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ABSTRACT

In the trend of innovating university teaching methods in the direction of student-centered learning, this article proposes the application of problem-based learning (PBL) in teaching English communication skills to engineering students at University of Engineering and Technology, Vietnam National University. With a combination of qualitative and quantitative methods, the research svhowed that PBL was an ideal teaching method since it enabled engineering students not only to improve their communication skills but also to apply the content knowledge in the English course. In addition, the study identified the main challenges faced by students in implementing group projects. It is hoped that this study can provide researchers and teachers with useful implications for using English as a medium of instruction in science-related subjects.

Keywords: problem-based learning (PBL), engineering students, English learning, communication skills, group work.

Foreign language teaching and learning in Vietnam in the past decade has undergone significant fundamental changes with the communication approach commonly applied in foreign language classes. Although these changes have helped learners become more active in acquiring knowledge, they have not really mastered the learning process. The learner-centered approach in the process of teaching and learning foreign languages in Vietnam has not been fully applied. Traditional teaching methods still exist, which means the teacher is still the main source of knowledge and understanding. As a result, the role of learners in creating knowledge in the teaching process has not been very focused.

In the era of globalization, learners must master the process of acquiring knowledge for international integration; therefore, traditional teaching methods are no longer suitable when learners need to learn together with practice, create, and share knowledge actively in real learning situations. On that basis, researchers have developed many new ideas and approaches in teaching such as interactive pedagogy (Madeleine & Jean, 2009), flipped classroom (Alvarez, 2011; Berrett, 2012), and problem-based learning (PBL) (Phan, 2002; Nguyen et al., 2010). The problem-based teaching approach is being studied, applied, and leveraged by educators in many countries in order to enhance students' effectiveness and positivity in studying, helping them to develop their own abilities and improve academic achievement.

Among all majors at universities, engineering graduates have required an ever-increasing range of skills to maintain relevance with the global environment of the new millennium (Riemer, 2007). Therefore, to gain success in the global arena, it is necessary for engineering graduates to acquire a sufficient level of communication skills, which are considered a valuable career enhancer. The application of PBL in engineering curricula has been regarded as one of the most efficient ways to enhance students' learning, and it has been considered an effective way to prepare students for professional careers (Boud & Feletti, 1997; Litzinger et al., 2011; Jollands et al., 2012). With the learning outcomes of both subject content and processing skills, learners can increase their understanding, as well as learn how to acquire skills during the process of a PBL approach. Moreover, students who receive instruction using PBL techniques can develop

into self-directed learners with the motivation to learn and the capacity to define their learning requirements. They can also choose and apply the most appropriate resources to meet those needs (Delisle, 1997). Compared with the traditional approaches, such as lecture-based learning, PBL has better prepared learners for their future careers in competitive working environments that require teamwork. Lu (2007) asserted that students who engage in PBL activities are more proactive, communicate better, have stronger group-working skills, and stand out as top professionals. The characteristics result from their practical ability to use their knowledge to address a work-related issue.

As a form teacher in English class, I had the opportunity to observe and experience the teaching and learning environments of first-year engineering students at Vietnam National University throughout two semesters. All engineering students, especially in fast-tracked programs, were trained to perform their future professional activity in compliance with the global engineering standards. Therefore, they were enabled to learn in authentic contexts including English classes, electronic learning courses, and conferences that persistently required them to use English as a foreign language (EFL) to pursue educational and professional interests. During this time, some specific problems related to English speaking skills were identified. In most cases, students did not know how to communicate effectively in English, especially when questioned about their professional interests and career.

Some previous studies also mentioned difficulties in teaching English for specific purposes (ESP). Specifically, Suzani (2011) mentioned difficulties related to the decrease in learning motivation of learners. The reason was that the ESP teaching method was still passive and there were still few activities for students to have the opportunity to work in groups, as well as to apply theoretical knowledge to solve problems related to their major. Therefore, some students were not aware of the importance of ESP and thought ESP was not important for their future work. Rezaei et al. (2012) conducted a study with the goal of assessing the difficulties EFL students encountered with reading comprehension in ESP lessons. Five passages from their course book were chosen, and the students were asked to underline the syntactically problematic sections in the passages. The study's sample consisted of 185 EFL engineering students. The chi-square analysis revealed that reading comprehension of ESP materials was seriously hampered by 15 primary syntactic categories. The results of these studies support the idea that engineering students should be given a method that can help them promote their interest in their professional knowledge.

The desire to improve the situation in EFL classes for engineering students has inspired and urged me to pursue the present study in the hope of causing students to progress in English learning, which will ultimately lead to their competence in their future professional careers.

Literature Review

PBL: An Overview of Its Process and Impact on Learning

The origin and application of PBL in the world.

The thought of PBL at different levels appeared quite early. Since ancient Greece, Socrates paid attention to the problematic features in teaching. In 1964, W. Okon (a Polish educator) completed a fairly complete and valuable work on problem-solving teaching. In this research, the author presented a relatively thorough description of the theoretical basis and the process of creating a problem situation (Okoń, 1964). According to Martin (1996), PBL first appeared in medical schools at Case Western Reserve University in the United States in the 1950s, but it was officially introduced as a methodology by Howard Barrows at McMaster University in Ontario, Canada, in the late 1960s (Boud & Feletti, 1997; Delisle, 1997; Magnussen et al., 2000). In the former Soviet Union, many authors conducted studies and applied PBL in teaching, such as M.N. Skatkin, A.IaGheedo, B.E. Raicop, N.A. Rizolop, M.A. Rupnicova, N.M. Verzilin, V.I. Makximova and others. In addition, PBL was widely studied and applied in many universities in America and Europe (Barrows, 1996; Boud & Feletti, 1997; Duch et al., 2001; Bédard et al., 2012). PBL also spread to many schools in Australia (Eun-Kyung et al., 2011; Barry et al., 2012; Choi et al., 2014) and to many countries in Asia (e.g., Singapore, Malaysia) (Teoh et al., 2011; Samsiah et al., 2012), with more focus placed on the method of learning rather than the subject being learned. These authors claimed that lectures were usually not theoretically verbose but guided inquiry and problem-based research. Students were able to conduct research in groups and independently search for information from many different sources when teachers summarized, adjusted and added important information.

In terms of main disciplines, PBL was applied in a variety of fields. PBL was first widely researched and applied in the field of medical education due to the explosion of medical information, new technology, and practical needs, which required changes in curricula and teaching methods (Boud & Feletti, 1997; Lee & Kwan, 1997). After the initial implementation of a PBL approach in medical education at McMaster University, it was also integrated into other fields such as occupational therapy (Royeen & Salvatori, 1997),

physical therapy (Saarinen-Rahiika et al., 1998), and veterinary medicine (Edmondson, 1994). Through the implementation of PBL, teachers realized that learners engaged in the professional world, not only to answer the questions regarding the problem or to reach solutions, but also to discover new explanations to problems that had not been answered. Edens (2000) stated that a PBL approach focused on the active engagement of students in inquiry and problem solving. In addition, PBL was applied in many areas of education such as mathematics, law, economics, business, social studies, engineering, science, teaching, and art (Duch, 1997; Major, 1998; Gasser, 2011). The application of the PBL method in accordance with educational goals was not simply a skill to remember knowledge, but it also provided necessary and effective skills for the future use of knowledge (Barrows, 1996).

From my own perspective, there are some similarities among the views of these researchers. First, problem-based teaching is a learner-centered teaching method, which is suitable for university teaching. It empowers learners to integrate theory and practice, apply knowledge and skills to develop possible solutions to a given problem. Second, learners must be responsible for their own learning, such as self-direction and self-regulating learning, while the teacher is a facilitator and guide for learning. Third, the problems used in PBL are often related to real situations in which there is no single correct answer and more than one solution. Finally, learning is always integrated from many fields and many different sources, making team cooperation essential.

PBL in Asian settings

The PBL method was introduced in the Asia-Pacific region ten years later than its official introduction at McMaster University, Canada, in 1960. The possible reason for this delay is that Asian students might tend to be passive in the classroom. In other words, their Eastern culture might prevent them from becoming more active and independent (Khoo, 2003). Achike and Nain (2005) mentioned other hindering factors such as the lack of PBL experts in the region, conservative attitudes along with participants' resistance to change, and the long-standing notion that Asian students did not fit the PBL approach.

However, many previous studies on the implementation of PBL approaches in Asian educational institutions showed optimistic responses to the use of this innovative method. A new medical school at the University of Sains Malaysia seized a fresh start to test PBL methods in its own curriculum in 1979 (Zabidi & Fuad, 2002). However, the real impetus to implement PBL in medical education in Asia came in the early 1990s, when a number of pioneering institutions experimented with the method in their programs. Throughout the 1990s, and especially in the early 2000s, the number of medical schools using PBL in Asia increased exponentially. For example, more than 90% of Japanese medical schools reported using some form of PBL in 2010 (Kozu, 2012), as well as all 12 medical schools in Taiwan (Tsou, 2012).

While medical education led the way in implementing PBL in Asia in its early years, programs in the areas of applied sciences (Keng, 2011) and social sciences (Pearson, 2005) began to emerge in the late 1990s. The main push for PBL in Asia came in the 2000s, when the number of programs and areas of application exploded: PBL programs could be found in almost any health science field. In Indonesia, the first law programs using PBL were established. Other areas, like clinical psychology and architecture, then began to develop their own programs (Lee et al., 2009). Finally, around the turn of the millennium, the PBL approach began to make breakthroughs in applied science and information systems engineering (Tozawa, 2009).

PBL in Vietnam

Vietnam is not an exception to the prevalence of PBL applications in numerous disciplines across Asia, as indicated above. From the 1980s onwards, much research was conducted in Vietnam with the aim of improving the quality of teaching and learning. Most teachers were familiar with terms such as PBL or problem-solving teaching. One of the earliest works is the deputy doctoral thesis of Dinh (1981), defended in the former Soviet Union. In this study, the author used questions and exercises to promote the activeness of students in teaching biology. The author succeeded in using logical measures to outline the direction of using them in students' research activities (Dinh, 1981). The content of the thesis also partly showed the idea of problem-based teaching. In addition, Nguyen's (1996) doctoral thesis studied the practical basis of problem-solving teaching to apply it systematically to teaching anatomy, physiology, and human hygiene in Grade 9. Furthermore, in the book Teaching Problem Solving in Biology (Continuous training material for high school teachers in the 1997 - 2000 cycle), Nguyen et al. (2000) presented the characteristics of problem-solving teaching, lesson design, and organization of problem-solving teaching in biology at high schools.

Although the research on problem-solving teaching has been going on for a long time, the method is mainly studied and applied in teaching in high schools. The application of this approach at the university level is still limited. In the framework of a project sponsored by the European Commission, the Faculty of Public Health (Hanoi Medical University) has been using the term "problem-based learning" in Vietnam since 2004. In the 2007-2008 school years that followed, the Medical University implemented this test

for a number of subjects. Other universities also applied PBL for some subjects. The results showed that PBL is suitable for selected subjects, making the learners active and interested in learning (Le, 2007; Nguyen, 2011; Nguyen et al., 2012). In addition, some teacher training documents mentioned the basics of PBL (Nguyen et al., 2010; Nguyen et al., 2010).

