REFLECTIVE TEACHING SKILLS OF EXPERIENCED AND INEXPERIENCED PHYSICS TEACHERS

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To

My father Soul

My mother, sisters and brothers

My beloved Husband, Hamidreza Kashefi

My Children, Melika and Vania

Dr. Fatin Aliah Phang

All who contributed to the completion of this research

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ABSTRACT

Observation, communication, teamwork, judgment, and decision making are important reflective skills for teachers. This study aims to determine the characteristics of experienced and inexperienced physics teachers' reflective teaching in three levels of reflection, namely technical, contextual, and dialectical levels. Comparing the reflective teaching skills used by experienced and inexperienced teachers leads to ways of improving these skills and generates a model for improving reflective teaching skills of inexperienced physics teachers. In this mixed method research, the quantitative data was collected through a questionnaire called 'The Profile of Reflective Attributes (PRA) Questionnaire' that measures reflection levels of 60 physics teachers. The qualitative data was collected via Reflective Teaching Open-ended Questionnaire (RTOEQ), interview protocol, and observation field notes. There were 30 experienced and 30 inexperienced physics teachers who answered the PRA and RTOEQ. Later, two experienced teachers and two inexperienced teachers from each reflection level (12 teachers in total) were selected for the interview and observation. The data was analysed using the Miles and Huberman method. The findings indicate that experienced teachers applied reflecting teaching skills to reflect on their teaching in three levels of reflection more compared to inexperienced teachers. Teacher training, discussions and the sharing of ideas with experienced teachers, observing the classrooms of experienced teachers, and observing inexperienced classrooms by experienced teachers were important ways to support the reflective teaching skills of inexperienced teachers. Based on the characteristics of experienced teachers reflective teaching and the ways of improving the reflective teaching skills, a model of reflective teaching skills is proposed to support inexperienced teachers' reflective teaching skills in different levels of reflection.

ABSTRAK

Pemerhatian, komunikasi, bekerja dalam pasukan, membuat penilaian, dan membuat keputusan adalah kemahiran reflektif yang penting untuk guru-guru. Kajian ini bertujuan untuk mengenal pasti ciri-ciri pengajaran reflektif guru-guru fizik yang berpengalaman dan kurang berpengalaman dalam tiga tahap refleksi iaitu teknikal, kontekstual, dan dialektik. Dengan membandingkan kemahiran pengajaran reflektif' yang digunakan oleh guru-guru yang berpengalaman dan kurang berpengalaman dalam tahap refleksi yang berbeza akan dapat mengenal pasti cara-cara untuk memperbaiki kemahiran ini dalam kalangan guru-guru yang kurang berpengalaman. Dalam kajian kaedah campuran ini, data kuantitatif diperoleh melalui soal selidik "Atribut Profil Refleksi" (PRA) yang mengukur tahap refleksi 60 orang guru Fizik. Data kualitatif dikumpul melalui Soal Selidik Terbuka Pengajaran Reflektif (RTOEQ), protokol temu bual, dan nota lapangan pemerhatian. Seramai 30 orang guru fizik berpengalaman dan 30 guru fizik kurang berpengalaman menjawab PRA dan RTOEQ. Kemudian, dua orang guru berpengalaman dan dua guru kurang berpengalaman dari setiap tahap (jumlahnya 12 orang) dipilih untuk sesi temubual dan pemerhatian. Data dianalisis menggunakan kaedah Miles dan Huberman. Dapatan kajian menunjukkan bahawa guru-guru yang berpengalaman dalam ketiga-tiga tahap refleksi lebih banyak menggunakan kemahiran pengajaran reflektif berbanding guru-guru yang kurang berpengalaman. Latihan guru, perbincangan dan perkongsian idea bersama guru berpengalaman, pemerhatian ke atas kelas guru berpengalaman, dan pencerapan kelas guru kurang berpengalaman oleh guru berpengalaman merupakan antara kaedah untuk meningkatkan kemahiran reflektif dalam pengajaran guru kurang berpengalaman. Berdasarkan ciri-ciri pengajaran reflektif guru berpengalaman dan cara-cara untuk memperbaiki kemahiran pengajaran reflektif, satu model kemahiran pengajaran reflektif dicadangkan untuk menyokong kemahiran pengajaran reflektif guru yang kurang berpengalaman dalam tahap refleksi yang berbeza.

