1998) advises, “simply expecting them to grow in response to need” (p. 1). The assistance and guidance

teachers offered was consistent with the constructivist techniques, “cognitive apprenticeship”, which demonstrate for students the process of thinking and solving a problem, rather than just handing in the results and solution, so that students can reflect back on how the teacher tackled the problem when they were stuck.

It is demonstrated that, in a class where teachers initiated active teaching strategies like PBL, teachers rely less on textbooks and embrace many other types of resources, from the Internet to community members (Delisle, 1997). PBL allows teachers to embrace many other resources besides textbook in numerous ways, For example, in the process of assisting students in finding out a solution of a real problem, teachers may suggest online resources, newspapers, technical books, etc. Further, conversion is likely to pass along strategies to the students as they reach out to assorted types of resources, from paper and text, to multimedia and beyond, germane to the problem.

Unlike the traditional way of teaching English as a language, with teachers assigning readings and a list of related questions to study PBL, students get to choose resources that fit their needs in the process of solving a problem and repeatedly went beyond textbooks and paper readings. In unit 3, students reached out to the community to interview community members and asking their opinions about the air pollution and what action they thought should be taken to improve it. It was essential that the students were not only trying out difference types of learning resources, but also actively interacting with them with the use of the episode of a video as evidence and argument, the citation of the statements from community members as supportive examples, etc.

So far, based on the facets of PBL presented here, it seems that PBL demands a lot of higher order thinking and reasoning and, thus, was suspiciously considered inappropriate for students with low learning capabilities. It is true that PBL, especially in the field of language study, requires an extensive amount of reading, and almost all of the reading materials consists of sophisticated, native language which is consequently very challenging for students to comprehend. Therefore, “in order to achieve successful results with a PBL model, it is crucial for the teacher to be trained to employ well-organized and thoughtful methodologies that lend themselves to the ability level and nature of the learner” (Boothe, et al., p. 2).

Another approach to avoiding cognitive and language overload for students is through group work. In each group, students were assigned a role of group leader, assistant group leader or recorder. The group leader was responsible for directing the group discussion, arranging the group activities and making sure every group member was doing their job on time with the support from the assistant group leader and cooperation of each group member. The assistant group leader assisted the group leader in arranging the group work and helping the group members accomplish their goal. A recorder was obliged to document what had been discussed during group discussions and online threaded discussions. By assigning roles, students knew that they were operating as a group and it also helped to spur leadership in students, stimulate collaboration among one another, nurture teamwork and many other facets that PBL provokes. Each group member had the opportunity to try at least one assigned role through the study.

Through observation, most of the students were doing well through collaborative learning in their roles during the entire educational intervention. Interestingly, research and teacher experience has demonstrated that PBL can help motivate students, especially “bored students,”

and raise their achievement level (Delisle, 1997, p. 5). As Delisle (1997) suggested, “PBL works with all students” (p. 7), and that allows it to be a comprehensive and all-embracing teaching strategy.

The research study was designed to compare two teaching methods in an English language learning classroom: PBL and NEP, examining performance in students’ skills on oral, written and self-efficacy in English language learning.

Three major research questions were proposed and examined in this study:

1. Does PBL result in higher writing performance than traditional English teaching methods?
2. Does PBL result in higher oral performance than traditional English teaching methods?
and
3. Does PBL result in higher self-efficacy in English learners than traditional English teaching method?

Multiple regression analysis methods were adopted to examine the data for this research study to test the three research questions. Pre-tests of English written and oral skills and English language self-efficacy were administered to both groups at the start of the study to obtain baseline measures of these skills. After the Pre-test, the experimental group of PBL students had the PBL curriculum for 2 out of 5 periods every week and traditional English curriculum (NEP) 3 out of 5 periods for a span of nine weeks. The NEP group had nine weeks of traditional English learning instruction throughout the intervention. After the nine weeks of intervention, post-tests (similar tests on Oral and Written language and the same on self-efficacy with the pretest) were administered to both groups on written, oral and self-efficacy of English language learning.

It was hypothesized that students' (PBL group) self-efficacy in English language learning would be significantly higher than the students in the NEP group, with the rationale that by being able to do things through applying previous knowledge, such as solving a complicated problem, students would increase their skills and confidence in their English performance. Furthermore, the PBL students would find the reason and meaning behind learning a subject, thereby motivating students to learn that subject to greater levels and potentially become more skilled. As Dewey (1916, 1944) stated, "The doing is of such a nature as to demand thinking, or the intentional noting of connections; learning naturally results" (1944, p.154).

Chapter 2

Literature Review

“The dominant approach to language teaching in Asia (and, indeed, most of the rest of the world), has been, and remains, a synthetic one” (Nunan, 2006, p. 13). In “synthetic” approaches, different parts of the language are taught separately and step by step so that acquisition is a process of gradual accumulation of parts until the whole structure of language has been built up (Wilkins, 1976, p. 2). Teachers who experienced this method as a student, see it as the normal and traditional way of teaching.

English language teaching instruction, as in other language learning education, generally reflects the commonly accepted approach embedded in traditional pedagogy; “The traditional behaviorist trend in language instruction has been to define desired goals independently of the learners and situation, present language in a structured, linear fashion, then attempt to reinforce the content through decontextualized practice. Learners end up knowing about the language but not how to use it” (Short, Harste & Burke, 1996, from Abdullah, 1998, p. 2). Even though it is evident that language learning was built upon mechanical memorization of distinctive fragments to form a target language system at the early stage, to become fluent in a language, one must practice using it as well (Mangubhai, 2006, p. 54).

The constructivist approach, in contrast, which is basic to PBL fundamental theory, holds that language learning should happen in a meaningful context that represent the real-life situation (Abdullah, 1998). Abdullah (1998) further explained that the PBL inquiry process provides students with situations that are anchored in the real world and require authentic use of language.

As Willis (1996) argued, PBL can “offer English learners exposure to authentic materials, opportunities to use the target language, and motivation to learn, which are all considered to be essential conditions for language learning” (Eguchi & Eguchi, 2006, p. 523). PBL, like the task-based learning approach, “provides a purpose for a classroom activity which goes beyond the practice of language for its own sake” (Richards, Platt & Weber, 1986, p. 289).

PBL, in general, is a developmental and instructional approach built around an ill-structured problem exhibiting complexity; requiring inquiry, information gathering, and reflection; that is changing and tentative; and lacking simple, fixed, formulaic, “right” solutions (Finkle & Torp, 1995).

A review of literature on PBL in English learning indicates that students have demonstrated a very positive perception of learning English using PBL (Salleh, Ghazali & Raidzuan, 2014). Therefore, PBL may be a beneficial teaching approach for English learners for “authentic language use, chances to improve communicative competence, and increased motivation and self-confidence as a learner” (Lee, Simons, & Ertmer, 2005, p. 352). PBL creates situations where learners need to communicate to get the job done (Moss & Van Duzer, 1998). A quasi-experimental study of PBL in English learning, conducted in Malaysia found that students had a positive viewpoint on language learning and PBL in general, and had a positive impact on the students’ language skills and in particular on their speaking skills (Azman & Shin, 2011).

In this study, self-efficacy is being measured both before and after the intervention to assess if students in China will have the same “positive perception of learning English using PBL,” as has been previously reported (Salleh, Ghazali & Raidzuan, 2014, p. 1).

PBL was identified by Boud and Feletti (1997) as, “the most significant innovation in education for the professions for many years. It is of tremendous beneficitation in education and beyond” (p. 3). Barrows (1996) described the PBL model as having the following features: student-centered learning, learning processed in small groups of 6 to 10, teachers acting as facilitators in the learning process, a problem proposed as the vehicle for skill development and stimulation of the cognitive process, and knowledge obtained through self-directed learning.

It is likely that the characteristics of the PBL paradigm may have greater potential to contribute to English language learning to a greater extent than in other domains. Student-centered learning is fundamentally required by PBL, as well as English language learning. Excessive use of lectures and textbook assignments in English language learning “seems to reinforce students' perception of many content areas as a static collection of incontrovertible facts, but “with little relevance to their daily lives” (Boothe, Vaughn, Hill, & Hill, 2011, p. 3) thus, they are less likely to motivate students towards active involvement in the learning process. While students are the center of the learning process in PBL instead of teachers, the teachers' role changes to that of facilitators and coaches, which is of significant importance in English language learning because of the wide variations in language usage – from conversational to technical. As for myself, being both the student and teacher in English language in China previously, I always have had a concern that teachers frequently have more opportunities to practice their English through speaking, reading, listening and writing than students in the classroom setting with lectured-based traditional English language instruction methods. PBL reverses the role of teachers and students, placing the student in the critical role, which allows students to learn English not only in a comprehensive level, but also in application.

Another distinctive feature of the PBL that requires a degree of self-direct learning, which demands a high degree of obligation and capability in each individual student, and this is also one of the many challenges that PBL presents, especially for those low language performance learners who may feel PBL is more challenging than the traditional English instruction, since it requires more participation from the students themselves in discussion, analysis, finding solutions and presentation, and the feeling of incapableness may turn into anxiety, frustration or other negative emotions triggering “affective filter” (Krashen, 1988). So, “in order to achieve successful results with a PBL model, it is crucial for the teacher to employ well-organized and thoughtful methodologies that lend themselves to the ability level and nature of the learner” (Boothe, et al., 2011, p. 2).

In PBL, problems functioned as the most important mechanism to stimulate the cognitive processes and content learning of students. There is no seamless “problem” that can fit all subjects, and a well-designed “problem” should be the one that is tailored to the needs of students’ intellectual level, language performance level for English language learning, and in particular, be both challenging yet sensible to cope with.

An alternative method to decrease anxiety of low proficient language learners is through group work, because group members can serve as another supporting source besides teachers. “Working in groups, students learn to analyze problems, identify and find needed information by posing and answering questions, share their research findings, and formulate and evaluate possible solutions” (Boothe, et al., 2011, p. 3).

The pedagogical assumption behind PBL is the integration of constructivism: espousing students’ construction of learning through interaction with the environment (the problem in this

case) and situated cognition in providing context (embodied in the problem) that represents the reality in the field for students to work with. A very successful example of situated cognition would be the series of Jasper Woodbury videos (Cognition and Technology Group at Vanderbilt, 1990), in which a complicated math problem is embodied in a real-life puzzle for the students to explore. Many students fear learning math partly because they may have to do tremendous amount of memorization of math formulas, spending a large amount of time bewildered by the peculiar logic of math, and most importantly, cannot understand the reason why they have to learn such a complicated subject. Students “constantly ask why they need to study a subject or what use the information will be to them” (Delisle, 1997, p. 8). The traditional way of teaching math, using textbooks and ongoing unconscious and logical (not making sense to the students) reinforcement (which does not make sense to the students) initiated by the teacher, sadly, separates the application of the subject and the knowledge and skills of that subject, which often makes math a harder subject. Similarly, through a synthetic approach in teaching English, students may end up losing the purpose and motivation to learn, just as they do in math: “Why do I have to memorize so much difficult vocabulary?” “Why do I need to learn grammar?” These questions were constantly being asked by my own students learning English. It feels so wrong for the students to have to go through so many tedious cognitive tasks without getting to see the point of doing the tasks in the first place. Therefore, we need PBL to step in and provide opportunities for students to demonstrate how much they have learned and to keep learning at the same time.