In short, studies on PBL and its application have occurred in different educational fields. However, applying PBL to teaching language skills for specific disciplines at universities still requires theoretical and practical research. An overview of PBL in teaching English for engineering students is discussed in the next section.

PBL in Teaching English for Engineering Students

As can be seen in the above overview, the application of PBL was very common in teaching different disciplines. However, according to Kosel (2002), the use of PBL was relatively new in the field of language teaching and learning. Gvardjancic (2001) pointed out that the problem-based teaching approach was introduced with the desire to integrate language and content, which facilitated autonomous learning. He contended that the idea to use problem-based approach in language learning was developed by a Leonardo da Vinci pilot project for the 1999/2000 school year, entitled Teaching English for Technical Purposes—TENTEC. The results of the project showed that this approach was especially appropriate for teaching languages across the curriculum for some reasons such as increasing students' motivation through a real-life problem and the significance of combining the disciplinary knowledge and the language knowledge. Therefore, PBL could be used to actively engage learners and bridge the gap between English language learners and their disciplinary subjects. Methodology rooted in inquiry could be particularly effective for teaching science and mathematics (Stoddart et al., 2002). Hence, Jollands et al. (2012) confirmed that the application of PBL in engineering curricula was one of the most efficient ways to enhance students' learning.

In the world, there have been a number of studies conducted on the application of PBL for teaching English to engineering students. Research by Hsieh and Knight (2008) described two studies. One study was a pilot, and the other was an enhanced study that compared PBL and lecture-based learning in library instruction for first-year engineering students. Two distinct assessment strategies were used to provide empirical evidence that supported the use of PBL as an effective teaching method. Based on the results of the enhanced study, the authors concluded that PBL led to better outcomes for the learning styles of engineering students. In line with this study, Hunt et al. (2010) provided details about implementation and evaluation of a particular PBL project. This PBL experience addressed course concepts, reinforced connections among the courses, and provided real-world applications for the students. Students viewed the experience as beneficial, increasing their understanding of content and applications in each discipline.

The benefit of implementing PBL for engineering majors was also the focus of some recent studies. Farah et al. (2018) examined how PBL could be adopted and applied in English for Specific Purpose (ESP) learning contexts for students at the University of Kuala Lumpur, Malaysian Institute of Industrial Technology. The overall findings of this research showed that students had a very positive perception of learning English through PBL. In addition, to better prepare engineering students for modern industry, McQuade et al. (2018) reported on how students working in tutorless PBL groups (because of teaching limitations) must effectively self-manage their team efforts in order to succeed.

Overall, this section briefly describes how PBL aligns with studies on teaching English to a specific discipline, in this case an engineering major. The next section provides guidelines for teachers and administrators on implementing PBL in classes.

The Implementation of PBL

The process of PBL

Depending on the characteristics of the subjects and universities, many problem-based researchers proposed an appropriate PBL organization process and applied that process in teaching. Below are some examples of PBL processes in the world and in Vietnam.

First, in the PBL learning guide at the University of New Jersey, Hmelo-Silver (2004) raised the issue of what and how learners study through the learning cycle, shown in Figure 1.

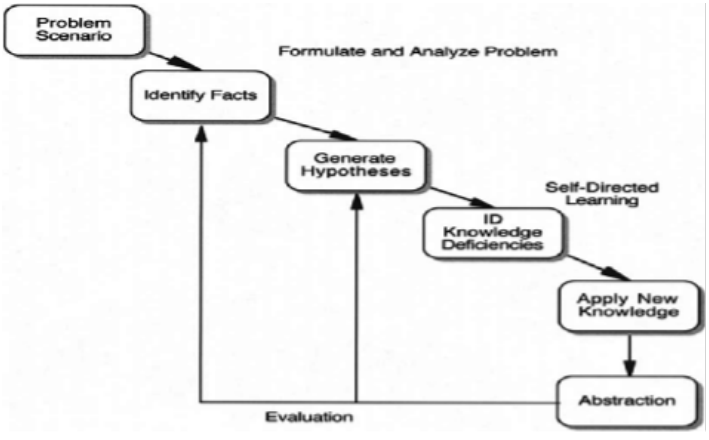

Figure 1. Process of Problem-based Learning Cycle (Hmelo-Silver, 2004, p.237)

According to Figure 1, in problem-based teaching and learning, students work in small groups and learn what they need to know to solve a problem. The teacher acts as a facilitator for students to learn according to the learning process depicted in Figure 1. In this process, also known as problem-based instruction, students are presented with a problem scenario. They construct and solve problems by identifying events relevant to the scenario. This fact-finding step enables students to describe the problem clearly. As students understand the problem better, they create hypotheses about possible solutions. An important part of this process is identifying problem-related knowledge gaps. These knowledge gaps become learning problems that students will investigate during self-directed learning. With self-directed learning, students apply their new knowledge and evaluate their hypotheses in light of what they have learned. At the synthesis of each problem, students reflect on the abstract knowledge gained. Teachers help students acquire the cognitive skills needed for problem solving and cooperation. Because students experience self-directed learning, manage their learning goals and strategies to solve problems including the unstructured problems of subject-based learning (i.e., problems that have no right solution), they also acquire the skills they need for future jobs.

Second, in recent years in Vietnam, some universities have applied the PBL model in some faculties and some subjects. The PBL process applied by the Hanoi University of Public Health training program also follows a 7-step process, which has similarities with the guiding process of Maatricht University in the Netherlands:

- *Step 1. Interpreting new terms*
- *Step 2. Identifying the problem*
- *Step 3. Brainstorming*
- *Step 4. Analyzing the problem*
- *Step 5. Determining learning goals*
- *Step 6. Self-studying*
- *Step 7. Presenting the results*

In addition to this process, according to Nguyen et al. (2010) from Vietnam National University, the teaching process based on problem solving was implemented through four stages, as listed in Figure 2. (See next page).

The guiding model in Figure 2 mentions 4 stages:

1. Identifying and finding problems –The teacher introduces some situations containing problems. After making questions to identify known and unknown factors, the teacher helps students propose ideas and hypotheses and then identify required and unknown knowledge.

2. Self-studying related knowledge– The teacher provides orientation to the classes to find information resources. Students spend time independently studying these materials.

3. Solving problems–Students systemize newly acquired knowledge and then test ideas and hypotheses.

4. Presenting the results–Groups report the final products, and the teacher provides an evaluation. The teacher then helps classes institutionalize learned knowledge.

The study of the PBL method found that the processes emphasized the role of learners as the center of learning, and the role of the problem as governing the entire learning process. Those processes primarily referred to problem identification and resolution, and the reporting of results with student-centered activities.

Limitations of PBL from learners' standpoints

In addition to the benefits of PBL, this section provides an overview of relevant studies on the limitations of this approach from learners' standpoints. The findings of the following studies provided me with some theoretical frameworks to investigate the difficulties my learners encountered when PBL was implemented in the language classroom.

According to Bayard (1994), in PBL, learners also had to spend more time outside the classroom preparing their problem-based lessons and gathering additional learning resources. In addition, student groups needed to spend time brainstorming and assigning tasks for the detailed script when solving problems. After presenting the results, students also needed to invest time in preparing the reflection for the group work. However, the author believed that although the many stages of PBL implementation could take a lot of time, the method was valuable for gradually developing students' problem-solving and self-directed learning skills. In line with the above study, Bligh (1995) also emphasized the time-consuming problem in different stages of implementing PBL, such as preparing for studying the problem, implementing the product, as well as discussing how to write reflections after group work.

Besides these difficulties, Pawson et al. (2006) listed other challenges that occur when students participated in PBL activities. First, regarding disciplinary knowledge, students may encounter obstacles from the lack of disciplinary knowledge and the English vocabulary relevant to their field of study. Second, in relation to English language knowledge, the requirement to make presentations of final products in front of the class caused anxiety for students because they were not confident in communicating in a second or foreign language.

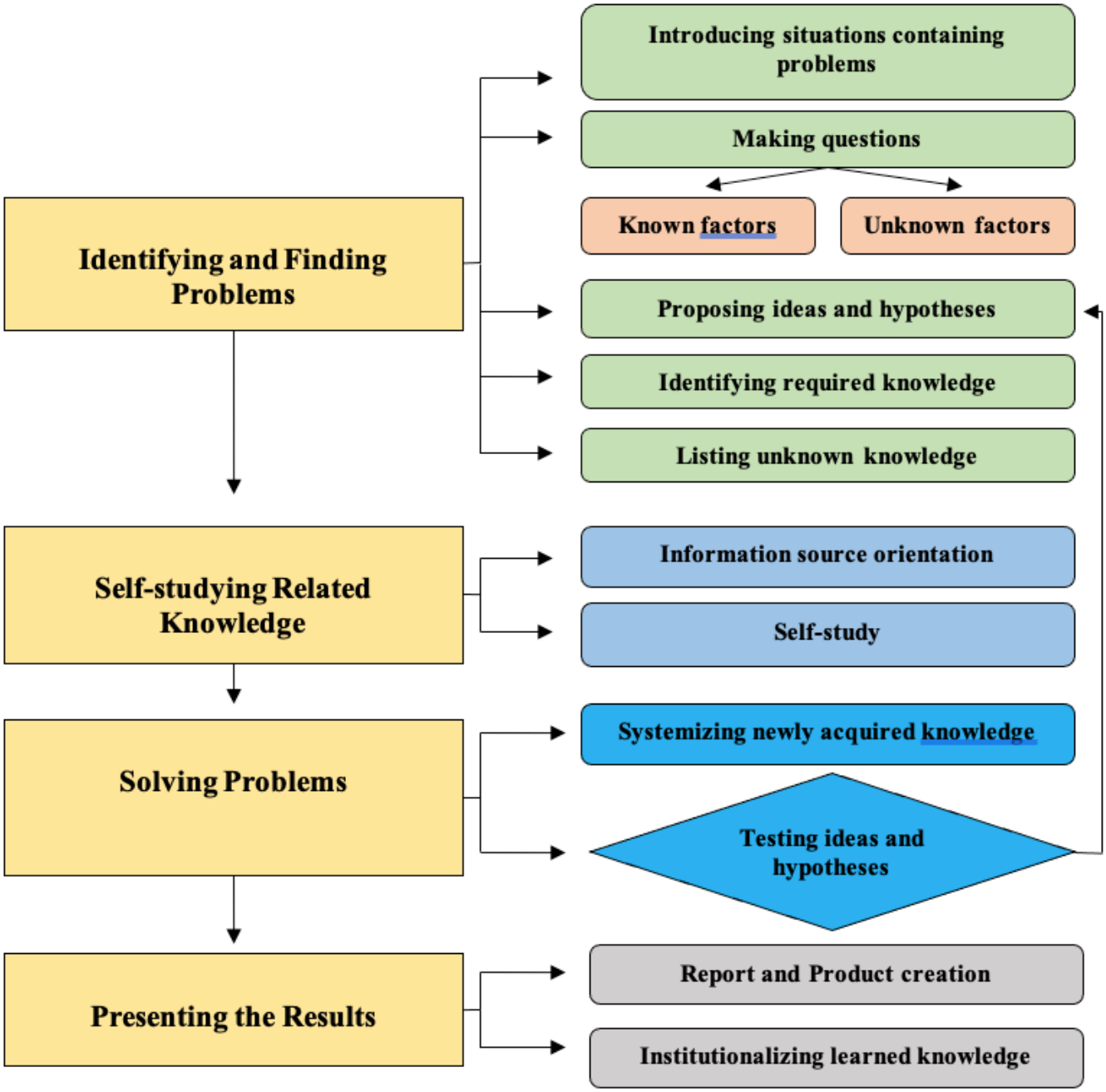

Figure 2. Process of Organizing Teaching Based on Problem Solving (Nguyen et al., 2010)

Assessment of PBL implementation

To evaluate the effectiveness of applying PBL in the classroom, the assessment framework was a topic of interest to many researchers. One of the earliest studies was that of Bridges and Hallinger (1996), in which the authors asserted that during PBL, peer and self-assessment needed to be part of a student's final grade. While self-assessment could be a useful method for learners to assess their own performance, peer assessment was regarded as an effective strategy to engage students in their learning activities for better teamwork results. These assessments also helped students understand their own contribution compared to the results of the group. In addition, moderators could provide detailed comments on the strengths and weaknesses of each team member.

