ENHANCING STUDENTS’ PROBLEM SOLVING SKILLS USING PROBLEM-BASED LEARNING AS AN INSTRUCTIONAL COMMUNICATION APPROACH

By

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Faculty: Modern Languages and Communication

Malaysian graduates do not fulfill the criteria as good potential workers as they are not efficient at the workplace and lacking of soft skills. One of the reasons why our graduates are not fulfilling the industry needs is due to low problem solving skills, which is one of the important aspects of soft skills (Bernama, 2010). To address this issue, the Ministry of Higher Education has proposed several instructional approaches to be used in class, and one of them is problem-based learning (PBL).

This study was designed to examine the application of Problem-based Learning as an instructional communication in class, which is believed can help students in enhancing their problem solving skills. A quasi-experimental study was done in investigating the effectiveness of problem-based learning (PBL) as an instructional approach. Two groups of students were selected as
the subjects of this research: the PBL group and non-PBL group. Subjects were assessed on their problem solving skills at the beginning and at the end of the semester. For the PBL group, their perceptions towards PBL environment and their intrinsic motivation were measured before and after receiving the PBL treatments.

In measuring the problem solving skills and solutions on PBL treatments, two inter-raters were employed in assessing them from the aspects of “accuracy” and “quality”. The “accuracy” and “quality” were measured using rubric used in Malaysian University English Test (MUET) examination. Selected questions from Motivated Strategies for Learning Questionnaire by Pintrich and DeGroot (1990) and Problem-based Learning Environment by Senocak (2009) were used in measuring students’ intrinsic motivation and their perception towards PBL environment. Furthermore, in examining PBL efficacy, this study used Social Development Theory by Vygotsky and The Toulmin Model of Argumentation.

The findings revealed that there were significant differences on students’ problem solving skills in PBL group compared to non-PBL group. Students in PBL group had better problem solving skills after experiencing four PBL treatments. They also perceived PBL in positive ways in enhancing their problem solving skills. However, their motivation did not change much, thus contributed to insignificant results. Finally, in investigating the relationship among motivation, and perceptions towards learning environment, with
problem solving skills, results showed that only motivation associated with problem solving skills.

In summary, this study demonstrates that students can enhance their problem solving skills through problem-based learning as one of instructional approaches in class as proposed by Ministry of Higher Education. Using this approach, the findings of this study are able to provide fresh ideas for teaching and learning in undergraduates’ courses by preparing syllabus which integrates the content knowledge and the requirements of industry.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

MEMPERMANTIKAN KEMAHIRAN PENYELESAIAN MASALAH PELAJAR MELALUI PEMBELAJARAN BERASASKAN MASALAH SEBAGAI SATU PENDEKATAN PENGAJARAN KOMUNIKASI

Oleh

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Graduan Malaysia didapati tidak memenuhi kriteria yang diperlukan bagi menjadi seorang pekerja yang baik kerana mereka kurang cekap di tempat kerja dan kurangnya kemahiran insaniah. Salah satu sebab mengapa graduan kita tidak memenuhi keperluan industri adalah disebabkan oleh lemahnya kemahiran menyelesaikan masalah, di mana ia merupakan salah satu aspek penting kemahiran insaniah. Untuk menangani isu ini, Kementerian Pengajian Tinggi telah mencadangkan beberapa pendekatan pengajaran yang boleh digunakan di dalam kelas, dan salah satu daripada pendekatan tersebut ialah pengajaran berasaskan masalah.

Kajian ini telah direka untuk meneliti aplikasi pembelajaran berasaskan masalah sebagai pengajaran komunikasi di dalam kelas, yang dipercayai dapat membantu pelajar dalam meningkatkan kemahiran menyelesaikan...
masalah mereka. Satu kajian kuasi-eksperimen telah dilakukan dalam menyiasat keberkesanan Pembelajaran Berasaskan Masalah (PBL) sebagai satu pendekatan dalam pengajaran. Dua kumpulan pelajar telah dipilih sebagai subjek kajian ini; kumpulan PBL dan kumpulan bukan PBL. Kemahiran menyelesaikan masalah subjek dinilai pada awal dan akhir semester. Bagi kumpulan PBL, persepsi mereka terhadap persekitaran pembelajaran PBL dan motivasi intrinsik mereka telah diukur sebelum dan selepas menerima tugasan PBL.


