EFFECTS OF SCHEMATA IN ENHANCING CRITICAL THINKING DURING PROBLEM BASED LEARNING TASK

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ABSTRAK

Kajian ini dijalankan untuk menyiasat kesan skemata bagi membantu mencungkil kemahiran pemikiran kritikal pelajar dalam Pembelajaran berasaskan Penyelesaian Masalah. Ini adalah kerana ramai pelajar yang berpendidikan gagal "berfikir di luar kotak". Di samping itu, pelajar juga gagal menyaluran pemikiran kritikal mereka secara lisan mahupun bertulis. Maka, tujuan kajian ini dijalankan untuk menyiasat sama ada skemata dari segi kandungan dan bahasa dapat membantu pelajar mencungkil pemikiran kritikal mereka seperti mengenalpasti masalah, mencari punca, dan akibatnya serta menyelesaikan masalah dalam pembelajaran berasaskan Penyelesaian Masalah. Responden untuk kajian ini terdiri daripada 6 orang pelajar tingkatan 2, dari sebuah sekolah menengah di pedalaman Perak. Kajian ethnographic ini dijalankan dengan menggunakan kaedah Vignettes. Maka, data dikumpul menggunakan 3 jenis instrumen kajian iaitu temuduga, latihan penulisan, dan latihan pemahaman. Data dianalisa menggunakan kaedah "constant comparisons". Hasil kajian mendapati bahawa kedua-dua skemata iaitu skemata dari segi bahasa dan kandungan dapat membantu pelajar berfikir secara kritikal untuk menyelesaikan masalah. Oleh itu, pelajar memerlukan kedua-dua skemata iaitu skemata dari segi bahasa dan kandungan untuk menyelesaikan masalah dalam pembelajaran berdasarkan Penyelesaian Masalah.

ABSTRACT

This study investigates the effects of schemata in enhancing critical thinking skills during Problem based learning task. This is because many educated students are not capable to "think out of the box". In addition, they are also not able to use their critical thinking in writing and speaking. Therefore, the purpose of this research is to investigate whether ESL learners' content schemata and formal schemata enhance their critical thinking skills such as identifying problems, causes, effects and suggesting solutions during Problem based learning. Purposive sampling was conducted on a group of 6 respondents from Form 2 in a rural secondary school, in Perak. This research is an ethnographic research using the Vignettes technique. Hence, the research instruments include the interview, writing task, and reading comprehension test. Data was analyzed using constant comparison method. The findings of this research revealed that, both content schemata and formal schemata enhanced ESL learners' critical thinking during Problem based learning task. Thus, both content schemata and formal is a necessary skill to enhance students' critical thinking during Problem based learning task.

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INTRODUCTION

1.0 Introduction

Problem based learning constitutes a very vital part of the essential skills required for English Language learning. Problem based learning has gained acceptance and has been found effective in enhancing critical thinking (Oon Seng Tan, 2004). Problem based learning satisfies three important criteria that promote optimal learning. Firstly, students are provided with problems in real life situation. Here, students are required to use their critical thinking to study the problems. Secondly, students are stimulated to think the causes and effects of these problems, based on their prior knowledge, previous experience or background knowledge. Finally, they are required to suggest alternative solutions to the problems. In addition, Problem based learning requires solutions, that can be revealed by referring to students' productive skills, such as students' speaking and writing. In other words, students' critical thinking are demonstrated in their speech and written activities. Therefore, the ability to speak fluently and write clearly are two of the main important productive skills required of ESL learners.

The observation by Elstein et al. (1978) in the field of medical education can be applied equally in English Language learning. He said;

> "With increasing frequency, medical educators were told that their objectives were to produce problem solvers, inquirers, individual skilled in gathering and interpreting information for the purpose of rendering judgements, making decisions, and taking actions based on the causes and effects of the problems" (cited in Onn Seng Tan, 2004, p 127).

Bearing the above in mind, the objective of the English Language Curriculum is to produce skilful ESL (English as a Second Language) thinkers who can solve problems. In a report titled "A Nation at Risk", it was concluded that a society's future depends on citizens who can think the causes and effects of a problem, by reasoning critically and effectively to solve problems which lead to the nations' development worldwide (American Educational Research, 1983 April, "A Nation At Risk Report").

Therefore, critical thinking in problem solving plays a vital role in the development of a nation. Thus, ESL learners should be exposed to this skill more closely for the betterment and development of the nation worldwide.

1.1 Research Problem

According to a briefing conducted by the Malaysian Ministry of Education with the district head of the English Language Department in 1997, one of the main weakness identified in students' writing is the inability to develop interesting and thoughtful ideas (Mariam Mohamed Nor, 2005). This revealed that Malaysian ESL learners do not apply critical thinking adequately. This is because they have limited vocabulary to express themselves in the English Language. Therefore, it is important to discover appropriate methods to stimulate critical thinking skills among ESL learners. Hence, it is essential to identify the influencing factors that can enhance and promote critical thinking skills among the ESL learners.

Besides that, the present Prime Minister, Datuk Abdullah Ahmad Badawi, pointed out that, many educated students can read and write, but they are not capable to "think out of the box" (Kadir Dikoh & Feroz Abu Bakar, 2007). Accordingly, he wants schools to give more emphasis in producing and developing critical thinking among students. He added that, this is in accordance with the type of human model that the government wants to produce, in order to face the competitive challenges in future (Kadir Dikoh & Mohd. Feroz Abu Bakar, 2007).

