RELATIONSHIP BETWEEN PROBLEM-BASED LEARNING EXPERIENCE AND SELF-DIRECTED LEARNING READINESS

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RELATIONSHIP BETWEEN PROBLEM-BASED LEARNING EXPERIENCE AND SELF-DIRECTED LEARNING READINESS

SITI NURZAKIAH BINTI ZAINAL ALAM

A project report submitted in partial fulfillment of the requirements for
the award of the Degree of
Master of Technical and Vocational Education

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Faculty of Technical Education
Universiti Tun Hussein Onn Malaysia

APRIL, 2007

"I hereby declare that the work in this report is my own except for quotations and summaries which have been duly acknowledged"

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For my loving parents. Thank you for always being there for me.

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ABSTRACT

Tun Hussein Onn University of Malaysia (UTHM) has been implementing Problem-Based Learning (PBL) to some degree in various subjects. However, to this day no empirical data has been gathered on the effectiveness of PBL as a methodology to develop self-directed learning (SDL) skills. The purpose of this study is to investigate self-directed learning readiness (SDLR) among UTHM students exposed to varying PBL exposure intensity. SDLR was measured using the modified version of Self-Directed Learning Readiness (SDLRS). Participants in this study were first-year undergraduate students at UTHM. The instrument was administrated to students in Electrical and Electronics Engineering, Civil and Environmental Engineering, and Technical Education (N=260). Data were analyzed using descriptive and inferential statistical techniques with analysis of variance (ANOVA) and the independent t-test for equal variance for hypotheses testing. The results of this study indicate that overall SDLR level increase with PBL exposure up to exposure intensity twice, beyond which no increase in SDLR was observed with increase in PBL exposure. Within the same academic programme, results did not show a statistically significant difference of SDLR level between groups exposed to varying PBL exposure intensity. However, significant difference was found in some dimensions of the SDLR for the Technical Education students. Within the same education background, results did not show a statistically significant difference of SDLR level between groups exposed to varying PBL intensity. However, significant difference was found in some dimensions of the SDLR for students with both Matriculations and STPM background. A statistically significant difference of SDLR level was found between Electrical Engineering and Technical Education students for exposure once and in some SDLR dimensions. No statistically significant difference was found between students from different academic programme for exposure twice or thrice. The data supports the conclusion that SDLR level increases with increase in PBL exposure intensity up to a certain extent only, beyond which no increase of SDLR can be observed. The data also suggest that only certain dimensions of the SDLR improve with increased exposure to PBL.

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ABSTRAK

Universiti Tun Hussein Onn Malaysia (UTHM) telah melaksanakan Pembelajaran Berasaskan-Masalah (PBL) sehingga ke sesuatu tahap di dalam pelbagai subjek. Walau bagaimanapun, sehingga hari ini tiada data empirikal dikumpul mengenai keberkesanan PBL sebagai suatu metodologi dalam membangunkan kemahiran pembelajaran terarah kendiri (SDL). Tujuan kajian ini adalah untuk menyelidik kesediaan dalam pembelajaran terarah kendiri (SDLR) bagi pelajar-pelajar di UTHM yang terdedah pada keamatan pendedahan terhadap PBL yang berbeza-beza. Responden bagi kajian ini adalah pelajar-pelajar Ijazah Sarjana tahun pertama di UTHM. SDLR diukur menggunakan Skala Kesediaan dalam Pembelajaran Terarah Kendiri (SDLRS) yang telah diubah suai. Instrumen tersebut diagihkan kepada pelajar-pelajar Kejuruteraan Elektrik dan Elektronik, Kejuruteraan Awam dan Alam Sekitar, dan Pendidikan Teknikal ($N = 260$). Data telah dianalisa menggunakan teknik statistik deskriptif dan inferensi menggunakan *analysis of variance* (ANOVA) dan *independent t-test for equal variance* bagi menguji hipotesis kajian. Dapatan kajian ini mendapati secara keseluruhannya tahap SDLR meningkat seiring dengan pendedahan PBL sehingga keamatan pendedahan dua kali, seterusnya tiada peningkatan SDLR diperhatikan dengan peningkatan pendedahan terhadap PBL. Di dalam program akademik yang sama, dapatan tidak menunjukkan perbezaan signifikan secara statistik pada tahap SDLR di antara kumpulan-kumpulan yang terdedah pada keamatan pendedahan PBL yang berbeza-beza. Walau bagaimanapun, terdapat perbezaan signifikan pada dimensi SDLR tertentu bagi pelajar-pelajar dari Pendidikan Teknikal. Di dalam latar belakang pendidikan yang sama, dapatan tidak menunjukkan perbezaan signifikan secara statistik pada tahap SDLR bagi pelajar-pelajar dari kedua-dua latar belakang Matrikulasi dan STPM. Walau bagaimanapun, terdapat perbezaan signifikan pada dimensi-dimensi SDLR tertentu untuk pelajar-pelajar dari kedua-dua latar belakang Matrikulasi dan STPM. Pada pendedahan sekali, terdapat perbezaan signifikan secara statistik pada tahap SDLR di antara pelajar-pelajar dari Kejuruteraan Elektrik dan Pendidikan Teknikal serta dalam beberapa dimensi SDLR. Tiada pebezaan signifikan secara statistik didapati di antara pelajar-pelajar dari program akademik yang berlainan pada pendedahan dua kali atau tiga kali. Data menyokong kesimpulan bahawa tahap SDLR meningkat seiring dengan peningkatan keamatan pendedahan terhadap PBL sehingga pada sesuatu takat sahaja, seterusnya tiada peningkatan SDLR dapat diperhatikan. Data juga mencadangkan hanya dimensi SDLR tertentu sahaja yang meningkat seiring dengan peningkatan pendedahan terhadap PBL.