Dapatan kajian menunjukkan bahawa terdapat perbezaan yang signifikan terhadap kemahiran penyelesaian masalah bagi pelajar dalam kumpulan PBL berbanding dengan pelajar dalam kumpulan bukan PBL. Terdapat peningkatan dalam kemahiran menyelesaikan masalah bagi pelajar dalam kumpulan PBL setelah menjalani empat tugasan PBL. Mereka juga melihat
PBL sebagai sesuatu yang positif dalam meningkatkan kemahiran penyelesaian masalah mereka. Walau bagaimanapun, motivasi mereka tidak banyak berubah, sekali gus menyumbang kepada keputusan yang tidak signifikan. Akhirnya, dalam melihat hubungan antara motivasi, dan persepsi terhadap suasana pembelajaran, dengan kemahiran menyelesaikan masalah, dapatan kajian menunjukkan ada perkaitan antara motivasi dengan kemahiran menyelesaikan masalah.

Secara ringkasnya, kajian ini membuktikan bahawa pelajar boleh meningkatkan kemahiran menyelesaikan masalah mereka melalui pembelajaran berasaskan masalah sebagai salah satu pendekatan pengajaran di dalam kelas seperti yang dicadangkan oleh Kementerian Pengajian Tinggi. Dapatan kajian ini dapat memberi idea-idea baru dalam proses pengajaran dan pembelajaran untuk kursus-kursus peringkat pengajian tinggi dengan menyediakan sukatan pelajaran yang mengintegrasikan pengetahuan dan keperluan industri.
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<td></td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for Social Science</td>
<td></td>
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<td>-----------</td>
<td>----------------------------------------</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Mean</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>Standard Deviation</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

1.1 Research Background

Education for human capital development at the higher education learning in Malaysia is at a critical stage (The World Bank, 2007). According to Malaysian Employers Federation (2011), Malaysian graduates do not fulfill the criteria as good potential workers. As fulfilling the needs of industry is one of the goals of the human capital development (Rancangan Malaysia Kesepuluh 2011-2015) this raises the question about the efficient role played by higher education learning in developing human capital for the industry. One the weakness of our graduates which has been debated extensively is that they are not efficient at the workplace. Another weakness is that they lack of soft skills which are the skills required by the industry (Ministry of Higher Education, 2006; Rahmah et al., 2011). Hence, the Government has recognized the needs to strengthen the teaching and learning system by incorporating soft skills in the current higher education curriculum.

There are seven skills listed by the Ministry of Higher Education (2006) as soft skills including creative thinking and problem solving skills. The study by the Federation of Malaysian Manufacturers (FMM) reveals that there are five reasons for the unemployment of our graduates and one of them is low problem solving skills, which is one of the important aspects of soft skills (Bernama,
Therefore, in order to minimize the lack of soft skills of our graduates, instructions should be organized in accordance with the desired exit outcomes (Mohd Ghazali et al., 2008). A shift of paradigm is essential in making the students acquire these valuable skills, which cannot be gained from books.

To address this issue, the emerging trend is the emphasis on student-centered learning. Currently, there is a movement to shift the paradigm in line with the concern of the industry locally and globally (Ministry of Higher Education, 2006). Hill (2007) mentions that there are benefits in the use of student-centered approach where students play an active role in the class. They do not depend on their lecturer all the time, waiting for instructions, approvals, advices, corrections or praises. They communicate, values other’s contributions, cooperate, learn and help each other. They ask the lecturer when they face difficulty after trying to solve the problem (Jones, 2007). The students are exposed to various activities that help them to build up certain skills. The Ministry of Higher Education (2006) has proposed several instructional methods such as e-learning and cooperative learning. One of promising instructional methods in the student-centered approach is problem-based learning (PBL) and it is becoming an emerging pedagogical paradigm in Malaysia (Al-Naggar & Bobryshev, 2012). PBL, as a form of instructional communication, is an instructional method in which students learn through facilitated problem solving (Hmelo-Silver, 2004).
Studies have shown that PBL has great impact to higher education students in various disciplines (Chapman, 2002; Kim and Kwon, 2003; Goodnough, 2008; Woei, 2008). Students play active roles in the class, thus enhancing their skills such as problem solving skills, leadership and decision making skills (Hmelo-Silver, 2004). These are the important skills that graduates should possess in making them marketable (Rohaizat and Ebi Sharin, 2009). Therefore, PBL is seen as providing rooms and opportunities in developing the soft skills as envisioned by the Ministry of Higher Education.

