

**IMPLEMENTATION OF *LESSON STUDY* AS AN INNOVATIVE
PROFESSIONAL DEVELOPMENT MODEL AMONG
MATHEMATICS TEACHERS**

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MATHEMATICS TEACHERS**

by

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PERLAKSANAAN “*LESSON STUDY*” SEBAGAI SATU MODEL INOVATIF PERKEMBANGAN PROFESIONAL DALAM KALANGAN GURU MATEMATIK

ABSTRAK

Kajian kualitatif ini meneroka pelaksanaan “*Lesson Study*” sebagai satu model perkembangan profesional guru Jepun yang berciri “*teacher-directed*” dan pendekatan “*bottom-up*” dalam konteks pendidikan di Malaysia. Kajian ini bertujuan menjawab tiga soalan kajian: (i) bagaimana *lesson study* mempengaruhi pengetahuan kandungan pedagogi guru matematik? (ii) bagaimana *lesson study* mempengaruhi amalan reflektif guru matematik? dan (iii) apakah faktor-faktor berasaskan sekolah yang menyokong atau menghalang pelaksanaan *lesson study* dalam konteks pendidikan di Malaysia?

Kaedah kajian kes telah digunakan dan melibatkan dua buah sekolah menengah di negeri Kedah. Setiap sekolah mewujudkan satu kumpulan *lesson study* sebagai satu kes. Kes A terdiri daripada 9 orang guru matematik manakala kes B mempunyai 8 orang guru matematik. Peserta dari kedua-dua kes melibatkan diri dalam proses *lesson study* selama 12 bulan. Dalam setiap kitaran *lesson study*, para peserta dikehendaki secara kolaborasi merancang, berbincang, mengajar, membuat pemerhatian dan refleksi terhadap suatu pengajaran yang khusus. Atas pelbagai kekangan, kes A hanya dapat menjalani tiga kitaran *lesson study* manakala kes B mampu menjalani dua kitaran di akhir kajian ini. Pengumpulan pelbagai sumber data telah dibuat melalui temu bual yang mendalam, pemerhatian, perbincangan kumpulan dan refleksi serta penulisan jurnal para peserta.

Penganalisan data kualitatif menunjukkan bahawa pembentukan kumpulan *lesson study* telah memberikan peluang dan ruang yang menggalakkan untuk para

peserta berkolaborasi, berbincang, berkongsi pengetahuan dan pengalaman mengajar mereka. Seterusnya, peserta menyatakan bahawa pengetahuan kandungan dan pengetahuan kandungan pedagogi mereka telah dipertingkatkan. Mereka menjadi lebih reflektif dan cenderung untuk memupuk penyertaan pelajar secara aktif dalam pengajaran mereka. Walau bagaimanapun, darjah peningkatan adalah bergantung kepada sikap dan komitmen peserta terhadap profesyen perguruan.

Oleh kerana *lesson study* merupakan satu budaya baru yang berkait dengan pembelajaran guru, maka pelbagai kekangan dan cabaran telah dihadapi semasa pelaksanaan *lesson study*. Di peringkat mikro, terdapat tiga kekangan iaitu masa, beban kerja guru dan persepsi terhadap pemerhatian pengajaran. Di peringkat makro pula, kajian ini mengimplicasikan dua cabaran utama: (i) kurang kesedaran guru terhadap perkembangan profesional, dan (ii) budaya yang berorientasikan peperiksaan dalam sistem pendidikan. Sungguhpun demikian, apabila dibekalkan dengan faktor-faktor sokongan yang mencukupi seperti sokongan positif daripada pentadbir sekolah, ketua kumpulan yang komited dan berdedikasi serta keakraban pasukan *lesson study* yang kuat, maka *lesson study* boleh dilaksanakan dengan berjaya sebagai suatu bentuk pembelajaran professional guru yang efektif dan inovatif.

IMPLEMENTATION OF *LESSON STUDY* AS AN INNOVATIVE PROFESSIONAL DEVELOPMENT MODEL AMONG MATHEMATICS TEACHERS

ABSTRACT

This qualitative study explored the implementation of *Lesson Study*, a kind of teacher-directed and bottom-up approach of Japanese model of teacher professional development in the Malaysian education context. It seeks to answer three research questions: (i) how does lesson study influence mathematics teachers' pedagogical content knowledge? (ii) how does lesson study influence mathematics teachers' reflective practice? and (iii) what are the school-based factors that support or hinder the implementation of lesson study in the Malaysian education context?

The case study method was employed involving two secondary schools in the state of Kedah. Each school set up a lesson study group as a case. Case A has 9 mathematics teachers while case B has 8. The participants of both cases engaged themselves in the lesson study process for a period of 12 months. Each lesson study cycle required the participants to collaboratively plan, discuss, teach, observe and reflect on a particular lesson. Due to various constraints, at the end of this study, case A conducted three lesson study cycles while case B only two cycles. Multiple data sources were gathered through in-depth interviews, observations, group discussions and reflections as well as participants' journal writing.