Statement of the Problem

The lack of empirical research on PBL in China and the apparent hesitancy to implement PBL in the domain of English learning in China is the primary rationale for this study. The purpose

of this study is to cooperate with Qingdao NO.2 high school to investigate the potential impact of PBL in English language teaching and further to demonstrate the power of empirical research of PBL in the field of English learning for future decision makers in China who seek research-based instructional improvement.

A literature review on PBL in English learning from 2004 to 2014 reveals that more research in the field of ESL has been done on project-based learning¹ than in problem-based learning (Beckett, 2006; Beckett & Miller, 2006; Ghazouani, 2014; Tiangco, 2005). The present study does not focus extensively on the distinction between problem-based learning, project-based learning and task-based learning, partly because they are very similar, grounded in the same instructional theory, primarily, constructivism, and are often used interchangeably. Additionally, they often overlap at some level and can be the same process, just with different phrasing. Table 1 below illustrates the similarities and differences between project-based learning and problem-based learning.

Table 1.

Comparisons of Problem-based learning, Project-based learning and Task-based learning.

<i>Problem-based learning</i>	<i>Project-based learning</i>	<i>Task-based learning</i>
Similarities among the Three <ul style="list-style-type: none"> ▪ Student-centered ▪ Teachers act as coaches or facilitators ▪ Emphasis on an authentic and meaningful learning context ▪ Collaborative learning ▪ Interdisciplinary 		

¹ There are few studies in English learning so the principles from the ESL literature were extended to guide the review of English learning.

Problem-based learning is “an instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem” (Savery, 2015, p. 5).	Project-based learning (PBL) is “a model that organizes learning around projects” (Thomas, 2000, p. 1).	Task-based learning is “giving learners tasks to transact, rather than items to learn, provides an environment which best promotes the natural language learning process” (ELT, 1999, p. 69).
Ill-structured	Well-structured	Well-structured
Learning-centered in a <u>problem</u> .	Learning-centered in a <u>project</u> .	Learning-centered in a <u>task</u> .
<ul style="list-style-type: none"> • The result is tangible, could be a single solution. • There are multiple possible solutions. • The solution is shared with the class. 	<ul style="list-style-type: none"> • The result is the generation of a product. • The project is shared with an audience. 	<ul style="list-style-type: none"> • The result is the accomplishment of a task. • The task outcome is shared with an audience.
Examples		
A zoo is going to open but they are running into the problem that they need to make a brochure in English for the international visitors, but found no team member who knows any English. Can you help?	The project is for you to make a brochure for the newly opened zoo, so that the visitors to the zoo feel more prepared when they visit.	A zoo is going to open and they need a brochure, your task is to help them make one.

This present study falls into the category of Problem-based learning because the topics are all phrased in the form of problems and are ill-structured. Problems in this study are designed from real cases and relevant to students’ lives. As Savery and Duffy (1995) suggested, problems work better when addressing real issues, because it tends to engage learners more, and the learners want to know the result of their solution. When designing the problems for this study, Delisle’s (1997)

guidelines and suggestions were followed, implementing PBL in the classroom by having problems “grounded in student experience”, (p. 8) “being developmentally appropriate, taking into account the intellectual development and social-emotional needs of students”, (p. 16) and being “ill-structured” (p. 19). The three problems in this study are all ill-structured in nature, including: (1) Qingdao Beer Festival, (2) College entrance exam, and (3) air pollution in China. These problems are relevant to their everyday life and identities as local residents in Qingdao, as students who are going to take the college entrance exam (i.e., GaoKao) and as Chinese citizens. In PBL the problem is often ill-structured, messy and complex in nature, requiring inquiry, information-gathering, and reflection. It is also changing and tentative, and has no simple, fixed, formulaic, "right" solution (Finkle & Torp, 1995).

After the problems are assigned to different groups of students, the students should develop the ownership of their problem-solving processes. Additional materials, information and directions are suggested but not given directly by the teacher, as in the case of learning objectives and assigned readings, because, as Duffy and Savery (2001; p. 139) state, when students are told what to study and what to learn related to the problem, they are not able to engage in “authentic thinking and problem solving in that domain”.

At this point, the three problems should be well designed to drive the teaching and the associated activities around it. The role of the teacher in PBL teaching is of significant importance, yet different from the traditional role of teachers. A number of PBL researchers identified the role of teachers as “facilitators” and “cognitive coaches” (Barrows, 1992; Duffy & Cunningham, 1997). Teachers using PBL should ask students questions like, "Why? What do you mean?" and "How do you know that is true?" (Savery & Duffy, 1994, p. 12) instead of “content-laden” questions

(Abdullah, 1998), to challenge students' reasoning and guide them through the thinking process. By asking such questions, facilitators also "model higher order thinking" with the purpose of stepping back and letting students begin to ask themselves and their peers those same types of questions as they prepare responses. As facilitators, teachers also "provide critical resources needed for the inquiry process" (Abdullah, 1998, p. 4). Given the significance of the role of teacher in PBL, a period of training to address their guidance and direction according to the literature review, was delivered to the teacher who was going to be in charge of the PBL group, in accordance with the literature review.

This study will examine students' written and oral performance and improvement after the PBL intervention. Swain and Lapkin's (1985) output hypothesis argues that input is a necessary but insufficient condition for language learning; students need opportunities for speaking and writing (i.e., output). PBL provides a very good approach to offer the opportunity for speaking and writing because it involves a lot of discussion, presentation and report writing, etc. PBL creates situations where learners need to communicate to get their job done (Moss & Van Duzer, 1998).

A curriculum for nine weeks was designed for the PBL intervention in this study following Barrows' (1985) model of the PBL process in *How to Design a Problem-based curriculum*, with slight adaptations designed to fit with English language learning, including presenting problems, student discussing and analyzing problems using prior knowledge and resources, students deciding what information to use and what new information or data is needed to be gathered. Students revisit the problem with new information and knowledge acquired during self-study, and reflection during their problem-solving process.

In conclusion, PBL is viewed by most of its advocates, “not as a replacement for other teaching methods”, but rather as “an approach to learning which complements mainstream methods” (Haines, 1989, p. 1). This is especially true in the field of second language teaching because of the considerable amount of prerequisite knowledge needed to be taught through memorization, drilling, adopting synthetic’ approaches, for example, grammar or vocabulary and etc., to be able to begin adopting PBL in English teaching, thereby promoting student-learning and achievement.

Chapter 3

Methods and Procedures

This chapter will include a description of the study participants, instrument development and a comprehensive explanation of the research procedures.

Participants

The participants include 88 first-year high school students from Qingdao No.2 High School in China, who have English as one of their common core subjects according to the national curriculum. They were selected by the school principal from two roughly equivalent classes and randomly placed into two groups, NEP and PBL. All students in both groups participated in speaking, written and self-efficacy questionnaire pretests. A total of 84 students participated in speaking and written self-efficacy posttest, and four students from the NEP group declined to participate in posttest of written and speaking test because they felt anxious about speaking and writing in English. Their participation in self-efficacy pretests and posttest, however, are still valid and were analyzed. To retain an equal sample size of written and speaking tests, four students from the PBL group were randomly selected and removed, which resulted in 40 students in each group for the written and speaking variable analysis. Statistically, the sample required for this study was 64, as determined using G-power, a power analysis software. The Type I error rate was set at 0.05 with a power of 0.8 to detect a medium effect size of 0.4. These results are shown in Table 2.

Table 2.

Sample Size Analysis.

F tests - ANCOVA: Fixed effects, main effects and interactions		
Analysis:	A priori: Compute required sample size	
Input:	Effect size f	= 0.4
	α err prob	= 0.05
	Power ($1-\beta$ err prob)	= 0.8
	Numerator df	= 2
	Number of groups	= 2
	Number of covariates	= 1
Output:	Noncentrality parameter λ	= 10.2400000
	Critical F	= 3.1477912
	Denominator df	= 61
	Total sample size	= 64
Actual power = 0.8047686		

First year high school students are believed to have less academic loads than second year high school students. Additionally, they have less pressure to excel on the national common core test and college entrance exams compared to the second and third-year graduates². Hence, the sample of 88 participants is composed of students in two classes selected by the school and randomly assigned to the PBL and NEP groups. Two teachers volunteered to participate as mentors and were randomly assigned to the PBL and NEP group.

² Note, that there are three years in high school, in total, in China. Students in their last year, are pre-occupied with preparation for graduate exams and the high stakes of the college entrance exam, which leaves them unavailable for an empirical experiment of this nature.

Research Design

Prior to the intervention, both groups were pretested in English written, speaking and self-efficacy. After the pretest, the PBL group was presented the intervention phase, a PBL curriculum, for two out of five class periods, each period lasting 45 minutes per week for nine weeks. The PBL group also had the access to a website, classchatter.com, with three-thread discussions were created for small group discussion and students were assigned a user name and password for logging in. Discussion, debates, presentations and other activities were carried out in class using technologies, including PC, digital projectors, document cameras and traditional media. Both groups attended the traditional English class for 3 out of 5 periods each week; the NEP group had only the traditional English language curriculum, which was carried out mostly through synthetic approach, for the same nine-week time period. After nine weeks, both groups were post-tested in speaking, written and self-efficacy.

Data were analyzed to test the effect of the instructional condition (PBL vs. NEP) and the student learning improvement. After the posttest, six randomly selected students, and the teacher from the experimental group were asked to write a short reflection on their impressions of the PBL English learning/teaching method. Table 3 provides the outline of the research process.

Table 3.

Outline of the research design.

Group	Pretest	Intervention	Posttest
PBL (Experimental group) Or NEP(Control group)	Speaking Written Self-efficacy in ESL	Instruction	Speaking Written Self-efficacy in English

Statistical Analysis

This research study was designed to compare two teaching methods in the English learning classroom: PBL and NEP, and seeks to determine if the PBL method increases performance in students' skill in English speaking, written and self-efficacy. The multiple regression method was adopted for this research study to test the three major proposed hypotheses; "The general purpose of multiple regression is to learn more about the relationship between several independent or predictor variables and a dependent or criterion variable" ("Multiple Regression," n.d. <http://www.statsoft.com/Textbook/Multiple-Regression>). Further, regression analysis allows us to test the hypothesis that "group" ("1"=PBL and "2"=NEP) is an effective predictor of students' speaking, written performance and self-efficacy in English learning.