PBL is a pedagogical method and it is a part of instructional communication. Instructional Communication is emphasizing on the teaching process that influences the learning process of the students (Frymier, 2005). Research in instructional communication is not new. A lot of issues have been studied. Among the issues that have been studied are communication apprehension (McCroskey et al., 2004) and the issue on communication that influences the students’ learning, motivation, and behaviours (Worley et al., 2007).

1.2 Problem Statement

In Malaysia, 32000 graduates are unable to get jobs in any sectors as they lack characteristics such as creativity, critical thinking and problem solving skills (Utusan Malaysia, 2010). Similarly, Federation of Malaysian Manufacturers (FMM) also found that low problem solving skills are among the major reasons the graduates are unemployed (Bernama, 2010). Therefore, there is a strong
significant indication that the industries want local graduates with strong soft skills especially problem solving skills to manage problems faced during work.

The problem among graduates lacking problem solving skills is not only in Malaysia, but it is a global problem. Dahlgren et al., (1998) mention that the graduates are able to acquire the knowledge but cannot use it to solve complex daily life problem. This is supported by Koray et al., (2008) who claimed that not many students graduate as good problem solvers and able to solve routine problems. Koray et al., (2008) also claim that graduates cannot adapt their prior knowledge for the solution of new problems. Dochy et al., (2005) also state that graduates are not able to solve problems of daily working life although they acquired extensive academic knowledge. These are some of the general observations on the graduates who do not fulfill the needs of the industries. Graduates should have skills that can fulfill the needs of industries in line with the rapid growth of technology. Not only the industries, the societies also need graduates who do not only possess knowledge but also employ skills that can solve, analyze, synthesize, present and evaluate contemporary problems (Senocak, 2009).

In encouraging students to develop problem solving skills, students need to engage themselves with real world design problem, case studies, internship, co-op education and mentoring (Tong, 2003). Malaysian Ministry of Higher Education (2006) has recognized these needs and several approaches of teaching and learning (among them are problem-based learning, cooperative learning, and e-learning) have been proposed for the purpose of enhancing
students’ soft skills. Unlike other approaches, PBL is an emerging pedagogical paradigm in Malaysia (Al-Naggar & Bobryshev, 2012) as many studies have indicated positive effects of PBL on problem solving skills (Hmelo-Silver, 2004; Koray et al., 2008; and Neo and Neo, 2005). In a local context, Khairiyah et al., (2005) find that students prefer to use PBL as a learning approach and findings also showed that students exposed to PBL performed better than students not exposed to PBL. Nur Izzati et al., (2010) study on students’ problem solving skills in PBL class and their findings support the efficacy of PBL in developing students’ problem solving skills.

Although researchers mentioned above have found PBL as the most helpful method in problem solving, critical thinking, and ethical decision making (Ward and Lee, 2002), a comprehensive review of past studies on PBL application shows mixed results. Berkson (1993) shows contradictory findings on the implementation of PBL. In addition, Wijnia, Loyens and Derous (2010) find that students’ motivation do not change after attending PBL class. Yadav (2011) also highlights that students prefer the traditional method, which is lecture-based method compared to PBL. Given these mixed results, the efficacy of PBL as a student-centered instructional strategy is unclear. Furthermore, there is still lack of empirical studies on the efficacy of PBL in local context.