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LIST OF ABBREVIATIONS

α	-	Reliability
ANOVA	-	Analysis of variance
Ex0	-	No exposure
Ex1	-	Exposure once
Ex2	-	Exposure twice
Ex3	-	Exposure thrice
PBL	-	Problem-Based Learning
SDL	-	Self-directed learning
SDLR	-	Self-directed learning readiness
SDLRS	-	Self-Directed Learning Readiness Scale
SDLRS-A	-	Self-Directed Learning Readiness Scale- Adult version
STPM	-	*Sijil Pelajaran Tinggi Malaysia*
UTHM	-	Universiti Tun Hussein Onn Malaysia
LOL	-	Love of learning
Tolerance	-	Tolerance of risk, ambiguity, and complexity in learning
Selfconcept	-	Self-concept as an effective learner
Responsibility	-	Responsibility for one's own learning
Selfunderstanding	-	Self understanding of one's own learning
Initiative	-	Initiative in learning
Hardwork	-	Acceptance of hard work
Lifelong	-	View of learning as a lifelong beneficial process

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CHAPTER I

INTRODUCTION

1.1 Introduction

The concept of self-directed learning (SDL) is one which educators have investigated and discussed for many years. SDL has its roots in adult education and has been heralded as one of the theories for adult-learning. It has been described as a process (Conlan, Grabowski & Smith, 2003), a psychological predisposition of the learner (Reio & Davis, 2005), a learning environment, autodidactitism, and goals (Ainoda, Onishi & Yasuda, 2005). An extensive study by Candy (1988) concluded that self-direction in learning has been used as: (1) a personal quality or attribute (personal autonomy), (2) as the independent pursuit of learning outside formal settings (autodidaxy), and (3) as the way of organizing instruction (learner-control) (Candy, 1988, cited in Brockett and Heimstra, 1991a).

One of the most common definitions of SDL was developed by Knowles (1984). Knowles (1984) described SDL as a process "…in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes." (Knowles, 1984). Knowles elucidated this process are labeled 'self-planned learning', 'inquiry method', 'independent learning', 'self-education', 'self-instruction', 'self-study', and 'autonomous learning' as found in the literature. He stated that most of these labels seem to imply learning in isolation, where as in SDL, "…learning usually takes place in association with various kinds of helpers, such as

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instructors, tutors, mentors, resource people, and peers" (Knowles, 1984). In SDL, the role of the teacher shifts to become a facilitator or instructor, rather than to direct the learning.

Another effort made to describe SDL was by Oddi (1985). Oddi described SDL as a personality characteristics off individuals "…whose learning behavior is characterized by initiative and persistence in learning overtime through a variety of mode" (Oddi, 1985, cited in Brockett and Heimstra, 1991b). Oddi identified three components or clusters that she hypothesized as being the essential personality dimensions of SDL, which are: (1) proactive drive versus reactive drive, (2) cognitive openness versus defensive openness, and (3) commitment to learning versus apathy or aversion to learning.

Candy (1988) summarizes the characteristics of the directed learner fall into two categories: attributes and skills (Candy, 1988, cited in Brockett and Heimstra, 1991a). Guglielmino (1977) cited in Guglielmino and Guglielmino (2003) describes a learner who is likely to be successful in SDL, based on a three-round Delphi survey process involving 14 individuals considered to be experts on SDL, as follows:

> "A highly self-directed learner is one who exhibits initiative, independence, and persistence in learning; one who accepts responsibility in his or her learning and view problems as challenges, not obstacles; one who is capable of self-discipline and has a high degree of curiosity; one who has a strong desire to learn or change and is self-confident; one who is able to use basic study skills, organize his or her time, set an appropriate pace for learning, and develop a plan for making it work; one who enjoys learning and has a tendency to be goal-oriented." (Guglielmino, 1977, 1978, cited in Guglielmino and Guglielmino, 2003)

Clearly, much debate has been done to clarify the concept of SDL. A study of the literature reveals a variety of definitions to describe SDL. In spite of this, and the fact that its definition had undergone some changes throughout the passage of time, it

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can be concluded that SDL can be perceived as both a process and personal attributes/skills (Brockett and Heimstra, 1991a; Siaw, 2001).

Brockett and Heimstra (1991b) described SDL under an umbrella concept which recognizes both the process and personal attributes of the learner, namely process orientation and personal orientation, which are two related dimensions of SDL. The process orientation, otherwise known as *external factors*, is where the learner assumes primary responsibility for planning, implementing, and evaluating the learning process. It refers to an instructional method in which an education agent or resource often plays a facilitating role. The second dimension, known as the process orientation (or *internal factors*), relates to the learner's characteristics that predispose him or her towards taking primary responsibility for personal learning endeavors. Both the process and personal orientation are encapsulated into a theoretical model called the "Personal Responsibility Orientation" Model (PRO) proposed by Brockett and Heimstra (1991b), which substantiates both Knowles' and Candy's theories of SDL. This theoretical framework proposed by Brockett and Heimstra (1991b) is the basis of the current study.

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1.2 SDL methodology : Problem Based Learning (PBL)

In the effort to promote the andragogical perceptive of SDL, academicians and researcher alike studied various teaching methodologies in an effort to empirically validate the learning outcomes of SDL. Out of various teaching methodologies, Problem Based Learning (PBL) emerged as one of the significant method of enacting the principles of SDL among learners (Boud & Feletti, 1997, cited in Walker and Lofton, 2003); Graaff & Kolmos, 2003; Graaff, n.d.; Savery, 2006; Helmo-Silver, 2004). SDL is considered to be the core concept in PBL (Silen and Uhlin, 2004).

