THE PRACTICES OF ACTIVE LEARNING APPROACH IN MATHEMATICS PROBLEM SOLVING AMONG PRIMARY SCHOOL TEACHERS IN KULAI

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DEDICATION

This thesis is dedicated to my father, who taught me that the best kind of knowledge to have is that which is learned for its own sake. It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done one step at a time. This thesis is also dedicated to my siblings and fiancé who have been my backbone. Without their endless love and support, I would never have been able to complete my graduate studies. I love you all and I appreciate everything you all have done for me.

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ABSTRAK

Kajian ini bertujuan untuk melihat Amalan Penerapan Pembelajaran Aktif dalam Proses Penyelesaian Masalah Matematik dalam Kalangan Guru Sekolah Rendah di Daerah Kulai merentas pengalaman mengajar guru. Seramai 150 responden yang terlibat sebagai sampel kajian. Reka bentuk kajian yang digunakan adalah kuantitatif. Alat kajian yang telah digunakan adalah borang tinjauan yang telah dibahagikan kepada 3 bahagian. Borang tinjauan tertumpu kepada Amalan Pendekatan Pembelajaran Aktif dalam Penyelesaian Masalah Matematik dalam Kalangan Guru Sekolah Rendah di Kulai. Hasil kajian menunjukkan bahawa kebanyakan guru sekolah rendah di Kulai telah menunjukkan maklum balas yang positif terhadap amalan pendekatan pembelajaran aktif dalam penyelesaian masalah Matematik bagi aspek perancangan; (median = 4.00), aspek pelaksanaan; (median = 4.00) dan aspek penilaian; (median = 4.00). Sementara itu, dapatan kajian juga membuktikan bahawa tidak terdapat perbezaan yang signifikan bagi kemahiran penerapan pembelajaran aktif dalam proses penyelesaian masalah matematik murid sekolah rendah merentas pengalaman mengajar guru, $[X^2\ (2) = 3.935,\ p\ =\ 3.237]$. Secara keseluruhan, kajian ini menunjukkan bahawa guru sekolah rendah di Kulai mengamalkan pendekatan pembelajaran aktif dalam penyelesaian masalah matematik dari aspek perancangan, pelaksanaan dan penilaian. Oleh itu, pentadbir sekolah dan guru dapat mengkaji penyelidikan ini untuk mendapatkan idea dalam pelaksanaan pendekatan pembelajaran aktif di bilik darjah.

ABSTRACT

This study aims to see the Practices of Active Learning Application in the Mathematical Problem Solving Process Among Primary School Teachers in Kulai District across the teaching experience of teachers. A total of 150 respondents were involved as the study sample. The study design that has been used is quantitative and the research tool that has been used is a survey form that has been divided into 3 parts. The survey form focuses on the Practices of Active Learning Approach in Solving Mathematical Problems Among Primary School Teachers in Kulai. The results show that most primary school teachers in Kulai have shown positive feedback on the practice of active learning approach in problem solving Mathematics for the aspects of planning; (median = 4.00), implementation; (median = 4.00) and evalaution; (median = 4.00). Meanwhile, the findings of the study also prove that there is no significant difference for the application of active learning skills in the process of solving mathematical problems of primary school students across the teachers teaching experience, $[X^2\ (2) = 3.935,\ p\ =\ 3.237]$. Overall, this study shows that primary school teachers in Kulai, practice active learning approach in solving mathematical problems from the aspects of planning, implementation and evaluation. Therefore, school administrators and teachers can study this research to get ideas in the implementation of active learning approaches in the classroom.

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MOE	-	Ministry of Eductaion
CPD	-	Continuous Professional Development

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CHAPTER 1

INTRODUCTION

1.1 Introduction

21st century learning was introduced in 2014 is a transformation in the national education system that demands changes in the teaching and learning process (Masyuniza, 2015). 21st century learning brings many new changes to the world of education. The implementation of 21st century learning in teaching aims to shift the paradigm of the education system and further make Malaysia a center of educational excellence in the Asian region and international level (Madinah Mohamad, 2014). 21st century learning focuses on the student centered learning process and emphasises on student skills (Jansen & Van Der Merwe, 2015). Bernet Berry (2011), explains that 21st century learning is a form of learning that requires students to master the content, synthesise and evaluate information from various subjects and solve problems. In this process, students are provided with the skills to deal with the challenges in the world of education that are exposed to various problem solving processes as well as challenging individual thinking (PPPM, 2013).

