Chapter 6
Profiling Mathematics Teacher Professional Development in Malaysia

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Abstract This chapter is aimed to provide an insight of mathematics teacher professional development in Malaysia. In general, there exist two strands on what constitute or perceive as teacher professional development in the Malaysian context. On one strand, the education agencies under the Ministry of Education (MOE) conduct in-service courses and workshops for teachers to cater the requirements and changes in the mathematics curriculum. This is meant to ensure that teachers are competent to teach and deliver what is transpired in the curriculum. On the other strand, research-based projects such as action research and Lesson Study have provided some autonomy and empowerment for teachers to dictate their own professional development. Both strands of teacher professional development would have direct or indirect influence towards teachers' teaching. The discussion includes some contemporary issues pertaining to the mathematics teacher professional development. It was observed that generally, teachers show little interest and commitment towards their professional development even though they are aware of its importance in their teaching. The factors are attributed to the over emphasis of examination, administrators' leadership, teachers' skepticism and lack of structural support in school for teachers' professional development. In recent years, the MOE mandated several policies that aimed to put emphasis on teacher professional development such as making it a compulsory requirement for career advancement. There are also efforts to make professional development a school-based programme through teacher collaboration. These would deem more effective and practical in long term as indicated in the research and literatures that promote and support teachers to be self-committed, motivated, and yearning for professional development.

Keywords Professional development · In-service programmes · Action research · Lesson study

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6.1 Introduction

The Ministry of Education (MOE) has been granted approximately one-fifth of the annual budget by the government. This acknowledged the importance of education in driving and moving forward the nation into a developed status. Based on the past and current development, the MOE has been dynamic in introducing and implementing changes to the education system: policy, curriculum, pedagogy, assessment, and teacher education with the aim to improve and uplift the standard of education in Malaysia. The Malaysia Education Blueprint 2013–2025 is the current reform launched in 2013 to transform the landscape of Malaysian education system.

Nonetheless, despite some major changes in recent years, mathematics achievement was nowhere to the standard desired. The performance of mathematics in the Trends in International Mathematics and Science Study (TIMSS) and Programme for International Student Assessment (PISA) was rather discouraging. In fact, local research studies concurred some consistencies with the results. In a study by the Higher Education Leadership Academy of the Ministry of Higher Education that observed 125 lessons in 41 schools across Malaysia, they disclosed that 12 % of the lessons were classified as high standard, 38 % met satisfactory standard while 50 % of the lessons were observed to be delivered unsatisfactory (Ministry of Education Malaysia 2012).

Similarly, the findings of *Teaching and Learning of KBSM Mathematics Study* by the Federal Inspectorate of Schools (1994) also revealed some weaknesses in mathematics teaching. It evaluated the teachers' teaching as follows: Good—38.8 %, Average—50.5 %, and Weak—10.7 %. 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. These reports 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. This reflected some weaknesses in the mathematics teaching that need to be addressed. The MOE is aware that standard of teachers' teaching is much related to teachers' quality. As stated in the McKinsey report (2007), "*no education system can exceed the quality of its teachers.*" Therefore, teacher professional development which is associated to teachers' quality is perceived as the panacea to improve the teaching and learning of mathematics.

6.2 The Mathematics Education Context

This part briefly reveals the education system for readers to grasp and understand the mathematics education context in Malaysia. The education system is perhaps the most unique in the world due to its historical and multicultural background. There exist three types of primary school (Year 1 to Year 6) using similar

mathematics curriculum but differ in the language of instruction: Malay, Chinese and Tamil language. However, the secondary school (Form 1 to Form 6) uses Malay language as the medium of instruction while some private schools may either use English or Chinese language. In short, Mathematics is delivered in three different languages at primary level but at secondary level, Mathematics is taught in Malay language for the national curriculum. Nonetheless, there was a short stint when Mathematics is delivered in English under the policy of Teaching and Learning of Science and Mathematics in English which started in 2003 but ended abruptly in 2012.

Despite the differences in the language of instruction at primary school level, it is vital to note that mathematics teacher education programme for both the primary and secondary school is solely in Malay language except for a brief period under the policy of Teaching and Learning of Science and Mathematics in English. As such, some practicing mathematics teachers, in particular the Chinese and Tamil vernacular primary schools are indeed Chinese or Tamil language option teachers but are assigned to teach Mathematics as one of their teaching subject. In other words, they do not acquire any mathematics teaching knowledge and skills during their teacher education programme. In general, the primary school mathematics teachers are graduates from 27 Teacher Education Institutes in the country which confer Bachelor of Education degree. It was upgraded from diploma status since 2007 in line with the MOE's plan to uplift the teaching profession status. Most of the secondary school mathematics teachers are graduates majoring in Mathematics from public universities. In addition, to address the shortage of teachers in the 1990s and early 2000s, non-education graduates were also recruited after attending a one-year education diploma course despite inadequately trained for the teaching tasks.

One of the main issues in mathematics education from the past till present is the discrepancy between teaching practices in the classroom with the mathematics curriculum. Despite several major reforms in mathematics curriculum, it was generally perceived there was little change in actual teachers' teaching practices. For instance, Noor Azlan (1987) disclosed the mismatch of the Modern Mathematics Programme implemented in relation to the intentions of the curriculum developers. He revealed that the activity-based, student-centered, and guided-discovery approach advocated in the secondary school mathematics curriculum was replaced with mainly teacher-centered and "*chalk and talk*" approach in the actual teachings. The notion of effective mathematics teaching was perceived as traditional whole-class teaching strategies with teachers dominating the classroom interaction (Mohd Majid 1997). Lim et al. (2002) acknowledged that *drills and practice* and *memorization* approaches are commonly employed in mathematics teaching. 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. The above scenario definitely posted a serious concern in the context of mathematics

teaching as teachers seemed not exhibit the intentions and objectives of the mathematics curriculum.