According to Atkinson (1997), Fox (1994), Ramanathan and Kaplan (1996), Asian learners are non-critical thinkers (cited in Mariam Mohamed Nor, 2005). They further explained that Asian culture plays a significant role in enhancing critical thinking among

the ESL learners. However, their view is contrast in reality among the ESL learners in Malaysia. Asian learners are actually capable to think critically, but they are unable to express their thoughts and ideas in English language, due to limited proficiency and vocabulary in the English language.

1.2 Objectives of the study

There are two objectives in this study: First is to investigate whether ESL learners' content schemata and formal schemata enhance their critical thinking during Problem based learning. Second is to investigate whether ESL learners need content schemata and formal schemata to enhance their critical thinking during Problem based learning.

1.3 Research Questions

(i) Do ESL learners' content schemata and formal schemata enhance their critical thinking during Problem based learning task?

(ii) Do students need content schemata and formal schemata to enhance their critical thinking during Problem based learning task?

1.4 Purpose of the study

There are several purposes in conducting this study. The first purpose is to investigate ESL learners' content schemata and formal schemata in enhancing their critical thinking skills during Problem based learning task, in a rural secondary school, in Perak.

The second, purpose is to investigate whether ESL learners need content schemata and formal schemata to enhance their critical thinking skills during Problem based learning task.

Besides that, several researchers such as Fuchs and Fuchs, Finelli, Courey, and Hamlett, (2004), in "Expanding Schema Based Transfer Instruction to Help Third Graders Solve Real-life Mathematical Problems", recommended a need to conduct further studies on critical thinking in Problem Solving context, in order to prepare students for the needs of real life situations.

Furthermore, Mariam Mohamed Nor (2005), conducted a study entitled, "Thinking Skills and Techniques to enhance ESL students' Reading and Writing". In this study, she suggested the need to emphasize problem-solving processes and to teach students on "how to think". This again strongly recommend the need to conduct an ethnographic study in order to investigate ESL learners' critical thinking skills and their schemata during Problem based learning task by referring to their productive skills such as speaking and writing.

1.5 Rationale for the study

There seems to be no studies, which have attempted to investigate how teachers construct pedagogical content knowledge to teach thinking skills (Rajendran, 1998, cited in Mariam Mohamed Nor, 2005). It is undeniable that, not much study has been done on critical thinking in "Problem based learning" in Malaysia. Thus, there is a need to conduct this study in Malaysia as the Ministry of Education is leading towards "The Malaysian Smart School".

The Malaysian Smart School is a learning institution. It has systemically being reinvented in terms of teaching, learning, and school management processes in order to help students to cope with the Information Age. One of the main objectives of this Smart School is "to produce a thinking workforce". This objective originated from the Malaysian National Philosophy of Education (The Smart School Flagship Application- The Malaysian Smart School, A Conceptual Blueprint, KPM, 1997). Thus, there is a need to conduct a study in Malaysia, to develop critical thinking skills, among the ESL learners, using Problem based learning.

In addition, the present Malaysian Prime Minister, Datuk Abdullah Ahmad Badawi, at the launch of the National Education Blueprint 2006-2010, pointed out that Malaysian schools should produce students who are not only literate, but who can think critically to solve problems (Kadir Dikoh & Feroz Abu Bakar, 2007). Datuk Abdullah Ahmad Badawi also urged the Education Ministry to cultivate the minds of students to

develop human capital that could add value to their knowledge and to compete globally by using critical thinking in solving problems wisely. This indicates that there is a need to conduct a study in Malaysia to develop critical thinkers who are able to solve problems in order to compete globally.

Besides that, several scholars such as Atkinson (1997), Fox (1994), Ramanathan and Kaplan (1996) categorized Asian learners as non-critical thinkers (cited in Mariam Mohamed Nor, 2005). Thus, the rationale for conducting this research is also to prove that their views are not applicable in the Malaysian context.

1.6 Hypothesis

Currently, a lot of emphasis is given on Problem based learning to stimulate critical thinking skills among ESL learners in Malaysia. Various approaches, methods, and resources are used around the world to infuse critical thinking skills among students. According to Atkinson (1997), Fox (1994), Ramanathan and Kaplan (1996), Asian learners are non-critical thinkers (cited in Mariam Mohamed Nor, 2005). Their views support the null hypothesis for this research. Thus, the null hypothesis is ESL learners' formal schemata and content schemata do not enhance their critical thinking skills during Problem based learning task. Meanwhile, the alternative hypothesis is that, ESL learners' content schemata and formal schemata enhance their critical thinking skills during Problem based learning task.

1.7 Significance of the study

There are several benefits of this research. Firstly, this research provides an insight to consider and diagnose students' content schemata as well as formal schemata before conducting Problem based learning in ESL classrooms. In other words, this research provides the need for ESL teachers to diagnose students' current content schemata and formal schemata pertaining to the themes or topics in Problem based learning.

Secondly, this research also helps in designing suitable "Problem Solving" activities and workbooks to enhance critical thinking skills in students. This is important, as workbooks seem to be one of the popular supplementary sources of education for both teachers and students lately. Besides that, pre-activities that help to tap students' content schemata and formal schemata, pertaining to the themes are also included in these activities.

In addition, this study can also aid teachers to develop students' critical thinking skills verbally and in written form by integrating Problem based learning task in their teaching. In other words, ESL teachers can enhance critical thinking skills in students' speaking and writing by using Problem based learning task effectively.

Finally, this research also provides an insight in teaching methods, to teach Problem based learning effectively. Teachers should localize the themes presented in Problem based learning before assigning the actual task. Therefore, this research helps to

develop the integration of critical thinking in the teaching and learning process in Malaysian schools, especially SMART schools by taking into consideration the students' schemata. In other words, the findings of this research favor English Language teachers to integrate critical thinking skills, in Problem based learning task, by referring to ESL learners' content schemata and formal schemata. It is undeniable, that ESL teachers are responsible for providing appropriate schemata to students when conducting the Problem based learning task.