Analysis of the qualitative data indicated that the lesson study group setting has provided an encouraging opportunity and venue for the participants to collaborate, discuss and share their teaching knowledge and experiences. Consequently, the participants expressed that their content knowledge and pedagogical content knowledge were enhanced. They became more reflective and keener in promoting

active student participation in their lessons. Nonetheless, the degree of enhancement is dependent upon each participant's attitude and commitment towards the teaching profession.

As lesson study was a relatively new culture of teacher learning, various constraints and challenges were encountered in implementing the lesson study. On a micro level, there were three constraints, namely time, teachers' workload and the perception of teaching observation. On a macro-level, this study implied two main challenges: (i) the lack of teachers' awareness of professional development, and (ii) the examination-oriented culture rooted in the education system. However, when provided with sufficient supporting factors such as positive support from the school administrators, committed and dedicated group leader and strong collegiality among the lesson study team, then lesson study could be successfully implemented as an effective and innovative mode of teacher professional learning.

CHAPTER 1

INTRODUCTION

Based on widely-held belief and perception that improving teachers will then improve teaching practices, professional development has become one of the main agendas in educational reforms. To improve mathematics teaching, it is sensible to improve teachers as *“teachers are key figures in changing the ways in which mathematics is taught and learned in schools”* (NCTM, 1991, p. 2). More importantly, high quality forms of teacher professional development are linked to improve students’ achievement (Garet, Porter, Desimore, Birman, & Yoon, 2001).

Although professional development encompasses a wide ranging domain, review of the literatures stressed great importance to improve teachers’ pedagogical content knowledge and reflective practice. According to Shulman (1986), pedagogical content knowledge is *“the ways of representing and formulating the subject that make it comprehensible to others”* (p. 9) while reflective practice is vital and imperative to enhance teachers’ knowledge in the context of teachers’ learning (Ball, 1996). The enhancement of teachers’ pedagogical content knowledge and reflective practice would certainly improve their teaching practices in the classroom.

For this reason, it is important to review and analyse the effectiveness of professional development programmes being conducted in Malaysia. As Guskey (2000) stated, *“Many conventional forms of professional development are seen as too top-down and too isolated from school and classroom realities to have much impact on practice. As a result, hoped-for improvements are seldom realized”* (p. 3).

1.1 Statement of the Problem

Reforms in curriculum and educational policies are aimed to overcome deficiencies and weaknesses as well as preparing the nation to face global challenges in the future. Malaysia, a developing nation has been revamping and reviewing educational policies to strive a higher level of educational standard. The *New Primary School Curriculum* (Kurikulum Baru Sekolah Rendah [KBSR]) implemented in 1983, which then followed by the *Integrated Secondary School Curriculum* (Kurikulum Bersepadu Sekolah Menengah [KBSM]) in 1989 are aimed to promote active student participation in learning. This is in tune with the research evidences and recommendations on effective teaching and learning strategies. Subsequently in 1997, the *Smart School Project* (Projek Sekolah Bestari) was launched to put more emphasis on the application of Information Communication and Technology [ICT] in teachers' pedagogical practices. In 2003, the Ministry of Education [MOE] implemented the policy of English language for teaching science and mathematics subjects and this is aimed to prepare the nation in facing global challenges in the future. These reforms showed the MOE has been working tirelessly to uplift the education standard to a higher level.

However, in the context of mathematics education, the *Trends in International Mathematics and Science Study 2007* [TIMSS 2007] revealed a decline of students' achievement in mathematics compared to TIMSS 1999 and TIMSS 2003. Based on the Form 2 students' mathematics achievement, Malaysia is ranked at 20th position from 59 participating countries (Mullis, I.V.S, Martin, M.O., & Foy, 2008). This was a setback compare to 16th and 10th position attained in TIMSS 1999 and TIMSS 2003 respectively. The TIMSS 1999 report disclosed the mathematics teaching in Malaysia is mainly teacher-centred and instructions are usually delivered via lecture

approach. This international comparative study also highlighted that mathematical reasoning and problem solving activities, though emphasised in the curriculum were rare in actual teachers' teachings while homework were given great emphasis (EPRD, 2000). Prior to this study, the findings of *Teaching and Learning of KBSM Mathematics Study* (Federal Inspectorate of Schools [Jemaah Nazir Sekolah Persekutuan], 1994) also revealed similar trend of teachers' teaching. In addition, it evaluated the teachers' teaching as follows: Good - 38.8%, Average - 50.5% and Weak - 10.7%. The report deduced that the mathematics teachers are yet to be competent in their basic teaching techniques although the knowledge and skills should have been acquired during their teacher education programme. Among the weaknesses of the teachers' teaching highlighted are: (i) questioning techniques were not effective to stimulate students' thinking, (ii) students were rarely encouraged to question and voice their opinion, and (iii) problem solving activities were not systematically and effectively conducted. Overall, the report concluded that the mathematics teachers' teaching could not be rated as satisfactory.