In regression model 1.1, 2.1, 3.1, shown in Table 4, the study examined the correlations between the independent variable "group" and the dependent variables (y) "written", "speaking" and "self-efficacy" respectively, and adjusted R^2 values retrieved from SPSS to see the proportion of variance in the dependent variable (y) explained by the two predictors together, i.e. "pretest" and "group." The study further compared the model of adding the "group" predictor, i.e., Model 1.1, 2.1 and 3.1 with Model 1.2, 2.2 and 3.2 correspondently, to see how much the overall error has been reduced by adding the predictor "group." Additionally, for the "written" and "speaking" variables, the test scores were further analyzed using the multiple regression model in two parts: English performance in written and speaking tasks and to higher order thinking skills; applying the written and speaking scoring rubrics. The study allows us to investigate the results of "written" and "speaking" score differences, and to determine if such changes of outcomes, if any, were due to the instructional environment.

Table 4.

The hypotheses of the experiment.

Model 1.1	$Y_{\text{postwritten}_n} = \beta_0 + \beta_1 \text{pretest}_w + \beta_2 \text{group} + e$	$H_0: \beta_2 = 0$
Model 1.2	$Y_{\text{postwritten}} = \beta_0 + \beta_1 \text{pretest}_w + e$	$H_1: \beta_2 \neq 0$
Compare Model 1.1 with Model 1.2		$H_0: R^2_1 - R^2_{1,2} = 0$ $H_1: R^2_1 - R^2_{1,2} \neq 0$
Model 2.1	$Y_{\text{postspeaking}_l} = \beta_0 + \beta_1 \text{pretest}_s + \beta_2 \text{group} + e$	$H_0: \beta_2 = 0$
Model 2.2	$Y_{\text{postspeaking}} = \beta_0 + \beta_1 \text{pretest}_s + e$	$H_1: \beta_2 \neq 0$
Compare Model 2.1 with Model 2.2		$H_0: R^2_1 - R^2_{1,2} = 0$ $H_1: R^2_1 - R^2_{1,2} \neq 0$
Model 3.1	$Y_{\text{postSE}} = \beta_0 + \beta_1 \text{pretestSE} + \beta_2 \text{group} + e$	$H_0: \beta_2 = 0$
Model 3.2	$Y_{\text{postSE}} = \beta_0 + \beta_1 \text{pretestSE} + e$	$H_1: \beta_2 \neq 0$
Compare Model 3.1 with Model 3.2		$H_0: R^2_1 - R^2_{1,2} = 0$ $H_1: R^2_1 - R^2_{1,2} \neq 0$

Instrumentation

A modified “Adult and ESL Literacy Learning Self-efficacy Questionnaire” was used as the instrument to compare the experiment group with the control group on variable “self-efficacy in English learning.” The “Adult and ESL Literacy Learning Self-efficacy Questionnaire” was

originally designed to “assess adult literacy and ESL learners’ self-efficacy expectations toward learning and literacy” (Mikulecky, 1996, p. 8). The questionnaire was tested in an Adult Basic Education Program in Indianapolis and Intensive English Program at Indiana, reporting a reliability coefficient estimate of .9215 and .799, respectively (Mikulecky, 1996).

In this study, the research participants are 16 to 18-year-old Chinese high school students, and the focus of self-efficacy is in English language learning only. Therefore, some modifications were made to address the interest of this research. All questions were modified by adding “English” or “in English” to specify self-efficacy in English learning, not in literacy in general. For example, question 2 was changed from “I enjoy learning” to “I enjoy learning English.” Questions 5, 8, 17 and 30, were modified by changing “reading” to “speaking” because questions 4, 5, 6, 7, 8, 11, 12, 14, 15, 17, 19, and 21 are all about reading and none of the questions are about speaking; to keep the balance and to address “Speaking” in this study. Further, 5, 8, 17 and 30 are modified to assess students’ self-efficacy in English Speaking (e.g. 30). Changing from “Sometimes I think I am not good at reading in English” to “Sometimes I think I am not good at speaking in English.” Modified “Adult and ESL Literacy learning Self-efficacy Questionnaire” originally drawn and modified from the *Children’s School Attitude Schedule*, (Barker Lunn, as adopted by Mikulecky, 1996, p. 9), *Locus of Control Scale* (Nowicki & Strickland, 1973), *Self-Efficacy Scale* (Sherer & Maddux, 1982), *Self-Efficacy for Academic Achievement Scale* (Zimmerman, Bandura & Martinez-Pons, 1992), and the original 119 questions has been reduced to 30, after a pilot testing to ensure its validity and reliability (Mikulecky, 1996, p. 2). A five-point measurement scale was used in this questionnaire: “1” as “strongly disagree”, “2” as “disagree”, “3” as “undecided”, “4” as “agree”, and “5” as “strongly agree.” The range of scores for self-efficacy is from 30 to 150.

The other two instruments used in this study are the modified Written and Speaking Test from “Quest 2, Reading and Writing”, (Hartmann, 2006), and “Quest 2, Listening and Speaking” (Blass, 2006). The pretest and posttest for the written and speaking are different but share similar topics to ensure its accuracy and reliability. For example, for the written test, the pretest is about eating healthy and the posttest is about exercising. The Written and Speaking Test were not only designed to measure students’ language performance but also their capability in higher order thinking -- determining point of view, identifying causes and effects, finding evidence and exploring implications and connections, that are believed to be highly correlated with PBL. The scoring rubric of the Speaking Test is comprised of two parts: language performance, drawn from Rubistar, a self-creating rubric website for PBL activity (<http://rubistar.4teachers.org/index.php>); and disposition, which is the assessment of higher order thinking skills related to PBL. For example, “analysis of ideas and concepts” generated from the PBL Speaking rubric, created in Rubistar. The assessment rubric of the Written Test is comprised of two parts as well: both of the language performance part and disposition part drawn from Rubistar and the disposition part adopted from persuasive essay catalog under Rubistar. There are 10 items for the Speaking Test consisting of 5 items of language performance and 5 items of disposition; similarly, there are 10 items for the Written Test consisting of 5 items of language performance and 5 items of disposition. A four-point measurement scale was adopted in determining the rubric score: “0” is “Failing”, “1” as “Poor”, “2” as “Fair”, and “3” as “Good.” The range of scores for both speaking and written are from 0 to 30.

Design of the Curriculum and Teacher Training

There are three major units that focus on the three problem scenarios in the PBL curriculum. Problems were presented to students at the beginning of each unit and students had

three weeks for gathering data, conducting research, discussing and exchanging solutions with group members for each problem. Students, in groups, were asked to present their solution/final report in the form of brochure, poster and report at the end of each unit. For purposes of this research, the curriculum of PBL intervention follows the modified version of Barrows' (1985) classic model of the PBL process in *How to Design a Problem-based Curriculum* shown in Table 5.

Table 5.

Modified Barrows' (1985) classic model of the PBL process in How to Design a Problem-based Curriculum.

Process	Purpose
Students read and address problem, without any background preparation.	*Teaches students to encode and organize information in useful ways. *Allows students to find what they know and what they don't know. Misconceptions can be corrected in discussion of the problem.
Students discuss and analyze problem using prior knowledge and resources available. Teacher poses questions: e.g. Do you need more information? Are you sure of the facts or will a review be helpful? Do you think more information on this area would be helpful?	*Development of cognitive skills for problem-solving process *Development of self-monitoring skills to identify the learning needs *Development of habitual student-initiated questioning
Students decide what they need to know and where they might best find the information. They decide which resources to use (people, published papers, etc.).	*Self-directed study

<p>Students revisit problem with new information and knowledge acquired during self-study.</p> <p>Students critique learning resources used.</p> <p>Group decides appropriate hypotheses and critiques prior performance.</p>	<p>*New organization of information to problem-solve.</p> <p>*Self-assessment</p> <p>*Peer-assessment</p>
<p>Students present their solutions in groups to the whole class.</p>	<p>*end product/solution presentation</p>
<p>Students reflect on the vocabulary, sentence pattern, and other new knowledge they learned through the problem solving process.</p>	<p>*Reflection</p> <p>*Self-assessment</p>

“*Speaking of Teaching, problem based learning*”, one of the topics covered in Stanford University's *Newsletter on Teaching*, was utilized as a teacher’s guide to enable effective and efficient implementation of PBL for the PBL group. The focus of the guide is to answer questions such as what is PBL, how can we implement PBL in the classroom and how do we apply PBL in teaching English as a foreign language. Basic rules and concepts of PBL in classroom settings were illustrated in the guide. In addition, the teacher in the PBL group was provided with three teaching plans intended to introduce three central problems formed in three units. Table 6 provides the list of three central problems carried out for three units. Table 6 shows the distribution of tasks accomplished weekly.

Table 6.

The list of three central problems displayed in three units.

<i>Unit 1</i>	1. The city is developing a brochure for the Qingdao Beer Festival, and as the festival attracts more and more international people, the city government hopes to have some brochures that are written in English.
<i>Unit 2</i>	2. Air pollution has been a real hot issue in China in recent years. Journalist Jing Chai’s documentary, “Under the Dome,” released and published in the New York Times raises global concerns. What do you think we can do as citizens to get our fresh air back as we had years ago? Please synthesize your idea in a poster.
<i>Unit 3</i>	3. Every Chinese student has to take the college-entrance exam, i.e. GAOKAO (high-stake test in China) in their last year of high school in China. Our government is proposing a reform to make it less burdensome but still maintain high quality in testing students’ academic level. But, how and what to change causes intense debate with parents and students holding different views and values. As a student, how do you think the reform should be done? Please write a report of your finding with suggested solutions.

Scoring Rubrics

Both the pretest and posttest of Speaking were digitally recorded by the PBL teacher and NEP teacher and emailed to the researcher of this study. The pretest and posttest of Written and Self-efficacy were conducted on the computer in the computer lab in Qingdao No.2 High School, and were saved in word documents that were also sent to the researcher of this study. The pretest and posttest were scored by two trained ESL major master students (one is a Chinese student and the other one is a native student whose mother language is English) in the U.S.A. using confidential procedures to protect student identity and ensure scoring reliability. Training and a workshop were provided for the two graders regarding the rubrics and objectivity in grading to minimize scoring partiality and bias. Table 7 shows the distribution of tasks conducted each week for the PBL group,

and the NEP group adopted the learning task that a traditional English teaching method, Presentation, Practice and Perform (PPP) offers.