1.8 Theoretical Framework of the study

There are four learning theories that form the basis for this study. They are Constructivist Theory, Gestalt Theory, Information Processing Theory, and Schema Theory. These theories provide better understanding in investigating ESL learners' schemata and their critical thinking during Problem based learning by referring to ESL learners' productive mediums such as students' speaking and writing (refer Figure 1.1).

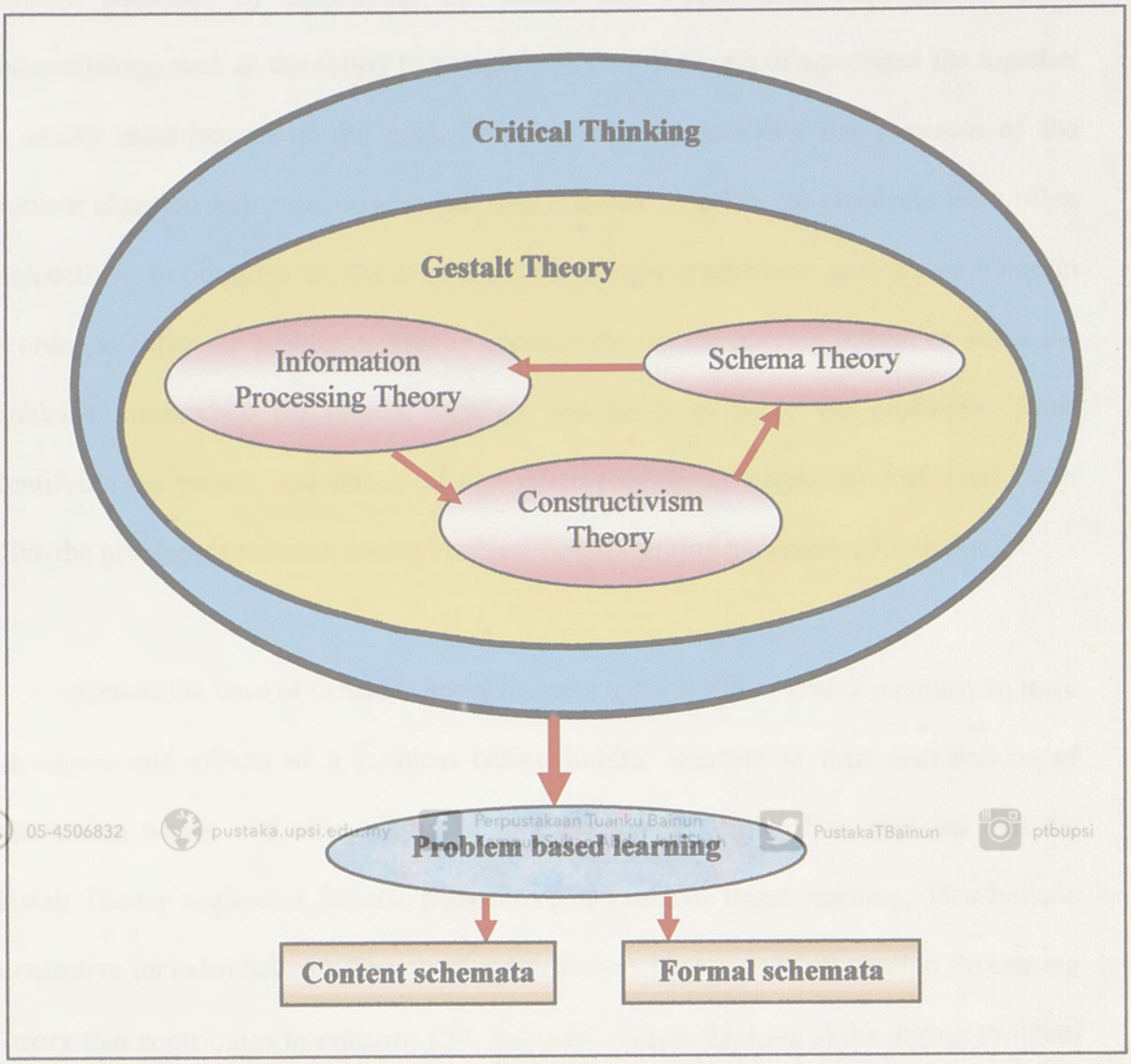

Figure 1.1: Theoretical framework of the study

Firstly, Gestalt Theory believes that individuals use insight and their prior experiences during Problem based learning (Oon Seng Tan, 2004). According to Gestalt psychologists, the process of problem solving is a search to relate each aspect of a

problem situation, by identifying the causes and effects that, leads to structural understanding, such as the ability to comprehend how the parts of a problem fits together to satisfy requirements of the goal. This involves reorganizing the elements of the problem situation in a new way so that they are able to solve the problems from other perspectives. In other words, the causes and effects of the problems seek closer attention in order to solve the problems. This is because the causes provide insight to solve the problems, meanwhile the effects highlight the needs to solve the problems. Thus, identifying the causes, and effects of a problem provide an insight for ESL learners to solve the problems presented during Problem based learning task more effectively.

Hence, the laws of Gestalt Theory leaves a trace in ESL learners' memory to trace the causes and effects of a problem before linking together to form connections of information which will ultimately lead to solve the problems. This explains that the Gestalt Theory requires a holistic perspective in Problem based learning. This holistic perspective includes Schema Theory, Constructivism Theory and Information Processing Theory that contributes to enhance ESL learners' critical thinking skills during Problem based learning task.