21st century learning emphasises five key skills elements that are important namely communication, collaborative, critical thinking, creativity as well as the application of noble values and ethics (4C 1V), (Buletin Anjakan, 2015). These five elements in 21st century learning skills can be applied through problem based learning using real life situations which is capable of preparing students to think critically and creatively (Dunlap, 2005; Watson, 1980). This method has the potential to make students to be more active in the classroom through the active learning approach. Hence, this study intends to incorporate this method in a mathematics classroom.

An active learning approach in mathematics classroom has the potential to affect students' active involvement in the teaching and learning process (Rahimi, 2012). Apart from improving the quality, it also helps students to follow learning better as well as optimizing the potential and motivation of students (Abdul Hakim, 2015; Emmanuel, 2014). The application of active learning can also have an impact in the problem solving process among students and help in the cognitive development of students especially in the problem solving process (Zuriawahida, 2016; Noor Hidayah, 2017). Mathematical problem solving is the application of mathematical skills to solve various problems (Voskoglou, 2008). Teachers today need to be more creative in providing teaching materials that involves problem solving methods which is in line with the objectives of 21st century learning and should always ensure that students are actively involved in the classroom.

However, in their comparative analysis of international frameworks for 21st Century competences, Voogt and Roblin (2012) identify a common recognition of the development of skills relating to communication and collaboration, problem-solving and creativity as being fundamentally important. Voogt and Roblin (2012), has also stated that teachers should not only facilitate in the acquisition of 21st century learning skills among their students, but they have to possess the skills. One of the findings has emerged with continuous professional development (CPD) for teachers in order to facilitate the development of 21st Century pedagogies (Conneely *et al.*, 2015; Maab & Artigue, 2013). The structured CPD module has been incorporated in 21st century learning skills for all the primary school teachers (Bridge21, 2014). Therefore, today's teachers have been provided with 21st century learning skills and are encouraged to design student centered learning experiences that support 21st century learning skills.

The application of 21st century learning practices in teaching and learning using active learning methods can benefit students in the process of solving mathematical problems. Therefore, this study examines the practices of active learning approach in mathematics problem solving among primary school teachers from the aspect of planning, implementation, evaluation and across teachers teaching experience.

1.2 Background of Study

Mathematics is a subject that involves many abstract concepts (Nurulhuda, 2014). Therefore, the process of learning mathematics that emphasizes memorization method is less effective (Noor Azlan, 1987). Mathematics teachers should be aware of teaching strategies and should always reflect on pedagogy by implementing relevant teaching strategies (Shulman, 1986; Nadzri, 2017). Furthermore, mathematics is considered a difficult subject to understand, tedious and lacks direct meaning for certain students (Noraini Idris, 2005). Therefore, negative perceptions towards this subject affect the mathematical problem solving process among students. Furthermore, the set of skills that students are required to acquire in the 21st century learning aims to provide a learning that focuses on active learning which is important to help students master the problem solving process (Aimi Hafizah, 2017).

1.2.1 The Importance of Problem Solving in Mathematics

Mathematical problem solving is considered difficult for certain groups of students because it often requires a student to analyze long Mathematical sentences (De Corte, 2000). As a result, students are confused in choosing the most appropriate method to apply in the process of solving mathematical problems. Previous studies report that difficulties in the process of solving mathematical problems are not only experienced by students in the Institute of Higher Learning but also experienced by most school students (Zamri, 2012; Ainun Rahmah, 2017). This situation has implications on teachers where teachers need to be more efficient in the method of presenting the content in the classroom. This enables students to receive the input that will be presented by the teacher and help them in the process of solving problems especially in mathematics.

The difficulty among students in the process of solving mathematical problems is also due to the fact that most concepts in mathematics are interrelated where the understanding of one concept is dependent on the understanding of other mathematical concepts (Wheeler, 1983). This means, students have to master the skills in all

mathematics topics in order to understand the requirements of the question and choose the right technique in solving the question. Therefore, mathematics is able to improve the problem solving skills such as understanding problems, planning strategies, implementing plans and reviewing the results should be emphasized to improve student's understanding (Polya, 1973).

Students sometimes understand the requirements of the question but they do not know the correct method to solve the problem. One of the common reasons for this problem is the lack of teacher's exposure in answering techniques as well as lack of training for problem solving questions (Zarina, 2012). Problem solving questions are important to be given to the students so that they will be able to experience answering the questions (Poon, 1994). Another factor that contributes to the weakness of students in solving mathematical problems is the lazy attitude to read long mathematical sentences (Lim Beng Tin, 2000). Certain students tend to choose to answer only direct and shorter mathematics questions as compared to a long mathematical problem solving question. This situation occurs because students think they will allocate more time to solve long mathematical questions. In this case, teachers can teach students how to answer problem solving questions effectively to avoid students from feeling the burden or lack of time to answer (Baharin, 2007).