Many PBL studies were done in the disciplines such as medicine (Albanese and Mitchell, 1993; Hmelo-Silver, 2004), engineering (Khairiyah et.al., 2005), management (Bigelow, 2004), and mathematics (Rohani et. al., 2010). However,
not many studies were conducted in the field of communication. Nussbaum and Friedrich, (2005) report that in the field of Instructional Communication, studies conducted on pedagogical methods/technology use contribute only 10% unlike other areas of Instructional Communication such as student communication (42%) and teacher communication (31%). PBL is one of the pedagogical methods. Therefore, this study is significant because it increases the number of studies conducted in this area.

Furthermore, studies that examine pedagogical method are limited compared to other parts of Instructional Communication research (Nussbaum and Friedrich, 2005). Accordingly, not much is known about the efficacy of PBL as a student-centered instructional strategy even though PBL has been implemented in higher learning institutions over than 30 years (Huang, 2005).

In addition, many studies on PBL were conducted using survey method (Lam et al., 2008; Wieth and Burns, 2000; Subadrah and Mohammed, 2011; Kivela and Kivela, 2005; Wun et al., 1999). However, not much attention is paid on the experimental method as limited number of studies used this design (Selcuk and Caliskan, 2010; Rohani and Sahar, 2012; Koray et al, 2008). Therefore, a study using a quasi-experimental design would provide empirical evidence on PBL efficacy in a more controlled setting compared to survey design.

Therefore, the present study was undertaken in order to determine whether PBL, as an instructional approach, could help students in enhancing their
problem solving skills. The following research questions were addressed in the present study:

1. What are the perceptions of students on PBL environment?
2. Is there any change on students’ intrinsic motivation after they attend PBL treatments?
3. Is there any difference on students’ problem solving skills between students attending PBL and non-PBL classes?
4. Is there a significant increase in the students’ problem solving skills in PBL class at the beginning and at the end of semester?
5. Is there any relationship between students’ perception of PBL environment and motivation towards their problem solving skills?

1.3 Objectives of the Study

The general objectives of the study are to examine students’ perception and motivation on PBL environment, and to examine the efficiency of PBL in enhancing problem solving skills among engineering students of Universiti Tun Hussein Onn Malaysia.
Moreover, the specific objectives of the present study are as follows:

1) To determine the perceptions of students before and after exposure to PBL as their learning environment.
2) To determine the students’ intrinsic motivation before and after the exposure of PBL as their learning environment.
3) To compare problem solving skills between the students in PBL and non-PBL settings.
4) To determine the students’ problem solving skills in PBL class at the beginning and at the end of semester.
5) To determine the relationship between students’ perception on PBL environment, PBL treatments, and the learning motivation with their problem solving skills.

1.4 Significance of Research

This research can serve as a model of student-centered approach in helping students to enhance their problem solving skills. Ministry of Higher Education (2006) has proposed several student-centered approaches to be implemented in class and this study would support the use of PBL as an instructional tool for the development of students’ skills, such as problem solving skills (Berkson, 1993; Davies, 2000).
In realizing the mission and vision of the university, practitioners and instructors need to find ways in helping the university to produce marketable graduates. Therefore, the findings of this study are intended to provide them with fresh ideas for teaching and learning in undergraduate courses by preparing syllabus that integrates the content knowledge and the requirements of the industry (UNESCO, 2010).

This study may also help instructors and researchers in higher education to better utilize PBL as an instructional method. Not much PBL research in the field of instructional communication is conducted in local context (Mohamad, Zuria and Thantawi, 2002; Rosnani, 2003; Romaizom, 2002). Therefore, this research may provide additional guidelines for the instructors as well as the researchers in implementing this student-centered approach in class.

Other than that, this study may also contribute to existing literature on Instructional Communication, and potentially impact on the practice of student-centered learning. This is because existing studies on the aspect of pedagogical in the field of instructional communication are limited (Nussbaum and Friedrich, 2005).

1.5 Scope and Limitations

The efficacy of PBL depends on many factors (Schmidt & Moust, 2000). One of the factors is students' perception towards the PBL environment (Visser, 2000).
Students may have different perceptions towards PBL instruction. Therefore, the issue of perception is important in examining the efficacy of any instructional strategy including PBL.