Schemata Theory refers to learners' background knowledge or prior knowledge pertaining to subject matter and linguistic in Problem based learning. Anderson and Pearson (1988, p39) claimed that, schemata are "an active organization of past reactions, or past experience" (cited in Mariam Mohamed Nor, 2003a). Students' schemata are stored in long-term memory and aid in the process of interpreting sensory data both

linguistic and non-linguistic in retrieving information (Rumelhart, 1980, cited in Mariam Mohamed Nor, 2003a, p 33-34). Thus, Schema Theory is the fundamental elements to process all the information during Problem based learning task.

Similarly, Albanese (2000) quoted that the information-processing theory propagated by Schmidt (1983) emphasized the important principles in information processing that is in tapping learners' prior knowledge (cited in Onn Seng Tan, 2004). Schmidt suggested that past learning affects current learning. Students use the knowledge that they already know in the past to understand and process new information as solution during Problem based learning. Hence, students learn better, when they activate their existing schemata and relate previous knowledge of the subject to understand new knowledge of the subject presented during Problem based learning. In other words, students' schemata play a major role in processing information pertaining to subject matter and linguistic during Problem based learning.

In addition, Constructivism views learning as a process in which the learner actively constructs or builds new ideas or concepts based upon current and past knowledge. In other words, learning involves constructing one's own knowledge from one's own experiences (Onn Seng Tan, 2004). This means, firstly, students try to activate their previous knowledge, past experience and background knowledge to help in comprehending problem based learning task presented to them. Next, they try to construct alternative solutions by identifying the causes and effects of the problems presented during Problem based learning task. Constructivist learning, therefore, is a very

personal endeavor, whereby internalized concepts, rules, and general principles applied in a practical real-world situation. (Oon Seng Tan, 2004). In other words, students actively process information to construct meaning and solution for real-life-situation problems during Problem based learning by activating both their content schemata and formal schemata.

Concisely, the holistic perspective of Gestalism includes Information Processing Theory and Schemata Theory that works inline with Constructivism Theory in enhancing ESL learners' critical thinking skills during Problem based learning.

1.9 Definition of terms as used in this study

1.9.1 Thinking

According to Ruzzerio, (1984), "Thinking is any mental activity that helps to formulate or solve problem, by identifying the causes and effects of the particular problem (cited in Baron J.B & Sternberg R.J, 1987). This means, thinking is a searching process that searches the causes, effects, and solutions of problems presented during a Problem based learning task.

1.9.2 Thinking Skills

Thinking skills includes strategies whereby students are engaged in purposeful, extended lines of thought where they identify the type of problem, define and clarify essential elements and terms in that problem, by gathering relevant information on the causes and effects, in order to solve the problems. In addition, students become more self-conscious about their thinking and develop their self-monitoring problem solving strategies, namely, cognitive, analysis, interpretation, revising, identifying the causes and effects of problems presented during Problem based learning task (Mayer, 1992).

1.9.3 Critical Thinking

Critical thinking skills are the skills required to make a skilful assessment of the authentic problems presented (Oon Seng Tan, 2004). This involves making a skilful analysis of the problems presented during a Problem based learning task by studying the causes and effects of the problems.

In other words, critical thinking requires learners to develop solutions during Problem based learning task by analyzing and assessing their own thinking which is closely related to their own content schemata and formal schemata.

1.9.4 Problem Based learning

A good starting definition of Problem based learning is that learning begins from a problem, a question, scenario, situation, or task (Salim Akbar, 2004, p. 216). In Problem based learning approach, students deal with unfamiliar problem, which may take the form of a question, scenario, or situation. They then, explore the nature of this unfamiliar situation and in the process, share their prior knowledge and past experience. Problem based learning challenges students to share real life experience to solve the presented problems.

Firstly, students explore the nature of this unfamiliar situation by activating their memory to recall their prior knowledge and experiences related to the unfamiliar situation. As they proceed, they pose questions, which they need to explore in order to progress with the task or problem. Then, students try to relate what they have learnt and relate it to the original situation, with the problems presented during Problem based learning task. This is a form of self – directed learning with teachers playing the role of facilitators and managers of students' learning process (Taylor & Burgess, 1997).

Besides that, Problem based learning is also a method based on the principle of using problems as the starting point for the acquisition of new knowledge. Pivotal to its effectiveness are the use of problems that create learning through both new experience and the reinforcement of existing knowledge. Situations that are in the learner's real

world act as problems and stimulate the need to seek out new information and synthesize it in the context of the problem scenario (Lambros, 2002).

In other words, Problem based learning integrates the subject knowledge that students require in order to solve a particular problem. Therefore, problem solving required studying the issues at a deep rather that surface level (Onn Seng Tan, 2004). "Real life" problems act as the initial triggers to create a point at which new learning or critical thinking skills takes place. In this way, learners build information and understanding in small chunks that eventually form a larger whole by identifying the causes and effects of that particular problem.

Problem based learning as a teaching and learning approach, is not a single definite entity. In fact, there are many version and programmes of Problem based learning. According to Onn Seng Tan (2004), the different varieties of Problem based learning task will generally include the following dimensions, albeit in varying degrees:

- self directed learning;
- learning that builds on students' existing experience and knowledge;
- reflective learning;
- linking theory and practice
- enhance critical thinking

In summary, the Problem based learning approach lends itself comfortably to students centered learning through self directed discovery, problems as triggers for learning as well as critical reflection that enhance critical thinking. This is because, Problem based learning incorporates and builds on students' personal experience, which leads learning to be more insightful and meaningful.