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LIST OF ABBREVIATIONS

AQS	-	Asking Questions from Students
ASU	-	Assessing Students' Understanding
CSU	-	Checking Students' Understanding
CT	-	Co-teaching
DE	-	Doing Experiment
DP	-	Discussion with Principal
DST	-	Discussion with Students about Teaching
DTT	-	Discussion with Teachers about Teaching
E_T		Experienced Teachers
Exp	-	Experience
F	-	Frequency
GS	-	Grouping Student
I	-	Interview
Inexp	-	Inexperience
I_T	-	Inexperienced Teachers
LCS	-	Lack Of Communication with Students
LP	-	Lesson Plan
LSP	-	Looking Students' Progress
LSU	-	Looking Students' Understanding
OM	-	Open-minded
OSB	-	Observing Students' Behavior
OSU	-	Observing Students' Understanding
PEQ	-	Preparing Exam Questions
PM	-	Preparing Materials
R	-	Reflection
RTOEQ	-	Reflective Teaching Open-Ended Questionnaire

SA	-	Students' Attention
SCD	-	Solving Class Difficulty
SI	-	Sharing Ideas
SM	-	Sharing Materials
SP	-	Students' Punishment
SPP	-	Students' Personal Problem
SR	-	Students' Reaction
SSW	-	Solving Students' Weakness
STW	-	Solving Teachers' Weakness
SW	-	Students' Weakness
Train	-	Training
TP	-	Taking Photos
TQ	-	Taking Quiz
TW	-	Teachers' Weakness
UT	-	Using Technology
UTM	-	Universiti Teknologi Malaysia
WR	-	Writing Reaction

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Learning physics face severe difficulties, based on research on physics education (Kong, 1993; MOE, 1998; Williams et al., 2003; Ornek, et al., 2008). The most fundamental natural sciences that many researchers aim to discover ways to carry students' learning, is physics. Many students think and say, "Physics is difficult." In a survey of why secondary students in the United Kingdom are not interested in studying physics, Williams et al. (2003) found that the main reason offered by students is that they perceive physics to be a hard subject. Physics concepts which may cause student difficulties followed by the method in which a physics course is taught, and physics problems which are sometimes very vague (Ornek, et al., 2008). There are different factors that may contribute to these difficulties. Some factors are related to the students and other factors are considered to the way in which physics is taught.

As a consequence, these difficulties cause students lose their interest and develop negative outlooks towards physics. Reports on Malaysian students' performance in learning science, mainly those that underlined students' unwillingness to do science (Kong, 1993; MOE, 1998) lead to a great worry about the capability to reach the targeted objectives.

Having students' outlooks about their problems with physics can give helpful information to the teachers in providing course syllabus, selecting the course textbooks, and applying the curriculum in a way that can lessen students' problems of learning and understanding of physics (Omek, et al., 2008). Prior researches have indicated that the understanding of how students associate with their lack of success and inefficacy to perform well in science subjects will be useful for instructors when attempting to push their students. In those researches, students did become discouraged and lost interest in a subject that they allocated poor performance to inner locus of control when the root of the problem is somewhere else (Weiner, 1979; Hicks and Nabilah, 1998).

According to Singh 2014, becoming an effective teacher needs more than repeated teaching practice in particular classes. In fact, it affects the performance of teachers and changes it (Singh, 2014).

Dewey (1933) described reflection as a deliberate, purposeful act that enabled teachers to use their artful skills to help students learn in meaningful ways. Teachers who engage in reflective practice are more effective and may encourage higher student achievement (Klug, 2010).

Developing science and physics teachers' competencies that comprise knowledge, attribute, and skills (Lerner, 2002) and specifically reflective teaching skills that are acquired through practice and experience in teacher education programs can foster inexperienced teachers' reflective teaching (Dymoke and Harrison, 2008).

Teachers must never stop learning if teacher education is to be a dynamic process (Rosenberg, et al., 2004). The learning process for teachers must be about their practice, must be built on experiences derived from their practice and, therefore, the learning of experience followed by reflection (Harrison et al., 2006). A great deal of educational research portrays reflection as a wholly beneficial practice for teachers (Husu, et al., 2006). One way of expanding and specifying in notions of reflection is

to think about the process embedded within it. The process of reflection includes that "how do teachers reflect" and ''what do teachers reflect on".

Dewey (1933) was the first to introduce the concept of reflection; he started the premise that instructors should be motivated to become contemplative and notify students of education, and argued that instructors should have more and more reflection. Rodgers (2002) presented Dewey's four principles for reflection as follows: Reflection (i) is a meaning-making procedure that motivates a learner to move from one experience into the next with more profound understanding of its connections and relationships to other opinions and experiences; (ii) is a systematic, controlled way of thinking, with its origins in scientific study; (iii) requires to occur in community, in interaction with others; (iv) needs outlooks that respect the intellectual and personal development of oneself and of others.