In the past two decades, research in mathematics education has been consistently upholding the constructivism philosophy and problem-solving strategies as the main pedagogical approaches. Although these were advocated in the Malaysian mathematics curriculum, practising teachers are yet to be close in demonstrating such pedagogical practices. Despite the in-service programmes and courses conducted, teachers were found to practise the mainly traditional teaching methods in the classroom. For instance, Lim, Fatimah and Tan (2002) revealed that *drills and practice* and *memorization* approaches are commonly employed in mathematics teaching.

Hence, making change to teachers' teaching seemed to face a strong challenge. However, this trend or phenomenon was not confined to Malaysia as other countries were also experiencing similar outcome. *"It may surprise some people to learn that we have a quite consistent, predictable way of teaching mathematics in the United States and that we have used the same basic methods for nearly a century"* (Hiebert, 1999, p. 11). Taking this cue, it would be a real challenge to change teachers' teaching as other factors such as teachers' beliefs and their teaching conceptions are also needed to be tuned towards the visions and goals of the curriculum reforms. These scenarios illuminated some of the constraints and challenges pertaining to the mathematics teaching in the classrooms.

Consequently, one of the major issues addressed in educational reforms is the teachers' quality and this is close related to teacher professional development. To overcome the deficiencies and weaknesses of teachers' teaching, the MOE has been conducting various in-service programmes and courses with the aim to improve teachers' teaching knowledge, skills and competency. It is a widely-held perception and belief that this would impact on teachers, and in turn change and enhance their teaching practices. However, this notion is not necessarily true based on the reports and research findings. Noor Azlan (1987) disclosed the discrepancy of the Modern Mathematics Programme implemented in relation to the intentions of the curriculum developers. He revealed that the activity-based, student-centred and guided-discovery approach advocated in the secondary school mathematics curriculum was replaced with mainly teacher-centred and *"chalk and talk"* approach in the actual teachings. Similarly, Poon (2004) exposed a significant difference between the intention of the curriculum developers and the actual mathematics teaching in classroom. Based on a qualitative case study involving four Form 4 mathematics teachers, she deduced that

the constraint was due to the teachers' attitude as they were not aware of the changes and development in the mathematics curriculum. Nonetheless, she disclosed that the information was not conveyed effectively to the teachers concerned by the curriculum developers.

To address the challenges in educational reforms and curriculum changes, every mathematics teacher ought to seek opportunities and ways to improve his/her teaching practices. According to Nik Azis (2003):

To be effective, mathematics teachers must know and understand deeply the school mathematics they are teaching and able to draw on that knowledge with flexibility in their teaching tasks such as providing explanation, making curriculum decisions, and responding to students. In other words, the teacher must know the substance of school mathematics and know the pedagogical content knowledge (pp. 5-6).

Usiskin (2003) stated that challenges for mathematics teachers would be continuous and inevitable due to the increasing presence of mathematics subject matter, applications of technology and sensitivity to the needs of the learner. It was generally perceived that mathematics teachers who had completed their teacher education programme would have adequate knowledge and skills to teach mathematics. However, the beginning teachers were found to be lacking in teaching knowledge and confidence (Abdul Halim, Nordin, & Hazri, 2002). Many trainee teachers were actually ill-equipped to teach certain topics in mathematics (Wrutheran, 1988). Lee (2003) found that reflective practices by trainee teachers were inadequately implemented as required in the teacher education curriculum. The above reflected some of the shortcomings of the teacher education programmes and research findings have proposed a revamp in the teacher education curriculum to ensure that trained teachers are sufficiently equipped with content knowledge and pedagogical skills to teach effectively (Jemaah Nazir Sekolah Persekutuan, 1994; Abdul Halim et al., 2002).