1.9.5 Problem Solving

Problem solving is a technique that focuses on solution of a specific problem presented. Besides that, it is also a process of analyzing a situation. Then, solutions are constructed or formed to solve the problems. Learners need to analyze the current problems by referring to the cause and effect, to generate workable solutions. This means, problem solving is the process of analyzing situation of uncertainty to produce actual improvements of changes in the situation.

According to Gagne (1985), problem solving is a natural extension of both rule learning and schema learning. Learners' stores verbal knowledge that aid in the interpretation of problems and leads to solutions. This verbal knowledge is "formal schema". Meanwhile, learners' previous knowledge is the contents of memory or "content schemata" that make problem solving possible. Hence, problem solving is a process by which the learners discover a combination of previously learned rules and

plans their application by tapping their content schemata and formal schemata, to achieve a solution for a novel problem situation.

Problem solving is not simply a matter of applying previously learned rules, however. In addition, a process yields new learning. Learners recall previously acquired rules in the attempt to find a "solution" for problems presented during Problem based learning task. In carrying out such a thinking process, learners may try a number of hypotheses and test their applicability. When they find a particular combination of rules that fit the situation, they have not only "solve the problem" but have also learned the new entity of "higher- order rule". This higher- order rule enables individuals to solve problems of a similar type.

In summary, problem solving tapped ESL learners' content schemata and formal schemata in constructing or formulating solutions for problems. Thus, this obliges learners to think critically by identifying the root cause of the problem and the effects, in order to solve the problem wisely.

1.9.6 Schemata

Schemata or schemas refer to background knowledge, past experience, or previous knowledge of the ESL learners. According to Widdowson, schemata refer to "cognitive constructs which allow for the organization of information in long term memory"

(Wallace, 1993). This means, the cognitive characteristics of schemata allowed ESL learners to relate incoming information or current knowledge to already known information or prior knowledge and experience. In other words, the ESL learners try to relate their previous knowledge to the problems presented during Problem based learning in order to arrive at proper solutions.

Carrell (1983) proposed two categories of schemata known as content schemata and formal schemata (cited in Mariam Mohamed Nor, 2003a) (refer Figure 1.2 to view a diagram on schemata).

(a) Content Schemata

Content schemata are concern with learners' background knowledge or knowledge about the subject matter of the problems presented in Problem based learning. For example, the background knowledge on the theme or topic of the problems presented during Problem based learning task. Learners who have more prior knowledge or past experience about a specific problem presented are able to comprehend and analysis it better compared to those who do not have prior knowledge on that particular problem. In other words, the background knowledge on the theme or topic of the problems aid in comprehending the problems better during Problem based learning task.

This means, ESL learners can actually activate their content schemata to relate their previous knowledge, past experience and current learning to identify the causes and effects of the particular problem in searching for appropriate solutions.

(b) Formal Schemata

Meanwhile, formal schemata refer to knowledge about the language, or the linguistic aspect of a problem. Examples of formal schemata are the different types of terms, tenses, idioms, and vocabularies found in a task or the authentic problems presented. This means, students' formal schemata plays an important role in comprehending the meaning of vocabularies, terms, grammar, phrases, and sentences presented during Problem based learning. In other words, ESL learners activate their formal schemata to comprehend the linguistic aspect of the problems to arrive at the proper meaning of the task presented in searching for the causes, effects, and solutions of the problems.