In line with this viewpoint, Gallagher (1997) stated that assessments used in PBL had to be authentic. When assessments were structured, learners could demonstrate their understanding of learning problems and their solutions in ways that made sense in context. The author claimed that the feedback that learners received from their peers was also an important part of assessment in PBL. Furthermore, learners could be assessed by their group members on criteria such as attendance, class preparation, listening and communication skills, ability to provide new and relevant information for the group, and ability to support and improve group performance in general (Allen et al., 1996).

In addition, the PBL assessment appealed to an active learning philosophy instead of encouraging learners to reproduce what they had passively memorized. Furthermore, the PBL assessment process required the individual learner to find and analyze a problem, and then actively apply relevant information (Reynolds, 1997).

The conclusion from the above points of view is that because the PBL assessment is process-oriented, it should be conducted continuously throughout the learning process. The assessment should be based on different criteria, such as individual and group contributions, individual and group self-assessment, group presentation of proposed solutions to the problem, and so on. These foundations establish my evaluation criteria for the implementation of PBL in English classes.

Using the Literature Review to Clarify the Research Gap

The literature review commenced with an overview of the process as well as the effects of PBL in the world, in the Asian context and especially in Vietnam. Specifically, the literature review discussed the PBL approach from its first introduction in medical education at McMaster University in Canada to its current form implemented across a range of subjects and disciplines at different institutions around the world. This discussion supports my research, which aimed to investigate PBL implementation as a way to promote active teaching and learning in the Vietnamese higher-education environment. In addition, the literature review provided an understanding of how to implement PBL in a classroom, including the process, assessment criteria, and limitations from students' standpoints. These studies provided me with a theoretical framework to build a model for applying PBL in a language class. These studies also suggested criteria for building research tools to investigate the benefits and difficulties of students when they participated in a PBL class. In short, the suggestive research premised my specific study on the application of PBL in the Vietnamese context.

However, some issues related to my research have not been solved completely by the above works, or they are still open to need further study. First, although there have been studies around the world on applying PBL in ESP classes for engineering students, the results of those studies have mainly focused on the benefits that PBL brought to students. The limitations of applying PBL have also been mentioned but only in disciplinary classes using the mother tongue. Moreover, in Vietnam, no recent study has focused on the challenges of PBL in an ESP class for engineering students. Vietnam is on the fast track of integration with the world. For that reason, providing a workforce with high communication skills for a competitive working environment is seen as a must for the Vietnamese education system, especially in vocational and university education. Therefore, the hope is that the implementation of the PBL approach in teaching English to Vietnamese engineering students will create generations of graduates who participate efficiently in their educational environment, thereby helping them be effective in their working environment.

Because of the above remaining problems, research which focuses on understanding the effectiveness of PBL in teaching English, especially in communication skills, would provide great theoretical and practical insight. With such research objectives, three research questions needed to be answered:

1. What is the effect of the application of problem-based learning in teaching communication skills in English to engineering students?

2. What is the attitude of engineering students to the application of problem-based learning in teaching communication skills in English?

3. What are the main difficulties that engineering students encountered when implementing group work?

Method

Research Study Design

Background

The study included 45 undergraduate students from two English classes (22 students from English Class A and 23 students from English Class B), to which I was assigned as an English teacher since the beginning of the semester. Participants consisted of 42 males and three females majoring in an engineering and technology fast-tracked program and enrolled in an EFL course at the University of Engineering and Technology, Vietnam National University. All students were first-year students, with an average age of 18 years.

In the English-teaching program for fast-tracked engineering students at Vietnam National University, the curriculum requires activities that apply PBL methods for students. Therefore, all engineering students were informed about the policy of PBL activities from the first session of the semester, and the lecturer of each class would directly guide, observe, and evaluate the final products of his/her students. For this reason, I chose these two classes, to which I was assigned to teach English, to serve as my research participants for the semester. My role as their lecturer made it convenient for me to observe their performances, assess their grades, as well as conduct subsequent research activities.

Ethical Considerations

According to Fleming and Zegwaard (2018), in addition to the importance of selecting appropriate research methods, the ethical considerations around conducting the research are crucial. Therefore, ethical issues were carefully considered for this study.

First, all students from two classes were informed about the policy of PBL activities in the first session of the semester. I explained the purpose and the procedure of the research to them. I also clarified how the data from the tests, presentations, and final products would be recorded and used in the study. After they asked a few questions, the students agreed to assist me with implementing this study.

Second, an informed-consent form (Appendix A) was sent to students to request their permission formally for the use of their project data and final products for the study. According to Denzin and Lincoln (2011), the cornerstone of ethical research is informed consent. This informed consent briefed the participants on how the research would be conducted, presented, and reported. The participants were advised that their participation was voluntary and that they may withdraw from the study, if desired. After the distribution of informed consent forms to 45 students from two classes, the research results showed that all 45 students supported and willingly participated in the PBL activities.

Video productions created by student groups, as well as the questionnaire and observation data, were also guaranteed to be viewed and used only by me, the researcher and teacher, which assured the confidentiality of data. In addition, all participants were only referred to by pseudonyms or code names; anonymity of students was thus assured.

Implementation of PBL in English Class

Based on the guiding principles of process development presented in the process of PBL section of the Literature Review, and in order to meet the educational innovation requirements of social needs, I proposed the process of PBL in my English classes in the form of a project, Video Production and Showcasing. The detailed process of applying PBL in English class is illustrated in Figure 3, below.

As shown in Figure 3, PBL took place through three stages: (a) preparation, (b) organization and study of the problem, and (c) report and evaluation. At each stage, corresponding steps occurred. Activities of my two classes in each stage and in each step were determined as follows in the next section.

Preparation. The Preparation stage included several tasks performed by the students and by me, the teacher. In my role as the teacher, I used output standards and teaching content to define teaching goals and set requirements for the learning content of my students. The Video Production and Showcasing project required students to introduce one given problem at the university or at a specific working environment related to engineering and technology. The goal of teaching English to engineering students is to improve their ability to use English in specific areas related to engineering majors. Therefore, in this stage, selecting suitable problem scenarios for students to work on may be the most difficult part of PBL for teachers. According to Mathews-Aydinli (2007), problems should ideally (a) be related to the students' lives to increase interest and motivation, (b) require students to make decisions and judgments, and (c) include a question or set of questions that are open-ended and likely to generate diverse opinions. Therefore, although the scenario is teacher-created, it mirrors the situations engineering students may face when they enter a future working environment. The Figure 4 below is one possible problem scenario and includes questions I created for students to implement in the project.

After presenting the scenario to the students, I divided them into groups. To increase their language-learning opportunities in a problem-based activity, the grouping rule for my students was to allow individuals of different proficiency levels to work together. Therefore, I grouped together students from

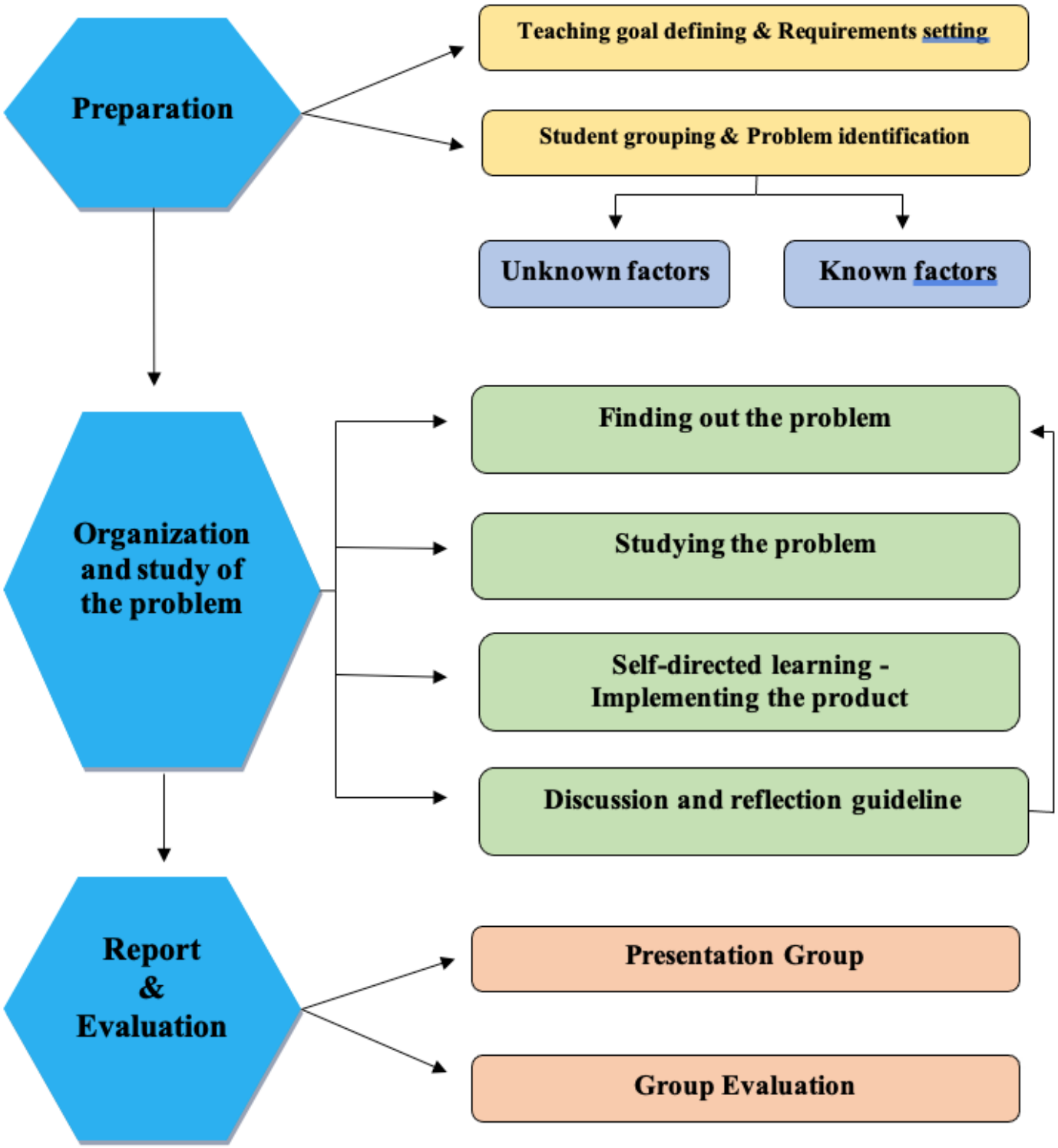

Figure 3. The Process of Video Production and Showcasing

In the video:
1. Give a brief introduction about the members themselves.
2. Film and describe in English some striking features of the profession, the main activities of a website developer during the day, steps in website development in a real workplace, the English usage frequency of a web developer during a working day, interviews of some web developers, clients, etc.
3. Talk about the feeling of professional activities in English.