With regards to the KBSR curriculum, Hussein (1990) found the massive in-service courses conducted were superficial and lack of content-depth. As a result, the teachers were not able to practise the teaching approaches as envisioned in the KBSR reform due to insufficient teaching knowledge. In another study, teachers who have attended the *14-week In-service Smart School Teacher Training* were only rated *average* in their smart-teaching practices which emphasise ICT and innovative pedagogical practices (Lee, Abd. Shukur, Ahmad Nasir Muhamad, Faharol Razi Shaari, & Ku Bahaudin Ku Hashim, 2000). This was consistent to a report by the MOE of the *Smart School Pilot Project* that highlighted the weaknesses of the teachers in pedagogical aspects (Kementerian Pendidikan Malaysia, 2001). In addition, the MOE also provides non-option mathematics teachers in primary schools to undertake the six-week intensive *Mathematics Conversion* course to address the shortage of school mathematics teachers. Such ad-hoc programme actually raised more doubts and concerns because given such a limited time, it would be a tremendous challenge for teachers to acquire sufficient knowledge and pedagogical skills to teach mathematics effectively. To conclude, the in-service programmes conducted may not leave the desirable effect on teachers' teaching. Hence, it is vital to devise, formulate and seek an effective approach of in-service programme that would enhance teachers' teaching.

Lack of continuity and support for the teachers in their professional development were argued to have not produce an effective change in teachers' teaching (Loucks-Horsley, Stiles, & Hewson, 1996). Conversely, it was pointed out that a critical component in any educational reform effort is to provide teachers with opportunities and appropriate support for improvement in pedagogical practice (Darling-Hammond & McLaughlin, 1995; Garet et al, 2001). Hence, it is vital to

analyse the situational context and identify the problems that might have influenced the effectiveness of the in-service programmes conducted for teachers in Malaysia. What are the main sources of problem? How should the in-service programmes be conducted effectively? In other words, is there an alternative approach of in-service programme that is deemed effective to enhance teachers' teaching?

1.2 Issues Related to Teacher In-service Programme

Acknowledging the importance and relevance of in-service programmes for teachers' professional development, the MOE continuously provides teachers with vast opportunities and support to improve teachers' teaching (Ministry of Education, 1996; Wong, 1998; Lee, 2000). These in-service programmes varying from a few days to a year and are usually conducted by various divisions of the MOE such as the Teacher Education Division, state education departments and district education offices. The aims of the in-service programmes and courses are (EPRD, 1990, p. 31):

- to upgrade the academic and professional knowledge of teachers and to widen their experience in various subject disciplines.
- to orientate teachers towards new developments in teaching methods, techniques and curricular programmes.
- to enhance the commitment and motivation of tenured teachers.

In the Malaysian education context, any revamp in curriculum and educational policies often require teachers to undergo some in-service courses and workshops (Lee, 2000). It is aimed to familiarise and update teachers' knowledge related to the demands and changes in the curriculum or policies of the education system (Lourdusamy & Tan, 1992). For instance, in implementing the policy of English language for teaching science and mathematics subjects in 2003, the MOE embarked

a nationwide in-service programme: *English for Teaching Mathematics and Science* [ETeMS] course to support and assist the teachers to be competent in the language.

Nonetheless, one of the issues is regard to the approach of in-service programmes being adopted by the educational authorities. A network of *master trainers* or *key personnel* is created at national and state levels to coordinate the in-service programmes. These trainers are school teachers or lecturers identified and specially trained at national level by the educational authorities. In turn, they conduct the courses and workshops at district and school levels. In norm practices, a teacher from each school will attend the course and on their return to the school, the teacher will conduct the same course content to his/her peers. Due to logistic, time and financial constraint, this approach has been widely adopted but the major criticism is the *information dilution*. This approach was known as the *multiplier effect* and was also coined as *cascade strategy* in the literatures.

Generally, teachers who attend these courses or workshops were expected to acquire them and learn new teaching strategies or receive new curricular materials. On their return to the classrooms, they were expected to implement what they had learned. However, these intended objectives were often neglected or not transmitted by the practising teachers as exposed by Noor Azlan (1987) and Poon (2004). In fact, there is lack of evaluation and research to justify the effectiveness of this multiple-level system approach of teacher professional development. On the contrary, there were evidences such as reports by Hussein (1990), and Lee et al. (2000) to suggest the weaknesses and shortcomings of the in-service programmes being conducted. For this reason, an effective approach of teacher professional development ought to be introduced and formulated to overcome the weaknesses of the in-service programmes.

The literatures and contemporary perspectives of effective professional development (such as Loucks-Horsley et al., 1996; Hawley & Valli, 1999; Elmore, 2002) have proposed that teachers need to be the learners and researchers in their own classrooms. By examining the actual teaching context, teachers develop the teaching knowledge and pedagogical skills that are the goals of teacher professional development. Through teacher collaboration, they share knowledge and experiences pertaining to the teaching and learning in the classroom. The *Standards for the Professional Development of Teachers of Mathematics* outlined by the National Council of Teachers of Mathematics [NCTM] stressed that teachers ought to be part of the learning community that foster the growth in knowledge. Hence, a learning environment should be created for teachers to discuss and analyse the students' learning and work in collaboration with other teachers to enhance their learning (Ball & Cohen, 1999). These provide the opportunities for teachers to interact and reflect as professionals which are the fundamental of teachers' learning. The MOE is aware the significance and importance of teacher professional development and life-long learning for quality education (Ministry of Education, 1996). Therefore, one of the strategies adopted is to promote the teachers to be self-directed of their own professional development and develop a collaborative culture in the school such as the *Buddy System* in the ETeMS course structure. The ultimate aim is to improve the quality of teachers' teaching that hold the key for effective students' learning. Looking to the East, one of the Japanese approaches of teacher professional development, *Lesson Study* has in the late gaining popularity in other parts of the world, in particular the United States and some Asian countries. Although lesson study is a practice decades ago in Japan, the attributes of lesson study were found to be consistent and coherent with the contemporary perspective of effective