Reflection deals with a procedure or an activity in which an experience is remembered, contemplated and assessed, typically with regard to a greater goal (Danielson, 1996). Husu et al. (2006) noted that reflection is often outlined as a procedure of self-inspection and self-assessment that instructors should constantly involve to explain and augment their professional practices. It is an answer to past experience and requires purposeful recall and inspection of the experience as a foundation for assessment and decision-making and as an origin for preparation and action. With experience, teachers become more discerning and can evaluate their successes as well as their errors. Many educators studied and investigated the content of reflection, its principles, how teachers think about their practice, and the features of reflection of various teachers (Dewey, 1933; Van Manen, 1977, 1995; Schön, 1983, 1987; Zeichner and Liston, 1985; McMahon, 1997; Artzt and Armour-Thomas, 2001; Mayes, 2001; Subramanian, 2001; Lee, 2005; Taggart and Wilson, 2005; Muir and Beswick, 2007; Larrivee, 2000, 2004, 2008; Savran, 2008; Pennington, 2011).

Van Manen (1977) was presumed as first by suggesting a hierarchical model (Davis, 2006). Scholars differ on the hierarchical nature of reflection but generally agree on three modes or levels: technical, contextual, and dialectical (Van Manen,

1977). There are several studies (Van Manen, 1977; Zeichner and Liston, 1985; Lee, 2005; Taggart and Wilson, 2005; Muir and Beswick, 2007; Larrivee, 2000, 2004, 2008; Pennington, 2011) that have attempted to study the levels of reflection achieved by pre-service teachers and if they can reach the highest levels through a variety of reflective exercises and experiences. These studies have revealed that pre-service teachers and teachers can achieve the highest levels of reflection over time and if reflective exercises and practices are present throughout their whole program.

The main target of reflective teacher education is to improve teachers' thinking about why they use particular instructional tactics and how they can augment their instruction to have a positive impact on students (Lee, 2005). Bartlett (1990) points out that to become a reflective teacher, one should go beyond the conventional primary concerns with instructional techniques and move towards broader educational purposes by asking "how to", "what" and "why" questions that consider instructions and managerial techniques as educational objectives. Regarding this belief, teacher reflection contributes to crucial approaches to one's teaching and as a result, causes better practice (see e.g., Oser et al., 1992; Swain, 1998; Artzt and Armour-Thomas, 2001; Mayes, 2001).

Reflective teaching is only one of the many important characteristics found in a competent educator who must also be able to rely on their abilities, knowledge and skills to conduct their lessons in an efficient and effective manner (Rosenberg, et al., 2004). Reflective teaching is an approach to teaching, learning and problem solving that employs reflection as the central mechanism. As defined by Bengtsson (1993), it motivates teachers to distance from their practice for a while. It engages them in discussing, analyzing assessing, modifying and developing their practice, by choosing an analytical approach to their work (Wood and Stevens, 1988; Coyle, 2002).

Dymoke and Harrions (2008) described five core components to be necessary skills of reflective teaching, namely observation, communication, judgment, decision making, and teamwork. In the reflective teaching, it is necessary to think highly of the persons you communicate with; fulfil the duty, think about the gaps in education

and estimate the learning enthusiasm. Weekly observation and cooperation make the teacher research like the students and generates significant notions. Furthermore, the performance of the teacher is very influential on the reflective teaching performance. Analyzing and explaining these capabilities and practices, increases students' success in the course of learning (Kronowitz, 1996). Larrivee (2000) argued that reflective practice moves teachers from their knowledge based on different abilities to a stage in their professions where they can change their abilities in a way that is adapted to certain situations and contexts, and ultimately to originate new tactics.

Investigation of teachers' reflective teaching allows us to take action deliberately and intentionally, to formulate new methods of teaching rather than sticking to traditional methods, and to explain new experiences from a brand new outlook (Posner and Vivian, 2010). In the Ninth Malaysian Plan (2006-2010) under the Education Division and Training Ministry of Education Malaysia has aimed at increasing the number of trained teachers, especially in Mathematics, Science and English at primary and secondary levels. Emphasis is also directed towards bridging the gap between theory and practice in teaching. To achieve this goal, the practice of reflection has been identified as an effective approach towards enhance the professional level and quality of teachers.