Questions:
+/ Do your actual experiences differ from what you learned in university?
+/ Do you think the knowledge and skills of ESP at university are relevant and compatible with the English used by the web developer in practice?
+/ What was the most interesting thing you saw? Why did it interest you?
+/ What did you learn from the field trip?
+/ How have your ideas about your future job changed after visiting the real workplace?

Figure 4. Problem Scenario 1. Exploring a Day in the Life of a Website Developer

different language backgrounds to guarantee that all students could communicate in English. Specifically, English Class A had 22 students, and English Class B had 23 students; thus, each class was divided into four groups, each of which had 5-6 students. In total, eight groups were formed from two English classes. To guarantee the diversity in language backgrounds of each group, I used entry test results of students (including four skills) as the basis; therefore, each group would have an equal number of excellent, good, and average students who could work together. After grouping students, I suggested some problem-based themes for students to select. To help students understand topics and identify the problems, I provided students with all materials, including the necessary group work information, sample videos in an attached link, and student handouts. I then informed the students of the timeline for implementation and submission of products.

The duty of the students in this phase, based on prior research into the learning content, was to identify known and unknown factors, to determine appropriate resources for class time, and to prepare resources (such as learning materials, technical tools, and equipping skills) to be ready to participate in group work.

Organization and study of the problem. The stage, Organization and study of the problem, was divided into four smaller steps. In the first step, Finding out the problem, I guided each group to clearly define the role of each group member. First, the group leader played a crucial part in the PBL process. Some of their responsibilities included being a group member, managing the discussion of a specific problem, ensuring the correct order of steps, organizing the discussion in the presence of the teacher, guiding group members to interact and discuss, encouraging participation, etc. Second, the secretary of each group supported the group leader in the discussion and recorded the discussion results in a complete and scientific manner. Third, group members worked under the assignment of the group leader, actively participating in the work of the group. All members in a group were equally assigned to do different jobs in the process of creating the final video product, such as being an actor, cameraman, or director; recording; inserting slide instructions; editing the final product; and so on. An important factor was that the division of work ensured that all team members would appear and perform in a video presentation (3-5 minutes per member). After assigning the role of each member, students worked in groups to choose the most suitable reading sources related to their given problem scenario.

They would then be able to prepare the outline for a scene script, (including content, general description about the topic, script, performers, etc.) for the group work.

Once the students were aware of their problem scenario and how to implement it in English, they could move to the second step of this phase, Studying the problem. The students were asked to write a detailed script for their group. A series of tasks was given to the students before they presented their final drafts of detailed scripts. First, the students were introduced to an authentic sample of a detailed script to become familiar with its sections. Second, they worked in groups to discuss the content of each scene in the script and assign tasks among members. Finally, the students were advised to prepare supplementary materials and equipment for their performance.

In the third step, Self-directed learning– Implementing the product, the students coordinated to implement and improve the product, creating one video on the given problem scenario that included the presence of all group members. In the video, the students were instructed to create an imaginary situation for an overview and narrate the given problem scenario. Some visitors would be interviewed to learn more about their feelings, and the students were required to use English to present in the video.

The fourth step of this phase, Discussion and reflection guideline, allowed me to answer the students' questions, and give suggestions on the scripting and content of the groups. I also guided students to requirements for the preparation of the presentation and reflection. Students prepared a group presentation with the following requirements in Table 1.

Time	Steps	Contents
5'	Lead-in	Introduce group members + problem scenario of the group. (encourage creativity in format and speech delivery)
20-25'	Main contents	Make a group presentation of the project (field trip content, difficulties encountered during the implementation, field trip success).
5'	Q&A	Put questions for the audience or answer questions from the audience. - ***Compulsory question***: The group will prepare a discussion question based on the content of the field trip. - Ask other groups to comment on the strengths and weaknesses of the product and make some suggestions for improvements. **Note**: The other groups give marks and comments for the product of the presentation group.

Table 1. Requirements of a Group Presentation

Furthermore, the students were introduced to the sample reflection and guided more specifically about the structure and content of the reflection. Suggested content for the reflection included the following questions for consideration:

- *How was the preparation done and shared by the team members?*
- *What did you learn from conducting this problem-based learning activity?*
- *What problems did you have while conducting this activity? How did you solve them?*
- *How successful is your final product?*
- *What are your recommendations to improve it?*

Report and evaluation. In the final stage, students were required to show all their products on Report Day, which was held at the end of the course. The students were graded based on the following two criteria: group presentation and group reflection. Notably, peer assessment was encouraged at this stage, in addition to writing comments about peers' videos, which was thought to be a vital component of EFL learning. Both the students and I (the teacher) assessed the products of each group in accordance with the selected criteria based on the framework of some previous studies mentioned in the Literature Review section. According to the conditions of the contest, the group with the highest average score was chosen to be the winner of the class.

After applying PBL processes to two English classes during an entire semester, I investigated whether this method was effective in developing English communication skills of engineering students. The research methods for this determination are described in the following sections.

Data Collection

Based on the objectives of the study, the main research methods used in to collect data included error analysis, fieldtrip, performance evaluation, questionnaires, and observation.

Error Analysis

The error analysis method was used to analyze and classify errors appearing in students' pre-speaking and post-speaking performances. To investigate to what extent the application of PBL in English classes could enhance learners' communication skills, students from the two classes were required to do entry tests at the beginning of the semester that included four skills. As the English teacher of these classes, I evaluated the errors appearing in the speaking performance, the results of which would be compared with the post-speaking performance of each student (video and presentation performances) at the end of the semester. The specific error analysis procedure is shown below.

First, regarding the assessment criteria, the speaking proficiency of students in pre-speaking and post-speaking was evaluated according to a rating scale of speaking rubric that included five criteria: grammar (range and accuracy), vocabulary (range and control), pronunciation (individual sounds, stress, and intonation), fluency (hesitation and extended speech), and discourse development (coherence, cohesion, and thematic development) (Appendix B). The development of this rating rubric was based on The Vietnamese Standardized Test of English Proficiency (Nguyen, 2020) and the Common European Framework of Reference for Languages (CEFR) and aligned rating schemes such as IELTS and Cambridge English exams such as PET, FCE, and CAE (Council of Europe, 2001). In the pre-speaking test, each student was required to speak for 10-12 minutes. This pre-speaking test aimed to test interaction, discussion, problem solving, and presentation skills, which were the same skills assessed in the post-speaking phase. The pre-speaking test consisted of three parts: social interaction (comprising 3-6 questions about two different topics), solution discussion (requiring students to select, present, and defend their solution to a given situation from three suggested solutions), and topic development (requiring students to present a given topic using prompts to develop their ideas). To ensure a valid comparison to the pre-speaking evaluation, the post-speaking phase also enabled each student to be assessed the skills of interaction, discussion, problem solving, and presentation. This evaluation reviewed the 3-5 minute appearance of each student on video and the 5-7 minute appearance of each student in the live group presentation (approximate total of 30-35 minutes) on Report Day. Thus, in both pre-speaking and post-speaking phases, I ensured that each student had a speaking performance duration of about 10-12 minutes and that each person was assessed by the same rating scale.

Second, the same evaluation process was applied to both phases. During the students' pre-speaking and post-speaking performances, the note-taking technique was first applied to directly record students' errors. According to the regulations on the English-speaking evaluation process, all students' speaking test samples and presentations were recorded so that I could listen to them more carefully for the second round of evaluation. Then, the errors obtained were grouped based on the five criteria, above, for easier analysis.

Third, for the error analysis procedure, I developed a detailed process based on the nature of my study and steps in Corder's (1967) work. This procedure included description and examples of each step and is presented in Table 2, below.

Steps	Description	Examples
Step 1: Collect errors	Pre-speaking and post-speaking recorded samples	Entry speaking test samples, videos, presentations
Step 2: Identify errors	Different types of errors	Verb tenses, subjects, pronouns, sounds, word choice, sentence intonation, ideas extension, hesitation, word formation, etc.
Step 3: Classify errors	Was it related to grammar? Was it related to vocabulary? Was it related to pronunciation? Was it related to fluency? Was it related to discourse development?	Five categories: grammar, vocabulary, pronunciation, fluency, discourse development
Step 4: Count errors	Error frequency	How frequent did errors occur in each category?
Step 5: Evaluate errors	Did error frequency decrease or increase between pre-speaking and post-speaking?	Compared the error frequency of two phases, explained the reasons, and discussed with relevant literature.

Table 2. Steps of Error Analysis

Field Trip Method

As described above regarding the implementation of PBL in English class, fieldtrips played an important role in helping students carry out assigned projects. The field trip method was applied in this study because of the potential for PBL within field trips to promote skills development. This method could also be applied in multiple disciplines to enhance students' learning for future application in the real world of work (Dedekorkut-Howes et al., 2017).

In addition, to make this learning method more suitable for university students, I adopted the informal fieldtrip model of Rennie (2007). Unlike the formal field trips in which students follow a documented format, informal field trips are less structured and offer students some control and choice concerning their activities or environment (Rennie, 2007). Therefore, in this study, informal field trips were applied. This approach allowed students to visit real workplaces suitable to the specific characteristics of their majors. They could also arrange a reasonable time for the field trips based on their university study schedules. The content of the course was divided into small modules and implemented through classroom activities, group exercises, and online exercises. Based on the taught content, students could actively approach, practice, and prepare for the application of knowledge during the fieldtrips. As described above in the Implementation of PBL in English Class section, each field trip required students to find the context for the given problem scenario and record a video detailing a work day or the specific job of a technology engineer. Some duties were carried out before and after the field trip day, such as script preparation, group assignment, video completion, commentary, inserting and cutting images and audio.