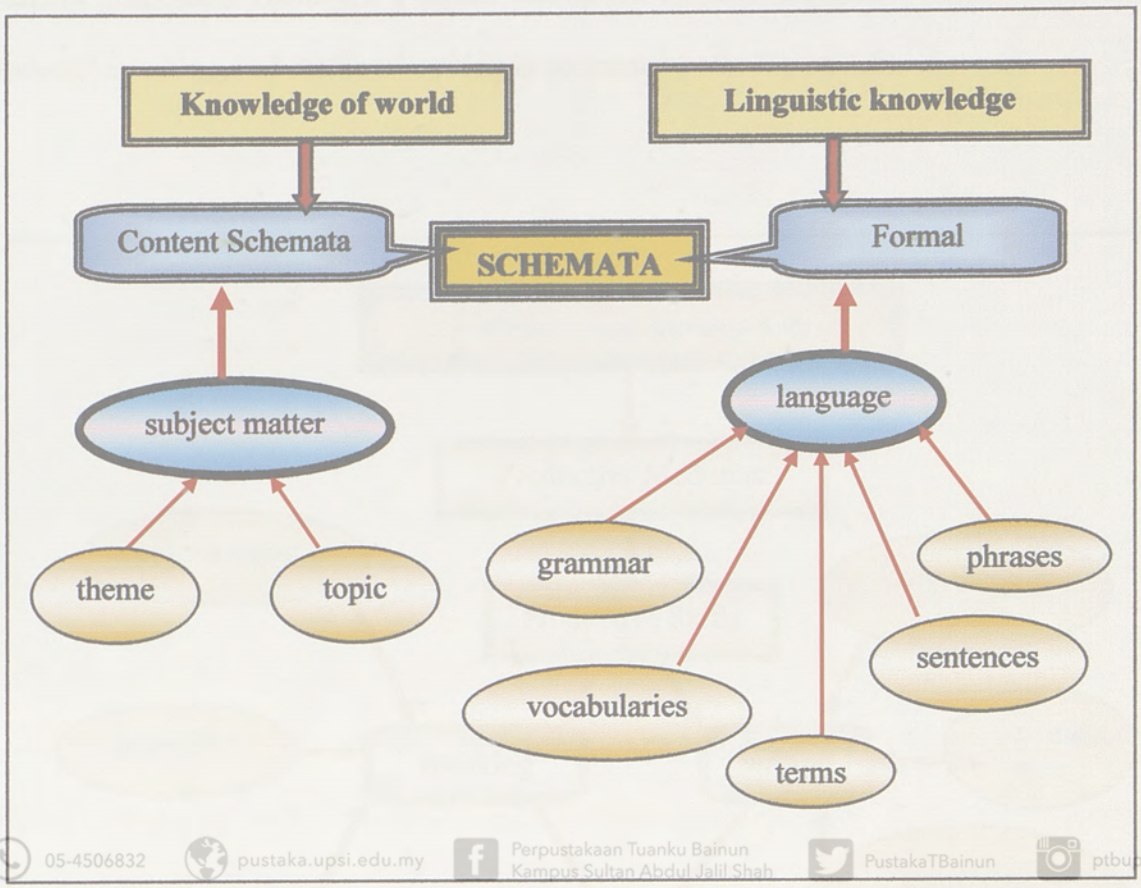

Figure 1.2: Content schemata and formal schemata

1.9.7 Productive Mediums

Productive mediums refer to medium used to represent productive skills such as learners' speaking and writing. Learners' use these productive medium or productive skills to convey the intended message across. In this study, productive medium is very important in identifying students' solutions for problems presented during Problem based learning task. Poor mastery of these productive skills leads to vague and unclear solutions on the

learners' responses. Therefore, a further discussion on these productive medium such as students' speaking, and students' writing is necessary (refer Figure 1.3).

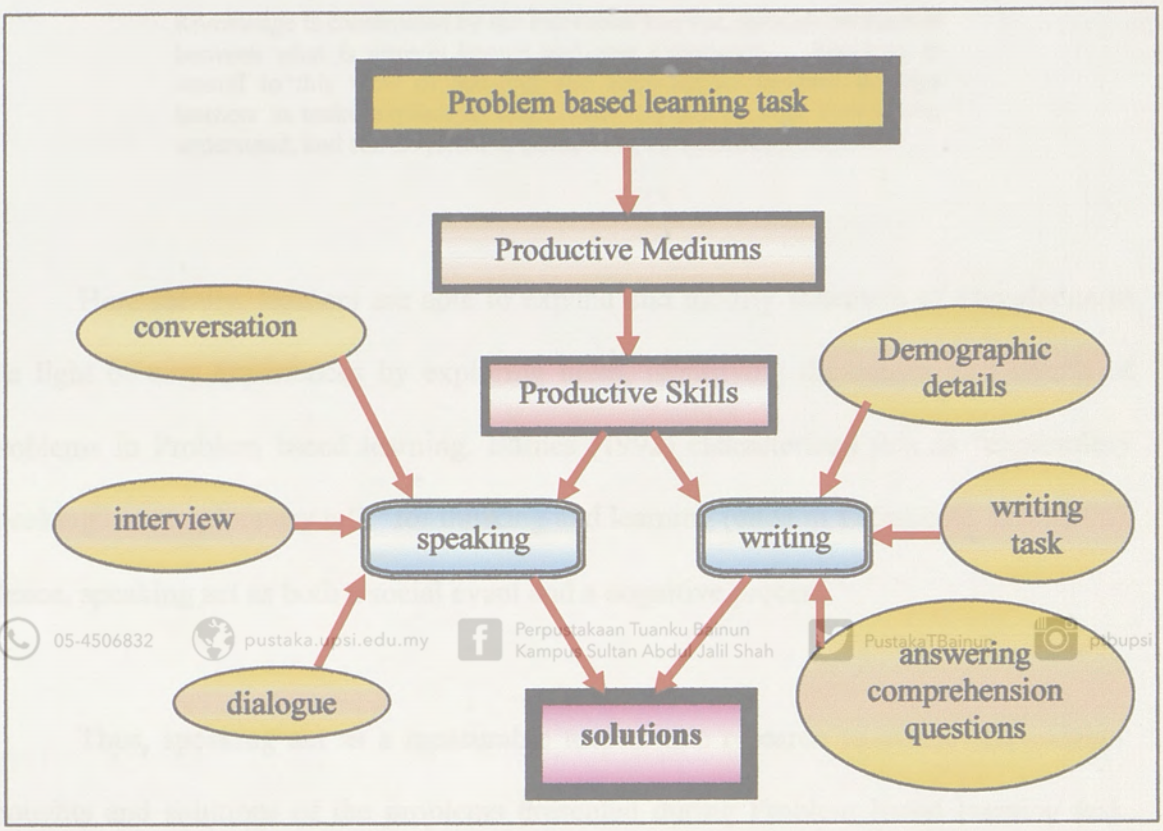

Figure 1.3: Productive mediums in Problem based learning.

(a) Speaking

According to the Oxford Dictionary, speaking means a "conversation" or "talk". Speaking includes interview, and dialogues. Theories of learning expounded by Vygotsky (1972), and Bruner (1986), emphasis on the importance of speaking in developing thinking and learning in Problem based learning (cited in Lefrancois, G. R, 2006, p 406).

Speaking can develop learners' understanding and move towards new learning in Problem based learning. Edwards and Westgate (1994) claims that:

> Knowledge is constructed by the individual knower, through interaction between what is already known and new experience.... Speaking is central to this view of learning and knowing ... because it helps learners to make explicit to themselves and others what they know, understand, and can do (cited in Lefrancois, G. R, 2006, p 260).

Here ideally, learners are able to expand and modify schemata of knowledge in the light of new experiences by exploring ideas, identifying the causes and effects of problems in Problem based learning. Barnes (1992) characterized this as "exploratory speaking" or "exploratory talk" for thinking and learning (cited in Lefrancois, G.R,2006). Hence, speaking act as both a social event and a cognitive process.