1.2 Background of the Problem

Previous studies (Cruickshank, 1985; Schön, 1987; Bartlett, 1990; Gore and Zeichner, 1991; Calderhead and Gates, 1993; Mok, 1994; Hatton and Smith, 1995; Larrivee, 2000; Arztz and Armour-Thomas, 2001; Galvez-Martin, 2003; Muir and Beswick, 2007; Goh and Matthews, 2011) show the important role of reflective teaching in teacher education. Reflective teaching is an approach to improve or enhance the education system through the changes that encourage teachers to become more aware of their teaching performance, and be critical of their teaching practices and are willing to change him in order to streamline and improve teacher performance as being excellent teachers (Calderhead and Gates, 1993). Researchers

investigated the levels of reflection achieved by teachers (Van Manen, 1977; Zeichner and Liston, 1985; McMahon, 1997; Subramanian, 2001; Lee, 2005; Taggart and Wilson, 2005; Muir and Beswick, 2007; Larrivee, 2000, 2004, 2008; Savran, 2008; Pennington, 2011), the processes of teachers' reflective teaching and the ways of improving it by reflective teaching skills and characteristics (Powell, 1985; Schon, 1987, Bailey, 1990; Gore and Zeichner, 1991; Licklider, 1997; Richards and Lockhart, 1997; Galvez-Martin, 1997; Collier, 1999; Guiney, 2001; Husu, et al., 2006; Maarof, 2007; Larrivee, 2008; Mohd Zaki, 2008; Rosaen et al., 2008).

Many studies focused on determining the level of reflection for pre-service teachers (Van Manen, 1977; Zeichner and Liston, 1985; McMahon, 1997; Subramanian, 2001; Lee, 2005; Taggart and Wilson, 2005; Muir and Beswick, 2007; Larrivee, 2000, 2004, 2008; Savran, 2008; Pennington, 2011). Van Manen (1977), in his theoretical model, defined three stages or levels of reflectivity. At the technical level, sometimes teachers showed consider is the technical aspect of educational knowledge. Hereinafter, at the contextual level, teachers involved with two important issues concerning about clarifying assumptions embedded competing pedagogical aims as well as evaluating educational circumstances (Zeichner and Liston, 1987). At the dialectical level, as it well described as a phenomenological paradigm, teacher deal with analyzing student, and are worried about how to educate students without any distortions of personal biases, it is observed in the society.

Subramanian (2001) identified the focus, the categories, and levels of reflectivity emerged from the pre-service teachers' journal writing. Based on Van Manen's three levels of reflectivity, the study revealed that most of the participants reflected only at the first level of technical competency and the second level of analysis of teaching decision whereas none of them reached the third level of critical reflection.

Muir and Beswick (2007) also identified a three reflection level model and also looked at more experienced teachers. At the technical level teachers often try to grab students' attention to perceive three main areas of reflection which started with technical description. Teachers talk about class experiences, concentrating on

technical aspects of teaching. At the second level the critical phenomena are diagnosed and finally it is identified and described and teachers try to find a solution for it.

Recently, it has been realized that conventional or traditional education programs that are based upon performance and technical competence are not enough to cultivate students who are sophisticated and inquiry oriented individuals who enable to think over issues. Reflective teaching consists of a conscious, systematic and deliberate acting in classroom through on-going inquiry in which teachers continually are capable of making instructional decisions as regard to students' needs and re-evaluate their instructional decisions and the outcome of those on student learning (Posnanski, 2002).

The studies on pre-service teachers reveal that the lack of experience in reflective teaching skills of pre-service teachers occur that they become on lower levels of reflection. Understanding communication with others, making materials with other teachers, and self-evaluation as reflective teaching skills and also using reflective teaching characteristics such as recording, lesson plan, and journal writing that request in each level of reflective thinking show how these reflective teaching skills can support teachers to improve their reflective thinking levels. Borghi et al. (2001) attempted to link reflection on physics subjects with teaching practice among in-service physics teacher education. They designed and tested a model of in-service physics teacher training. One of the models to help teachers cope with such situation is that they consider their disciplinary knowledge as well as team working in order to interact better with class and students and this is exactly what we called teaching skill.

Cochran and Brookes (2013) also investigated perspectives pre-service physics teachers on reflective practice. A program established for preparing pre-service physics teachers and develops their reflective practice. The results showed that pre-service physics teachers did self-evaluation on the teaching method that they used.

There are studies on developing such skills for under-trained teachers. Maarof (2007) did an investigation on 42 under-training teachers. Maarof (2007) studied these teachers' perceptions and strategies in writing reflective journals. Maarof (2007) found that 77% of the respondents of the study considered reflective journal writing helpful in understanding their strengths, weaknesses, and problems of their teaching. In short, Maarof (2007) introduced this strategy as an appropriate self-evaluation tool for teachers.

More recent studies proposed other strategies to develop self-evaluation tools for teachers. Rosaen et al. (2008) is one of these studies that investigated the efficacy of video recording. Video recording is an observational tool for teachers that enable them to reflect on their teaching accurately. This accuracy is because video recording provides information that can lead to specific reflections and discussions on teachers' teaching methods and practice, classroom management, and students' progress and difficulties.