PBL originated from medical education in the Faculty of Medicine at McMaster University in Canada during the mid 1960's. It has been sub sequentially adopted by medical schools at other universities such as the University of Limburg at Maastricht (Netherlands), the University of Newcastle (Australia), and the University

of New Mexico (United States of America). Nowadays, we are seeing the explosion of PBL in various adaptations especially in engineering education (Khairiyah et al., 2005; Ping, 2005; Yong, 2005; Afandi Ahmad, 2006), business education (Siaw, 2001), multimedia and ICT (Ellis et al., 1998; Nor Ratna Masrom, 2006), and dentistry (Lohman & Finkelstein, 2000).

PBL was grounded in the constructivist framework where learning is believed to be most effective when students are actively involved and learn in the context in which knowledge is to be used (Savery & Duffy, 1995). Three primary constructivism principles, according to the authors are: understanding comes from our interactions with our environment, cognitive conflict stimulates learning and learning evolves through social negotiation and evaluation of the viability of individual understandings. The philosophy behind PBL is that students gain both content and thinking strategies through the experience in solving problems. The teacher acts as a facilitator to guide the learning process rather than as a provider of knowledge which promotes 'spoon-feeding' in the traditional learning environment (Kwan, 2000; Hmelo-Silver, 2004). PBL is also said to be a set of approaches under the broader category of inquiry-based learning, where learning begins with the curiosity of the learner (Barett, 2005; Savery, 2006), and is also related closely to other instructional strategies such as case-based learning and project-based learning (Savery, 2006; Graaff, n.d.). The concept of PBL is also known to be closely related to Kolb and Dewey experiential learning (Graaff & Kolmos, 2003; Hmelo-Silver, 2004).

Numerous attempts have been made to define the theoretical principles that underline PBL. For instance, Savery (2006) described that the critical success and factors to the implementation of PBL is the selection of ill-structured problems and a tutor who guides the learning process. Guzelis (2006) defines PBL is a total learning approach in education, both a curriculum and a process curriculum that consists of carefully selected and designed problems. The author stated that the problems demand the learner acquisition of critical and creative knowledge, problem-solving proficiency, self-directed learning strategies and team participation skills. Helmo-Silver (2004) described PBL as an instructional method in which students manage

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their learning goals and strategies to solve ill-structured problems (problems with no single correct answer) and acquire skills needed for lifelong learning. Students work in collaborative groups to identify what they need to learn in order to solve the problems, engage in self-directed learning, apply their new knowledge to the problem, and reflect on what they learned and the effectiveness of the strategies they applied.

Based on the review of the literature, the principles underlying PBL can be summarized as follows:

i. The use of ill-structured, cross-disciplinary, complex, real-world problems that allow inquiry and with any number of correct solutions.
ii. The problem is encountered first and used as the focus from which the learning is structured.
iii. Self-directed learning is primary. Students must have responsibility for their own learning and acquisition of both information and knowledge.
iv. Problem is presented to the students without direct instruction of how to solve it. However, resources and scaffolding are made available for the students to solve the problems themselves.
v. Harnessing of a variety of knowledge sources and the use and evaluation of information sources are essential PBL processes.
vi. Emphasis is on meaning and not on facts.
vii. Collaboration is essential. Students work in small groups, with the help of a facilitator.
viii. PBL fosters collaboration, stresses on development of problem-solving skills, self-directed learning, and increases motivation.
ix. Self and peer assessment should be carried out at the completion of each problem and at the end of every curricular unit.
x What students learn during their self-directed learning must be applied back to the problem with reanalysis and resolution.
xi. A closing analysis of what has been learned from work with the problem and a discussion of what concepts and principles have been learned is essential.

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xii. Student examinations must measure student progress towards the goals of problem-based learning.

xiii. PBL must be the pedagogical base in the curriculum and not part of a didactic curriculum.

Perhaps one of the reasons why PBL is increasingly gaining to have so much interest by researchers and educators alike is because fits the tenets of adult learning. Knowles (1984), considered to be the 'father' of adult learning, proposed an androgogical model in which he stated that adults become ready to learn when they feel the learning process relates to and uses their own experiences. Adults are naturally self-directed learners, and experience a feeling, often subconsciously, of resentment and resistance when the learning is imposed on them. Group discussions, simulation exercises, and the like among adults make use of the experiences of the learner. The learning environment which is characterized by physical comfort, mutual respect, collaborativeness, mutual trust, supportiveness, and openness and authenticity in important in adult learning. Adults feel the need to set and diagnose their own learning needs, participate actively and collaboratively, share a responsibility for planning and operating the learning goals, evaluate their learning outcomes, and take responsibility for their own learning (Knowles, 1984). Clearly, the atmosphere which surrounds a PBL curriculum matches the tenets of adult learning theory and facilitates the SDL process.

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1.3 PBL Implementation

There are also several different approaches of infusing PBL into a curriculum. Tan (2003) categorizes the approaches into three levels: mega, macro, and micro levels. At the mega level, it may entail a total revamp of current curricula in terms of course structures, assessments structures, and design of the entire learning environment. The macro level is more common, where certain subjects or courses in the curriculum are designated to be taught utilizing PBL (Tan, 2003). At the micro level, PBL is used in certain topics in a course within a certain amount of time (Khairiyah et al., 2005). A review of the literature indicates that PBL has been more

widely implemented at the macro level, where specific courses or subjects utilize in PBL (Khairiyah et al., 2005; Afandi Ahmad, 2006; Chu & Lai, 2002; Kelly, 2005; Sanchez & Berrios, 2001). Studies on PBL have focused on determining the effects of PBL on students' problem-solving skills (Nor Ratna Masrom, 2006), effective communications (Elizabeth Anthony, Zulida Abd Kadir, & Noryani Neni Ahmad Jamain, 2006), generic skills development such as problem-solving abilities, self-directed learning and motivation in learning, interaction and teamwork skills, and self-confidence (Hasyamuddin Othman & Rahifa Mustafa, 2006; Khairiyah et al., 2005) and the like.