Problem solving in mathematics not only involves the process of listening, reading but also the process of visualisation (Radazt, 1979; Hoon, 2013). Pupils find it very difficult to do visualisation process after reading mathematical questions based on problem solving. The visualisation process requires high skills to from various directions either from two dimensions or three dimensions when it is manipulated by a person (Mohd Daud Hamzah, 2004). This is because mathematical problem solving questions are more focused on the visualisation process and students can solve the question by relating it to real life situations. Pupils can solve problems that require visual skills if the teacher can display images, drawings on whiteboard, display on computer or by using interactive books (KPM, 2019).

1.2.2 Active Learning Approach in Teaching and Learning Mathematics

Students' active involvement and the need for students to work in groups during the learning process is an effective strategy in improving student's mastery (Nortan & Zhang, 2014; Kamruddin, 2011). Students' negative perceptions in Mathematical problem solving is connected to teachers teaching methods (Uya, 2011). However, in the process of learning mathematical problem solving, there are still teachers who use pen and paper, chalk and talk as well as memorisation methods (Samuelsson, 2010). As a result, there are no interesting activities that involves students actively interacting with their friends or teachers (Neuman & Fisher, 2012). Hence, students will expect the teacher to always provide information and ideas in exploring problem-solving questions. Therefore, students are not independent to think critically or creatively and do not strive to find and build their own knowledge in solving mathematical problems (Yang & Wu, 2012).

The one-way teaching and learning process between teachers and students causes students to not apply their ideas in the learning process. The lack of active involvement of students in the process of solving mathematical problems, causes them to be discouraged and feel unmotivated. This statement is also supported by Rosati (2016), who has stated that teacher centred learning has made it difficult for students to visualise and understand the actual problem. Rohani Arbaa, Hazri & Nordin (2010) has proven that one of the factors that leads to students' weaknesses in solving Mathematical problems is poor teaching methods. This is due to the fact that teachers often lecture in a classroom without trying to diversify the methods according to different groups of students.

Students are also found to be less interested in the problem solving process if the teacher does not relate the lesson to daily life situations (Khairuddin Ahmad, 2011). This causes students to not understand what they have learned and how to apply what they have learned when they are engaged in mathematical problem solving questions. This is supported by the study of Emily (2017), who found that most students are sensing learners, who like things that happens around them and which is relatable to

their daily lives. He also found that students show lack of interest if the teacher does not relate it to the real life situations.

Teaching activities that encourage student's active involvement in learning are less practiced by teachers in teaching and learning process (Mok.Soon.Sang, 2011). There are teachers who still tend to use teacher centered teaching methods such as lecturing techniques (Wright, 2011 & Norlela, 2007). According to Zamri and Nur Aisyah (2011), most mathematic teachers still use traditional methods in the teaching process. This causes students to misunderstand the things they have learned. Teaching methods that are one-way are no longer suitable in curriculum reformation and is not in line with 21st century learning skills.

Overall, there are some constraints faced by teachers in mathematical problem solving. Therefore, teachers should plan the teaching and learning process using appropriate techniques and methods in order to help students overcome the challenges when they are engaged in mathematics problem solving questions.

1.2.3 Teachers Skills in the Implementation of Active Learning

Active involvement of the students has to be ensured by a teacher during the planning of a lesson. It needs to be done meticulously to make sure the teaching and learning process runs smoothly. According to a study by Richards (2010), the planning, implementation and evaluation of teaching and learning should be done by giving priority to the active learning process of students. However, the study of Mok Soon Sang (2011), found that teachers are capable in the aspects of assessing their students but they face obstacles in handling it due to lack of skills. Teachers are lacking active learning skills and face difficulties in preparing their lesson plans (Hallinger, 2010). They face difficulty in choosing the most appropriate activity to ensure students are actively involved in the classroom. Teachers rarely choose appropriate techniques that could result in students not being able to understand the topics that they have learned (Noriati Rashid, 2010).

Active learning can also be implemented through good questioning techniques and encourage critical and creative thinking skills among students. However, the failure of teachers in managing time while planning and implementing activities results in teachers not being able to carry out active learning approach in the classroom. As a result, most teachers are comfortable using traditional method that emphasise one-way communication. In addition, lack of time causes teachers to focus more on completing the syllabus before the test (Zamri, 2011) which is a common situation that is prevalent in Malaysia.