Mohd Zaki (2008) tried to improve the training of pre-service physics teachers in Malaysia. He indicated the role of reflections on the physics teaching methods course and his findings revealed that the existing research findings on students' alternative conceptions could be used as an alternative to the use of prerequisite knowledge usually written in a daily lesson plan as a reflective teaching tool in Malaysia. Specifically, the participants' experiences of the physics teaching methods course and teaching practices in the microteaching and practicum, led them to think about the constraints of covering the syllabus, and ways of transforming specific physics content into a teaching sequence.

Goh and Matthews (2011) examined the concerns and experiences of Malaysian science student teachers during their practicum. The study has intended to draw attention to the underlying reasons given by student teachers about their concerns prior to and during the practicum in order to integrate areas of concern into future management and development of teacher education. Student teachers were asked to maintain a reflective journal throughout their practicum to document their teaching concerns and confidence to teach. The results showed that teachers tend to

have more talks about elements of the lesson in the class, paying more attention to students' progress and achievement for main concerns usually teacher have cared about managing class and the kind of behavior as it is known "discipline".

In summarize, the studies indicated that applying reflective teaching skills supported by some reflective teaching characteristics can help pre-service teachers, inexperienced teachers and experienced teachers to reflect their teaching in different levels of reflection. Furthermore, the studies show that experienced teachers are more reflective and aware in understanding teaching. As a consequence, from the above studies supporting of reflective teaching and reflective teaching skills that are acquired through practice and experience in teacher education programs can support inexperienced teachers' reflective teaching.

1.3 Statement of the Problem

Teaching method, personal adjustment and the way student digest and learn new knowledge, for instance, students believe some courses like physics is tough to learn. All the time they challenge with such courses (Hongsa-ngiam, 2006). The teacher plays an important role to support students to overlook their difficulties. But the point is preparing teachers is not quite enough to educate future generations of students (Richards, 2004).

Educational reform promotes learning environments that encourage meaningful learning rather than rote learning and create a different view of teaching and learning that are the ways of supporting learning and teaching of science and physics (Lowery, 2003). In the Ninth Malaysian Plan (2006-2010) under the Education Division and Training Ministry of Education Malaysia has been aimed at increasing the number of trained teachers, especially in Mathematics, Science and English at primary and secondary levels (Siti Eshah et al., 2009).

The pre-service and in-service training programs are the two major kinds of trainings that a teacher may receive. Pre-service programs are academic (Carroll, et al., 2003). This suggests that education provider that provides pre-service teaching programs provides formal training and the courses are offered based on determined and standardized curriculum. Babion and Shea (2005) argue that novice teachers should receive training to develop practical and reflective decision making skills. They emphasized education provider should prepare novice teachers to use this skills in their real context of teaching. However, Carroll, et al. (2003) claim that education providers were not successful in achieving this goal, because they do not provide them with field based practice. Therefore, if the ultimate aim of teacher training services is having teachers with practical reflective decision making skills, in-service trainings should compensate for the shortcomings of pre-service trainings.

There are many studies on reflective teaching (as shown in the background) but there are not many studies about reflective teaching skills and their characteristics of them among physics teachers specifically comparing experienced and inexperienced teachers reflective teaching. Many variables and problems are entailed in a complex process of educational changing of secondary science teachers (Davis, 2003; Vázquez, Jiménez and Mellado, 2008). Teaching experience is one of these variables. Research studies conducted on science teachers with different work experience shows that the process of change in both experienced and inexperienced teachers are different because of their special aspects (Hargreaves, 2005; Meyer, 2004).

Experienced and inexperienced teachers differ in their ability and skills to learn from reflection on experience. Having enough experience helps teachers to manage the class, to consider students' achievements and progress push teacher to know when and how to plan and use instructional and management routines (Borko and Livingston, 1989; Borko and Shavelson, 1990). The main goal of teacher education programs should enable the inexperienced teachers as a reflective practitioner to learn from and learn through experiences in sustaining their professional development for lifelong learning. The inexperienced teachers need to be experienced along with the more experienced cooperating teachers in a real

classroom environment to develop insights into their teaching through the interaction between personal reflection and theoretical ideas.