In addition to determining students’ perceptions toward the implementation of PBL in class, it is also essential to know students’ motivation in experiencing the PBL approach of learning. Generally it is agreed that motivation is essential in the process of learning and achievement (Wijnia et al., 2010). Students who are intrinsically motivated are more likely to achieve meaningful understanding on the subject matter (Araz and Sungur, 2007). Therefore, “perception towards PBL environment” and “intrinsic motivation” were included as independent variables in this study along with “PBL treatments”.

There are several ways in assessing problem solving skills in PBL environment. Hmelo-Silver (2004) assesses the problem solving skills among her students based on their ability to solve the problem accurately, explain coherently, reasoned strategically, and use the science concepts correctly. Schmidt et al., (1996), and Hmelo-Silver (1998) in their study include accuracy as an outcome variable. They find that students attending PBL classes are able to solve problems more accurately compared to students in non-PBL classes. Accordingly, in this present study, accuracy was one factor examined.

In addition to accuracy, quality is another aspect that one of the researcher of the present study intended to examine. This is an aspect of problem solving skills as done by Lee and Kim (2005)[cited in Belland et al., (2009)] who assess
students' project rating among their PBL students on, among other parameters, the qualities of the outcomes. Thus, in this present study, the aspects of accuracy and quality of the solution provided by the students were chosen as the parameters in measuring the problem solving skills. FILA table is used as one of the ways in implementing PBL approach in class where it provides a systematic way in structuring the problem solving process. Therefore, with the FILA table, students are able to provide quality thus better solutions for the given problems.

In examining PBL efficacy, this present study used Social Development Theory by Vygotsky and The Toulmin Model of Argumentation. Social Development Theory explains that social interactions enable students to learn from one another, thus leading to the development of cognitive and intellectual skills, knowledge, and understanding (Mohd Nasir, et al., 2010). This is what Vygotsky calls as the Zone of Proximal Development (ZPD). Vygotsky describes it as “the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978 in Mohd Nasir et al., 2010). It is believed that a student can work on a task that could not be achieved alone under the guidance of adults or with peer collaboration. The Zone of Proximal Development connects that gap between what is known and what can be known, and Vygotsky stated that learning occurs in this zone.
This study was limited to students of Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia who agreed to participate in the research. This study was also limited to the number of subjects tested and the length of time was 14 weeks i.e., one semester. The validity of the study was limited to the reliability of the instruments used. It was also limited by the design-based research approach chosen (Collins et al., 2004). This study was quasi-experimental because the selection of subjects for the control and experimental groups was non-randomized (Campbell & Stanley, 1963). Furthermore, this study was limited to the measurement of problem solving skills, which represented only two dimensions, namely accuracy and quality.

1.6 Operational Definition

A number of terms are used throughout this thesis. They are used as defined below:

Problem based-learning (PBL)

Problem based learning is “a method of instruction that uses problems as a context for students to acquire problem-solving skills and basic knowledge” (Bigelow, 2004). In this study, the students were given four problems or triggers as treatments, based on the syllabus of “Effective Communication (UMB 1052)”. The four problems are “Chaotic Tsunami”, “RM5”, “To be or not to be”, and “It’s a bird! No! It’s a plane!”.
**Non-PBL**

Non-PBL is a traditional approach of learning, which is teacher centered, where students are given lecture based on the UMB 1052 syllabus. Lecturer gives or teaches the students what to do in completing the course.

**Intrinsic Motivation Orientation**

Intrinsic motivation orientation in this study refers to the degree to which the students’ are concerned about course achievement and perceive themselves as participating in a task for reasons such as challenge, curiosity, and mastery (Pintrich et al., 1991). In this present study, the students were given problems that met the criteria of PBL problems as highlighted by scholars such as Barrows & Wee (2007) and Wee et al. (2001). The complexity of the problems would challenge students and motivate them towards the construction of knowledge.