Psychological knowledge refers to the knowledge needed to create and optimize teaching and learning environment. The absence of psychological knowledge among teachers such as ignoring student's learning styles causes active learning cannot be implemented effectively (Wiseman, 2008). This is because, each individual has a different learning style (Callie, 2020). Teachers' skills in using manipulative materials are very important so that students can have a clear picture of what they have learnt and students can be actively involved in the teaching and learning process. Experts from America argue that the use of manipulative objects is not emphasized by teachers in learning although research has concluded that students can learn mathematics through participation in daily activities and engaging in student centered activities (Azizi Yahya, 2007). This situation occurs in the context of most classrooms in Malaysia. Manipulative materials are not constructively and regularly used in a classroom.

According to Alexandra (2020), the process of reflection can occur when the teacher discusses with other colleagues to obtain information and views on how to solve an issue or problem and give importance on that area when planning the next lesson. Lindh (2016), states that individuals who practice reflective thinking will always be aware in giving importance to problems and are committed to find solutions, willing to sacrifice time to ensure that problems can be overcome and always consider the expert's views that have the potential to solve problems.

Teachers do less reflection process after the end of teaching and learning sessions. In addition, teachers do not take into account the suitability of teaching aids, students' prior knowledge as well as methods and techniques used in the topics that is being taught. This is evident by the existence of various studies on reflective thinking and practice conducted by educational researchers around the world from time to time (Roessger, 2014; Ong, 2004). Teachers' skills in the implementation of active learning are very important in order to create a conducive learning environment and to reciprocate students' interest in the mathematical problem solving process.

1.2.4 Application of Active Learning in Mathematical Problem Solving Process across Teacher's Teaching Experience

A teacher's teaching experience also may affect the application of appropriate methods used in solving mathematical problems. This is because the effectiveness of an effective teaching is the result of teachers' skills in planning, implementing and evaluating active learning approach. This is also stated by Cruickshank, Jenkins and Metcalf (2006) who argue that an effective teacher is a teacher who can help students gain knowledge from a teaching and learning process. Sulaiman (2003), says that teachers should have skills and expertise in mastering certain subjects. Novice teachers can improve the quality of students learning as a result of improving the skills and teaching quality of the teachers themselves (Duke, 2006).

The duration of teacher's teaching experience throughout their service influences the effectiveness of a practical teaching and learning method (Lovorn, 2017). This matter arises because there are differences between newly graduated teachers (novice) who are placed at schools among experienced teachers (experts). The research study done by Lovorn (2017) is in line with Hattie (2003) who have explained that new teachers are still less experienced with the school situation and the teaching and learning process in the classroom compared to the teachers who taught for more than five years with extensive experience in issues related to class management where they can implement active learning. However, the study of Abbas and Niloofar (2012), has reported that teacher's motivation is not influenced by factors of teacher's teaching

experience. Therefore, they are able to implement active learning approach in mathematical problem solving. Furthermore, Muhamad Yazid Khalil (2018) has stated that teaching experience does not affect level of knowledge in practicing active learning skills among teachers in primary schools.

There are many results of the study conducted in western countries shows the method of learning based on problems is an alternative method in providing students who can solve problems critically, prioritize self directed and active learning in **f**acing the challenges in today's world. (Sternberg, 2010). Therefore, teachers must equip themselves with active learning approach in mathematical problem solving despite their teaching experience.

1.3 Problem Statement

21st century learning emphasises that the active learning of students should be able to improve communication, collaboration, critical and creative skills as well as values and ethics in themselves (Clark, 2009). Therefore, applying active learning in the process in solving mathematical problems will enable students to understand, analyse and answer questions with excellent should be strived by all teachers in all Malaysian classrooms.

However, teachers are confused in choosing the most appropriate method to be applied during the planning aspect of the problem solving process because it involves long sentences (Glazer, 2010). Problem solving process not only involves one specific topic to obtain the answers but it involves a combination of several topics. Lack of teachers' exposure in the technique of answering mathematical problem solving questions and lack of worksheets cause students to face difficulties when they are engaged I problem solving questions (Katherine *etc,al.*,2009). Lack of training in doing worksheets involving mathematical problem solving causes students to run out of time to read, understand and analyse for solutions. In addition, teachers face challenges in the implementation of the process due to the lack of learning aids for this subtopic.

Therefore, students have a negative mindset towards mathematical problem solving questions (Rohimi, 2014). In addition, the use of traditional methods that is commonly used by teachers' cause students to be dependent and this hinders their critical thinking process. It also disables students from applying ideas in the teaching and learning process. Teachers who do not apply active learning in the classroom cause students to be less focused (Yeliz, 2016). In addition, the relatively poor level of mastery in Mathematical concepts and the use of inappropriate teaching methods cause students to not be able to answer mathematical problem solving questions.