Thus, speaking act as a measurable tool in this research to assess respondents' thoughts and solutions of the problems presented during Problem based learning task. Thus, the researcher request respondents to deliver their solutions and thoughts in English language during Problem based learning task. Respondents are also prompt to speak in English language by posing further questions during the interview sessions.

However, the researcher permit respondents to slide back to their first language, which is the Malay language if they had difficulties conversing in English language.

In summary, ESL learners' will have to tap both their content schemata as well as their formal schemata in delivering their solutions verbally during the Problem based learning task.

(b) Writing

According to Nunan (2003), writing is a mental act (cited in Mariam Mohamed Nor, 2003b). Writing is the mind's product on discovering and presenting solutions by thinking of the causes and effects of the problems presented during Problem based learning. Writing activities includes writing the solutions for the problems presented during Problem based learning task.

Writing can also act as a medium of interaction in sharing the solutions of a particular problem presented during Problem based learning. Learners illustrate various ideas, causes, effects of problems and the solutions in their writing. It is undeniable that writing provides freedom to ESL learners to express their ideas, thoughts, and opinion on the causes and effects of problems during Problem based learning task without fearing of mockery by others.

Besides that, writing provides opportunity even to ESL learners who shy away with their speaking ability in the second language to contribute in problem solving. These

students are able to share their thoughts and ideas during Problem based learning by writing the suggested solutions.

Hence, it is clear that writing requires thinking too. Therefore, writing act as a powerful tool to tap ESL learners' critical thinking skills during Problem based learning task. Therefore, it is undeniable that thinking and writing is a complex process in Problem based learning that works close to each other.

Briefly, writing requires the ESL learners to tap both their content schemata as well as their formal schemata in completion during Problem based learning task.

1.9.8 Code Mix

Code refers to a language used by human for the communication purposes (Fowler, W.H & Fowler, F.G & Thompson, D, 1995). Wradhaugh, R, (1999, p 99) in, "An Introduction to Sociolinguistics" further supports by claiming that, "the particular dialect or language that a person chooses to use on any occasion is a code, a system used for communication between two or more parties".

According to Wardhaugh, R, (1998), code mix refers to the process whereby speakers indulge in code switching between languages. Code mix takes place rapidly and density, even within words, sentences or phrases. In other words, code mix occurs when

the speaker include two or more languages in the conversation. This may due to the lack of formal schemata such as unable to identify the proper words or vocabularies during the conversation in English language. Thus, the speaker includes some vocabularies from their first language, such as the Malay language in the speech. This explained that the speaker, code mix in order to convey the intended messages across.

It is not possible to determine or predict on code mixing of a speaker in an informal conversation. According to Trudgill, P and Crystall, D (1992), code mix reveals the projection of two or more identities of the speaker. Besides that, code mix also reveals the incapability of the speaker in maintaining the speech in the target language. As mention earlier, the target language in this study refers to English language.

1.10 Bloom's Taxonomy

Bloom Taxonomy classifies questions into three overlapping domains such as cognitive domain, affective domain and psychomotor domain. It is undeniable that "questions" aid in tapping ESL learners' content schemata and formal schemata during Problem based learning (Nor Azmi Mostafa, 2005). Therefore, the researcher uses Bloom's Taxonomy to construct questions in the research instruments.

Cognitive domain plays a vital role in this research as it enhanced critical thinking during Problem based learning. There are six levels of questions within the cognitive

domain, such as, knowledge, comprehension, application, analysis, synthesis, and evaluation. The lower order thinking skills include knowledge, comprehension, and application of the cognitive domain. Meanwhile, the analysis, synthesis, and evaluation levels refer to the higher order thinking skills (refer Figure 1.4 to view all the levels in the cognitive domain in Bloom's Taxonomy and Table 1.1 to view a summary on all these levels).