**Perception towards Problem-based Learning Environment**

Perception towards problem-based learning environment is operationally defined as the participants’ view or perception on three dimensions of PBL: teacher support, student commitment towards learning, and perceived collaborative works.

**Problem Solving Skills**

The assessment on problem solving skills can be done through authentic assessment tasks or problem (Gijbels & Dolcy, 2005). In the present study, the
researcher measured problem solving skills by two aspects: accuracy and quality of solution.

**Accuracy**

Accuracy in this study is defined as how close the students’ answers are to the answer scheme prepared by the lecturer. Accuracy in this study focuses on the format and terms used in the process of solving the tasks in group.

**Quality**

Quality in this study refers to the students’ answers that provide more than required, showing own initiative to present better answers and having effort to give the best. These include students’ ability to give additional information with reference and include examples in explanation to ensure clarity and easy understanding of answers provided. Quality is defined as how well the students use the target language in speaking and writing.

**Enhancing**

Enhancing in this study is defined as to make students' problem solving skills greater than their current ability. Students' problem solving skills are better after they experience problem-based learning approach in class. The treatments work as the platform for the students to practice solving problem. With practices students are able to improve their problem solving skills.
CHAPTER II
REVIEW OF LITERATURE

This chapter discusses the relevant literatures and is presented in nine sections - the first section discusses the Instructional Communication, followed by problem-based learning. The next sections deal with research on problem-based learning, research on problem solving skills, research on perception towards problem-based learning, and research on perception towards problem-based learning and problem solving skills. Next, literatures on motivation as well as research on motivation in problem-based learning, and, motivation and problem solving skills are discussed. The following section is about communication in small groups in PBL environment, and finally, theories related to PBL, conceptual framework and summary are presented.

2.1 Instructional Communication

Instructional communication started when speech courses were offered by Indiana University in 1892 as reported by Smith in the year of 1954. International Communication Association’s Division 7 was established in 1972 and it is now known as Instructional Communication Division. Several efforts had been made to summarize the status of instructional communication research, for instance, the publication of five volumes of ICA’s Communication Yearbook. Nussbaum and Friedrich (2005) highlighted that there were 186
empirical studies from selected journals, namely, ICA, NCA, and regional communication journals which dated from 1974 to 1981.

Instructional Communication emphasizes on the teaching process that influences the learning process of the students (Frymier, 2005). Many researches on Instructional Communication were conducted in college classrooms as well as studies which focused on the effect of mass media on children. Studies were conducted within the three dominant of philosophical traditions of social science research (Nussbaum and Friedrich, 2005), where many were under positivism, lesser number under interpretive and little work on critical theory perspective.

Based on history, there are debates in understanding what Instructional Communication and Communication Education are all about. Since 1938, speech professors have been training teachers to be public speakers (Sprague, 1993), as they teach communication courses or perhaps communicative development of children. Later it is known as Instructional Communication. Somehow, in 1970’s, the “Speech Teacher” became “Communication Education” and has been identified as a journal thus invitations were given to the speech teachers to send manuscripts on teaching method.

At the early establishment of Instructional Communication, studies were more on individual differences in students, such as measuring the levels of communication apprehension (McCroskey et al., 2004). Instructional
communication is an area that has been explored by scholars for the past 30 years where its focuses are on issues on communication that influences the students’ learning, motivation, and behaviours (Worley et al., 2007). There is no specific theory in conducting research on instructional communication but it is based on two general approaches that have been used by researchers as guidance of their research namely relational and rhetorical approaches.

Nussbaum and Friedrich (2005) use Shulman’s model of “knowledge growth in teaching” in seeing Communication Education and Instructional Communication as a domain of research. In the study, the Instructional Communication Researches were conducted in college classrooms, within the context of the three dominant philosophical traditions for social science research.

Instructional Communication could be different in different settings. Many studies were done by researchers and most of the studies were in American context or in the context of other foreign countries. Most of these works can be accessed in journals. An example of such studies is as reported by McCroskey et al. (2004) who describe an instructional setting in the context of United States.