However, not many studies emphasize on the importance of active learning in the teaching and learning process in mathematical problem solving. Therefore, this study aims to identify the practices of active learning approach in mathematics problem solving among primary school teachers from the aspect of planning, implementation, evaluation and across teachers teaching experience. In a nutshell, students can be actively involved in the activities implemented in the classroom as well as they will be able to apply methods and techniques in the process of solving mathematical problems.

1.4 Research Objectives

There are four research objectives to elaborate. The aims of this research are:

i. To identify the practices of active learning approach in mathematics problem solving among primary school teachers from the aspect of planning.

ii. To identify the practices of active learning approach in mathematics problem solving among primary school teachers from the aspect of implementation.

iii. To identify the practices of active learning approach in mathematics problem solving among primary school teachers from the aspect of evaluation.

iv. To identify the practices of active learning approach in mathematics problem solving among primary school teachers across teachers teaching experience.

1.5 Research Questions

The questions for this study are as follows;

i. What is the level of active learning approach in mathematics problem solving among primary school teachers from the aspect of planning?
ii. What is the level of active learning approach in mathematics problem solving among primary school teachers from the aspect of implementation?
iii. What is the level of active learning approach in mathematics problem solving among primary school teachers from the aspect of evaluation?
iv. Is there any significant difference in the level of active learning practice in the mathematics problem solving among primary school teachers across their teaching experience?

1.6 Research Hypotheses

The aims of this study is to test the following hypothesis:

i. Ho 1: There is no significant differences in practices of active learning approach in mathematics problem solving among primary school teachers from the aspect of planning across the teachers teaching experience.

ii. Ho 2: There is no significant differences in practices of active learning approach in mathematics problem solving among primary school teachers from the aspect of implementation across the teachers teaching experience.

iii. Ho 3: There is no significant differences in practices of active learning approach in mathematics problem solving among primary school teachers from the aspect of evaluation across the teachers teaching experience.

iv. Ho 4: There is no significant differences in practices of active learning approach in mathematics problem solving among primary school teachers across the teachers teaching experience.

1.7 Theoretical Framework

Teaching models and theories contain important elements that can give an idea of the teaching process. Teachers should take various considerations in choosing teaching models that can have a positive impact on their teaching and to determine the effectiveness of teaching and learning process. This can be ensured by the selection of appropriate methods, techniques and approaches. Each model has its own strengths in assisting teachers in their teaching and learning process (Mok Soon Sang, 2003). For this study, Glaser's basic teaching models and constructivism theory were used

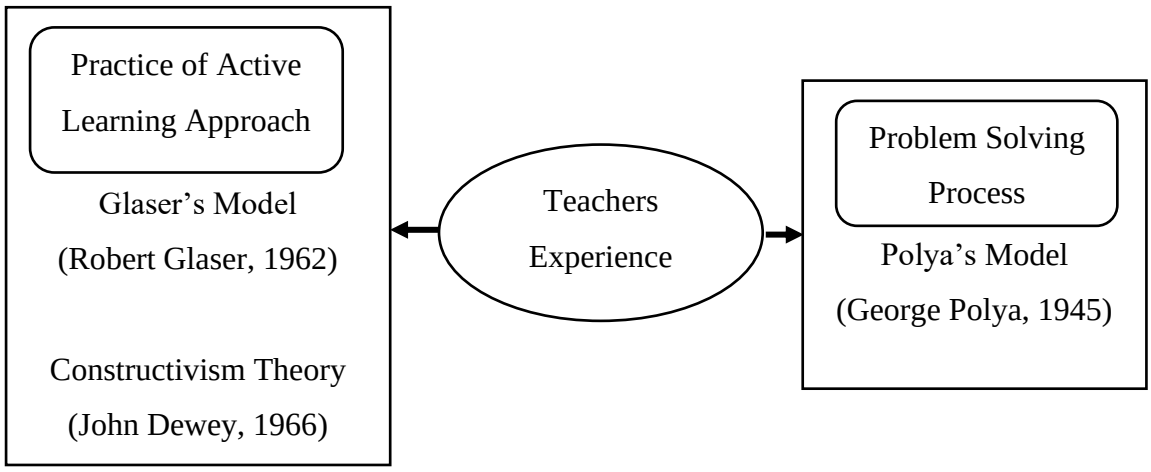

Figure 1.1 Theoretical Framework of the Study

Figure 1.1 shows the relationship between models and theories used to apply in active learning in the mathematics problem solving process. The Glaser's model and the theory of constructivism were used in this study. The basic teaching model was introduced by Robert Glaser in 1962. The Glaser's model divides the teaching process into four parts, namely teaching objectives, prepared behaviour, teaching procedures and performance behaviours. Teachers as facilitators, can plan and implement their daily lesson plans based on the Glaser Model. The learning objectives emphasised in this model help teachers to observe and measure students' behavior after the teaching steps are carried out. A clear statement of the students' behavior to be achieved through the lesson, allows the teachers to plan the teaching steps and make an assessment on the effectiveness of their teaching process.