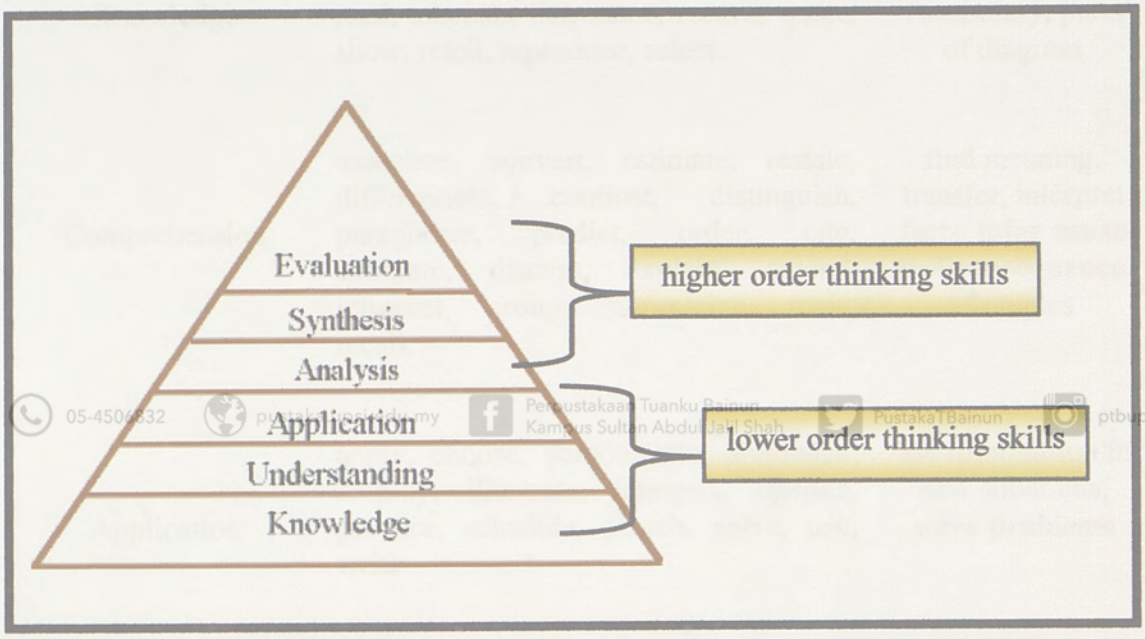

Figure 1.4: The levels in the cognitive domain in Bloom's Taxonomy

Table 1.1

Summary on the 6 levels of Bloom's Taxonomy in cognitive domain (Source: Johnson, L & Lamb, A. (2007). "Teacher Tap – Professional Development Resource for Education and Liberians". http://eduscapes.com/tap/index.htm)

Levels in Cognitive Domain	**Verbs that represent intellectual activities**	**Examples**
Knowledge	collect, define, tell, state, enumerate, describe, match, copy, identify, label, read, tabulate, list, name, record, quote, show, retell, reproduce, select.	dates, events, places, key, ideas, vocabulary, parts of diagram
Comprehension	associate, convert, estimate, restate, differentiate, contrast, distinguish, paraphrase, predict, order, cite, compare, discuss, explain, extend, interpret, group, summarize, trace, recall.	find meaning, transfer, interpret facts, **infer cause and consequence**, examples
Application	apply, choose, demonstrate, dramatize, employ, illustrate, interpret, operate, practice, schedule, sketch, **solve**, use, write	use information in new situations, **solve problems**
Analysis	analyze, appraise, calculate, categorize, compare, contrast, criticize, test, differentiate, discriminate, distinguish, examine, experiment, question	recognize and explain patterns and meaning, see parts and wholes
Synthesis	arrange, assemble, collect, compose, construct, create, design, develop, formulate, manage, organize, plan, prepare, propose, set up, write	discuss "what if" situations, create new ideas, predict and draw conclusions

Table 1.1 (Continue)

Levels in Cognitive Domain	Verbs that represent intellectual activities	Examples
Evaluation	appraise, argue, assess, attach, choose compare, defend estimate, judge, predict, rate, core, select, support, value, evaluate	**make recommendations**, assess value, critique ideas and make choices

1.11 Framework of analysis

Table 1.2
Framework of analysis

No.	Research Questions	Instruments	Analysis Data	Expected Outcome / tentative
1.	Do ESL learners' content schemata and formal schemata enhance their critical thinking during Problem based learning task?	(i) demographic details. (Appendix 1) (ii) interview. (Appendix 2) (iii) writing task (Appendix 3) (iv) reading comprehension test (Appendix 4)	-analyze the demographic details - analyze the speaking patterns - highlight all the causes and effects presented in their speaking. - analyze the language used while delivering the causes, effects, and solutions verbally. - code into a coding scheme	(a) Respondents' formal schemata and content schemata enhance their speaking during Problem based learning task. (b) Respondents' content schemata enhance their critical thinking during Problem based learning. (c) Respondents' formal schemata influence the choice of vocabulary, language, and code mix in their speaking.
2.	Do students need content schemata and formal schemata to enhance their critical thinking during Problem based learning task?	(i) demographic details. (Appendix 1) (ii) interview. (Appendix 2) (iii) writing task. (Appendix 3) (iv) reading comprehension test (Appendix 4)	-analyze the categories of patterns based on the content and language used in all the responses	(a) Respondents' formal schemata and content schemata do assists to enhance critical thinking during Problem based learning.

1.12 Limitations of the Study

Firstly, this study includes the selected Form 2 students from a rural secondary school. The respondents for this research are limited to Malay students as the research site is a partly residential religious school in a rural setting.

Secondly, the respondents for this study are also limited to the ESL learners only. In other words, the respondents for this research are limited to students who do not speak English as their mother tongue.

Besides that, the respondents for this research are limited to three female students and three male students, from Form 2. This means, 6 ESL learners from Form 2 took part in this study as respondents.

Next, the research materials for this study are limited to demographic detail form, interview, writing task and reading comprehension test only. This is due to time factor that plays an important role in investigating students' schemata in enhancing critical thinking during Problem based learning. Therefore, I was unable to carry out various approaches in this study such as group discussion and observation.

Fifthly, I am only able to focus on the critical thinking skills related to "causes, effects and solutions" in Problem based learning in this research. This means I am unable

to include other sub skills such as categorizing, generalizing and defining in Problem based learning, in this research due to time constrains.

Finally, the researcher uses Microsoft Excel, which is much easier to operate compared to Microsoft SPSS to analyze data in this research. The Microsoft Excel aids in displaying descriptive statistic in this research such as respondents' demographic details by using the bar charts and pie charts. Meanwhile, the researcher uses thick description and Venn Diagrams to present the research findings.

1.13 Conclusion

In conclusion, Problem based learning is an essential component in English Language learning to enhance critical thinking skills among the ESL learners. ESL learners can develop their thinking skills by identifying the causes, effects and solutions of an issue or problem presented during Problem based learning. It is undeniable that learners' schemata play an important role in enhancing critical thinking. Besides that, students' productive mediums such as writing and speaking required closer attention in investigating ESL learners' critical thinking skills during Problem based learning task. Therefore, Chapter 2 provides further discussion on historical background, critical discussion on previous studies done and benefits of Problem based learning for in-depth understanding.