professional development in the literatures. Taking this cue, the lesson study may provide an alternative and a promising approach to enhance teachers' professional development in Malaysia.

1.3 An Overview of Lesson Study

Education in Japan is envied by many nations following their success in developing a teaching force that is competent, committed and well respected. Despite this recognition, the Japanese Ministry of Education [Monbusho] is not resting on its laurels and has been continuously sought ways to improve the educational standard. In Japan, the in-service programmes for teachers are given vast attention for teacher professional development and there are five main types (Sato & Ushiwata, 1990; Beauchamp, 1991; Shimahara, 1998). One of the in-service programmes that is organised and conducted by the teachers themselves as study groups at the school or district level to improve their teaching competency is the "*kenkyuu jugyou*," literally means "*lesson study*" or "*research lesson*." The main purpose of lesson study is to enhance teachers' pedagogical knowledge and skills through peers' review, criticism and collaboration among teachers (Shimahara, 1998).

In Japan, teachers would engage in a relentless manner and continuous process to improve their teaching practices by participating in lesson study process (Stigler & Hiebert, 1997; Shimahara, 1998; Lewis & Tsuchida, 1998; Stigler & Hiebert, 1999; Yoshida, 1999; Lewis, 2000). A survey on lesson study conducted by Murata and Takahashi (2002) involving 125 elementary school teachers in Tokyo and its surrounding area revealed that over ninety percent (91.3%) of the respondents regard lesson study as the most effective form of teacher professional development.

Lesson study is an on-going practice in many of the elementary and junior high schools throughout Japan (Fernandez & Yoshida, 2004). Japanese teachers used the lesson study process to systematically examine their teaching with the aim and goal of becoming more effective (Lesson Study Research Group, 2007). In Japan, the lesson study process begins with a small group of teachers examining the educational goals of their school and the educational needs of their students. These teachers develop a “research lesson” based on these goals and then present the lesson to their students. The other members of the group observe this lesson and make notes of students’ learning. Often, a person outside the lesson study group, known as *outside observer* or *knowledgeable other* may be invited to share his/her expertise when commenting on the lesson. Later, the teachers discuss how the lesson impacted on students’ learning and make revision where necessary. The process is repeated and subsequently, published as a resource for other teachers. In the lesson study process, teachers work together to (Fernandez & Yoshida, 2004):

- Collaboratively planning the study lesson
- Seeing the study lesson in action
- Discussing the study lesson
- Revising the lesson
- Teaching the new version of the lesson
- Sharing reflections about the new version of the lesson

In short, small groups of teachers meet regularly and collaborate to plan, teach, observe, evaluate and revise a lesson. The concept and process of lesson study is simple but it is the teacher-initiated or self-directed of the teachers that makes it unique and differ from the other types of professional development (Wang-Iverson,

2005). Due to its long history in Japan, teachers have well adapted lesson study as part of their teaching profession and culture in the school.

1.4 The Emergence of Lesson Study

Although much about educational research and innovations evolved in the West and the United States, there is little doubt that the lesson study originated from Japan. Literatures revealed that the practice of lesson study in Japan was already well established in the 1960s (Fernandez & Yoshida, 2004) but claims were also made that lesson study had actually begun in the late 19th century (Isoda, Stephens, Ohara, & Miyakawa, 2007). The *The Teaching Gap* published in 1999 by Stigler and Hiebert probably sparked the surge of interest on lesson study in the United States. Based on the findings of the *TIMSS Video Study* conducted in 1995 that compared the teachings of mathematics in Germany, Japan and the United States, Stigler and Hiebert (1999) found the Japanese lessons were highly rated in three aspects: (i) mathematics content, (ii) coherence and connections of contents, and (iii) students' thinking and reflection during the lesson. This book highlighted that the Japanese structure of teacher professional development: *Lesson Study* has contributed much to the significant improvement of mathematics teaching in the classroom. In 1999, Makoto Yoshida presented his dissertation in the United States about a lesson study group in Hiroshima, Japan probably had also stirred some interest. Another researcher, Catherine Lewis was exposed and wrote some articles about lesson study while doing her research work in Japanese schools in the 1990s. These developments may have contributed to the lesson study development in the United States.