The theory used in this study is constructivism theory. This theory was put forward by John Dewey in 1966. Constructivist learning theory emphasises that teachers can relate new learning to their prior knowledge, abilities and interests of students so that the teaching and learning process becomes more meaningful. While implementing the planning process, teachers can refer to the prior knowledge, skills and attitudes of a student. Teachers have an important influence and role in increasing students' commitment to their lessons (Ismail Abas, 2007). Next, in the process of implementing the teaching procedures outlined in the Glaser's model help teachers to select appropriate activities based on 21st century learning and learning elements.

Teachers can implement the teaching and learning process by using appropriate methods so that the content of the lesson is delivered effectively. Active learning activities can be inserted to attract students which has been emphasized in constructivist theory (John Dewey, 1966). Pupils can also be involved in learning activities such as observing, concentrating, discussing and solving problems. The evaluation process which is the final process in this model, allows teachers to reflect on the teaching and learning process. Teachers can observe and conduct tests to determine whether students have mastered the problem solving process. Teachers can conduct quizzes or formative tests after completing each subtopic. By doing so, the teacher can find out the weaknesses of the students and can conduct various activities to overcome the weakness.

Trotter (1986) has stated that there are 5 stages in teacher's development. The first stage of teacher's development is novice level teachers. At this stage, teachers begin to learn how to teach. Novice teachers also learn basic facts, concepts and rules in teaching. According to Ragbir Kaur (2013), the learning and facilitation process in the classroom requires teachers to master some knowledge related to pedagogical practices. The second stage of teacher's development is advanced novice level. The results of the teacher's initial experience related to practice in the classroom help the teacher to build self confidence. According to Syed Ismail Syed Mustapa and Ahmad Subki Miskon (2010), advanced novice teachers need the guidance of mentor teachers to maintain the interest and motivation of the advanced novice teachers. Advanced novice teachers need to add and strengthen the understanding of facts, concepts, principles related to the learning process and facilitation.

The third stage of teacher's development is skilled teachers. At this stage, teachers already have professional qualifications. The fourth stage of teacher's development is expert teachers. At this stage, teachers have become proficient in their field. Syed Ismail Syed Mustapa and Ahmad Subki Miskon (2015), argues that expert teachers are a group of teachers who have skills, expertise and excel in their respective subjects or areas of specialization.The fifth stage of teacher's development is master level. At this stage, an expert teacher is an authoritative person in his or her profession because his or her ideas and skills can influence policies related to classroom practice. At the master level, teachers have acquired specialized expertise and the ability to manage change efficiently and effectively (Ministry of Education Malaysia, 2016).

The problem solving process in mathematics can be solved using the Polya's Model which has been introduced by George Polya in 1945. This model emphasizes four principles in mathematical problem solving namely understanding the problem, formulating strategies, implementing strategies and checking answers. This model can help students solve mathematical problems easily guided by clear and orderly steps. By using this step, teachers can use appropriate methods and strategies in solving mathematical problems by using active learning.

1.8 Conceptual Framework

The conceptual framework briefly explains how dependent and independent variables are closely related to each other to improve students' achievement in the mathematical problem solving process.

Teachers need to take into account several factors in implementing active learning in the classroom as shown in figure 1.2. Teacher's teaching experience is an independent variable in this study. Planning, implementation, evaluation and teaching experience of teachers are dependent variables in this study.