Table 7.

Distribution of tasks conducted each week.

Week 1~2	Introduction of experiment, division of groups and pretest.
Week 2~3	Unit 1: identify the problem, gathering materials (center problem: Qingdao Beer Festival)
Week 3~4	Unit 1: group discussion and present solution
Week 4~5	Unit 2: identify the problem, gathering materials (center problem: Air Pollution in China)
Week 5~6	Unit 2: group discussion and present solution (center problem: Air Pollution in China)
Week 6~7	Unit 3: identify the problem, gathering materials (center problem: College entrance exam)
Week 7~8	Unit 3: group discussion and present solution (center problem: College entrance exam)
Week 8~9	Posttests and reflection

Chapter 4

Data Analysis

This chapter describes the statistical treatment of data cleaning process and reviews the research questions, hypotheses and associated data analyses. Three research questions addressing ESL written, oral and self-efficacy was analyzed separately.

Self-efficacy Variable Analysis

Table 8.

Self-Efficacy Description Analysis Table.

Assessment	Group	N	Mean	STD	Std. Error
pretest of self-efficacy	PBL	44	90.68	7.001	1.055
	NEP	44	90.89	7.176	1.082
	Total	88	90.78	7.049	.751
posttest of self-efficacy	PBL	44	92.86	7.721	1.164
	NEP	44	89.25	8.562	1.291
	Total	88	91.06	8.306	.885

To get an overview of the sample, a descriptive analysis of the data was conducted. Table 8, above, shows the means, standard deviations and standard errors of the self-efficacy scores for the 44 students in each group at the pretest and posttest questionnaire. The average score of group one (PBL) in pretest is 90.68, with a Standard deviation of 7.001 and range from 78 to 108; the average score of NEP group in pretest is 90.89, with a standard deviation of 7.176 and range from 76 to 104. The pretest shows that PBL group and NEP group seem to have similar self-efficacy in English learning means and standard deviations. The average score of PBL group in posttest is

92.86, with a standard deviation of 7.721 and range from 77 to 114; the average score of NEP group in posttest is 89.25, with a standard deviation of 8.562 and range from 51 to 103. The mean difference in pretest and posttest of group 1 is 2.18, and -1.64 in group 2.

Table 9.

Extreme Values of self-efficacy Z-scores.

Assessment			Case Number	Value
Pretest of self-efficacy	Highest	1	57	2.44232
	Lowest	1	8	-2.09733
Posttest of self-efficacy	Highest	1	54	2.76210
	Lowest	1	41	-4.82239
		2	14	-2.05345

The +/- 3 Z-score rule were employed to identify outliers that are + or - 3 SDs away from the mean using Z-score. Thus any Z-scores less than -3 or greater than +3 are considered an outlier. One outlier ($Z=-4.82239 < -3$) from posttest of self-efficacy was identified, shown in the extreme value table. The outlier from the posttest of self-efficacy was kept in the data because chances are it may reflect the nature of the population. The same method was adopted for identifying and treatment for outliers for written and speaking variables thus was not repeated in the text.

Table 10.

Self-Efficacy Sample Regression Coefficients Table.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	36.600	9.959		3.675	.000
	pretest of SE	.600	.109	.509	5.484	.000
2	(Constant)	34.378	9.706		3.542	.001
	pretest of SE	.604	.106	.512	5.687	.000
	group	3.737	1.488	.226	2.511	.014

In the coefficients table, Model 1 represents $Y_{postSE} = \beta_0 + \beta_1 pretestSE + e$, and Model 2 represents $Y_{postSE} = \beta_0 + \beta_1 pretestSE + \beta_2 group + e$; the coefficient of dummy (group) variable is 3.737 ($p = .014 < .05$) significant in predicting Y_{postSE} as group changes from NEP group to PBL group, the value of Y_{SE} is increasing by 3.737 unit, the $H_0: \beta_2 = 0$ was rejected. Thus group is a good predictor in predicting students' ESL self-efficacy scores, and in addition, PBL group of students tended to have higher self-efficacy scores in ESL than NEP group.

Table 11.

Self-Efficacy Sample Regression Model Summary Table.

Model	R	R Square Change	Change Statistics	
			F Change	Sig. F Change
1 pre-test	.509 ^a	.259	30.079	.000
2 pre+group	.557 ^b	.051	6.307	.014

a. Predictors: (Constant), self-efficacy pretest score

b. Predictors: (Constant), self-efficacy pretest score, dummy variable

Model 1 represents $Y_{postSE} = \beta_0 + \beta_1 pretestSE + e$; the proportion of variance explained by pretest is $R^2_{y,pretestSE} = .259$. Model 2 represents $Y_{postSE} = \beta_0 + \beta_1 pretestSE + \beta_2 group + e$; the proportion of variance explained by pretest and group is $R^2_{y,pretestSE,group} = .310$. The increase in R^2 (proportion of variance explained) from Model 1 to Model 2 is $.310 - .259 = .051$ and it is statistically significant ($p = .014 < .05$) at .05 level, so the $H_0: R^2_1 - R^2_{1,2} = 0$ was rejected and to further conclude that $Y_{postSE} = \beta_0 + \beta_1 pretestSE + \beta_2 group + e$ is an effective model, since it accounts for significantly more variance in self-efficacy than would be expected by chance.

Written English Analysis

Table 12.

Written Description Analysis Table.

Assessment	Group	N	Mean	STD	Std. Error
Pretest total score	PBL	40	13.838	3.209	.507
	NEP	40	13.163	4.598	.727
	Total	80	13.500	3.954	.442
Posttest total score	PBL	40	16.350	3.607	.570
	NEP	40	15.575	4.176	.660
	Total	80	15.963	3.897	.435

To get an overview of the sample, descriptive analysis was conducted. Table 12 shows that 40 students in each group attended the English written pretest and posttest. The average score of PBL group in pretest is 13.838, with a standard deviation of 3.209 and range from 7.0 to 22.5; the average score of NEP group in pretest is 13.163, with a standard deviation of 4.598 and range from 2.5 to 24.5. The mean score of PBL group in posttest is 16.35, with a Standard deviation of 3.607 and range from 9.5 to 24.0; the average score of NEP group in posttest is 15.575, with a standard deviation of 4.176 and range from 3.0 to 26. It shows that PBL group and NEP group seem to have similar written scores in pretest and posttest respectively, with similar means and Standard deviations. The mean difference in pretest and posttest of PBL group is 2.512, and 2.412 in NEP group.

Table 13.

Written Sample Regression Coefficients Table.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.087	1.343		6.765	.000
	written pretest total score	.509	.096	.517	5.332	.000
2	(Constant)	8.934	1.375		6.497	.000
	written pretest total score	.505	.096	.512	5.240	.000
	group	.434	.757	.056	.574	.568

In the coefficients table, Model 1 represents $Y_{\text{post}_{\text{written}}} = \beta_0 + \beta_1 \text{pretest}_{\text{w}} + e$, and Model 2 represents $Y_{\text{post}_{\text{written}}} = \beta_0 + \beta_1 \text{pretest}_{\text{w}} + \beta_2 \text{group} + e$; the coefficient of dummy variable (group) of .434 ($p = .568 > .05$) is not significant in predicting $Y_{\text{post}_{\text{written}}}$, therefore, $H_0: \beta_2 = 0$ was not rejected and thus group is not a good predictor in predicting written scores.

Table 14.

Written Sample Regression Model Summary Table.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	Sig.F Change
1Pre-test	.517 ^a	.267	.258	3.3577	.267	28.426	.000
2pre+group	.520 ^b	.270	.251	3.3723	.003	.329	.568

a. Predictors: (Constant), written pretest total score

b. Predictors: (Constant), written pretest total score, dummy variable

Model 1 represents $Y_{\text{post}_{\text{written}}} = \beta_0 + \beta_1 \text{pretest}_w + e$; the proportion of variance explained by pretest is $R^2_{y.\text{pretest}_w} = .267$. Model 2 represents $Y_{\text{post}_{\text{written}}} = \beta_0 + \beta_1 \text{pretest}_w + \beta_2 \text{group} + e$; the proportion of variance explained by pretest and group is $R^2_{y.\text{pretest}_w, \text{group}} = .270$. The increase in R^2 (proportion of variance explained) from Model 1 to Model 2 of .003 is not statistically significant ($p = .568 > .05$) at .05 level, hence, $H_0: R^2_1 - R^2_{1,2} = 0$ was not rejected.

Table 15.

Written Part One (higher-order thinking skills in writing) Sample Regression Model Summary Table.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	Sig. F Change
1pre-test	.436 ^a	.190	.179	1.9038	.190	18.274	.000
2pre+group	.446 ^b	.199	.178	1.9055	.009	.866	.355

a. Predictors: (Constant), written pretest part1 score of higher-order thinking skills

b. Predictors: (Constant), written pretest part1 score of higher-order thinking skills, dummy variable

Model 1 represents $Y_{\text{post}_{\text{written}1}} = \beta_0 + \beta_1 \text{pretest}_{w1} + e$; the proportion of variance explained by pretest_{w1} is $R^2_{y.\text{pretest}_{w1}} = .190$. Model 2 represents $Y_{\text{post}_{\text{written}1}} = \beta_0 + \beta_1 \text{pretest}_{w1} + \beta_2 \text{group} + e$; the proportion of variance explained by pretest and group is $R^2_{y.\text{pretest}_{w1}, \text{group}} = .199$. The increase in R^2 from Model 1 to Model 2 of .009 is not significant ($p = .355 > .05$) at .05 level, hence the $H_0: R^2_1 - R^2_{1,2} = 0$ was not rejected. That is to say the proportion of language performance in writing explained after adding group factor did not cause any significant changes.

Table 16.

Written Part Two (language performance in writing) Sample Regression Model Summary Table.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	Sig. F Change
1Pre-test	.389 ^a	.151	.140	2.1748	.151	13.909	.000
2pre+group	.389 ^b	.151	.129	2.1888	.000	.002	.961

a. Predictors: (Constant), written pretest part 2 score of English Performance skills

b. Predictors: (Constant), written pretest part 2 score of English Performance skills, dummy variable

Model 1 represents $Y_{\text{post}_{\text{written}2}} = \beta_0 + \beta_1 \text{pretestw}2 + e$; the proportion of variance explained by $\text{pretestw}2$ is $R^2_{y, \text{pretestw}2} = .151$. Model 2 represents $Y_{\text{post}_{\text{written}2}} = \beta_0 + \beta_1 \text{pretestw}2 + \beta_2 \text{group} + e$; the proportion of variance explained by pretest and group is $R^2_{y, \text{pretestw}2, \text{group}} = .151$. The increase in R^2 (proportion of variance explained) from Model 1 to Model 2 of $.000$ is not significant ($p = .961 > .05$) at $.05$ level, hence $H_0: R^2_1 - R^2_{1,2} = 0$ was not rejected. That is to say the proportion of higher-order thinking skills in writing explained after adding group factor did not cause any significant changes.