In the case of Malaysia, although there are many studies examine factors that influence on science and physics learning, the studies are not related to the ways of supporting science and physics teachers' reflective teaching too. Moreover, most studies in Malaysia focused on pre-service physics teachers' reflective teaching (Maarof, 2007; Mohd Zaki, 2008; Goh and Matthews, 2011). Understanding the reflective teaching skills and its characteristics among experienced and inexperienced teachers and the differences between them can help to find the ways of supporting and improving teachers' reflective teaching. Gaining awareness towards the different reflective teaching skills and how they can be used would improve inexperienced physics teachers' reflective teaching skills to work as reflective and experienced teachers. To the researcher's knowledge, there is few if any studies have been done on reflective teaching skills and their traits in Malaysia. As a result, this study was done to shed light on reflective teaching skills in Malaysian context. It is expected that the results of this study would improve experienced and inexperienced physics teachers' reflective teaching.

1.4 Objectives of the Study

In this study, firstly the teachers' reflection levels of experienced and inexperienced teachers are identified. Then, the characteristics of reflective teaching of experienced and inexperienced teachers at different reflective thinking levels will be discussed. Finally, the ways of improving teachers' reflective teaching skills including observation, communication, judgment, decision making, and team working are put forward. Based on the differences of reflective thinking skills in different levels for experienced and inexperienced teachers and the ways of improving inexperienced teachers' reflective teaching, a reflective teaching skills model is proposed. To achieve these goals the objectives of this study are:

1. To investigate experienced physics teachers' reflective teaching skills.
2. To investigate inexperienced physics teachers' reflective teaching skills.
3. To compare reflective teaching skills between experienced and inexperienced physics teachers.
4. To identify the ways to improve reflective teaching skills among inexperienced physics teachers.
5. To propose a model to develop reflective teaching skills of inexperienced physics teachers.

1.5 Research Questions

In particular, the research would answer questions that include:

1. What is the level of experienced physics teachers' reflection?
2. What are the characteristics of experienced physics teachers' reflective teaching skills in each level?
3. What is the level of inexperienced physics teachers' reflection?
4. What are the characteristics of inexperienced physics teachers' reflective teaching skills in each level?
5. What are the differences among the reflective teaching skills between experienced and inexperienced physics teachers?
6. How the inexperienced physics teachers' reflective teaching skills can be improved?
7. What kind of reflective teaching skills model can be proposed to develop inexperienced physics teachers' reflective teaching?

1.6 Theoretical Framework

It is widely known that John Dewey is considered as the founder of reflection. The thought of Dewey as the main inventor of the reflection's concept is not disputed in the reflection literature (Valli, 1992; Hatton and Smith, 1995; Carson

and Fisher, 2006). Dewey (1938) emphasises that reflective thinking needs "the continual evaluation of beliefs, assumptions, and hypotheses against existing data and against other plausible interpretations of the data." Dewey additionally mentioned that "experience has to be formulated in order to be communicated." Altogether, in performing so, one should have a value's attitude to bring profits for oneself and other in addition. For Dewey (1938), rational theory and investigation was in fact a reflective process' generalization in which we all are connected infrequently. As Dewey mentioned, the general reflection theory, which is against its concrete implement, emerges when chances for reflection are so irresistible and so jointly conflicting that precise sufficient reply in thought is choked-up. Once more, it demonstrates itself when sensible issues are so assorted, complex, and distant from control that thinking is withstand from winning passage into them (Dewey, 1976, p. 300). Dewey's reflective thinking theory is significant due to its frequent assistance a learner to achieve any knowledge from experience.

Donald Schön has significantly affected reflection in teacher education. He has been helpful in proposing a basis for our knowledge of reflection. While Dewey proposed the basis for reflective thinking, Schön laid the reflective practice basis (Spalding and Wilson, 2002). The requirement for professionals to be reflective practitioners was highlighted by Schön (1983). He specially applied this requirement to teachers. He focused on the senior practitioner or coach critical role (i.e. the supervising teacher), considering that coaches in a reflective practicum do not basically view performance to notice errors or indicate exact processes, but rather "emphasise indeterminate zones of practice and reflective conversations" (p. 40).

To expand a model for investigating the participants' reflective practice in the study, many researchers have developed theories on the pre-service and practising teachers' reflective tendencies. Most researchers normally recognize three reflection levels, which extracts from an event's simple descriptions, regularly considering and focusing on teaching technical aspects , such as content delivery of or management of classroom, to consider the teaching problems where alternative viewpoints are investigated considerately, resulting new problems that may be resolved (Edwards-Groves and Gray, 2008). Each shows general parts of reflective practice – a first

preoccupation with useful anxieties of teaching leading to an investigation for reasons to describe actions and, at last, to visualize substitute courses of action with a superior concentration on student learning.