1.4 Research Background

One of the purported benefits of PBL is its claim to prepare life-long learners because its emphasis on SDL (Helmo-Silver, 2006). Many efforts have been done to understand the concept of SDL but little in the context of PBL as a methodology to develope SDL for the pass several years with perhaps the exception of Siaw (2001), Walker & Lofton (2003), and Litzinger, Wise, & Lee (2005), based on the little empirical evidence found in the literature. SDL in PBL has been taken for granted and has little been emphasized on, especially concerning the process of learning involving responsibility and independence (Silen & Uhlin, 2004).

Walker & Lofton (2003) stated that SDL 'has been heralded as a theoretical approach to learning on the androgogical perspective that individuals should be able to make logical and significant choices in learning'.

> 'Problem Based Learning (PBL) has been one of the most powerful teaching methodologies to encourage students to take responsibility for their own learning. The authors state that PBL approach provides the student the motivation to actively pursue concepts and principles that they need for life. The authors believe that students, using a PBL approach, learn to develop knowledge acquisition skills, flexibility, and deeply rooted theoretical

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concepts, that better equips them for life long learning' (Boud & Feletti, 1997; cited in Walker & Lofton, 2003).

Based on the claim made by Boud & Feletti (1997), it can be said that the PBL is a fitting approach to foster self-direction in learning, especially in encouraging students to take responsibility for their own learning, besides fostering the development of necessary skills for lifelong learning. Empirical evidence suggests that students' participation in a PBL curricula leads to an increase in some SDL skills such as scientific thinking, problem solving, and conflict resolutions in students (Yalcin et al., 2006).

Referring to the theoretical framework proposed by Brockett and Heimstra (1991b), in which SDL is referred to a concept that recognizes both process orientation and personal orientation, PBL can be described as the process orientation (instructional methods) while the personal characteristics of the learner can be described as the personal orientation. Guglielmino and Klatt (n.d.), stated that '…it is assumed that self-direction in learning can occur in a wide variety of situations, ranging from a teacher directed classroom to self-planned and self- conducted learning projects. Although certain learning situations are more conducive to self direction in learning than others, it is the personal characteristics of the learner- including his attitudes, values and his abilities- which ultimately determine whether self-directed learning will take place in a given learning situation'. Knowles (1984) stated that the skills and attributes of self-directed learning do not grow in isolation, but are interwoven into the academic content.

A glance at the literature suggests that mismatches sometimes occur between teaching strategies and learner's self-directedness (Grow, 1991, 1996; Tan, 2003). Grow emphasized effective teachers consider that learner's level of self-direction while matching their teaching strategies with the learners learning styles. For example, a student with low level of self-directedness may encounter problems if the teacher acts in the role of a facilitator. "Students may resent freedom they are not ready for" (Grow, 1991, 1996). Thus, a mismatch occurs. If the roles were reversed - the student is self-directed and the teacher assuming the authoritarian role –

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mismatch will also occurs. In this case, "…this mismatch may cause learner to rebel or retreat into boredom" (Grow, 1991, 1996). As one of the core principals of PBL is students-centred learning where they must have responsibility for their own learning and acquisition of information and knowledge, this can pose a bit of a problem for students who have a low level for SDL in a PBL environment. It is the teacher's responsibility to adjust their role based on the students' level of self-directedness. Unfortunately, not much evidence was found in giving this issue a more serious attention. In most cases, PBL had been done without first determining the current level of readiness of students for SDL in a PBL environment. In the attempt to develope individuals who have the ability for self-direction in learning, Robotham (1995) suggests the first step is to assess the learner's current level of self-direction in learning. Reflection on past learning experiences and identifying events that have hindered or helped the effectiveness their learning is also important to assess the current level of self-directedness.

Apart from that, relatively few studies explore the areas where the students are weak in for self-directed learning with the exception of Siaw (2001). Most research tend to focus on the effects of PBL on students' overall readiness for self-directed learning, classroom learning performance, age, gender, SDL skills, and GPA (Walker and Lofton, 2003; Litzinger et al., 2005; Reio, 2004; Yalcin et al., 2006).

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A study by Siaw (2001) investigated whether the implementation of PBL improve students' preparedness for self-directed learning in a period of eight months. The Self-Directed Learning Readiness Scale (SDLRS) by Guglielmino (1977) was used in this study. A hundred students who enrolled in a postgraduate business course at a Hong Kong University were allocated to a non-PBL group, while another batch of eighty-seven students were allocated to a PBL group. The two groups were homogenous in the sense that they were very similar in age, marital status, highest qualification achieved, years of working experience and SDLRS pre-test mean scores (198.8 and 199.3).

The author reported that only the PBL group showed a significant increase ($p<0.05$) between pre- and post- administration of SDLRS. The non-PBL group showed no significant difference between pre- and post- SDLRS overall mean scores. However, significant results were not found for all the factors of the SDLRS. 'Acceptance of responsibility for one's own learning' scored the highest for both PBL and non-PBL groups and 'Self-concept as an effective learner' scored the lowest. At the end of the study, 'Acceptance of responsibility for one's own learning' still had the highest score and 'Tolerance of risk, ambiguity, and complexity in learning' scored the lowest. The only significant increase in PBL group was in 'Tolerance of risk, ambiguity, and complexity in learning' and no significant increase for non-PBL for that factor. The study concluded that PBL approach should lead to an increase in self-directedness in learning and shows that normal tutorials experienced by non-PBL group do not significantly affect the level of self-directedness for learning.