Speaking variable analysis

Table 17.

Speaking Description Analysis Table.

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
PRE	PBL	40	16.113	5.6890	.8995	14.293	17.932
	NEP	40	16.225	4.7998	.7589	14.690	17.760
	Total	80	16.169	5.2301	.5847	15.005	17.333
POST	PBL	40	16.763	5.2342	.8276	15.089	18.436
	NEP	40	17.613	4.9814	.7876	16.019	19.206
	Total	80	17.188	5.0949	.5696	16.054	18.321

The descriptive table above shows that 40 students in each group attended English speaking pretest and posttest. The mean score of PBL in pretest is 16.113, with a standard deviation of 5.689; the average score of group 2 in pretest is 16.225, with a standard deviation of 4.799. The average score of group one in posttest is 16.763, with a Standard deviation of 5.234; the average score of group 2 in posttest is 17.613, with a standard deviation of 4.981. It shows that PBL group and NEP group seem to have similar speaking scores in general, with similar means and Standard deviations. The mean difference in pretest and posttest of group 1 is .65, and 1.388 in group 2.

Table 18.

Speaking Sample Regression Coefficients Table.

Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients		
1	(Constant)	7.960	1.518		5.243	.000
	PRES	.571	.089	.586	6.384	.000
	(Constant)	8.367	1.595		5.245	.000
	PRES	.570	.090	.585	6.363	.000
	G	-.786	.931	-.078	-.844	.401

In the coefficients table, Model 1 represents $Y_{\text{post}_{\text{speaking}}} = \beta_0 + \beta_1 \text{pretests} + e$, and Model 2 represents $Y_{\text{post}_{\text{speaking}}} = \beta_0 + \beta_1 \text{pretests} + \beta_2 \text{group} + e$; the coefficient of dummy (group) variable is $-.786$ ($p = .401 > .05$) not significant in predicting $Y_{\text{post}_{\text{speaking}}}$, so $H_0: \beta_2 = 0$ was not rejected and thus group is not a good predictor in predicting speaking scores.

Table 19

Speaking Sample Regression Model Summary Table

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	Sig. F Change
1Pre-test	.586 ^a	.343	.335	4.1555	.343	40.755	.000
2pre+group	.591 ^b	.349	.332	4.1632	.006	.713	.401

a. Predictors: (Constant), PRES

b. Predictors: (Constant), PRES, G

Model 1 represents $Y_{\text{post}_{\text{speaking}}} = \beta_0 + \beta_1 \text{pretests} + e$; the proportion of variance explained by pretest is $R^2_{y.\text{pretests}} = .343$. Model 2 represents $Y_{\text{post}_{\text{speaking}}} = \beta_0 + \beta_1 \text{pretest} + \beta_2 \text{group} + e$; the proportion of variance explained by pretest and group is $R^2_{y.\text{pretests, group}} = .349$. The increase in R^2 (proportion of variance explained) from Model 1 to Model 2 is .006, and it is not significant ($p = .401 > .05$) at .05 level, hence $H_0: R^2_1 - R^2_{1,2} = 0$ was not rejected.

Table 20.

Speaking Part One (higher-order thinking skills in speaking) Sample Regression Model Summary Table.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	Sig. F Change
1pre-test	.523 ^a	.274	.264	2.4079	.274	29.383	.000
2pre+group	.525 ^b	.276	.257	2.4198	.002	.235	.629

a. Predictors: (Constant), Pres1

b. Predictors: (Constant), Pres1, G

Model 1 represents $Y_{\text{post}_{\text{speaking}1}} = \beta_0 + \beta_1 \text{pres1} + e$; the proportion of variance explained by pretests1 is $R^2_{y.\text{pretests}1} = .274$. (pres1 refers to pretest of speaking part 1, the higher-order thinking skill part) Model 2 represents $Y_{\text{post}_{\text{speaking}1}} = \beta_0 + \beta_1 \text{pres1} + \beta_2 \text{group} + e$; the proportion of variance explained by pretests1 and group is $R^2_{y.\text{pretests}1, \text{group}} = .276$. The increase in R^2 (proportion of variance explained) from Model 1 to Model 2 is .002, and it is not statistically significant ($p = .629 > .05$) at .05 level, hence $H_0: R^2_1 - R^2_{1,2} = 0$ was not rejected. That is to say the proportion of language performance in speaking explained after adding group factor did not cause any significant changes.

Table 21.

Speaking Part Two (language performance in speaking) Sample Regression Model Summary Table.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	Sig. F Change
1Pre-test	.605 ^a	.366	.358	2.0852	.366	45.040	.000
2Pre+group	.614 ^b	.377	.361	2.0808	.011	1.325	.253

a. Predictors: (Constant), Pres2

b. Predictors: (Constant), Pres2, G

Model 1 represents $Y_{\text{post}_{\text{speaking}2}} = \beta_0 + \beta_1 \text{pres}2 + e$; the proportion of variance explained by pretests2 is $R^2_{y, \text{pretests}2} = .366$. (pres2 refers to pretest of speaking part 2, the English speaking performance part) Model 2 represents $Y_{\text{post}_{\text{speaking}2}} = \beta_0 + \beta_1 \text{pres}2 + \beta_2 \text{group} + e$; the proportion of variance explained by pretests1 and group is $R^2_{y, \text{pretests}2, \text{group}} = .377$. The increase in R^2 (proportion of variance explained) from Model 1 to Model 2 is .011, and it is not statistically significant ($p = .253 > .05$) at the .05 level, hence $H_0: R^2_1 - R^2_{1,2} = 0$ was not rejected. That is to say the proportion of higher-order thinking skills in speaking explained after adding group factor did not cause any significant changes.

Standard Z-score rule was used to identify outliers in each variable. Descriptive analyses were presented to provide an overview of the dataset in both PBL group and NEP group and were repeatedly processed in each three variables independently. Three variables of interest were analyzed through multiple regressions separately; writing variable and speaking variable were further analyzed broken down into language performance and higher-order thinking skills. The conclusions drawn from the data analysis above are that, group membership is a significant

predictor in predicting students' self-efficacy in English learning and what's more, PBL results in higher self-efficacy in English learning than traditional English teaching method. Conversely, group is not a suitable predictor in predicting students' writing and speaking performance, neither in predicting language performance nor in foretelling higher-order thinking skills in writing and speaking.

Chapter 5

Discussion

The major purpose of this study was to investigate if PBL is a potentially effective approach for teaching Chinese students' English speaking and writing skills, and increasing students' self-efficacy towards English learning. Three research questions were addressed.

For the self-efficacy variable, the data analyses support rejecting the null hypothesis, that $H_0: \beta_2=0$ and demonstrates that PBL is an effective instructional approach with this sample of Chinese high school students, increasing their self-efficacy for learning English, which is to say that the PBL group of students tended to have higher self-efficacy scores towards English learning than NEP group after the intervention. In addition, the null hypothesis ($H_0: R^2_1 - R^2_{1, 2} = 0$) was rejected, and further it was concluded that $Y_{SE} = \beta_0 + \beta_1 \text{pretest} + \beta_2 \text{group} + e$ is an effective model in predicting students' self-efficacy scores towards English learning, accounting for significantly more variance in self-efficacy of English learning than the NEP group.

The answer to the third research question, of whether PBL results in higher self-efficacy in English learning, is “yes”, which is consistent with the concept Lee, Simons, and Ertmer (2005) proposed, that PBL could be a beneficial teaching approach for English learners for “authentic language use, chances to improve communicative competence, and increased motivation and self-confidence as a learner” (p. 352).

When the teacher reflected her impressions on this PBL English teaching methods, she stated, “the students in this PBL group has very low interest in English learning and their English

performance in general was comparatively lower than other classes in that grade, but she sees hope in getting students interested and engaged in English learning through PBL.”

The significant improvement of students in self-efficacy in English learning also is consistent with the theory Barrows and Tamblyn (1980) and Engel (1997) proposed, that regardless of the discipline, PBL tends to boost confidence in students in speaking the target language, and target language learning overall, through the provision of a perfect milieu for students to practice their target language in speaking and many other aspects. Based on this principle, Barrows and Tamblyn (1980) and Engel (1997) further suggested that the more confidence and enthusiasm students get from using PBL to learn the target language, the more likely they will spend more time learning it, which will then improve students' language performance. This, however, did not apply to this study in the measures of writing and speaking language performance.

For variables of writing and speaking, the clear conclusion emerging from these data is that “group” is not a significant predictor in predicting students' English writing and speaking level and, adding the instructional “group” factor does not significantly improve students' English writing and speaking scores. Thus, it answers the remainder of the two research questions; that PBL does not result in higher speaking and writing performance than traditional English teaching method in a 9-week intervention. Furthermore, writing and speaking scores were analyzed broken down into two parts: higher-order thinking skills, more precisely, higher order thinking skills in writing and speaking (part 1) and English language performance (part 2) in writing and speaking. The results demonstrate that PBL is not significant in improving students' higher order thinking skills nor in improving English language performance than traditional English teaching method in both writing and speaking, within the limitations of this study.

One possible explanation for PBL instruction not significantly improving students' writing and speaking performance, is that the PBL intervention period of 9-weeks in this study is too short to trigger any kind of significant measurable improvement in writing and speaking performance. And that the PBL instruction was only applied in a subset of the total number of classes during the 9-week period. Research has demonstrated that it usually takes 3 to 5 years for English learners to develop speaking performance (Hakuta, 2000). And it takes a long time for English learners to develop writing skills (Leki, 1991). In other words, the development of writing and speaking performance is long-term systematic endeavor, and the duration of this study may have been too short to show growth in skills.

Another hypothetical explanation could be that albeit PBL, in theory, creates more opportunities for students to practicing communication and writing skills than traditional language teaching approach, practically, there is still a good chance that students may unintentionally switch to their native language back and forth so that it's easier to get the task (problem-solving process) accomplished. This code switching was not a variable examined in this study.

The third probable reason or, more precisely, limitation, for PBL having no significant improvement in writing and speaking skills in this study is that the nine-week period of PBL intervention is not exclusively for PBL method application. Three out of five periods each week during the intervention, traditional English teaching curriculum was adopted in the PBL group to keep up with the English subject learning plan required by provincial educational department, which left only two out of five periods each week for PBL group students to explore PBL curriculum for nine weeks (40% of the instruction was PBL) so the intervention may have been diluted and not powerful enough to result in significant skill gains.