Performance evaluation method

To evaluate the final products of each group after implementing the PBL project, a performance evaluation method was used. Students were graded based on the following two criteria: group presentation and group reflection. For the grading of group presentations, the study used the Scoring Rubric for Oral Presentation, as illustrated in Figure 5 below:

Scoring Rubric for Oral Presentation

Group: …… *Report Date: ……*

Category	Scoring Criteria	Total Points	Score
Organization (15 points)	The type of presentation is appropriate for the topic and audience.	5	
	Information is presented in a logical sequence.	5	
	Presentation appropriately cites requisite number of references.	5	
Content (45 points)	Introduction is attention-getting, lays out the problem well, and establishes a framework for the rest of the presentation.	5	
	Technical terms are well-defined in language appropriate for the target audience.	5	
	Presentation contains accurate information.	10	
	Material included is relevant to the overall message/purpose.	10	
	Appropriate amount of material is prepared, and points made reflect well their relative importance.	10	
	There is an obvious conclusion summarizing the presentation.	5	
Presentation (40 points)	Speaker maintains good eye contact with the audience and is appropriately animated (e.g., gestures, moving around, etc.).	5	
	Speaker uses a clear, audible voice.	5	
	Delivery is poised, controlled, and smooth.	5	
	Good language skills and pronunciation are used.	5	
	Visual aids are well prepared, informative, effective, and not distracting.	5	
	Length of presentation is within the assigned time limits.	5	
	Information was well communicated.	10	
Score	**Total Points**	**100**	

Figure 5. Scoring Rubric for Oral Presentation

For the grading of group reflections, the study used the Scoring Rubric for Field Trip Reflection as presented in Figure 6 below:

Scoring Rubric for Fieldtrip Reflection

Category	Poor (5 pts)	Fair (15 pts)	Good (20 pts)	Excellent (25 pts)
Depth of Reflection	Writing demonstrates lack of reflection on the selected topic, with no details.	Writing demonstrates a minimal reflection on the selected topic, including a few supporting details and examples.	Writing demonstrates a general reflection on at least 2 selected two main points, including some suporting details, examples, and real world applications.	Writing demonstrates an in-depth reflection on at least 2 selected main points, including supporting details, examples, and real world applications.
Quality of Information	Information has little to do with the main topic.	Information clearly relates to the main topic but no details and/or examples are given.	Information clearly relates to the main topic with supporting details and/or examples.	Information clearly relates to the main topic with relevant supporting details and/or examples
Structure & Organization	Writing is unclear and disorganized. Thoughts make little to no sense. Missing or non existent introductory and concluding paragraphs. Learning is very unclear.	Writing is unclear, and thoughts are not well organized. Contains only minimal basic information, with no in depth exploration. Thoughts are not expressed in a logical manner. Missing either introduction or conclusion paragraph.	Writing is mostly clear, concise, and organized (at least 1 paragraph per topic) with the use of excellent sentence/paragraph structure. Thoughts are expressed in a logical manner. Includes brief intro and conclusion paragraphs.	Writing is clear, concise, and well organized (at least 1 paragraph per topic) with the use of excellent sentence/paragraph structure. Thoughts are expressed in a logical manner. Very detailed and well thought out intro and conclusion paragraphs.
Grammar & Vocabulary	There are numerous spelling or grammar errors per page of writing reflection, making understanding difficult.	There are more than five spelling or grammar errors per page of writing reflection.	There are no more than five spelling or grammar errors per page of writing reflection.	There are no more than three spelling or grammar errors per page of writing reflection.

Figure 6. Scoring Rubric for Field Trip Reflection

The total score of each group was calculated based on the distribution of points as follows in Table 3:

Fieldtrip video	Reflection	Oral Presentation
Weighting: 40%	Weighting: 30%	Weighting: 30%

Table 3. Point Distribution of the Total Score

With these three methods, above, it was believed that the study would obtain a reliable result for the first research question, which investigated the effect of the application of PBL in the development of English communication skills among engineering students.

Questionnaires

To investigate the findings for the two remaining research questions, a questionnaire was used (Appendix C). The use of questionnaires has become one of the most popular research methods applied in the social sciences (Dörnyei, 2007). Questionnaires have advantages over some types of data collection instruments because they are inexpensive and do not require much effort on the part of the researcher. Questionnaires save the researcher much time as the information can be gathered easily without the presence of the researcher. Furthermore, the participants can feel free and comfortable in answering the questions. For these reasons, the questionnaire was the main research tool used to investigate the attitudes, as well as the main difficulties engineering students encountered when implementing group work. The questionnaire was divided into two main parts that closely followed the content of the second and the third research questions.

Part 1 included a survey on students' attitudes toward beneficial aspects of applying PBL in teaching English communication skills to engineering students. This section consisted of 10 subsections. Based on assessment criteria of PBL outlined in the Literature Review section, I investigated the attitudes of students toward three main aspects: satisfaction and motivation; group dynamics and team-based learning; and enhancement of knowledge and different skills. In addition, the 5-point Likert scale (strongly disagree, disagree, neutral, agree, strongly agree) was adopted to elicit the participants' attitudes. According to Nunan (1992), the Likert scale accurately revealed the participants' attitudes because participants were only required to select the number that they felt was the most appropriate. Previous studies also found that a 5-point Likert scale was readily comprehensible to respondents and enabled them to express their views (Marton-Williams, 1986).With a 5-point Likert scale, it was quite simple for the interviewer to read out the complete list of scale descriptors (Dawes, 2008). More importantly, 5-point Likert scales were deemed less confusing and could increase the response rate (Babakus & Mangold, 1992; Devlin et al., 1993; Bouranta et al., 2009). According to these authors, the human attention span reaches efficiency when presented with six items at a time—any more results in a loss of interest. For this reason, 5-point Likert scales ensured respondents would not lose interest. By using a 5-point Likert scale, analyzing the different answer choices was easier for respondents, eliminating the urge to select middle options or leave items blank. It also took less time and effort to complete than higher-point scales and gave respondents an option to be neutral (rather than having to choose an alternative that did not reflect their thinking) (Bouranta et al., 2009). To design a closed Likert questionnaire, I followed the guidelines provided by Dörnyei (2007) and Wellington (2015).

Part 2 examined the main difficulties that students encountered when implementing group work. In this section—based on previous studies on the limitations of PBL from learners' standpoints in the Literature Review section—I proposed some main difficulties for students to choose (i.e., multiple answers could be selected) and provided open-ended questions for students to expand on other challenges they faced.

The questionnaire form was one page, which could be completed in about 10 minutes. Thanks to these characteristics, the process of data collection and analysis could be implemented in a relatively fast and straightforward manner.

Observation

The observation method (Appendix D) was used throughout the semester to investigate the attitudes, progress, as well as difficulties students encountered during group work to solve assigned problems. According to Miller and Boulton (2007), observation methods consisted of systematically observing people and recording their actions by sound, image or writing to provide researchers with rich and authentic data. Observation was also the most basic research technique used in the classroom (Miller & Boulton, 2007). In addition, observation could be used to cross-check data from the questionnaire obtained later. For these reasons, observation was the method used to supplement the information obtained from the questionnaire in this study.

While the students were working in their groups—gathering information, discussing it, considering, and choosing the best solution for the problem—my role was to observe and support them. Specifically, I arranged time to join in each group's activities, accompanied them to some real workplaces to implement the project and offered help if needed. I took notes on the language used, language problems encountered,

and the individual student's participation in the activity. If asked, I provided linguistic or technical help to a group but avoided directing the group's efforts or controlling their activities to solve the problems in any way.

The criteria for this observation closely followed the process of implementing PBL in English class (see Figure 3) and included three main points as follows:

- Section 1 provided an overview of the preparation of the groups including understanding of problems, prepared resources, and learning materials before conducting PBL activities.
- Section 2 observed the participation, the video-making process, and the English communication of students when they implemented projects at real workplaces.
- Section 3 explored students' attitudes, interest, and involvement in peer assessments on Report Day.

Data Analysis

Methods of Data Analysis

The collected data were processed with the application of both interpretive and statistical methods. Interpretive methods were used to discuss the results from the data collection instruments. The interpretation of results from each instrument was viewed in comparison with that of other instruments to detect any differences or additions. Noticeably, the nature of observation required me to understand the information beyond the surface of the stated words with the aid of non-verbal cues. With the use of statistical methods, the data were synthesized and presented in forms of figures and tables. Comments were then made in reference to relevant knowledge discussed in the Literature Review section.

Procedure of data analysis

After the data collection process, the information obtained from the collection instruments was classified according to the research questions. Since I had intentionally arranged the questions in the questionnaire and observation sheet to correspond to the research questions, the task became less complicated.

Subsequently, participants' responses to each research question were calculated and transferred into a numerical format. One example was the percentage of participants who shared similar ideas or their average rating. The data for those responses were tabulated and charted for clearer presentation and easier comparison and synthesis.

Results

Research Question 1: What is the effect of the application of problem-based learning in teaching communication skills in English to engineering students?

In order to answer this research question, the errors appearing in the pre-speaking performance in the entry tests were compared with those of each student in the post-speaking performance (video and presentation performance) at the end of the semester. The results of error frequency are presented in Table 4 below.

Table 4 shows that in the post-speaking performance at the end of the semester, students had a significant reduction in error frequency related to the criteria of grammar, vocabulary, pronunciation, fluency and discourse development, with a total decrease of more than half, from 716 to 338. As shown in the above criteria, students made the most progress in grammar and vocabulary. Even though grammar errors were made the most frequently by students in the pre-speaking performance, with the frequency of 164, they dramatically decreased in the post-speaking performance with a frequency of 60. Grammatical errors related to subjects and pronouns were also no longer made by students. Similarly, vocabulary issues with typical errors like collocation, word choice, and word formation caused many difficulties for students in the pre-speaking test, with the error frequency of 157. However, the frequency of errors was halved during the post-test evaluation with a score 78. The frequency of errors in these two criteria in the post-speaking performance was reduced by nearly half compared to the pre-speaking performance. This result is in line with the study of Karyuatry and Irawati (2014). They found that after applying PBL, the students in SMP 21 Malang achieved the passing grade and elements including grammar, vocabulary, pronunciation and fluency in speaking skill were all improved. Similarly, Fogarty (2014) stated that PBL improved students' speaking performance, as shown in his students' pre-speaking score of 59.34 and post-speaking score of 71.84. The students also felt enthusiasm in learning English with PBL methods. In the most recent study of Fahmi et al. (2021), 19 students gained bad scores and 11 students reached good scores in the pre-test, whereas in the post-test, 17 students obtained bad scores and 13 students obtained good scores. Also, the study of Fahmi et al. (2021) placed emphasis on the most improvement of grammar and vocabulary of students. The findings of those studies showed that the students' scores after the use of PBL in speaking were higher than before.