Among the various approaches to measure reflection, Van Manen (1977) presumed as first by suggesting a hierarchical model (Davis, 2006). Van Manen's (1977) three-level hierarchical model has been used extensively by teacher educators or drew to reconstruct new frameworks or typologies to measure reflective thinking (Davis, 2006). Van Manen's framework focuses on pre-service teachers' reflective practice that in this study is adopted to identify the level of experienced and inexperienced physics teachers' reflective thinking. According to Van Manen (1977), teachers must be able to apply a variety of techniques to the curriculum and to the teaching-learning process so that a predetermined set of objectives can be brought to fruition efficiently and effectively. He adds that teachers should also be concerned with making educational experiences and actions visible to other teachers, learners, and the other participants of the curriculum process. In order to achieve this goal and to make practical decisions, educators must be aware of alternative theories and/or the underlying assumptions, principles, and premises of knowledge.

Reflective teaching became a popular aspect of teacher development in the early 1980s (Bartlett, 1990, p. 202), though it can be traced to commentaries made by Dewey (1933), who referred to teachers as reflective practitioners and as professionals who could be active in developing curriculums and reforming education (Zeichner and Liston, 1996, p.8). Dewey (1933) see reflective teaching as improving teaching through individual recollection of past experience and evaluation of that experience. Rather than receiving a direct comment on one's practice from another person, it is effective in that one has the opportunity to recollect the practice and to self-evaluate it. This gives them the chance to become more aware and be responsible for its consequences.

Most of beginning teachers have a usual innate reflection on teaching practice features and their concentration is on solving special problems dilemmas in special teaching session. The evaluation forms of lesson helps them to recognise the strength

and weakness of the teaching session to improve their work by generating changes or recognizing what they can experience in the next teaching session. This kind of reflection takes them away from a technical reflection assumption which they do in their work. Van Manen (1977) pointed out; ethical and political dimensions of educational goals and consensus about their results which are critically reflected by teachers are the uppermost critical level of reflective practice. Dymoke and Harrison, (2008) recommend reflective teaching skills such as observation, communication, judgment, decision making and team working in the teaching classes to help teachers specially inexperienced ones in their practices.

Within a teacher education programme, reflection at Van Manen's three levels can be promoted in a variety of contexts. In this study, the three levels of Van Manen used to see the differences between experienced and inexperienced teachers' reflective teaching skills in different levels of reflection. In developing teachers' reflective teaching skills, the reflection and reflective teaching theory of Dewey (1933) was adopted to design a reflective teaching skills model to improve inexperienced physics teachers' reflective teaching.

1.7 Conceptual Framework

According to Lester (2005), a research framework is "a basic structure of the ideas that serves as the basis of phenomenon that is to be investigated" (p. 458). The research framework of this study is constructed based on the purpose and research questions of the study, as shown in Figure 1.1.

The conceptual framework reflected the skills of reflective teaching variable to be used in this study, namely observation, communication, judgement, decision making, team-working (Dymoke and Harrison, 2008) among experienced and inexperienced physics teachers in three levels of reflection.