Besides language performance, this study also examined students' higher order thinking reflected in writing and speaking because it has proved to be relevant to PBL methodology, and in the current study, it was found that there is no evidence provided that PBL is a good instructional approach in developing students' higher order thinking skills in writing and speaking.

Apart from insufficient time and lack of intensity of the experiment, it is important to go back and review the concept of higher order thinking; "From the cognitive scientist's point of view, the mental activities that are typically called higher order thinking are actually a subset of three types of thinking: reasoning, making judgments and decisions and problem solving" (Willingham, 2007, p.11). There is a possibility that students from PBL group may have demonstrated improvement in higher order thinking throughout the problem solving process, but, unfortunately, due to the limitations of the instruments and scoring rubrics, there is no way to capture that moment and the development of these potential higher order thinking skills. Just as Willingham (2007) further pointed out, "Higher order thinking is not a set of skills that can be deployed at any time, in any context" (p.10).

Another potential explanation for PBL not showing significant improvement in writing and speaking overall may be linked to the PBL teacher, including limited accessibility to multimedia for students to participate group discussion in class, teacher's recommended readings that did not fit students' current language performance, which leads to students' incompetence and, potentially, even anxiety in accomplishing assigned educational tasks, the teacher not being used to the PBL teaching methods and a tendency to step in and intervene when problems arose for students, regarding problem-solving processes, instead of guiding and scaffolding, which left students little time to adjust on their own; "Frequently teachers will give students ownership of the problem, but dictate the process for working on that problem" stated by Savery and Duffy (1995, p. 5).

Moreover, by checking on the website of classchatter.com, it was clear that students were being very passive in participating in the threaded discussions, created to make up for less discussion time during class period. The reason behind that, according to the reflection of the students, is that the tremendous schoolwork and assignment left them no time for doing the online threaded discussions and since it was not a mandatory assignment by the teacher, they tended to overlook it.

Those possible explanations above were implied by Krashen (1988) in his affective filter theory, that low language performance learners may feel PBL is more challenging than the traditional English instruction, since it requires more participation from the students themselves in discussion, analysis, finding solutions and presentation, and the feeling of being incapable may turn to anxiety, frustration or other negative emotions, triggering “affective filter.” So, “in order to achieve successful results with a PBL model, it is crucial for the teacher to employ well-organized and thoughtful methodologies that lend themselves to the ability level and nature of the learner” (Boothe, et al, 2011, p. 2). What’s more, as Duffy and Savery (2001) suggested, additional materials, information and directions are recommended but are not to be given directly by the teacher, as in the case of learning objectives and assigned readings, because, when students are told what to study and what to learn related to the problem, they are not able to engage in “authentic thinking and problem solving in that domain” (p. 2).

Six students were randomly selected from PBL group to write a brief reflection on their impression on this study and they were labeled as student 1 to 6. All of the six students mentioned that PBL is a very interesting and inquisitive teaching method and it makes English learning a fun experience. Student one said that “through using target language, English, in this case, to solve realistic problem like global warming broaden her knowledge in many ways and make learning a

meaningful, thought-provoking and stimulating practice.” This is consistent with the position that Savery and Duffy (1995) suggested, problems work better when addressing real issues, because it tends to engage learners more and the learners have stronger motives to test out the result of their solution.

Student 3 stated, “PBL learning experience offered her opportunity to challenge myself to the limits in so many ways, such as information-gathering, cooperative learning and many more. Moreover, she felt that her ability in understanding big chunk of information in English has substantially improved.” It re-confirmed that students tended to have a positive viewpoint on language learning and PBL in general, consistent with the position shown in a quasi-experimental study of PBL in English learning, conducted in Malaysia (Azman & Shin, 2011). Though student 4 did mention that PBL learning experience tended to provide more opportunities for him to practice writing in English, compared with traditional English learning experience, the statistical results differs from the interpretation concluded in the same experiment conducted in Malaysia, in that the students tended to show a positive impact on their language skills and, in particular, on their speaking skills (Azman & Shin, 2011).

All six of the students have expressed positive attitudes towards the PBL English learning experience. Salleh, Ghazali and Raidzuan (2014) established that students have reported very positive perception of learning English using PBL. And most of the students mentioned that through PBL approach, they have acquired various cooperative learning strategies and more importantly, they were able to enjoy in the process of learning. Most of the students implied on their reflection that compared to normal English teaching method, which they described as “boring and test-based”, PBL provides them opportunities to broaden their knowledge using English as a

language tool and being able to explore hot topics in society using English. Students' descriptions about traditional English instruction demonstrated again that the traditional behaviorist trend in language instruction has been to define desired goals independently of the learners and situation, present language in a structured, linear fashion, then attempt to reinforce the content through decontextualized practice. Learners end up knowing about the language but not how to use it" (Short, Harste & Burke, 1996, see from Abdullah, 1998, p. 2).

"I, myself have learned a lot in adopting PBL teaching approach; students took turns to play group leader, recorder and assistant group leader and I can tell they were very engaged and motivated; PBL provide students a lot of opportunities to get to learn authentic language usage, practice their English and make a learning a fun and hands-on experience" recalled by the teacher. Therefore, PBL, as proposed by Lee, Simons and Ertmer (2015), may be a beneficial teaching approach for English learners for "authentic language use, chances to improve communicative competence, and increased motivation and self-confidence as a learner" (p. 352), even though the current study was unable to provide statistical evidence.

As much as the positive viewpoints PBL generates, there were a few concerns raised by students and the teacher as well. Three out of six students mentioned in their reflection that in air pollution unit, most of the reading both they found on their own and recommended by the teacher are very difficult to comprehend and involve a lot of academic vocabulary and technical jargon, and as the substantial reading amount required by PBL in nature, students sometimes felt a little overwhelmed and anxious. To avoid this from happening in an experimental study of PBL, suggested by Savery and Duffy (1995), "It may well require discussion and negotiation with the learner to develop a problem or task which is authentic in its cognitive demands and for which the learner can take ownership" (p. 4). The teacher recalled on the PBL teaching process and wrote

that: It takes time for students to get used to a large proportion of discussion in class; students tend to feel insecure without teacher lecturing and instructing the whole time through PBL curriculum; the teacher herself needs to get used to stepping outside and coaching without giving direct solutions to students' questions, but to demonstrate thinking process to students instead.

Summary

To summarize from the data mainly and taking students' and the teacher's reflection into account, PBL is perceived "not as a replacement for other teaching methods", but rather as "an approach to learning which complements mainstream methods" (Haines, 1989, p. 1).

Fairly speaking, there are some limitations in this study that needs to be addressed for future reference. For example, one of the students stated that the PBL intervention was conducted at a period of time along with a lot of exams and schoolwork required from other subjects, so that she was not able to fully immersed in the threaded discussions and sometimes other activities of PBL. The intensity and time allowed for this PBL intervention may be inadequate to fully test the effect of PBL in English writing and speaking learning, and also in higher order thinking development.

It is important to note that it is the first time for the PBL group teacher to embrace PBL teaching approach, so it took time for her to adjust as well, and to be able to be competent in the instructional approach and may require further experience in developing confidence in coaching, monitoring, and demonstrating effective thinking process for her students. If applicable, it is beneficial for students to design the problem they like and to fit their competence and language performance, together with the teacher, so that they can be fully engaged. Additionally, for the future PBL studies in English language learning in China, researchers and teachers need to ensure

the accessibility for the students to multimedia tools so that they can conduct activities PBL stimulate, for example, threaded discussions.

In conclusion, PBL may be a very affective teaching method in English language teaching in China and it is worth for further investigation and additional empirical experiments to be conducted in high school classrooms.

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Appendix A
Speaking Test

Pretest

Do you think Climate Change will impact you in your lifetime? Why or why not and provide support for your reasons.

- You have 10 minutes to prepare your thoughts
- Your oral presentation should be five minutes long

Posttest

How do you think of water scarcity will impact you in your life time? Why or why not and provide support for your reasons.

- You have 10 minutes to prepare your thoughts
- Your oral presentation should be five minutes long

Appendix B

Written Test

Pretest

Do you think eating healthy will help you be happy? What are the reasons for your answer?

- You have 30 minutes to organize and provide support for your arguments.

Posttest

Do you think doing exercise everyday will make you happy? What are the reasons for your answer?

- You have 30 minutes to organize and provide support for your arguments.

Appendix C

Teacher training for PBL group

Date	Activities /topic covered	Materials used
03/25/16 - 03/26/16	<ul style="list-style-type: none"> • Basic Framework of PBL Teaching • Significant Characteristics of PBL Teaching 	<ul style="list-style-type: none"> • Problem-based learning, <i>Speaking of Teaching</i>, Stanford University Newsletter on Teaching
03/26/16 - 03/27/16	<ul style="list-style-type: none"> • The Teacher's Role in Promoting PBL Teaching • Developing PBL Classroom Environment and Management 	<ul style="list-style-type: none"> • http://ldt.stanford.edu/~jeepark/jeepark+portfolio/PBL/skipintro.htm (Website on PBL by Stanford)
03/27/16 - 03/28/16	<ul style="list-style-type: none"> • Practical Applications of PBL for the ESL Classroom • Sample PBL Activities to Improve ESL Classroom Instruction 	<ul style="list-style-type: none"> • Three unit lesson plans • Modified Barrows' (1985) classic model of the PBL process in <i>How to Design a Problem-based Curriculum</i>

Appendix D

Self-Efficacy Questionnaire

Response Scale

1= Strongly Disagree 2=Disagree 3=Undecided 4=Agree 5= Strongly Agree

Prompt Stems

1. I do a good job of participating in English class discussions.
2. I enjoy learning English.
3. I am not good at learning writing skills in English.
4. I am able to keep reading English books even when there are other interesting things to do.
5. One of my main goals is to be much better at writing and speaking in English by next year.
6. I have no problems learning English reading skills.
7. My problem is that I cannot get down to writing and reading English when I should.
8. Sometimes I think I am not good at speaking in English.
9. When I decide to write something in English, I go ahead and do it.
10. Doing well in learning English is not one of my main goals in life.
11. I think that I am pretty good at speaking in English.
12. I avoid trying to read news articles in English, when they look too difficult for me.
13. I find a lot of English writing assignments hard to do well.
14. When I decide to read something in English, I go ahead and do it.
15. I remember the important points in English readings very well.
16. I feel insecure about my ability to write in English clearly.
17. One of my main goals is to be much better in English speaking by next year.
18. I think I am pretty good at my English writing work.
19. I can motivate myself to speak in English.
20. My English writing work worries me.
21. I find a lot of English readings hard to understand.
22. It is difficult for me to concentrate on my English learning tasks.
23. I am useless at my English schoolwork.
24. I enjoy writing in English.
25. I learn new English words easily.
26. If I can't understand an English reading the first time, I keep trying until I can.
27. My English reading assignments worry me.
28. Reading English is boring.
29. I can study English well when there are other interesting things to do.
30. Sometimes I think I am not good at speaking in English.