In another study, Walker & Lofton (2003) investigated the effects of a PBL curriculum on student's perception about SDL. The instrument used was the adult version of Self-Directed Learning Readiness Scale (SDLRS-A) developed by Guglielmino (1977). The design of the study was a pre-test and 2 post-tests measuring a group of seventy-three students enrolled in a PBL curriculum in a School of Pharmacy. The pretest was administrated during the student orientation of the PBL curriculum. The first post-test was administrated to the same group of seventy-three subjects after eight weeks of experience in the PBL curriculum while the second post-test was administrated again at the end of the sixteen weeks of PBL curriculum.

The results indicated a statistically significant nine-point decline in the mean scores for all subjects from the pre-test and first post-test ($p< 0.018$). An 11-point statistically significant decline in the mean scores also occurred from the pre-test and second post-test ($p < 0.007$). There was a statistically significant decrease in SDLRS-A scores for all subjects from pre-test and first post-test ($p<0.018$).

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Walker & Lofton (2003) reported that students have difficulty in maintaining their perceived ability to perform SDL and their perceived importance of SDL in a PBL curriculum. The results of this study indicate that the teaching methodology of PBL may initially diminish students' perception in their confidence and ability to perform SDL. The study supports that diminished student's confidence levels continues for up to 16 weeks in a PBL curriculum.

Litzinger et al. (2005) have also conducted two studies related to the readiness for SDL of engineering students using the SDLRS test. The first test – which was a cross-sectional study - of students in the first through final year of study, showed that their SDLRS scores are significantly correlated with academic year of study and grade point average, but not gender. This indicates that neither male nor female is being disadvantaged in the development of SDL. However, it was found that neither academic year nor grade point average is good predictors of SDLRS scores; together they account for less than 5 percent of variance. The results for mean SDLRS score suggest a possible upward trend with academic year.

The second study investigated the effect of PBL experience on students' readiness for SDL. Average readiness for SDL increased significantly for students in PBL courses. However, further investigation revealed that only nine out of eighteen students showed significant increases in their SDLRS scores, and two showed significant decreases. The study indicates that a PBL experience may increase average readiness for SDL. However, changes for individual students vary substantially. They concluded that implication of these studies suggest engineering curricula must be modified to include multiple learning experiences that challenge students to develop SDL skills, if all students are to improve on these critical skills.

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1.5 Problem Statement

Universiti Tun Hussein Onn (UTHM) has been implementing PBL to some degree in various subjects. The PBL model used in UTHM varied from one lecturer to another. Nonetheless, the closest model used was adapted from the Republic Polytechnic of Singapore. However, to this day no empirical data has been gathered on the effectiveness of PBL as a methodology to develop SDL skills. The purpose of this study is to investigate self-directed learning readiness among UTHM students exposed to varying PBL exposure intensity.

1.6 Research Objectives

The objectives of this research are to determine:

i. The difference in SDLR level for students exposed to varying PBL intensity, irrespective of academic programme.
ii. The difference in SDLR level for students exposed to varying PBL intensity, within the same academic programme namely Electrical and Electronics Engineering, Technical Education, and Civil and Environmental Engineering.
iii. The difference in SDLR level for students exposed to varying PBL intensity, within the same education background namely Matriculation and STPM.
iv. The difference in SDLR level between students of different academic programme, irrespective of PBL intensity.
v. The difference in SDLR level between students of different academic programme, within the same PBL exposure intensity namely exposure once, exposure twice, and exposure thrice.

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1.7 Research Questions

The research questions can be stated as follow:

i. Is there a difference in SDLR level for students exposed to varying PBL intensity, irrespective of academic programme?
ii. Is there a difference in SDLR level for students exposed to varying PBL intensity, within the same academic programme namely Electrical and Electronics Engineering, Technical Education, and Civil and Environmental Engineering?
iii. Is there a difference in SDLR level for students exposed to varying PBL intensity, within the same education background namely Matriculation and STPM?
iv. Is there a difference in SDLR level between students of different academic programme, irrespective of PBL intensity?
v. Is there a difference in SDLR level between students of different academic programme, within the same PBL exposure intensity namely exposure once, exposure twice, and exposure thrice?

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1.8 Conceptual Framework

The conceptual framework that encompasses all the important elements in this research depends on the variables set by the objectives, research questions, and the scope of research. There are two variables used in this research, which are the predictor variables and outcome variable.

The outcome variable is the main factor that will be investigated, whereas the predictor variables are factors that are expected to affect the outcome variable. For this research, the variables understudies are illustrated in the theoretical framework as follows:

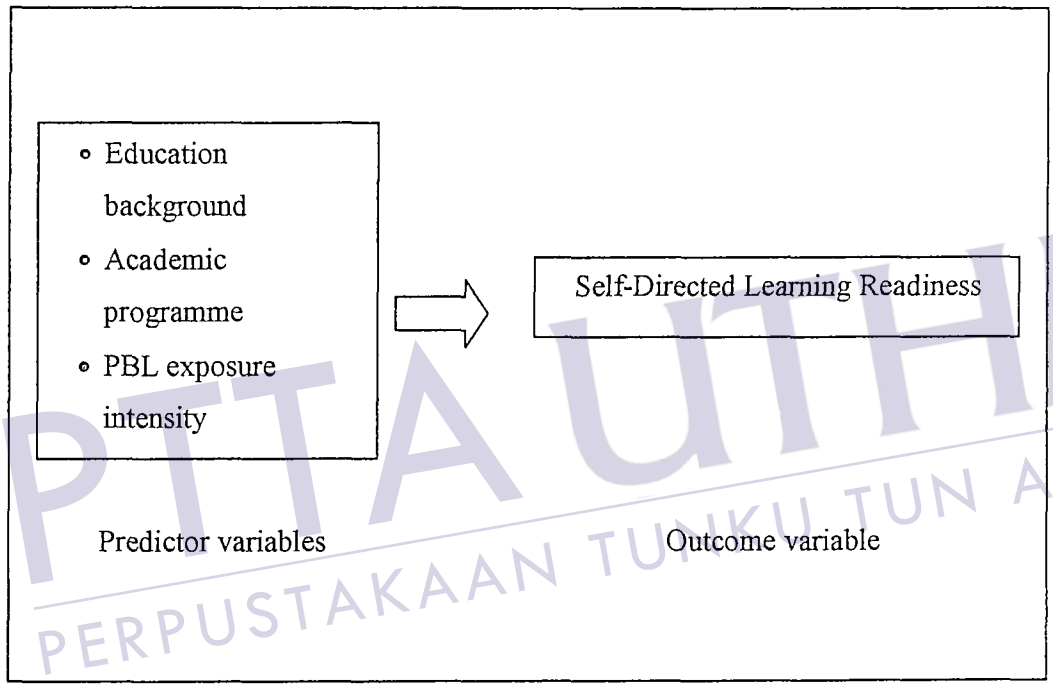

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Figure 1.1: The conceptual framework for this research

The predictor variables (education background, academic programme, and PBL exposure intensity) will predict the outcome variable (self-directed learning readiness). The indicators for self-directed learning readiness are dependent on dimensions as stated in the statement below:

Self-directed learning readiness = f { Love of learning;
Self-concept as an effective learner;
Tolerance of risk, ambiguity, and complexity of learning;
Creativity;
View of learning as a lifelong, beneficial process;
Initiative in learning;
Self-understanding of one's own learning;
Acceptance of responsibility for one's own learning;
Acceptance of hard work…
}

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1.9 Research Benefits

This study provides empirical evidence of the effectiveness, strengths, and weakness of PBL as a method in developing self-directed learning readiness among students. This information can be used as a basis for decision-making for instructional-design purposes, as well as for policy-making. The evidence provided for this study is also useful for future-applied studies.

1.10 Scope

The research is focused on the student's readiness for SDL in a PBL environment. The aspects focused in this research are the student's readiness for self-directed learning according to academic programme, education background, and intensity of PBL exposure. Further analysis is conducted to determine the readiness for self-directed learning in every dimension outlined in the SDLR. The research is focused only on first-year undergraduate students from Civil and Environmental Engineering, Electrical and Electronics Engineering, and Technical Education.

1.11 Limitations

The research is limited to first-year undergraduate students in Tun Hussein Onn University of Malaysia (UTHM) in Civil and Environmental Engineering, Electrical and Electronics Engineering, and Technical Education. Not all academic programme were taken for this research due to time constraint, cost, and students' willingness to participate in this study. The dependent variables were measured using the modified SDLRS, an instrument to assess the learners' perceived ability to engage in self-directed learning readiness and may not truly indicate their level of SDL skills or abilities. This study is an ex-post-facto i.e. there was no effort made to control over the independent variables namely the PBL exposure intensity, education background, and academic programme. Equal number of exposures does not necessarily indicate the students are studying the same subjects.

1.12 Conceptual and Operational Definitions

Based on the literature review, some term definitions are used in this research. A term definition refers to the definition made by an organization or individual working in the language field or is based on a research done with a reference source (Mohamad Najib Abdul Ghafar, 1999). The purpose of a term

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definition is to make sure that the research does not cross the boundaries of the research scope.

1.12.1 Student

According to the Oxford Study Dictionary (1991), a student (noun) is a person who is engaged in studying something; a pupil at a university or other place of higher education or technical training. Therefore, a student can be seen as a product from the education system he/she received. In this study, student refers to a student or learner in the first academic year and who is taking a full-time course at Bachelor's level in any academic programme in UTHM.

1.12.2 Academic programme

Academic programme in this study refers to any of the faculties in UTHM (Civil and Environmental Engineering, Electrical and Electronics Engineering, and Technical Education).

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1.12.3 Experience in PBL

Experience in PBL refers to whether or not the student has undergone a subject or course in PBL throughout his/her undergraduate study in UTHM.

1.12.4 PBL exposure intensity

PBL exposure intensity in this study refers to the number of subjects the students learning using PBL. PBL exposure ranged from none to thrice in the current study. Equal number of exposure does not necessarily indicate the same subject. A student with an intensity of once and another student exposed to the same intensity may not be studying the same subject.

1.12.5 Education background

Education background refers to the type of education (Matriculation, STPM, Diploma, and Certificate) the students have undergone before continuing their undergraduate study in UTHM.

1.12.6 Self-Directed Learning

Self-directed learning (SDL) based on the PRO model by Brockett & Heimstra (1999a) is a concept that recognizes both external factors (the instructional method) that facilitate the learner taking primary responsibility for planning, implementing, and evaluating learning, and internal factors (the personality characteristics) that predispose one towards accepting responsibility for one's thoughts and actions as a learner.

1.12.7 Self-Directed Learning Readiness

Self-directed learning readiness (SDLR) is a complex of attitudes, values, and abilities that create the likelihood that an individual is capable of self-directed learning (Brockett & Heimstra, 1999b).

1.12.8 Self-Directed Learning Readiness Scale

Self-Directed Learning Readiness Scale (SDLRS) is an instrument for measuring the degree to which people perceive themselves as possessing the skills and attitudes usually or frequently associated with the self-directed learning (Guglielmino, 1977, cited in Brockett & Heimstra, 1991b).