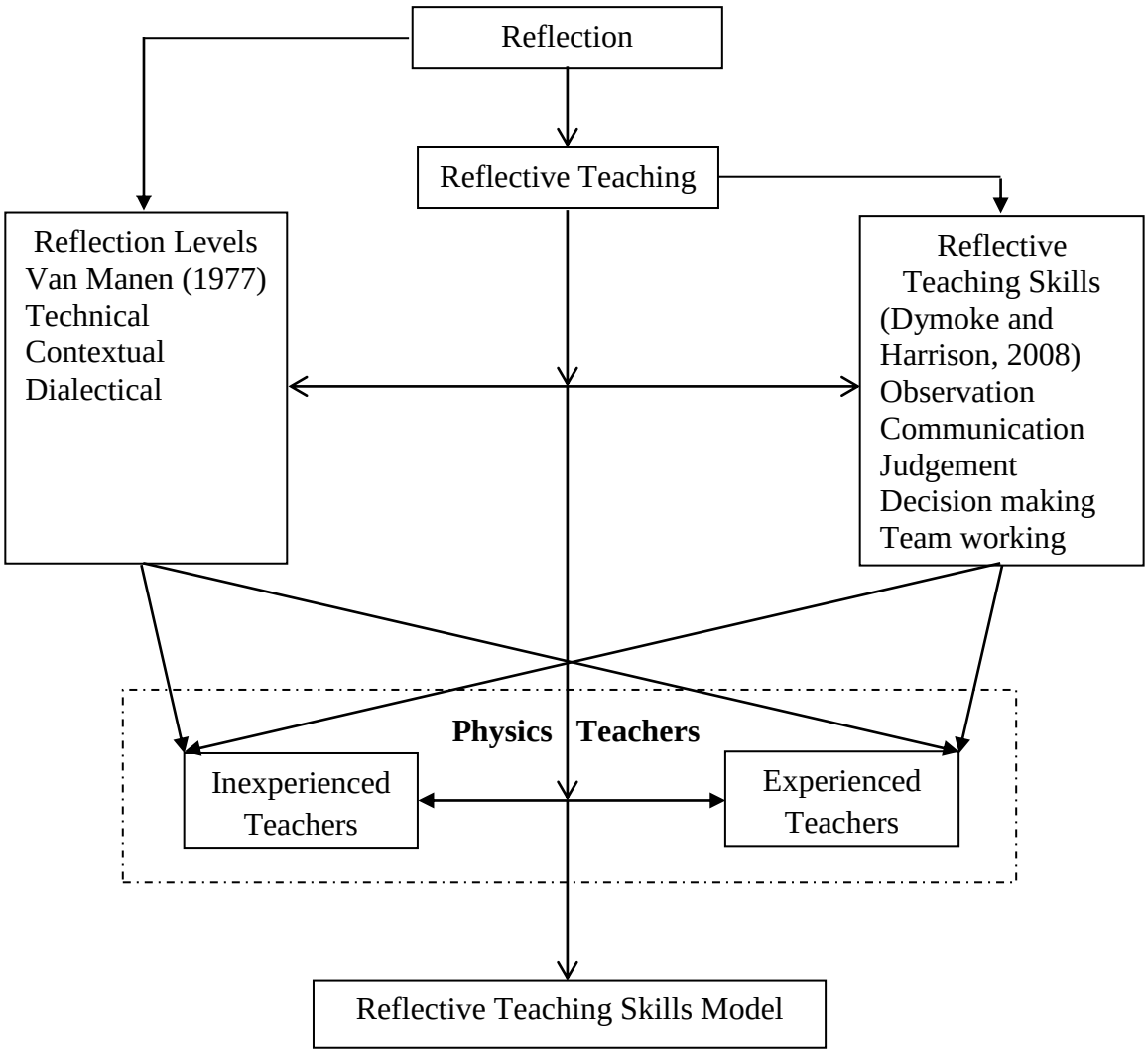

Figure 1.1 Conceptual framework of the study

In this study, different levels of reflection for experienced and inexperienced physics teachers are identified. Based on the differences of reflective teaching skills in different levels for experienced and inexperienced teachers, a reflective teaching skills model is proposed as alternative teaching approach. In this model, the advantages of experienced teachers' reflective thinking characteristics are considered to improve inexperienced teachers reflective thinking.

1.8 Concept Definitions

In this section, the concept definition of terms used in the context of this study as following:

(i) Experienced Teachers and Inexperienced Teachers – In this study, a teacher with more than 7 years classroom teaching experience is called experienced teacher and a teacher with less than 7 years classroom teaching experience is called inexperienced teacher (Curtis and Szestay, 2005).

(ii) Reflection - Dewey (1933) initially introduced the reflection concept; he initiated the proposition that teachers must be motivated to turn into considerate and notify students of education, and discussed that teachers should pursue to raise in reflection.

(iii) Reflection Levels - Van Manen (1977) stated that the degree of reflective thinking is categorized into three levels: technical, contextual, and dialectical level that increase from first level to third level.

(iv) Reflective Teaching - Dewey (1933) see reflective teaching as improving teaching through individual recollection of past experience and evaluation of that experience.

(v) Reflective Teaching Skills - In this study, observation, communication, judgment, decision making, and team working are applied as reflective teaching skills. According to Dymoke and Harrison (2008), these skills are important for good practitioner, professional competences and are applicable to all stages of teacher learning, including initial teacher education.

(vi) Reflective Teaching Characteristics – In this study reflective teaching characteristics such as portfolio, journaling, recording, peers conversation and co-teaching are kind of activities, tools or ways that promote teachers' reflective teaching skills (e.g., Richert, 1990, Arredondo and Rucinscki, 1994; Stiler and Philleo, 2003; Minott, 2005; Taggart and Wilson, 2005; Maarof, 2007, Dymoke and Harrions, 2008; Rosaen, et al., 2008; Aranega, et al., 2010).

1.9 Summary

This chapter gave the background of the study where the importance reflective teaching and using reflective teaching skills and reflective teaching characteristics to improve physics teachers' reflective teaching. It also discussed about the ways that researchers try to help teachers to become reflective teachers by supporting their reflective teaching. Knowing the characteristics of reflective teaching and skills that experienced and inexperienced physics teachers used in different levels of reflection and comparing between them can be used to find the ways of developing teachers' reflective teaching especially for inexperienced physics teachers.

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