There are six components of general model of instructional communication. In Nussbaum and Friedrich (2005), the researchers studies four of the six components; which are teachers, students’ perceptions of teacher’s verbal and nonverbal communication behaviour, students’ perceptions of teacher’s source
credibility and task attractiveness, and instructional outcomes. The other two components are students and instructional environment.

Teacher’s verbal and nonverbal communication brings message to students as the teacher is being observed by the students. Experience, communication competence, content knowledge is among the requirements that a teacher should possess. These elements influence the teacher’s choice of verbal and nonverbal communication behaviour in instruction. In the class, students may differ in the aspects of intelligence, personality, prior learning and temperament. Other than that, they are different in terms of gender, ethnicity, culture, religion, socio-economic status, etc. These aspects contribute to how they perceive the teacher and teacher’s communication behavior (Nussbaum and Friedrich, 2005).

Having said that instructional communication has many parts and the most popular is the research on student’s communication and teacher’s communication, both contribute 42% and 31% respectively (Nussbaum and Friedrich, 2005). However, only 7 studies were focused on the aspect of pedagogical method. Therefore, in the present study, problem-based learning was considered as one aspect of Instructional Communication, which was a pedagogical method.
2.2 Problem-based Learning (PBL)

The original method of problem-based learning (PBL) was developed in 1950’s and 1960’s in Canada due to dissatisfaction with common practices in medical education (Barrows, 1996). Students were unable to relate first-year course material to their future career as medical doctors. They were looking forward to facing with real patients and solving their problem, in which they could only experience it during internship (Loyen et al. 2008). Initially, it was developed for medical training at McMaster University. Later, other disciplines adopted the PBL approach in the learning process (Gijbels et al., 2005). Generally, PBL is known as a student-centered approach of learning, having authentic and ill-structured problems as the starting point of learning process (Barrows, 1996).

PBL is one of many instructional approaches that create the process of learning in a meaningful task (Hmelo-Silver, 2004). Gijbels et al. (2005) mention that although some aspects of PBL are considered new, the basic idea of PBL can be found in the work of Dewey, Piaget and Burner, where students are given the opportunity to create and accomplish their own learning goal. PBL has been applied in other disciplines such as in the fields of architecture (Fadzidah Abdullah & Maharan Yaman, 2008), business administration (Arfah Salleh et al., 2005), law (Mobarak Ali et al., 2009) and engineering (Khairiyah et al., 2005). Although there are various ways in implementing it, the goals and characteristics of PBL implementation are similar.
2.2.1 Characteristics of PBL

PBL stresses on student-centered approach in the process of learning (Hmelo-Silver, 1998). Students work in small group and they learn collaboratively, communicatively, and cooperatively. They have high level of interaction among peers and facilitator (Tan, 2003). Students do take their own responsibility in their learning with the guidance of facilitators/tutors. They need to identify what they need to know better and manage the triggers on which they are working using available sources such as books, journals, faculty and online information resources. In addition, the learning process occurs in small group students where the groups are formed of five to eight students (Gijbels et al., 2005). PBL is well suited in helping students to become active learners as real-world problems are used in the learning process and students are responsible for their learning (Hmelo-Silver, 2004).

Since the students become active learners, the role of teachers is no longer lecturing but they are regarded as facilitators or guides. Teachers guide the students by asking question related to the topic discussed and students construct knowledge in the process of solving the problem (Khairiyah et al., 2005; Hmelo-Silver, 2004; Gijbels et al., 2005).

Other than having teachers as facilitators, another important aspect of PBL is the problems or triggers themselves. Problems form the organizing focus and stimulus for learning. As in medical courses, a patient problem or community
health problem represents the challenge that students need to face, thus it provides the relevance and motivation for learning (Gijbels et al., 2005). The problem presented is usually a real-world problem and it appears unstructured. If the problem presented is a simulated problem, therefore, it should be as authentic as possible (Tan, 2003). Problems also give students focus for integrating information from various disciplines (Neo and Neo, 2005). A key feature in many PBL curricula is the use of cross-disciplinary knowledge and it encourages the solution of the problem by using knowledge from various subjects and topics. The problem posed to the students challenges their current knowledge, attitudes, and competencies, thus leading to the new learning areas (Tan, 2003). Problems are a vehicle for the development of clinical problem solving skills. As the format of the problem presented reflects the real-world problem, students may ask questions to patient; carry out physical examinations, conduct tests in labs, thus these activities would help the students to work out with the problem (Gijbels et al., 2005).