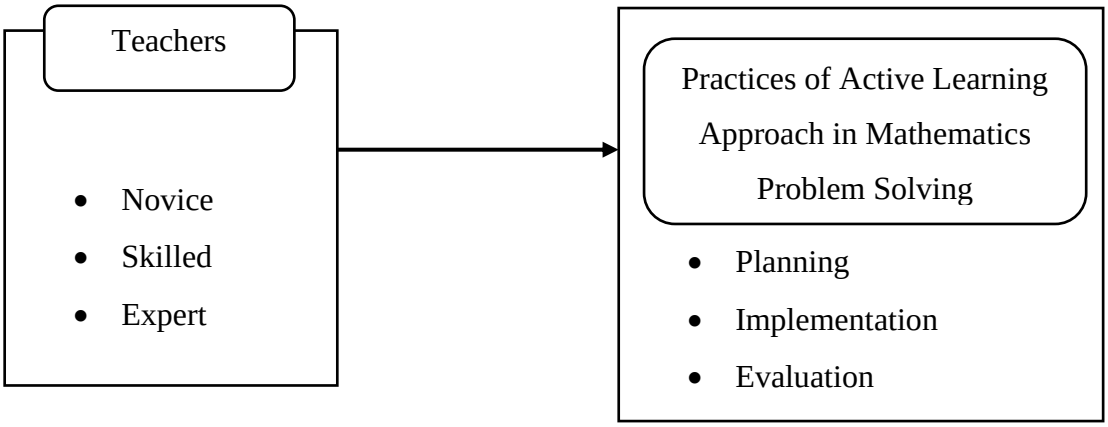

Figure 1.2 Conceptual Framework of the Study

According to Noriati (2010), the teaching aspect is considered as a profession when teachers' acquired knowledge or skills through training over a long period of time, increase professionalism, commitment and have autonomous power in decision making. According to Trotter (1986), there are five stages of development for a person to become an expert in the field. Novice, advanced novice, skilled, expert and master level. Novices and advanced novices are teachers who learn and strengthen their understanding of facts, concepts and principles related to the teaching and learning. Meanwhile, skilled level teachers can understand the concepts and principles of learning in various situations. Expert level refers to experienced teachers. An

experienced teacher is someone who is rich in experience and can analyse and organize complex information related to a learning situation creatively and uniquely.

Teachers teaching and learning methods impact students' interest and efforts to achieve academic excellence or better achievement in the problem solving process. According to Kamarudin (2008), students' attitude towards education is essential in achieving their success. Therefore, by applying 21st century learning and active learning in classrooms, it can stimulate interest in learning, cultivate curiosity and develop critical and creative mind. By using communication skills, collaboration, creative and critical thinking skills in addition to the values and ethics found in 21st century learning, teachers can create a two-way interaction between teachers and students. Teachers can indirectly create a positive attitude among students and encourage them to participate in classroom activities via active learning.

Based on Figure 1.2, planning in the teaching and learning process is the input stage. Teachers should master the skills of 21st century learning and the characteristics and methods that can be used in active learning. Teachers will absorb input in the form of lesson content delivered by teachers based on the syllabus by combining active learning. According to Johnson (2003), there are several techniques and skills required in this stage. For example, students need listening skills, reading skills, thinking skills, note taking skills, questioning skills, learning skills, practical skills, remembering skills and so on.

Active learning activities such as hot seats, round table, think-pair-share, role-play and gallery walk can optimize the potential and motivation of students in learning as well as give students the freedom to think critically and creatively. Therefore, teachers can use active learning activities in the process of solving Mathematical problems of primary school students. Management involves the formulation and planning, implementing planning and working effectively with others to do the right thing until the goal is achieved (Scott, 2015).

Teachers can plan and implement daily lesson plans by applying active learning in order to elicit students' interest in the problem solving process. Skills

diversifying teaching strategies, learning assessment and information and communication technology (ICT) are focused on the skills that have to be equipped by teachers (Ahmad & Jinggan, 2017). Therefore, teachers should equip themselves with skills in line with the 21st century learning to create a conducive classroom.

In today's educational context, students' learning outcomes can be measured through observations, quizzes, questions and answers, classroom assessments and examinations held at schools. Good planning, implementation and evaluation enable teachers to apply active learning methods in the mathematical problem solving process. Therefore, by providing an effective lesson plan by taking active learning skills into account can help students in the problem solving process.

1.9 Significant of the Study

This study is expected to benefit several parties such as schools, teachers and the Ministry of Education (MOE). Further details are explained in subtopic 1.9.1, 1.9.2 & 1.9.3.

1.9.1 School

Students can realise the strength of an active learning approach when a more active and effective teaching and learning session is implemented in classrooms. Therefore, it indirectly creates interest and achievement among students to participate in the teaching and learning sessions. This will further facilitate students to understand the mathematical problem solving process in more depth from the theoretical aspects, concepts and applications in daily life.

1.9.2 Teachers

This study can provide alternative guidance for teachers on active teaching approach as a constructive approach to improve the quality of teaching in the problem solving process without rejecting traditional teaching methods because this method is more effective in conveying information. Next, it also serves to provide guidance to teachers in the preparation of daily lesson plans that include the process of planning, implementation and evaluation to include student centred activities in the problem solving process. As educators, teachers can also choose appropriate methods and teaching materials in active learning implementation to attract students to engage in mathematical problem solving process.

1.9.3 Ministry of Education

Based on the findings obtained from this study, it is hoped that the MOE can make improvements to the teaching and learning system for a better curriculum. This study helps the MOE to know the level of planning, implementation and evaluation among teachers. This can be used as a guide in conducting courses and workshops for teachers so that they can improve their level of knowledge in the mathematical solution process. This study can also help the MOE to provide and supply teaching aids in order to assist teachers in the mathematical problem solving process and produce excellent students.