Appendix E

Lesson Plans for the Three PBL Units

Subject	ESL, Problem based learning, Unit 3
Date	Undecided
Time Allotted	240 minutes
Instructional objectives	At the end of the unit, students, as a group, will be able to synthesize an applicable solution for improving the air condition in China as a citizen, and make a poster out of it.
Question or Problem for students	The air pollution has been a real problem in China in recent years. As the journalist Jing Chai's document " <i>under the dome</i> " released and published in New York Times, it raises concerns all over the world. What do you think we can do as a citizen? To get our fresh air back as we had years ago? Please synthesize your idea in a poster.
Special direction for cooperative grouping	<ul style="list-style-type: none"> • Group into 4 to 5 • Every group member is going to participate in the process of problem solving • Be aware of the time limit of each section • Listen to, share with and supports the efforts of others.
Resources for Groups	<p>http://www.nytimes.com/2015/03/19/opinion/why-under-the-dome-found-a-ready-audience-in-china.html?_r=0</p> <p>"China's 'Silent Spring moment'" New York Time</p> <p>http://sinosphere.blogs.nytimes.com/2015/03/01/documentary-on-air-pollution-in-china-grips-a-nation/</p> <p>Documentary on Air Pollution Grips China, New York Time</p> <p>https://en.wikipedia.org/wiki/Pollution_in_China</p> <p>"Pollution in China" Wikipedia</p> <p>https://en.wikipedia.org/wiki/Air_pollution_in_the_United_States</p> <p>"Air pollution in the United States" Wikipedia</p> <p>http://earthjustice.org/features/invasion-of-the-clean-air-army?gclid=CNXXzO2P_sYCFYiPHwodGOIEjg</p> <p>"Invasion of the Clean Air Army"</p> <p>https://en.wikipedia.org/wiki/Great_Smog</p>

	<i>“Great Smog” Wikipedia</i>
Lesson procedures	<ul style="list-style-type: none"> • Pre-teach Emphasize the importance of using English in the whole process • Introduce problem and vocabulary Provide some major excerpt of the documentary “Under the Dome” by JingChai with English subtitles (suggest students to watch the English subtitle because there are a lot of jargon that they may need to use in the later task.) <ul style="list-style-type: none"> • Vocabulary: sustain, sustainable, contamination, PM (Particulate Matter), severe, reduce, emission, exposure, smog, inhale, persistent... • Ask students questions about their previous experience with air pollution. E.g. what do you know about the air pollution in China? What do you know about the major cause of the air pollution? Do you know the “Great Smog” in London in 1952? Have you ever heard about the air pollution in Los Angeles? How do U.S. and U.K. solve the problem? • Provide pre-reading exercise about air pollution. <ul style="list-style-type: none"> ➤ Pre teach concept of PM. http://www.epa.gov/pm/ • Group students, Provide resources (shown above) • Observe and support • Follow up (Students present their poster in group)

Subject	ESL, Problem based learning, Unit 2
Date	Undecided
Time Allotted	240 minutes
Instructional objectives	At the end of the unit, students, as a group, will be able to come up with an applicable suggestion for “GAOKAO” reform and write it in a report in English.

<p>Question or Problem for students</p>	<p>Every Chinese student has to take college-entrance exam, i.e. “GAOKAO” (College entrance exam in China) in their last year in high school in China.</p> <p>Our government is trying to conduct a reform to make it less burdensome but with high quality in testing students’ academic level, but how and what to change are still in debate with parents and students holding different views and values.</p> <p>As a student, how do you think the reform should be done? Please write a report of your finding and solutions.</p>
<p>Special direction for cooperative grouping</p>	<ul style="list-style-type: none"> • Group into 4 to 5 • Every group member is going to participate in the process of problem solving • Be aware of the time limit of each section • Listen to, share with and supports the efforts of others
<p>Resources for Groups</p>	<p>http://www.cnn.com/2014/09/09/opinion/china-education-opinion/</p> <p><i>“Opinion: China’s education arms race” CNN News</i></p> <p>http://www.enz.govt.nz/news/bold-gaokao-reforms-announced</p> <p><i>“Bold gaokao reforms announced” New Zealand education</i></p> <p>http://news.xinhuanet.com/english/china/2014-12/18/c_133864657.htm</p> <p><i>China Focus: Gaokao reform sparks fairness discussion English.News.cn</i></p> <p>http://www.bbc.com/news/world-asia-china-33059635</p> <p><i>“China’s gaokao: High stakes for national exam” BBC News</i></p>
<p>Lesson notes</p>	<ul style="list-style-type: none"> • Pre-teach

	<p>Emphasize the importance of using English in the whole process</p> <ul style="list-style-type: none"> • Introduce problem and vocabulary Provide the article of <ul style="list-style-type: none"> • Vocabulary: reform, separate, mandatory, pressure, system, educational equality, common subjects, advocate admission... • Ask students questions about their knowledge of <i>gaokao</i> and the reform E.g. what do you know about <i>gaokao</i> and the reform? Do you know how other countries look the <i>gaokao</i> system? Do you know what's going to be changed after the reform? • Provide pre-reading exercise about <i>gaokao</i>. • Group students, Provide resources (shown above) • Observe and support • Follow up (Students present their report in group)
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Subject	ESL, Problem based learning, Unit 1
Date	Undecided
Time Allotted	240 minutes
Instructional objectives	At the end of the unit, students, as a group, will be able to design a brochure for Qingdao Beer Festival in English.
Question or Problem for students	The city is gathering brochure for Qingdao Beer Festival, and as the festival attract more and more international people, the city government hope to have some brochures that are written in English.
Special direction for cooperative grouping	<ul style="list-style-type: none"> • Group into 4 to 5 • Every group member is going to participate in the process of problem solving • Be aware of the time limit of each section • Listen to, share with and supports the efforts of others

<p>Resources for Groups</p>	<p>http://www.qingdaochinaguide.com/news/events/international-beer-festival.html</p> <p>“<i>Qingdao International Beer Festival</i>” qingdaochinaguide website</p> <p>http://www.bamboocompass.com/qingdao-beer-festival-a-passion-for-beer-and-celebrating-137046.html Qingdao Beer “<i>Festival: a passion for beer and celebrating</i>” Bamboo compass</p> <p>http://www.world-guides.com/asia/china/shandong/qingdao/qingdao_events.html</p> <p>“<i>Qingdao Events and Festivals</i>” world guides</p> <p>http://www.fredholidays.co.uk/tailor-made/theme-departures/beer-festivals</p> <p>“<i>Beer Festivals</i>”</p>
<p>Lesson notes</p>	<ul style="list-style-type: none"> • Pre-teach Emphasize the importance of using English in the whole process • Introduce problem and vocabulary Provide the article of <ul style="list-style-type: none"> • Vocabulary: brochure, schedule, opening/closing ceremony, held, live performance, atmosphere, annual, take place ... • Ask students questions about their knowledge of <i>Qingdao Beer Festival</i> E.g. what do you know about <i>Qingdao Beer Festival</i>? What is a brochure for? Have you ever seen a brochure for the beer festival in English in other country? E.g. Germany • Provide pre-reading exercise about <i>Qingdao Beer Festival</i>. • Group students, Provide resources (shown above) • Observe and support • Follow up (Students present their brochure in group)

Appendix F

Speaking Scoring Rubric

Disposition	Failing (0 pts)	Poor (1 pts)	Fair (2 pts)	Good (3 pts)	Total Pts
Being well informed	Presenter clearly does not understand the issue, and the science and human values surrounding it.	Presenter's knowledge is basically correct, but errors are more numerous and substantial.	Presenter's knowledge appears to be accurate with only a few minor and no major errors of fact.	Presenter clearly has a thorough understanding of both the science and the arguments surrounding the issue.	
Staying focused	Presenter varied from subject matter to such an extent as to produce substantial distraction.	Presenter included Substantial amount of non-pertinent information.	Presenter included a small amount of nonpertinent information, but most "on target."	Presenter included relevant and meaningful information only.	
Analysis of ideas and concepts	Relevant ideas, or concepts resented with inaccuracies, omissions and in part.(ambiguou s)	Relevant ideas or concepts presented with minimal inaccuracies and omissions.(acceptab le)	Relevant ideas or concepts presented in correct and appropriate format referring to appropriate contexts.(clear)	Relevant ideas or concepts presented and interpreted precisely and thoroughly within new and appropriate contexts.(exac t)	
Taking a supportable	Presenter did not state position, or stance taken	Presenter ambiguous or	Presenter clearly	Presenter clearly	

Disposition	Failing (0 pts)	Poor (1 pts)	Fair (2 pts)	Good (3 pts)	Total Pts
position	was strongly based on emotion and/or weak logic.	did not make a clear statement of his or her position on the issue; indecisive.	indicated where s(he) stands on the issue, but make a weak argument in favor of that position.	indicated where (s)he stands on the issue and make a substantial logical argument in support of it.	
Proceeding in a logical and orderly manner	Presentation is illogical, disorganized, confusing, and ultimately disinteresting.	Presenter gave a somewhat disorganized delivery, but the main points were still clear.	Presenter made a reasonably logical presentation, but migrations resulted in minor confusion.	Presenter methodically addresses topic from presentation of issue to solution of problem; well organized.	
Vocabulary	Uses only basic vocabulary and expressions	Uses limited vocabulary and expressions	Uses a variety of vocabulary and expressions, but makes some errors in word choice.	Uses a variety of vocabulary and expressions	
Pronunciation and Intonation	Frequent problems with pronunciation and intonation	Pronunciation and intonation errors sometimes make it difficult to	Pronunciation and intonation are usually clear/accurate	Pronunciation and intonation are almost always	

Disposition	Failing (0 pts)	Poor (1 pts)	Fair (2 pts)	Good (3 pts)	Total Pts
		understand the student.	with a few problem areas	very clear/accurate	
Grammar and Accuracy	Errors in grammar and word-order so severe as to make speech virtually unintelligible	Make frequent errors of grammar and word-order which occasionally obscure meaning herself to basic patterns	Occasionally makes grammatical and/or word-order errors which do not obscure meaning	Grammatical usage and word-order is very accurate and appropriate in conveying intended meaning.	
Content	Does not seem to understand the topic very well.	Shows a good understanding of parts of the topic.	Shows a good understanding of the topic.	Shows a full understanding of the topic.	
Uses Complete Sentences	Rarely speaks in complete sentences.	Sometimes (70-80%) speaks in complete sentences.	Mostly (80-98%) speaks in complete sentences.	Always (99-100% of time) speaks in complete sentences.	