In 1999, Fernandez and Yoshida guided the first lesson study group at Paterson School No. 2 in New Jersey while Lewis also began lesson study work at

San Mateo-Foster City School a year later (Lewis, 2002). Within three years of its inception, lesson study groups had emerged in at least 200 schools and across 25 states in the United States (Lesson Study Research Group, 2004). While lesson study in the United States were mainly school-based research project initiated by groups of teachers and researchers, the Lesson Study Project in Australia for mathematics teachers in 2001 was a state-wide government secondary schools initiative conducted by the New South Wales Department of Education and Training (White & Southwell, 2003). In Thailand, the Lesson Study Project was conducted at province-level by the Khon Kaen University in 2004 (Inprasitha, 2007). As much interest has been generated about the Japanese lesson study, this study is aimed to explore and investigate if lesson study is also feasible in the Malaysian education context.

1.5 Purpose of the Study

The aim of this study was to investigate the influence of lesson study on teachers, specifically the pedagogical content knowledge and reflective practice. Of late, lesson study has been credited in research studies to improve teachers' teaching and for this reason, there is a strong interest to know if such findings and results could replicate in the Malaysian education context. The influence on teachers' teaching could be gauged in two main domains: pedagogical content knowledge and reflective practice as these have been acknowledged to have direct influence on teachers' teaching in the literatures.

Lesson study as an innovation to promote teacher professional development is relatively new to the Malaysian education context. To investigate the influence of lesson study, it is vital that the participating teachers have the authentic experience of the lesson study process as envisioned in the Japanese model of lesson study. To

achieve that, the participants are engaged in a few lesson study cycles to gain and conceptualise the concept and idea. However, due to the differences in the educational system and teaching culture between Japan and Malaysia, lesson study is likely to face constraints and challenges in its course of implementation (as suggested by Chokshi & Fernandez, 2004). Hence, this study also seeks to explore the school-based factors that would support or hinder the lesson study implementation in the Malaysian education context.

1.6 Research Questions

Given these purposes of the study, this research would seek to address the following research questions:

1. How does lesson study influence mathematics teachers' pedagogical content knowledge?
2. How do lesson study influence mathematics teachers' reflective practice?
3. What are the school-based factors that support or hinder the implementation of lesson study in the Malaysian education context?

1.7 Significance of the Study

To date, very little is known about lesson study in Malaysia as it is comparatively new in the literature. However, the rapid growth of lesson study groups and research beyond Japan, in particular the United States have provided ample evidences and promises that lesson study is an effective approach and model of teacher professional development. By engaging the participating teachers in the actual process of lesson study, this study would provide rich descriptions on how lesson

study would influence on teachers' pedagogical content knowledge and reflective practice which would then enhance the teachers' teaching practices. This study would also uncover the constraints and challenges faced in implementing lesson study in the Malaysian schools due to the differences of the educational system and teaching culture. Therefore, this study was significant in a number of ways.

1.7.1 Practising Teachers

The study would expose the strengths and benefits of teacher collaboration that has been alienated in the Malaysian school teaching culture. By providing the opportunity and engaging the teachers to work collaboratively as a team, they would realise that working together brings mutual benefits to one another. Through the lesson study collaboration, the teachers may enhance their content and pedagogical content knowledge. Upon the benefits gained or realised, the teachers will appreciate and be motivated to work together and this could reduce the issue of teachers' isolation in teaching practices.

Through lesson study process, the teachers may enhance their reflective practice with support from their peers. Research studies have acknowledged that reflective practice is the core element in teachers' learning when they discuss students' problems and share their teaching knowledge and experiences. This aspect would help to reduce their teaching problems and consequently, they will appreciate the practice of lesson study in developing as professional mathematics teachers. The benefits gained, in turn would further motivate and encourage the teachers to continue learning for self-development in the teaching profession which ultimately, enhance their teaching practices in the classrooms.

1.7.2 School Administrators

For the school administrators, this study would provide evidences of an innovative and effective model of school-based teacher professional development that has been reckoned in research studies and literature. More importantly, the practice of lesson study could be carried out with little financial budget. The constraints and challenges as exposed in this study would provide valuable guidance and directions to the school administrators to avoid some potential pitfall in implementing lesson study in the school.

This study may generate strong interest from the school administrators in searching an innovative and effective approach of teacher professional development. To date, research and information pertaining to lesson study are mainly drawn from other countries, namely the United States and Japan. The findings of this study may convince and provide confidence to the school administrators that lesson study is indeed relevant and feasible to enhance teachers' teaching in Malaysia. This would spur and encourage them to set up lesson study groups to promote teacher professional development in their schools.