The improvement of each aspect of a speaking skill might be explained through my observation notes as follows. In terms of grammar, the students in this project implementation

Criteria	Types of errors	Pre-speaking	Post-speaking
		Error frequency	Error frequency
Grammar	Verb Tenses	45	21
	Articles	43	18
	Prepositions	35	15
	Nouns	22	6
	Subjects	10	0
	Pronouns	9	0
	Total	**164**	**60**
Vocabulary	Collocation	44	28
	Word choice	42	21
	Word formation	39	17
	Word repetition	32	12
	Total	**157**	**78**
Pronunciation	Sentence intonation	39	19
	Word stress	35	11
	Mispronounced consonants	25	10
	Mispronounced vowels	19	8
	Mispronounced words	14	5
	Total	**132**	**53**
Fluency	Repetition and self-correction	45	32
	Content related hesitation	41	27
	Language related hesitation	39	21
	Speech length	27	17
	Long pause	10	4
	Total	**162**	**101**
Discourse development	Expansion of ideas	31	15
	Cohesive devices	24	12
	Discourse markers	20	10
	Organization of ideas	17	9
	Response relevance	9	0
	Total	**101**	**46**
Total		**716**	**338**

Table 4. Error Frequency in Pre-speaking and Post-speaking

had to know how to distinguish between present tense and past tense when making videos at real workplaces. Although students knew basic word structures, they could not implement them perfectly when speaking. After careful preparation to conduct the project at a real workplace, they paid more attention to using tenses correctly when carrying out a conversation. Similarly, in the pre-test speaking at the beginning of the semester, I observed that students had limited vocabularies to express their ideas and feelings. They only used familiar and simple words in their sentences. After joining in the problem-based activities, students enriched themselves with a variety of vocabulary in order to make good conversations with others and for the sake of their discussion. Other aspects of speaking like fluency, pronunciation, and discourse development were also positively influenced by practical activities of making videos, interviewing others, and presenting their discussion in front of their classmates.

To obtain a more reliable result for the first research question, which investigated the effect of the application of PBL to the progress of engineering students in English communication skills, I utilized the assessment of each group's final products. I, as well as the students, evaluated these products in accordance with the selected criteria. The grading of each group work in the two English Classes A and B is illustrated in the Table 5, below.

The findings from Table 5 allowed me to conclude that the engineering students' group works on the PBL activity, Video Production and Showcasing, were performed at a good level

Group No	Video (40%)	Reflection (30%)	Presentation (30%)	Total score (max 10 pts)	Final grade
English Class A					
1	8.5	8.7	9.2	8.8	**Good**
2	8.0	7.5	8.5	8.0	**Satisfactory**
3	9.5	8.7	9.3	9.2	**Excellent**
4	8.3	8.5	8.7	8.5	**Good**
English Class B					
1	8.9	9.3	9.5	9.2	**Excellent**
2	8.7	8.5	8.8	8.7	**Good**
3	8.5	7.7	8.3	8.2	**Satisfactory**
4	8.7	9.0	8.3	8.7	**Good**

Table 5. Grading of Group Work in English Class A and B

and generally got positive evaluation from the teacher, as well as the peers. Specifically, two out of eight groups from the two classes received the Excellent grade, whereas four groups received Good grades. The two remaining groups were graded Satisfactory. It was noted that the results of each section ranged in a small margin. For this reason, I concluded that all engineering students in the two classes made progress and not many differences occurred in the performance of students.

Research Question 2: What is the attitude of engineering students to the application of problem-based learning in teaching communication skills in English?

To find out engineering students' attitudes toward PBL in teaching English communication skills, I investigated students' satisfaction with specific aspects of the application of PBL, including satisfaction and motivation, group dynamics and team-based learning, and enhancement of knowledge and different skills. Based on the questionnaire results, students generally had very positive perceptions of most aspects of PBL, with the mean frequency of overall aspects being 4.41 and no aspect gaining M< 4.0. Moreover, all aspects gave a

small standard deviation (SD< 0.8), which signified that the data were closely distributed around the mean value. It was especially interesting to see that the aspects that received the highest rating from students (M> 4.50) included aspects related to the enhancement of knowledge and different skills. This result was consistent with what I obtained from the first research question about the positive effect of PBL on students' English-speaking ability.

First, in terms of the satisfaction and motivation, Table 6 presents the learners' attitudes together with their percentages, mean scores, and standard deviation:

Items	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean Score	Standard Deviation
	1	2	3	4	5		
1. Continuation of PBL in subsequent courses	0	0	13.3%	46.7%	40%	4.26	0.69
2. Satisfied and motivated with PBL	0	0	8.9%	42.2%	48.9%	4.4	0.65

Table 6. The Overall Attitude of Students Toward Problem-based Learning

Dağyar (2016) indicated that PBL was effective in encouraging students' favorable attitudes toward courses. Sutrisna and Artini (2020) also shared the same results that students' attitudes toward English language learning increased as they expressed a feeling of satisfaction during the PBL cycle. Similarly, in Fahmi et al.'s (2021) work, more than half of students strongly agreed that PBL was a good approach for speaking and that it should be used in following courses. Moreover, 91.1% of students stated that PBL made them feel satisfied and motivated in their English learning (Fahmi et al., 2021).

Second, regarding group dynamics and team-based learning, one positive result from the questionnaire showed that students were inclined to use group dynamics and team-based learning in solving the problems. The results are illustrated in the Table 7, below.

As shown in Table 7, no students denied the role of PBL in developing the group dynamics and collaboration in teamwork. From my observation notes, PBL played a great role in fostering collaborative learning. As students discussed how to solve the problems in small groups of five or six, they began to gain better conceptual knowledge through the brainstorming of ideas. The problem-based assignment provided a platform for students to express their ideas and to share responsibility in managing problem situations. Additionally, from my observations, students' various perspectives on a problem inspired them to pose new inquiries. As a result, greater interpersonal communication was facilitated, and group dynamics were also developed. Brimble and Davis (2005) also asserted that problem-based learners had to play diverse roles during PBL, such as leader, recorder, critic, discussant, teacher, researcher, presenter, communicator, problem solver, as well as facilitator. The learners, therefore, gradually gained a range of skills in teamwork and problem solving. The study of Nurtanto et al. (2018) also added further evidence that PBL improved group dynamics skills during group discussion and group activities; therefore, in PBL, new information was acquired through cooperative learning.

As shown in Table 6, 86.7% students (40% and 46.7% indicated strongly agree and agree, respectively) gave their agreement for the continuation of PBL in subsequent courses. Few students were uncertain in their reply to the question on whether they wished to continue carrying out problem-based activities in their subsequent courses. Recent studies supported this result. First, this finding was reported by Noura (2014), who declared that PBL has become a beneficial instructional medium. Therefore, PBL should be widely used in various teaching contexts due to its numerous benefits for educational purposes. Additionally, a study by Demirel and

Lastly, concerning the perceptions of students on enhancement of knowledge and different skills, those aspects gained the highest rating from students. Four out of six aspects in the questionnaire received the mean score of M> 4.50. All the data are shown in Table 8, below.

Items	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean Score	Standard Deviation
	1	2	3	4	5		
3. Development of group dynamics in PBL	0	0	15.6%	51.1%	33.3%	4.17	0.68
4. Building collaboration from team-based learning	0	0	11.1%	46.7%	42.2%	4.31	0.67

Table 7. The Attitude of Students Toward Group Dynamics and Team-based Learning

Items	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	Mean Score	Standard Deviation
	1	2	3	4	5		
5. Enhancement of knowledge in which the problem was based	0	0	15.6%	42.2%	42.2%	4.27	0.72
6. Enhancement of self-confidence in using English in PBL	0	0	4.4%	42.2%	53.4%	4.50	0.59
7. Enhancement of communication skills by PBL	0	0	0	33.3%	66.7%	4.67	0.48
8. Enhancement of vocabulary relevant to their field of study	0	0	17.8%	44.4%	37.8%	4.2	0.73
9. Enhancement of video making skills	0	0	0	44.4%	55.6%	4.56	0.50
10. Enhancement of presentation skills	0	0	0	26.7%	73.3%	4.73	0.45

Table 8. The Attitude of Students Toward Enhancement of Knowledge and Different Skills

Table 8 shows that all students agreed that the implementation of PBL could enhance their speaking skills, more particularly in terms of communication and presentation skills, with the highest mean scores (4.67 and 4.73 respectively). According to my observations of the entire semester, many students were actively involved in academic exchanges with their classmates and with me as they conducted self-study and group work. Their involvement increased their communication ability and helped them build new interactive relationships. PBL enabled the students to develop their speaking skills as they shared ideas and actively communicated with the other partners to form new ideas during group discussion or presentation session, as claimed by Surif et al. (2013). In line with this finding, Yuda et al. (2016) stated that problems were found to effectively encourage the students to have active and communicative participation during the problem-solving activities. As the students actively demonstrated verbal interaction during PBL activities, their speaking skills were developed.

The next two aspects with almost equally high mean scores belonged to the enhancement of self-confidence in using English and skills in making use of technology, like making videos (4.50 and 4.56 respectively). These aspects were considered very vital for engineers' professional training. This finding was supported by the study of Utomo et al. (2019), which showed that the PBL model positively influenced the improvement of creativity in video making. The study of Wibowo and Wuryandani (2020) also emphasized the improvement of students' self-confidence after the implementation of PBL.

The most noticeable finding was that the two aspects that gained the most neutral opinions from students were the enhancement of disciplinary knowledge and vocabulary. Seemingly, some students were not sure about those aspects after participating in the project. This attitude of students was interesting for me to explore because it contrasted with my observation. As shown in the results of error analysis in the first research question (see Table 4), vocabulary was the aspect in which students made the most progress. According to my observations, through stages such as analyzing problems, finding solutions, and organizing field trips to real workplaces to obtain project information, students could also learn from shared knowledge and accumulate expertise by their own study and research—similar to real practitioners. However, from the viewpoint of the students, vocabulary and disciplinary knowledge were areas in which they had not actually acquired enough information. The reflections of the students may reveal the answer to this phenomenon. One group said, "It may cause some difficulties for our group in taking notes when observing and interviewing an engineer at the workplace. Our content knowledge is still not much, and many words are quite difficult to remember."According to the students' reflection, disciplinary knowledge and vocabulary are likely obstacles that they encountered. For this reason, I dedicated the last research question to a more in-depth discussion of this issue, which is presented in the next section.

Research Question 3: What are the main difficulties that engineering students encountered when implementing group work?

Although almost all engineering students considered PBL as productive for the development of their professional field, when asked to tick some suggested challenges from the questionnaire, the students marked a number of difficulties they encountered when implementing the group work to solve the problems. The results are presented in Figure 7, below.

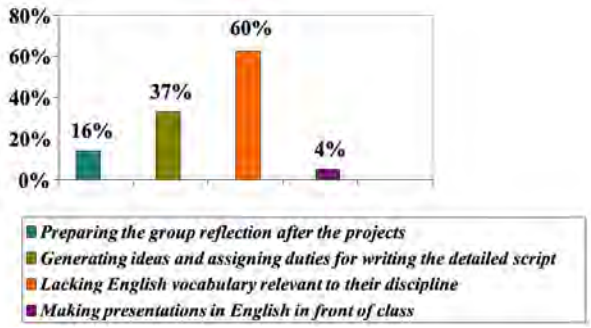

Figure 7. Difficulties of Students in Implementing Group Work

According to Figure 7, the most challenging aspect for almost all students (60%) was their lack of English vocabulary relevant to their field of study. This result was followed by the difficulty of brainstorming ideas and assigning tasks, which made it hard for students to write a detailed script. This difficulty accounted for 37% of students. Not many students found it difficult to prepare the group reflection after the projects (16%). Only 4% of students felt pressure in making presentations in English in front of class.