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CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter discusses the principles underlying Problem-based Learning (PBL) and the approaches of infusing PBL. A discussion of the different theories of SDL is also provided in which a conceptual framework of SDL has been derived.

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2.2 Principles Underlying Problem-Based Learning (PBL)

PBL at its most fundamental level is an instructional method that characterized by the use of 'real world' problems as a context for students to learn critical thinking and problem-solving skills, and acquire knowledge of the essential concepts of the course. Students acquire lifelong learning skills which include the ability to find and use appropriate learning resources when engaged in PBL (Duch, 1995).

In defining the principles that relate to PBL, several similar principles of PBL were noted. One of them is that the heart of the PBL is the problem itself. The activities carried out in PBL must be those valued in the real world (Barrows, n.d.; Tan, 2000c, cited in Tan, 2003). Other studies further described the characteristics of the problems must be ill-structured, 'real world', cross-disciplinary, complex, problems with any number of correct solutions and is used as the focus from which the learning is structured (Delaney & Mitchell, 2002.; Beasley & Ford, n.d.; Ellis et

al., 1998; Tan, 2000c, cited in Tan, 2003). Grimheden & Hanson (2003) further stresses that problems should emphasis on meaning and not facts. Meanwhile, Barrows (1980) stated that the problem must be presented first before other curriculum inputs (Barrows, 1980, cited in Barett, 2005).

In the PBL tutorial process, students work in small groups, with the help of a facilitator (Beasley & Ford, n.d.; Ellis et al., 1998), where direct instruction of how to solve the problem is not given (Beasley & Ford, n.d.; Ellis et al., 1998). However, resources and scaffolding are made available so that the students can solve the problems themselves (Ellis et al., 1998). It is said that harnessing of a variety of knowledge sources and the use and evaluation of information sources are essential PBL processes (Grimheden & Hanson, 2003; Barett, 2005). In PBL, the students also have responsibility for their own learning and in acquiring both information and knowledge (Delaney & Mitchell, 2002; Ellis et al., 1998; Grimheden & Hanson, 2003) and is said to be the essential part in defining self-directed learning (Tan, 2000c, cited in Tan, 2003).

Besides that, a closing analysis of what has been learned from work with the problem and a discussion of what concepts and principles have been learned is essential in PBL tutorial process (Barrows, n.d.; Tan, 2000c, cited in Tan, 2003). PBL is said to be fostering on collaboration, development of problem-solving skills, self-directed learning, and increase sing motivation are the goals of PBL (Delaney & Mitchell, 2002; Ellis et al., 1998).

In evaluating the outcomes of PBL, student examinations must measure student progress towards the goals of PBL (Barrows, n.d.). Self and peer assessment should also be carried out at the completion of each problem and at the end of every curricular unit (Barrows, n.d.; Grimheden & Hanson, 2003; Tan, 2000c, cited in Tan, 2003). Student examinations must measure student progress towards the goals of PBL (Barrows, n.d.). Barrows stated that PBL must be the pedagogical base in the curriculum and not part of a didactic curriculum.

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One of the goals of PBL is to develop learners who are self-directed in the sense of understanding, being able to handle and assess their ongoing learning process, and also the need for learning (Silen & Uhlin, 2004). The goals of PBL are designed to help students construct an extensive and flexible knowledge base, to develop effective problem-solving skills, to develop self-directed, lifelong learning skills, to promote problem-solving skills, to be able to use the appropriate learning resources, to develop critical thinking skills, to acquire knowledge of the essential learning concepts related to the subject or course, to develop the ability to continue to learn effectively throughout their lives, to help students become effective collaborators, and also to stimulate students' interest and become intrinsically motivated learners (Ellis et al., 1998; Hmelo-Silver, 2004; Yong, 2005).

2.3 Different Approaches in Infusing PBL

There are different approaches of infusing PBL in the curriculum, which is divided in three levels: mega, macro, and micro levels (Tan, 2003). At the mega level, it may entail to a total revamp of curricula in terms of course structures, assessments structures, and design of the entire learning environment, besides requiring a great deal of expertise, planning, and resources. It also emphasizes the effective use of problems through an integrated approach to active and multidisciplinary learning (Tan, 2003). An example of such implementation is when students undergo the entire third year of a course/programme, or an entire programme in PBL (Khairiyah et al., 2005).

The macro level is more common, where certain subjects in the curriculum are designated to be taught utilizing PBL. Formally designating subjects ensures that PBL will be consistently implemented, not matter who is in charge of the subject. At this level, it requires departmental approval and the commitment of lecturers teaching the subjects. Subjects that are taught in multiple sections would require coordination between lecturers (Khairiyah et al., 2005).

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At the micro level, PBL is used in certain topics in a course within a certain amount of time. It requires the least amount of resources and coordination. This approach is highly recommended for those who are trying out PBL for the first time (Khairiyah et al., 2005). Readings indicate that PBL at the macro level is more commonly used (Khairiyah et al., 2005; Afandi Ahmad, 2006; Chu & Lai, 2002; Kelly, 2005; Sanchez & Berrios, 2001).