1.10 Research Limitations

This study has some limitations in order to facilitate the data collection process and make the study successful. This study will only be conducted in regular day primary schools in Kulai district. Hence the scope of the study is restricted to only one area. Additionally, the respondents of this study only involve teachers who teach Mathematics of various genders. Students are not involved in this study. The approach used in this study is quantitative and the design used is survey so it is not subjected to

views and reflections of teacher individually for a wholesome study. Moreover, this study only examines aspects of planning, implementation, evaluation and teacher experience in the process of solving Mathematical problems.

1.11 Definition of Terms

This subtopic will discuss the operational and conceptual definitions of the key terms for this study. The terms include active learning, problem solving, planning, implementation, evaluation and teachers teaching experience which will be described in subtopics 1.11.1 to 1.11.6.

1.11.1 Active Learning

According to Akmaliza (2016), active learning is a method of teaching and learning that encourages students to be actively involved in the learning processes and activities through writing, discussion, problem solving or reflection. In addition, active learning also allows students to engage in learning activities other than just listening and observing to the teachers. Teachers can create diversity and change the level of ability in students so that students will be able to participate and not just being spectators. In this study, active learning refers to the active involvement of students in the teaching and learning of mathematics among primary school students.

1.11.2 Problem Solving

Problem solving in mathematics is a problem in the form of structure, involving more than one operation or applying mathematical skills in real situations (Tan Son Nan, 2014). Good strategy and planning are needed to answer problem solving questions. Therefore, teachers should choose the most interesting and appropriate techniques and methods that are in line with the 21st century learning process so that

students can understand the problem solving process in mathematics. In this study, problem solving refers to the cognitive process of students in solving mathematical problems by using appropriate steps through active learning.

1.11.3 Planning

According to Esah Sulaiman (2004), planning a lesson is a decision that should be made by teachers on what to teach and how to teach so that students can understand. Teachers can see a positive impact in the teaching and learning process when they are careful and comprehensive in planning. Teachers can determine the effectiveness and emphasise on the content of each lesson through careful planning. This guide allows teachers to allocate their time more systematically. Planning in teaching allows teachers to schedule the time accurately and can ensure that the syllabus is completed on time. In this study, planning stage will be measured using survey form consist of eight items. The survey form refers to the set induction, selection of appropriate methods and techniques according to the topics to be taught.

1.11.4 Implementation

According to Aimi Hafizah (2017), implementation refers to the teaching process by teachers in the classroom based on daily lesson plans that have been prepared after careful planning. Noraini and Shuki (2009) stated that teaching includes all methods, strategies and approaches used to convey the content of subjects found in the curriculum. In this study, implementation stage will be measured using survey form consist of nine items. In implementation process, teachers will use teaching aids, methods and appropriate teaching techniques which are aligned with the 21st century learning so that students can achieve the teaching objectives set by the teachers.

1.11.5 Evaluation

According to Mok Soon Sang (2010), evaluation is the process of analysing, finding reasons, suggestions and actions for self-improvement. Teachers use feedback from students and others to evaluate and improve their teaching while reflecting on their own classroom performance in an effort to improve the quality of teaching (Lucas and Bernstein, 2005). In addition, through the process of evaluation, teachers can determine the best ways to teach students. Teachers can also detect successful and unsuccessful methods and techniques as well as implement improvements so that students can understand the content of the lessons presented by the teacher. In this study, evaluation stage will be measured using survey form consist of six items. Evaluation refers to teachers obtaining feedback on the effectiveness of active learning approach in the mathematical problem solving process.

1.11.6 Teachers Experience

Teaching experience is the working hours of the teachers in carrying out their duties as educators in accordance with the letter of assignment from the authorized institution (Mansur Muslich, 2007). In this study, teaching experience of novice teachers are 1 to 5 years of service. Meanwhile, skilled level teacher's teaching experience is 6 to 10 years and expert level teacher's teaching experience is 11 to 15 years. Teacher's teaching experience means a teacher's teaching period and the input gained during their teaching times in school. Teaching experience allows a teacher to plan and implement the teaching and learning process well and select appropriate techniques and methods based on the topics.

1.12 Summary

In conclusion, this chapter highlights that the best approach to ensure students achieve excellence should teachers should emphasise on the 21st century learning skills. This is believed to help in the process of solving mathematical problems and students can be actively involved through the active learning approach implemented by teachers in the teaching and learning process. Teachers should improve their skills and modify appropriate teaching methods and techniques from time to time so that the delivery of input to students will be interesting and meaningful.

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