1.7.3 Policy Makers

This study would offer some insights and information with regards to lesson study implementation in the Malaysian education context. The policy makers of the MOE, in particular the Teacher Education Division which is directly responsible and involve with matters pertaining to the in-service programmes would be enlightened from the evidences and findings of this study. Although the lesson study originated from Japan, this study would be invaluable help to the policy makers to review, restructure and refine the model of Japanese lesson study to suit the local context.

This study would provide some supporting evidences and data to convince the educational authorities, in particular the Teacher Education Division that the practice of lesson study is indeed an effective and long term strategy to cope with the demands and challenges in the context of teacher professional development.

This study may also shed some light to the problems and constraints that have been restraining the practising teachers to continue learning for the sake of their self-development in the teaching profession. It is imperative and vital that the educational authorities realise and aware of the contextual problems that have been affecting the effectiveness of in-service programmes being conducted for the teachers' professional development.

1.8 Limitations of the Study

Due to time and contextual constraints at the schools, the intended number of lesson study cycles in this study was not achieved. Hence, the influence of lesson study exerted on the participating teachers may be limited. Lesson study, to a certain extent is viewed as cultural activity and therefore, not all the participating teachers were readily to be involved in lesson study for their professional development. The participants' commitment and participation was also affected by other factors such as their teaching beliefs and conceptions. In addition, the knowledgeable others engaged in this study were not readily to play their role as *qualified expert* due to lack of experience and this actually has affected the degree of influence of the lesson study.

Unlike the practice in Japan, the lesson study cycles carried out were influenced and affected by various contextual factors and constraints in the school. In fact, this study also sought to explore the constraints and challenges in implementing lesson study in the Malaysian education context. As these constraints were part of the

study, the participating teachers have to be persistent psychologically to wade through the lesson study experience. They were recruited mainly on the instruction of the school administrators and this might have influenced and indirectly coerced the teachers. As a result, involuntarily participation was noted particularly at the beginning of the study. However, in retrospect, the method of recruitment of the participants has enhanced the reliability of this study as it better reflects the truthful situation of the Malaysian teachers.

This study employed qualitative research methods in the process of analysing and interpreting the data, and hence researcher bias was inevitable. In addition, the researcher also participated as the facilitator to guide the lesson study process, particularly at the initial stage of this study. To minimise this effect, various strategies were employed to enhance the credibility and trustworthiness of the data collected, and the details will be discussed in chapter 3. This included the familiarity with the sites, long-term observation, member check, and triangulation of methods and data through multiple strategies of data collection: interviews, journal writing and field notes.

1.9 Definition of Terms

Professional development

This refers to the activities that enhance the professional career growth. In the context of teaching, it is the process and activities that are designed and carried out to enhance the professional teaching knowledge, skills and competency of the teachers that in turn, improve the learning of the students (Guskey, 2000).

In-service programmes

These are activities for teachers such as courses or workshops conducted by various educational authorities varying from a few days to a year. The objective is to upgrade and enhance teachers' teaching knowledge and pedagogical skills, usually in relation to the demands of the curriculum or policies in the education system.

Influence

The perceived effect or change on a particular aspect or context. In this study, it refers to the resulting outcomes, namely the teachers' pedagogical content knowledge and reflective practice as a consequence of the intervention of lesson study process.

Lesson study

It is a form of teacher professional development originated from Japan; the school teachers collaborate to discuss and make a lesson plan, to teach, observe, criticise and subsequently, revise the lesson plan. Established decades ago, it is derived from the Japanese word, *kenkyuu jugyou* (literally means *research lesson*) and practised widely in the Japanese schools (Lewis, 2000).

School-based factors

The feasibility of lesson study for teachers' professional development in the school context would be influenced by school-based teaching and learning culture, environment, teachers and school administrations. These factors may support or hinder lesson study implementation in the school.

Contextual factors

The factors that surround the circumstances or occurrence of an event that influence the teaching and learning in the classroom. These factors may encompass mathematics contents, students' ability and teachers' teaching knowledge and skills that have an immediate and direct influence towards the teaching and learning in the classroom.

Knowledgeable Others

Refers to the person invited outside research study who is also present during some stages of the lesson study process. They are generally known as outside observers or invited advisors who came from other academic institutions. According to Fernandez, Yoshida, Chokshi and Cannon (2001), their roles are: (i) to provide a different perspective when reacting to the lesson study work of the group, (ii) to provide information about subject matter content, new ideas, or reforms, and (iii) to share the work of other lesson study groups.

Pedagogical content knowledge

Refers to the synthesis of both content knowledge and pedagogical knowledge with the aim to understand better how certain topics, problems or issues can be arranged, represented and adapted in a form of teaching which take care of the student's interest and ability (Shulman, 1987). According to Ball (2000), it is the interplay of content and pedagogy in teaching that makes useful representations for teaching a specific idea or ways to develop a particular idea. This knowledge is formed through active processing and reflection of the teacher.