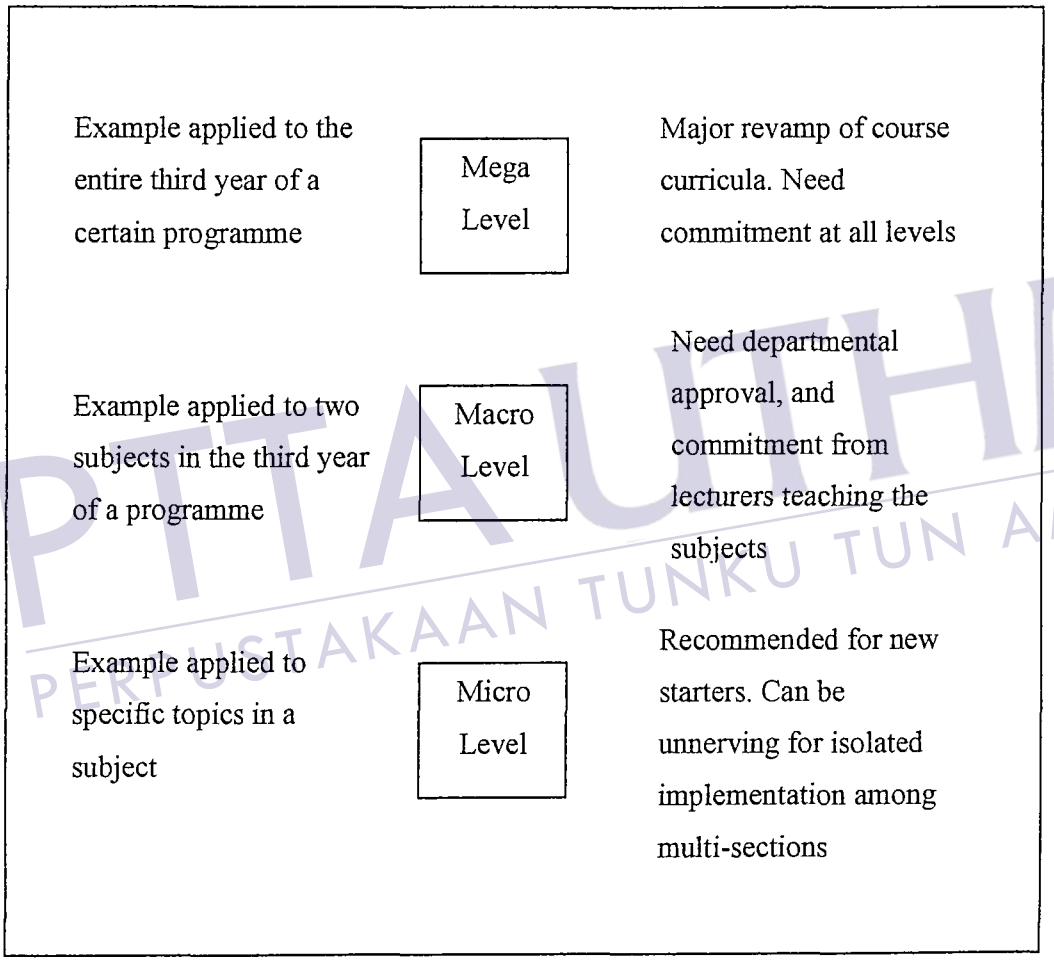

Figure 2.1: Different approaches of infusing PBL. Adapted from Khairiyah et al. (2005)

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2.4 Theories of Self-Directed Learning

Self-directed learning (SDL), which has its roots in adult education, is an approach that has also been tried with learners in elementary and secondary schools (Mardziah Hayati Abdullah, 2001). Several theoretical concepts of SDL have arisen through the evolution of defining SDL.

SDL in health professions is described as "a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcome" (Knowles, 1984).

Conlan et al. (2003) described self-directed learning as the process in which learner take on the responsibility for their own learning process by diagnosing their personal learning needs, setting the goals, identifying the resources, implementing strategies and evaluating the outcomes (Conlan et al., 2003).

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The authors stated that three categories are involved with self-directed learning, which are the goals, the process, and the learner. The goals and process are generally self-determined in an adult education. Self-directed learning can be enhanced with facilitation, particularly by providing resources. Motivation is the key factor to the success of self-directed learning.

They further stated that self-directed learning is dependent on the situation. Learners will not necessarily be self-directed in all situations. Research has shown that some adult learners are incapable of engaging self-directed learning because they lack independence, confidence, or resources. Also, not all adults prefer self-direction options and because self-direction is unstructured, learners can be easily distracted by their own needs, assumptions, values and misinterpretation (Conlan et al., 2003).

Brockett & Heimstra (1991b) on the other hand describe self-directed learning as an instructional method (process orientation) which focuses on characteristics of the teaching-learning transaction. This process orientation concerns the external factors to the individual. Such factors are like needs assessment, evaluation, learning resources, facilitator roles and skills, and independent study are examples of the few concepts that falls into this category (Brockett & Heimstra, 1991b).

Another factor related to SDL is the internal factors (personal orientation) related to the individual. They define it as learner self-direction, where it refers to the characteristics of the individual the predispose one toward taking primary responsibility for personal learning endeavors (Brockett & Heimstra, 1991b).

They further described the relation between self-directed learning (process orientation) and learner self-direction (personal orientation) under one theoretical mode, which is the self-direction in learning. The relationship between process orientation and personal orientation to self-direction learning has been illustrated in the PRO model, where internal and external distinction is made. It recognizes the strong connection between internal and external factors.

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However, another perspective of looking at the concept of SDL is from Oddi (1985), who defines SDL as a personality characteristic (Oddi, 1985, cited in Litzinger et al., 2005). The author summarizes the characteristics of the self-directed learner in two categories: attributes and skills and further hypothesized three clusters to be essential in personality dimensions of SDL for continuing learners. These dimensions include proactive drive versus reactive drive, cognitive openness versus of ambiguity, and commitment of learning versus apathy or aversion to learning (Oddi, 1984, 1985, cited in Brockett & Heimstra, 1991b).

Two assessment tools have been identified to that addressed both attributes and skills, which are Guglielmino's (1997) Self-Directed Readiness Scale (SDLRS) and Oddi's Continuing Learning Inventory (OCLI) (Brockett & Hiemstra, 1991b).

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PTTA UTHM PERPUSTAKAAN TUNKU TUN AMINAH