Hasibuan et al. (2015) also reported the obstacle of lacking a disciplinary vocabulary. The authors stated that a new vocabulary was the problem that sometimes appeared when students wanted to comprehend sentences or paragraphs. The results for this research question also shared some similarities with the study of Pawson et al. (2006), in which the authors put the obstacles of lacking disciplinary knowledge and English vocabulary on the top. However, the difference was in the fact that according to Pawson et al. (2006), students regarded making presentations in English in front of the class as a big challenge: they were nervous and unconfident in presenting in a foreign language. However, in my study, this difficulty held the smallest proportion among the

suggested problems in Figure 7. The reason for this result is found in the group reflection, which revealed that students could learn how to express ideas during the group work, have appropriate and effective responses to other groups in class presentations, and acquire knowledge from their ways of learning and thinking. Particularly, one group shared that they felt more confident in communication and had opportunities to learn from other areas while searching for resources to solve the problems.

Through observing the process of students organizing group activities to solve the given problems, I also realized some other difficulties. First, although each class was divided into four small groups, it was difficult for me to closely monitor and support each group. In traditional classes, Vietnamese students are used to going to class to sit and listen to lectures, sometimes getting up to answer the teacher's questions. However, in an English class applying PBL, students have to study in groups and learn to self-direct. Therefore, it was observed that some members in each group did not really promote their roles. Therefore, from my observation, some students still relied on members who were more active. Because of these issues, the teaching process was occasionally less time-active and sometimes did not fully utilize the function of PBL.

In short, besides progress in speaking performance and positive attitudes toward PBL, engineering students also encountered some difficulties during the process of implementing group work. It was interesting to find out that they were much more influenced by objective factors which affected them, such as lack of knowledge and vocabulary, rather than subjective factors, like their attitudes and motivation toward the benefits of PBL. Such objective-limited aspects were unavoidable in this stage when engineering students were preparing to finish their freshman year at university and had quite limited experience in their disciplinary field. In my opinion, it is easier for teachers to reduce such trouble than the problems related to attitudes of students to this course. With students' enthusiasm and responsibility, the implementation of PBL effectively improved their English in general and their communication skills in particular.

Discussion and Conclusion

Major Findings

This research was conducted with subjects who were all the first-year students majoring in engineering and technology. Tables and figures were used to present the results of the group work and problem-solving practices as well as the students' questionnaires distributed at the end of the semester. The process of organizing PBL in teaching English was built including three stages: (a) preparation, (b) organization and study of problems, and (c) report and evaluation. Each stage was divided into steps with specific activities of the teacher corresponding to the activities of students, in which students' activities accounted for a large proportion.

All being considered, the results of this exploratory study highlighted the necessity and feasibility of PBL in teaching communication skills in English for first year students at the University of Engineering and Technology, Vietnam National University. The first conclusion is that the application of PBL had a positive effect on the development of the students' EFL proficiency related to their engineering activities. PBL also brought many benefits to engineering students because it created learning contexts in which students could both practice a variety of communication skills and apply the content knowledge in the field of their study in a meaningful way. As the study moved into the investigation of difficulties students encountered during the study, it helped me draw some lessons in teaching methods.

Theoretical and Practical Implications

In the 21st century, teaching and learning in the engineering field is the subject of a great deal of studies. Globalization along with the growth of technology and information communication means that we need students who can do more than apply their major knowledge. Engineering students should be able to think and investigate problems, make judgments and assessments, and use English communication skills to exchange and access knowledge globally. For this reason, the process of teaching and learning English for engineering students needs to move from the traditional lecture-based method to problem-based teaching and learning. Therefore, from the findings in this study, it is suggested that PBL can be applied in English classes in Vietnam to benefit students' education, especially those studying engineering. Based on the conclusions described above, the following implications are considered relevant to the research.

Theoretical Implications

The development of an appropriate PBL organization process and the application of that process in English classes in the form of a project named Video Production and Showcasing highlight the originality and value of this study as an innovative teaching strategy. Moreover, this study also offers an opportunity to reflect on the implications of using PBL in the education of engineering students.

The theoretical implications of this study also support the theoretical models of the social constructivist theory and the PBL model. According to Rachman et al. (2020), the social constructivist theory asserts that students develop knowledge through social interactions with diverse people.

The results from this study affirmed that the social interactions of students through sharing ideas with their peers and gaining diverse perspectives and experiences from people at real workplaces play an important role in the success of students as they acquire content knowledge and social skills for their careers. Additionally, the PBL model is also supported through the research. Research results showed that activities in PBL (such as problem identification, information seeking, problem solving and reflection), which are carried out collaboratively with team members and supported by the teacher, have a positive influence on students' thinking and learning.

Practical Implications

Practical implications exist for individuals responsible for the planning and implementation of curriculum for engineering majors at universities. From the findings of difficulties encountered by engineering students during implementing problem-based activities, practical implications can be identified as follows. First, in terms of identifying problems, teachers should guide learners to find problems containing elements that are close to reality and suitable for the content knowledge. Second, the practical implication lies in the instructional design of courses. Kwon et al. (2019) stated that students gained a deeper conceptual understanding when they spent their time collaborating and focusing on the problem. Therefore, teachers should specify the proportion of time for individual activities, group activities, presentations, and report writing. It is recommended to arrange each class session for three periods in which group activities and individual activities are performed alternately, with priority given to group activities. Their active involvement in group work can help students actively gather knowledge and prepare necessary skills for future careers.

Third, regarding reference materials, teachers should prepare some basic reference materials in advance and guide learners to possible sources (e.g., libraries, books, and internet). Teachers should also guide learners how to retrieve documents, how to collect and exploit information in documents, and how to store and share the collected information with classmates. Finally, additional practical implications are for teachers' involvement. The process of PBL implementation in the Literature Review section also revealed that teachers' involvement was a determining factor in students' success during PBL. Teachers should take a prominent role in encouraging learners to be active in researching, exploring, and giving ideas. Teachers should help learners realize that they should not be afraid to state their opinion but pay attention to arguments to defend their opinions and counter their peers.

Limitations and Suggestions for Further Research

Despite my effort in justifying the methodology of the study, collecting, as well as analyzing the data with careful consideration, the study has several unavoidable limitations within its scope. One limitation is that this research was limited to the two classes that I directly taught in this semester and was not extended to the whole faculty. Undoubtedly, this number is too small to provide an overall picture of the effectiveness of PBL implementation in students' English communication skills. To make up for this limitation in part, I attempted to involve all members of the two classes in completing the questionnaires, and I also studied the reflections of each group very carefully to obtain diverse opinions from the students. I also encountered some challenges in the process of implementing PBL. At the beginning of the semester, some students struggled with accepting the PBL assignment, as they had not previously been exposed to problem analysis in PBL scenarios. Other students were initially hesitant to discuss their thoughts about the problems with other members during group discussions. In addition, students were also worried that they might not be able to obtain much information from the real workplaces they intended to visit. To overcome these difficulties as their teacher, I played the role as a tutor or a cognitive coach who modeled inquiry strategies, guided investigation, and helped students explain and pursue their research issues.

It is hoped that this study can provide researchers and teachers with useful implications for using English as a medium of instruction in engineering-related subjects. If further research is allowed, I hope to conduct a large survey with more cooperative and representative respondents for more precise and reliable findings. Future researchers might also examine undergraduate students in another STEM major, such as technology and math, or investigate undergraduate students in other programs to obtain an overall picture of the effectiveness of PBL implementation.

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Appendix A

Research Informed Consent

TITLE OF STUDY

Investigation into the Effectiveness of Using Problem-Based Learning in Teaching Communication Skills in English to Engineering Students

PRIMARY RESEARCHER

Name - _____

Department - _____

Address - _____ City _____

Phone - _____

Email - _____

PURPOSE OF STUDY

The study aims at proposing the application of problem-based learning in teaching English communication skills to engineering students at University of Engineering and Technology, Vietnam National University, in the hope of making students have a progress in English learning, which ultimately leads to their competence in their professional career in the future.

PROCEDURES

As organizing activities that apply problem-based learning methods for students is a requirement included in the curriculum, all of you will be informed about the policy of problem-based learning activities from the first session of the semester. As the lecturer of class, I will be the one who directly guides, observes, as well as evaluates your final products.

You will be asked to perform a set of tasks applying problem-based learning methods in a project named as *Video production and showcasing*. This project consists of three stages: preparation, organization and study of the problem, report, and evaluation. Your role in these tasks is to help us evaluate the skills of interaction, discussion, problem-solving, and presentation after using problem-based learning in English classes. During project implementation, your actions and comments will be observed and noted, and you will be asked to describe verbally your learning process. As a mandatory requirement in the evaluation process, all of your speeches in speaking tests and presentations will be recorded so that I can listen to them more carefully for the second round of evaluation. Besides, video productions created by your groups will also be collected and graded. After project implementation, you will also be required to fill out a questionnaire relating to your application of problem-based learning.

RISKS

There are no known risks to the participants of this study.

BENEFITS

Your participation in this study will provide information that may be used for the application of problem-based learning on the development of your EFL proficiency related to engineering activities. Besides, this study can create learning contexts where all of you can both practice a variety of communication skills and apply the content knowledge in the field of your study in a meaningful way. In addition, you can also be aware of the difficulties when applying problem-based learning, thereby drawing your own lessons to improve your English as well as your major subjects.

CONFIDENTIALITY

Please do not write any identifying information.

Every effort will be made by the researcher to preserve your confidentiality including the following:

- Assigning code names/numbers for participants that will be used on all research notes and documents; anonymity of students is thus assured.
- Keeping notes, interview transcriptions, and any other identifying participant information in a locked file cabinet in the personal possession of the researcher.
- Ensuring that all the final products (videos, recorded speaking samples, presentations) as well as the questionnaire and observation data is guaranteed to be viewed and used only by me. Hence, confidentiality of data was assured.

COMPENSATION

Your participation is voluntary and unpaid.

CONTACT INFORMATION

If you have questions at any time about this study, or you experience adverse effects as the result of participating in this study, you may contact the researcher whose contact information is provided on the first page. If you have questions regarding your rights as a research participant, or if problems arise which you do not feel you can discuss with the Primary Researcher directly, contact by telephone at _____ or at the following email address _____.

VOLUNTARY PARTICIPATION

Your participation in this study is voluntary. Although the project implementation is a requirement included in the curriculum, it is up to you to decide whether or not to take part in the study implemented during and after the project. If you decide to take part in this study, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this study will not affect the relationship you have, if any, with the researcher. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed.

CONSENT

I have read, and I understand the provided information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study.