Content knowledge

It refers to the amount and organisation of knowledge per se in the mind of the teacher (Shulman, 1986). It is the understanding of the subject matter in a manner as defined by scholars and is also known as subject matter knowledge.

Reflective practice

According to Shulman's (1987) definition, it is "what a teacher does when he or she looks back at the teaching and learning that has occurred, and reconstructs, re-enacts, and or recaptures the events, the emotions, and the accomplishments" (p. 19). In this study, it refers to the act of an individual to think deeply, analyse, question and evaluate either one's own or others' teaching.

Teacher collaboration

The act of a teacher working together with another teacher, or in a group of teachers to accomplish a particular task. Its attributes are mainly based on team-work, cooperation, agreement and consensus among the group members.

CHAPTER 2

REVIEW OF THE LITERATURE

2.1 Introduction

This chapter presents the literature review of this research in four broad areas: (i) background of professional development, (ii) literature of professional development, (iii) lesson study, and (iv) effective teaching. First, the review traces the roots of teacher professional development in some of the countries, namely United States, United Kingdom, Australia, Japan and Singapore. The outlook and perspectives derived are then compared to the teacher professional development in Malaysia.

Next, the literature of teacher professional development is reviewed to provide a broader understanding of its goals and concept. From the historical review, it was realised that various issues concerning teacher professional development had emerged from different countries and changed across different period of time. This was partly due to the ongoing research on teacher learning and professional development that is still evolving to meet the demands in the educational reforms. Furthermore, teaching is a cultural embedded activity and hence, the process is complex in nature (Stigler & Hiebert, 1999). In other words, it is practically impossible to discuss teacher professional development without referring to the actual context of discussion. Nevertheless, research concerns teacher professional development in recent years has shown that there is a consensus on what constitute an effective form of teacher professional development (Darling-Hammond & McLaughlin, 1995; Loucks-Horsley

et al., 1996; Guskey, 1997; Hawley & Valli, 1999; Elmore, 2002). When examined explicitly, it provides a distinctive and clear direction of teacher professional development that is consistent with literature of teacher learning. More importantly, research studies such as by Garet et al. (2001), and Cohen and Hill (2001) showed that effective professional development have significant impact on teachers' teaching that in turn improve students' learning and achievement.

Subsequently, the literature of lesson study is reviewed and in many ways, it was found to be consistent to the principles of effective professional development. Two main attributes of effective teaching: teaching knowledge and reflective practice were also reviewed. Finally, a conceptual framework is formulated to guide this study showing how lesson study process would influence teachers' knowledge, both content and pedagogical content knowledge, and reflective practice.

2.2 Background of Professional Development

2.2.1 The Concept and Goals of Professional Development

According to Dean (1991), the term "professional development" suggests "*a process whereby teachers become more professional*" (p. 5). She also explained that professional development is referred to activities that are aimed to increase some aspects of professionalism of a teacher. More accurately, Guskey (2000) defined professional development as "*those processes and activities designed to enhance the professional knowledge, skills, and attitudes of educators so that they might, in turn, improve the learning of students*" (p. 16).

In fact, there are other terms that have been used interchangeably in the literature to refer to the same meaning and concept of professional development, for examples: in-service training, in-service education and staff development (Dean,

1991; Sparks, 1994; Garrett & Bowles, 1997). Morant (1981) defined in-service education as activities to support and assist the professional development of teachers in the profession while Sparks and Loucks-Horsley (1989) described staff development as those processes that improve teaching knowledge, skills and attitudes of the teachers. Regardless of the term used, the ultimate aim of teacher professional development is to improve the students' learning (Guskey, 1986).

In the 1980s, the interest on teacher professional development grew rapidly (Sparks & Loucks-Horsley, 1989). It was then widely acknowledged that in order to achieve significant change or improve teaching, the central focus must be on teachers. The educational reports such as *Everybody Counts* (National Research Council, 1989) and *Professional Standards for Teaching Mathematics* (NCTM, 1991) have asserted that teachers are the key in educational reforms. These documents also emphasised the significance of teacher professional development in changing teachers' teaching which later led to the emergence of teacher professional development as an important aspect in educational reforms (Guskey, 2000). In the following section, the background and development of teacher professional development in some of the countries is reviewed to provide a broader perspective of teacher professional development.

2.2.2 *Teacher Professional Development in United States*

Despite abundant and overwhelming of research studies and literature, Bernier and McClelland (1989) revealed that teacher professional development in United States actually has a brief history. Although this may surprise many researchers and educators, Corcoran (1995) shared the view. He explained that state education policy makers had paid very little attention on teacher professional development in the past