The mode of learning is self-directed learning, and students have major responsibility in acquiring the information and knowledge (Tan, 2003; Selcuk and Caliskan, 2010; Hmelo-Silver, 1998). New information is acquired through self-directed learning. Based on the characteristics described above, the students are expected to learn by gathering information from various sources and disciplines. During this self-directed learning, the students work together, having discussions, doing comparing and reviewing and debating on what they
have learned or gathered. Problem solving and inquiry skills are as important as content knowledge acquisition in finding solutions of the problem (Tan, 2003).

2.2.2 Process of PBL

<table>
<thead>
<tr>
<th>F (Facts)</th>
<th>I (Ideas)</th>
<th>L (Learning Issues)</th>
<th>A (Action Plan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Based on the trigger / task given to the students, they fill up this column with the information they gather.</td>
<td>• Students come out with their hypotheses on the solution of the trigger/task</td>
<td>• Students record their questions for further study (which they need to find out more)</td>
<td>• Plans for resolving the trigger</td>
</tr>
</tbody>
</table>

Problem based-learning (PBL) is “a method of instruction that uses problems as a context for students to acquire problem-solving skills and basic knowledge” (Bigelow, 2004). In PBL setting, students are given a problem (trigger) on the related issue. This is the starting point of learning (Tan, 2003). Students start preparing what is called as “FILA table” (Hmelo-Silver, 2004). Table 2.1 explains the “FILA table”.

Table 2.1: “FILA Table”

FILA table is one of the systematic processes of PBL. Barrows and Wee (2007) introduce another way of getting the PBL process. In the FILA table, students identify the concept known as “learning issues”. With the “learning issues”, they start to seek information to develop their FILA table. They can get information
from websites, books, articles and other resources. Finally, students end the process of PBL by including the synthesis, integration of learning, evaluation and review of the students’ experience and learning process (Tan, 2003). Figure 2.1 shows the flow chart on the process of PBL as what Hmelo-Silver (2004) highlighted.

![Figure 2.1: Flow chart on the Process of PBL (Hmelo-Silver, 2004).](image)

Barrows and Wee (2007) also present a four-column table, which is similar to the FILA table. The differences on the tables introduced by Barrows and Wee (2007) and Hmelo-Silver (2004) are in the first two left hand side columns.
In addition, Barrows and Wee (2007) came out with a detailed process of implementing PBL. They produce eleven stages in completing the process. The detailed of the process are presented in Table 2.3.

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Information</th>
<th>Learning Issues</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generate hypotheses about possible causes of the problem and possible resolutions</td>
<td>Identify key information about the problem gathered from the presenting picture of the problem and information obtained through hypothesis-guided inquiry</td>
<td>List down what needs to be learned in order to understand and resolve the problem</td>
<td>List the things that need to be done by the group as they work with the problem</td>
</tr>
</tbody>
</table>

**Table 2.2: Template for a PBL Process**

In addition, Barrows and Wee (2007) come out with a detailed process of implementing PBL. They produce eleven stages in completing the process. The detailed of the process are presented in Table 2.3.

**Table 2.3: A PBL Educational Process (Barrows and Wee, 2007)**

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Orientation (to be conducted once at the beginning of a new unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 2</td>
<td>Encountering the problem</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Making a commitment</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Tackling the learning issues</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Conducting self-directed learning</td>
</tr>
<tr>
<td>Stage 6</td>
<td>Returning from self-directed learning</td>
</tr>
<tr>
<td>Stage 7</td>
<td>Reiterating and reassessing the problem</td>
</tr>
<tr>
<td>Stage 8</td>
<td>Summarizing and knowledge abstraction</td>
</tr>
</tbody>
</table>
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