Participant's Signature _____ Date_____

Researcher's Signature _____ Date_____

Appendix B

Speaking Rating Scales

Score	Grammar	Vocabulary	Pronunciation	Fluency	Discourse management
10	- Uses **flexibly and accurately a variety** of sentence structures and makes **almost no mistakes**.	- Uses a large vocabulary, including **uncommon words, idioms,** and **fixed phrases.** - Actively finds **alternative expressions** and/ or avoidances with **almost no hesitation.** - Has almost **no false starts** and **no small vocabulary mistakes**.	- Makes **correct, appropriate, and natural** pronunciation, word stress and sentence intonation. - **Can change intonation** to express different shades of meaning and different functions of language.	- **Usually** speaks at length and can express ideas **easily, fluently, naturally**, and **rarely** has repetition or error correction. - Has **no sign of hesitation** to find words and structures, **only shows hesitation** when trying to find ideas to express some difficult concepts.	- **Easily** develops **complete and clear ideas** with details and illustrative examples and draws **appropriate** conclusions. - Presents ideas **clearly, coherently, and concisely**; demonstrates the ability to **competently use a variety of** means of cohesion and organization of ideas.
9	- Uses **flexibly and accurately** simple structures and **a wide range of** complex structures. - **Occasional non-systematic errors** may occur	- Uses a large vocabulary, including **uncommon words, idioms,** and **fixed phrases.** - Actively finds **alternative expressions** and/ or avoidances albeit **hesitant at times.** - Sometimes still has **false starts** and still **makes a few small** vocabulary mistakes.	- Makes **accurate and appropriate** pronunciation, word stress and intonation. - **Can change the intonation** of sentences to express different shades of meaning.	- **Often** speaks at length and expresses ideas **easily, fluently, and naturally**, but **sometimes** has repetition or error correction. - Has **almost no sign of hesitation** to find words and structures, **only shows hesitation** when trying to find ideas to express some difficult concepts.	- **Easily** develops **clear ideas** with details and illustrative examples and draws **appropriate** conclusions. - Presents ideas **clearly, coherently, and concisely**; demonstrates the ability to **quite competently use a variety** of means of cohesion and organization of ideas.
8	- Uses **flexibly and accurately** simple structures and **a range of**	- Uses **a wide range of vocabulary of most** topics and	- Is **intelligible** and has acquired **a very clear natural** pronunciation.	- Deals with familiar and unfamiliar topics with **ease and a**	- Relevantly develops ideas with **relative ease, elaborating**

	complex structures. - **Non-systematic errors** occur with instances of self-correction.	shows **great effort** of avoiding lexical repetition for unfamiliar topics. - **Attempts** to use a few less common words and idiomatic expressions. - Has **high lexical accuracy** despite occasional **confusion and incorrect** word choices.	- **Clearly** articulates individual sounds. - **Generally** places word and sentence stress. - Shows **good effort** with intonation.	**fairly even tempo**; **hesitation may occur** for grammatical and lexical planning but **rarely noticeable**. - Produces extended stretches of language with **rare** repetition and self-correction.	on ideas with **appropriate** details and examples. - Uses **a variety of** linking words **efficiently** to mark **clearly** the relationships between ideas.
7	- Uses **flexibly and accurately** simple structures and shows **a good control** of some complex structures. - **Non-systematic errors** occur but **sometimes** do not lead to misunderstanding.	- Uses **a wide range of vocabulary of most** topics and shows **some effort** of avoiding lexical repetition for unfamiliar topics. - Has **generally high lexical accuracy** despite **some confusion and incorrect** word choices.	- Is **intelligible** and has acquired **quite clear natural** pronunciation. - **Generally clearly** articulates individual sounds. - **Generally** places word stress and show efforts with sentence stress **despite rather low accuracy**. - Shows **some efforts** with intonation.	- Deals with familiar and unfamiliar topics with **ease and a fairly even tempo**; **hesitation may occur** for grammatical and lexical planning but **not too noticeable**. - Produces extended stretches of language with **occasional** repetition and self-correction.	- Relevantly develops ideas with **relative ease**, **elaborating** on ideas with **many appropriate** details and examples. - Uses **a variety of** linking words to mark **clearly** the relationships between ideas.
6	- Uses **flexibly and accurately** simple structures and shows **some** control of some complex structures. - **Non-systematic errors** occur but do not lead to misunderstanding.	- Uses **a range of vocabulary of most** topics and **occasionally shows efforts** of avoiding lexical repetition for unfamiliar topics. - Has **relatively high lexical accuracy** (**incorrect** word forms and word choices are found)	- Is **intelligible** and has acquired **clear natural** pronunciation. - **Generally clearly** articulates individual sounds. - **Generally** places word stress but does not show efforts with sentence stress - Show **few efforts** with intonation.	- Deals with familiar and unfamiliar topics with **ease; hesitation may occur** for grammatical and lexical planning but **not too noticeable**. - Produces extended stretches of language but **shows some evidence** of error correction.	- Relevantly develops ideas with **relative ease**, **elaborating** on ideas with **some appropriate** details and examples. - Uses more complex connectors to link his/ her utterances but **fails to mark clearly** the relationships between ideas.
5	- Uses relatively **accurately**-frequently used simple structures. **Some errors** occur but he/she can make himself/ herself easily understood. - Shows **some**	- Uses a range of vocabulary of familiar topics and **occasionally** uses them **repetitively**. - Has some difficulty with unfamiliar topics and makes **some**	- Is mostly **intelligible** and has acquired a quite **clear** pronunciation. -Makes **occasional errors** with individual sounds. - **Shows efforts in** word stress despite	- Keeps speaking **comprehensively on familiar** and unfamiliar topics despite **evident hesitation** for grammatical and lexical planning. - Produces extended	- **Relevantly** responds to questions and can develop ideas **in a simple list** of points, even though **some attempts of idea elaboration** (details and

	attempts to use complex sentences but **makes many errors.**	**lexical errors.**	**frequent mispronunciation**.	responses but **shows clear evidence** of **error correction**.	examples) are evident, they are either **vaguely or repetitively** expressed. - Flexibly links ideas with **simple connectors.**
4	- Uses relatively **accurately**-frequently used simple structures. **Some errors** occur but he/she can manage to express ideas clearly.	- Uses sufficient vocabulary of familiar topics and **at times** uses them **repetitively**. - Has some difficulty with unfamiliar topics and makes **many lexical errors.**	- Is mostly **intelligible** and has acquired **a quite clear** pronunciation. -Makes **some error**s with individual sounds. - **Shows some efforts in** word stress despite **frequent** mispronunciation.	- Keeps speaking **comprehensively on familiar topics** and shows **some attempts** for unfamiliar topics despite evident hesitations for grammatical and lexical planning. - Produces extended responses using simple structures.	- **Relevantly** responds to questions and can develop ideas **in a simple list** of points, show **some attempts of idea elaboration.** - Links ideas with some **simple connectors but sometimes repetitive.**
3	- Uses relatively **accurately**-frequently used simple structures. **Many errors** occur but he/she can manage to express the main ideas.	- Uses appropriate vocabulary of familiar topics but **frequently** uses them **repetitively**.	- Is **intelligible** and has acquired **a quite clear** pronunciation. -Makes **many error**s with individual sounds and other sound errors.	- Keeps speaking **quite comprehensively** on **familiar topics** and **hardly** expresses complex ideas.	- **Quite relevantly** responds to questions and can develop ideas **in a simple list** of points. - Links ideas with **some simple connectors but frequently repetitive.**
2	- Uses some simple structures correctly, but still **systematically makes basic mistakes**; however, he/she can manage to express **some** main ideas.	- Uses appropriate vocabulary and can control **a narrow repertoire** dealing with familiar situations.	- Is **mostly intelligible.** - Can articulate simple words and phrases but conversational partners will need to **ask for repetition from time to time.**	- Can construct **short words and phrases** with **noticeable hesitation**, **frequent false starts,** and **repetition**.	- Expresses his/her ideas with **limited relevance** to questions and **cannot develop ideas** without relying heavily on repetition of the prompts. - Links ideas with some **simple** conjunctions like "and", "but".
1	Shows **only limited** control of a few **simple** grammatical structures and sentence patterns in a learnt repertoire.	Only uses a basic vocabulary repertoire of **isolated** words and phrases related to particular concrete topics.	- Is **often intelligible.** - Can articulate **a very limited** repertoire of learnt words and phrases with **limited accuracy**.	- Can only manage **very short, isolated** words and phrases, **mainly learnt** utterances, with much pausing.	- **Hardly expresses** or develops his/ her ideas. - **Hardly links** ideas with some simple conjunctions like "and", "but".
0	**Test-taker is not present**				

Appendix C

Questionnaire for Students

Investigation into the Effectiveness of Using Problem-Based Learning in Teaching Communication Skills in English to Engineering Students

Hi, everybody. I would like to ask for your help with this questionnaire, which serves as the major source of data for my paper. Thank you very much for your help!

Part 1: Attitudes towards beneficial aspects of applying problem-based learning (PBL)

Circle the number that best describes your choice.

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	2	3	4	5

Items	Likert Scale
1. Continuation of PBL in subsequent courses	1 2 3 4 5
2. Satisfied and motivated with PBL	1 2 3 4 5
3. Development of group dynamics in PBL	1 2 3 4 5
4. Building collaboration from team-based learning	1 2 3 4 5
5. Enhancement of knowledge in which the problem was based	1 2 3 4 5
6. Enhancement of self-confidence in using English in PBL	1 2 3 4 5
7. Enhancement of communication skills by PBL	1 2 3 4 5
8. Enhancement of vocabulary relevant to their field of study	1 2 3 4 5
9. Enhancement of video making skills	1 2 3 4 5
10. Enhancement of presentation skills	1 2 3 4 5

Part 2: Difficulties that engineering students encountered when implementing group work.

Please tick beside the answers suitable to your choice. You can choose more than one.

A. Generating ideas and assigning duties for writing the detailed script.	□
B. Lacking English vocabulary relevant to their discipline.	□
C. Preparing the group reflection after the projects.	□
D. Making presentations in English in front of class.	□
E. Other difficulties	.....
	.....
	.....

THANK YOU FOR YOUR COOPERATION!

Appendix D

Observation Sheet for Teachers

Group's name: **Problem scenario:**		**Date:** **Time:** **No. of students:** **Fieldtrip place:**		**Teacher' name:**	
Preparation		**Excellent**	**Good**	**Average**	**Poor**
Identification of known and unknown factors	- Good understanding of problems - Easy to understand and follow				
Determination of resources	- Appropriate resources				
Preparation of learning resources	- Prepared learning materials				
Comments					
Implementing the project		**Excellent**	**Good**	**Average**	**Poor**
Making video at a real working place	- Clear instruction & Eliciting - Timing - Variety of activities - Clear stages - Voice and eye contact - Variety of media - Techniques for interviews				
Learners' participation & interaction	- Active participation - Students' interaction - Students' interest				
Use of English	- Balance of English/ Vietnamese - Good English model - Fluent use of English				
Comments					
Report and Evaluation		**Excellent**	**Good**	**Average**	**Poor**
Manner & Interest	- Confident - Rapport with the students - Flexible/ adaptable - Good model				
Peer assessment	- Students' involvement - Clear comments - Equal assessment				
Comments					