Appendix G

Written Scoring Rubric

Disposition	Failing (0 pts)	Poor (1 pts)	Fair (2 pts)	Good (3 pts)	Pts
Critical thinking	No evidence of critical thinking	Little evidence of critical thinking	Some evidence of critical thinking	Clear evidence of critical thinking	
Support for Position	Includes 1 or fewer pieces of evidence (facts, statistics, examples, real-life experiences).	Includes 2 pieces of evidence (facts, statistics, examples, real-life experiences) that support the position statement.	Includes 3 or more pieces of evidence (facts, statistics, examples, real-life experiences) that support the position statement.	Includes 3 or more pieces of evidence (facts, statistics, examples, real-life experiences) that support the position statement. The writer anticipates the reader's concerns, biases or arguments and has provided at least 1 counter-argument.	

Disposition	Failing (0 pts)	Poor (1 pts)	Fair (2 pts)	Good (3 pts)	Pts
Position Statement	There is no position statement.	A position statement is present, but does not make the author's position clear.	The position statement provides a clear statement of the author's position on the topic.	The position statement provides a clear, strong statement of the author's position on the topic.	
Evidence and examples	Evidence and examples are not relevant and/or are not explained.	At least one of the pieces of evidence and examples is relevant and has an explanation that shows how that piece of evidence supports the author's position.	Most of the evidence and examples are specific, relevant and explanations are given that show how each piece of evidence supports the author's position.	All of the evidence and examples are specific, relevant and explanations are given that show how each piece of evidence supports the author's position.	
Sequencing	Many of the support details or arguments are not in an expected or logical order, distracting the reader and making the essay seem very confusing.	A few of the support details or arguments are not in an expected or logical order, distracting the reader and making the essay seem a little confusing.	Arguments and support are provided in a fairly logical order that makes it reasonably easy to follow the author's train of thought.	Arguments and support are provided in a logical order that makes it easy and interesting to follow the author's train of thought.	
Grammar & Spelling (Conventions)	Writer makes more than 4 errors in	Writer makes 3-4 errors in grammar or	Writer makes 1-2 errors in grammar or	Writer makes errors in grammar or	

Disposition	Failing (0 pts)	Poor (1 pts)	Fair (2 pts)	Good (3 pts)	Pts
	grammar or spelling that distract the reader from the content.	spelling that distract the reader from the content.	spelling that distract the reader from the content.	spelling that distract the reader from the content.	
Word choices	Writer uses a limited vocabulary that does not communicate strongly or capture the reader's interest.	Writer uses words that communicate clearly, but the writing lacks variety, punch or flair.	Writer uses vivid words and phrases, but occasionally the words are used inaccurately or seem overdone.	Writers use vivid words and phrases. The placement of the words seems accurate, natural and not forced.	
Sentence Structure (Sentence Fluency)	Sentences lack structure and appear incomplete or rambling.	Most sentences are well-constructed but have a similar structure.	Most sentences are well-constructed with varied structure.	All sentences are well-constructed with varied structure.	
Flow & Rhythm	The sentences are difficult to read aloud because they sound awkward, are distractingly repetitive, or difficult to understand.	Most sentences sound natural and are easy-on-the-ear when read aloud, but several are stiff and awkward or are difficult to understand.	Almost all sentences sound natural and are easy-on-the-ear when read aloud, but 1 or 2 are stiff and awkward or difficult to understand.	All sentences sound natural and are easy-on-the-ear when read aloud. Each sentence is clear and has an obvious emphasis	
Transitions	The transitions between	Some transitions work well;	Transitions clearly show how ideas are	A variety of thoughtful transitions	

Disposition	Failing (0 pts)	Poor (1 pts)	Fair (2 pts)	Good (3 pts)	Pts
	ideas are unclear or nonexistent.	but connections between other ideas are fuzzy.	connected, but there is little variety.	are used. They clearly show how ideas are connected.	

Appendix H
Grader training

Date	Activities /topic covered	Purposes
05/20/16 - 05/25/16	<ul style="list-style-type: none"> Go through the Speaking and Written Scoring rubric. 	<ul style="list-style-type: none"> To clarify the standard and reach a shared understanding on each.
05/26/16 - 05/31/16	<ul style="list-style-type: none"> Three sample tests (range from poor to advanced level) will be provided to two graders to grade. Compare the grades of the three sample tests graded by the two graders and 	<ul style="list-style-type: none"> To match assessment of students' task to the description in the rubric to avert the rush to judgments. To reach agreement on grading and avoid "generous" and "harsh" grader
06/21/16 - 06/23/16	<ul style="list-style-type: none"> Ten tests of the students will be test graded by the two graders. Compare the grades of the ten tests graded by the two graders and let them grade the rest of the test after they get the same scores over the ten tests. 	<ul style="list-style-type: none"> To reach agreement on grading and avert bias and partiality.

Appendix I

Writing sub-scores mean outcome tables

Table 22

Writing Subscale of Position Statement Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
prew1sub	1	40	1.475	.649	1.267	1.682
pow1sub						
pow1sub	2	40	1.375	.686	1.155	1.594
	1	40	1.050	.667	.836	1.263
	2	40	.950	.607	.755	1.144

Table 23

Writing Subscale of Critical Thinking Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound

prew2sub	1	40	1.388	.568	1.206	1.570
	2	40	1.350	.601	1.157	1.542
pow2sub	1	40	1.725	.479	1.571	1.878
	2	40	1.650	.568	1.468	1.831

Table 24

Writing Subscale of Support for Position Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
prew3sub	1	40	1.787	.451	1.643	1.931
	2	40	1.637	.650	1.429	1.845
pow3sub	1	40	1.962	.307	1.864	2.060
	2	40	1.875	.315	1.774	1.975

Table 25

Writing Subscale of Evidence and Examples Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
prew4sub	1	40	1.512	.625	1.3126	1.7124
	2	40	1.250	.708	.9233	1.3767
pow4sub	1	40	1.950	.667	1.7364	2.1636
	2	40	1.737	.690	1.5167	2.1583

Table 26

Writing Subscale of Sequencing Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
prew5sub	1	40	1.362	.542	1.188	1.536
	2	40	1.187	.695	.965	1.409
pow5sub	1	40	1.687	.527	1.518	1.856
	2	40	1.512	.541	1.539	1.885

Table 27

Writing Subscale of Grammar and Spelling Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
prew6sub	1	40	1.812	.551	1.636	1.988
	2	40	1.600	.744	1.362	1.838
pow6sub	1	40	1.750	.566	1.568	1.931
	2	40	1.812	.489	1.656	1.969

Table 28

Writing Subscale of Word Choices Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
prew7sub	1	40	1.351	.518	1.185	1.516
	2	40	1.237	.630	1.035	1.439
pow7sub	1	40	1.600	.521	1.433	1.766
	2	40	1.575	.500	1.414	1.735

Table 29

Writing Subscale of Sentence Structure Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
prew8sub	1	40	1.301	.487	1.145	1.457
	2	40	1.150	.632	.947	1.352
pow8sub	1	40	1.462	.592	1.273	1.652
	2	40	1.312	.459	1.465	1.759

Table 30

Writing Subscale of Flow and Rhythm Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
prew9sub	1	40	1.623	.610	1.468	1.859
	2	40	1.437	.717	1.207	1.667
pow9sub	1	40	1.662	.441	1.421	1.703
	2	40	1.562	.423	1.627	1.897

Table 31

Writing Subscale of Transitions Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
prew10sub	1	40	.976	.596	.785	1.167
	2	40	.887	.548	.712	1.063

pow10sub	1	40	1.012	.415	.879	1.145
	2	40	1.050	.586	.862	1.237

Appendix J

Speaking sub-scores mean outcome tables

Table 32

Speaking Subscale of Being well-informed Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
presubs1	1	40	1.462	.762	1.218	1.706
	2	40	1.675	.645	1.468	1.881
possubs1	1	40	1.775	.518	1.609	1.940
	2	40	2.062	.568	1.880	2.244

Table 33

Speaking Subscale of Staying Focused Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
presubs2	1	40	1.700	.658	1.489	1.910

	2	40	1.500	.716	1.271	1.729
posubs2	1	40	1.925	.525	1.656	1.993
	2	40	1.950	.469	1.999	2.300

Table 34

Speaking Subscale of Analysis of Ideas and Concepts Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
presubs3	1	40	1.500	.640	1.295	1.704
	2	40	1.437	.671	1.222	1.652
posubs3	1	40	1.512	.571	1.329	1.695
	2	40	1.662	.577	1.577	1.947

Table 35

Speaking Subscale of Taking a Supportable Position Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
presubs4	1	40	1.562	.590	1.373	1.751
	2	40	1.575	.561	1.395	1.754
posubs4	1	40	1.787	.564	1.606	1.968
	2	40	1.802	.455	2.254	2.545

Table 36

Speaking Subscale of Proceeding in a Logical and Orderly Manner Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
presubs5	1	40	1.512	.674	1.296	1.728
	2	40	1.387	.625	1.187	1.587
posubs5	1	40	1.882	.637	1.108	1.516
	2	40	1.617	.614	1.790	2.184

Table 37

Speaking Subscale of Vocabulary Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
presubs6	1	40	1.587	.473	1.468	1.707
	2	40	1.462	.458	1.315	1.609
posubs6	1	40	1.537	.619	1.107	1.567
	2	40	1.512	.635	1.309	1.715

Table 38

Speaking Subscale of Pronunciation and Intonation Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
presubs7	1	40	2.062	.323	1.958	2.166
	2	40	1.925	.331	1.819	2.030
posubs7	1	40	1.787	.655	1.177	1.597
	2	40	1.737	.650	1.529	1.945

Table 39

Speaking Subscale of Grammar and Accuracy Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
presubs8	1	40	2.075	.446	1.932	2.217
	2	40	2.237	.620	2.039	2.435
posubs8	1	40	1.612	.478	1.259	1.565
	2	40	1.925	.549	1.749	2.100

Table 40

Speaking Subscale of Content Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
presubs9	1	40	1.212	.451	1.068	1.356
	2	40	1.300	.420	1.165	1.434
posubs9	1	40	1.662	.581	1.476	1.848
	2	40	1.650	.540	1.777	2.122

Table 41

Speaking Subscale of Uses Complete Sentences Description Analysis Table

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
presubs10	1	40	1.575	.416	1.441	1.708
	2	40	1.487	.473	1.236	1.538

An Empirical Study of Problem-based Learning of English in China

posubs10	1	40	1.875	.667	1.261	1.788
	2	40	1.887	.627	1.686	2.188