6.3 Mathematics Teacher Professional Development

Beginning 2013, practicing teachers are required to undergo *Continuing Professional Development* (CPD) course at various stages of their teaching career under the Malaysia Education Blueprint 2013–2015 (Ministry of Education Malaysia 2012). While it was mandated as a requirement for promotion to a higher category or grade, it is aimed to update and enhance teachers the teaching knowledge and skills that are essential to their daily teaching tasks. The first 30-h course of CPD, targeted at novice teachers (below 5 years of teaching service) has four main areas: (i) policy and way forward, (ii) planning and teaching, (iii) managing learning and action research, and (iv) professional values. Other CPD courses for higher grades are being formulated and will be implemented at later stages. It is imperative to note that these CPD courses have reflected the MOE's strategic plan to enhance teachers' professional development. Besides, there was a circular issued in 2005 by the MOE which required teachers to undergo seven days of in-service training in a year. However, when the school administrators were given empowerment, there was quite a variation and flexibility of courses and activities carried out which may not necessary relate to teachers' teaching in the classroom.

To assist and support non-option mathematics teachers who are teaching Mathematics in primary schools, the Teacher Education Division (TED) conducts 6-week In-service Mathematics Conversion course from 1998 until 2005. The aim was to equip these teachers with basic mathematics knowledge and pedagogy skills. In a case study involving 16 participants in a teacher education institute to investigate the effectiveness of the Mathematics Conversion course, Wong (2003) revealed that the overall course content was indeed relevant to their mathematics teaching. However, the content course of abacus, calculator, Internet, enrichment, and remedial mathematics activities were insufficient due to lack of time and therefore, the participants were not confident to engage it in their classroom teaching.

In general, mathematics teachers would appreciate any courses or programmes that would assist them to teach mathematics effectively. However, the in-service courses though relevant towards their professionalism but offer little help to improve students' achievement would likely be ignored. For instance, the MOE via the Curriculum Development Division and state education departments have conducted workshops and courses on Geometer's Sketchpad (GSP) and graphic calculators since 1990s to mathematics teachers at various levels, yet to date they rarely attempt or use it to vary their teaching practices. Despite numerous GSP workshops conducted, Kasmawati (2006) surveyed that only 2 % of mathematics teachers use GSP in their classroom teaching. Furthermore in 2004, the use of abacus was introduced to the primary school mathematics curriculum and

subsequently, workshops were conducted to train teachers with regards to the use of abacus in mathematics teaching. A research study by Abd Rahman (2008) revealed that the usage of abacus by mathematics teachers in classroom was extremely low.

In fact, the MOE has been working tirelessly to equip and enhance mathematics teachers' professional knowledge through various in-service courses. Lourdusamy and Tan (1992) classified these courses into three main types of programmes: enrichment, familiarization, and specialization. They noted that the familiarization programmes made the bulk of these courses which is mainly to inform and update teachers' information pertaining to the changes and requirements in the curriculum or policies in the education system. For instance, mathematics teachers were inducted to the *Primary School New Curriculum* since 1983 and the *Secondary School Integrated Curriculum* in 1989 when the MOE revamped the mathematics curriculum. Almost three decades later, the MOE made another major curriculum reform: *Primary School Standard Curriculum* and *Secondary School Standard Curriculum*. In both these curriculum reforms, mathematics teachers were required to attend in-service courses to being informed and update any changes to the mathematics curriculum.

One particular issue that needs to be highlighted is the approach and implementation of the in-service courses adopted by the MOE. A network of master trainers or key personnel is created at national and state levels to coordinate the in-service programmes. Sometimes they designed the modules of training to ensure that the courses will be systematically conducted. These trainers or facilitators are usually lecturers or excellent teachers identified and specially trained by the MOE. In turn, they conduct the courses at state and district levels. In practice, a teacher from each school will be required to attend the course and on his/her return to the school, the teacher will conduct the same content to his/her peers. This approach is known as *cascade strategy* or *multiplier effect* and has been widely adopted due to logistic, time, and financial constraint. One major criticism or weakness of this approach is the information dilution. For example, a two or three-day workshop or course at higher level may be reduced to merely two or three-hour by the teacher at school level. Obviously, the information or impacts received at the lower end are greatly reduced and diluted.

In 1997, the Smart School Project was launched by the MOE to put more emphasis on the application of *Information Communication and Technology* (ICT) in pedagogical practices. The In-service Smart School Course which commenced in 1999 was conducted at 16 teacher education institutes. Mathematics teachers were equipped with a wide range of knowledge and skills on computer hardware, software, networking, multimedia, Internet, and integration of ICT in teaching and learning. This 14-week In-service Smart School Course was funded by the World Bank. A tracer study using questionnaire involved 427 respondents to study if teachers could apply the knowledge and skills acquired during the course to their work in schools. The findings of the study showed that teachers are able to apply the acquired knowledge and skills to prepare and implement in their teaching and learning. On the whole, teachers have positive attitude towards the use of the acquired knowledge. This study concluded that the majority teachers are able to

apply the knowledge and skills in planning and implementing teaching and learning in the classroom (Teacher Education Division 2003).

In a related case study involving 46 participants in one of the teacher education institute, Badrul Hisham (2001) admitted that although teachers' skills in ICT and their readiness to improve their ICT skills were enhanced, the study was unsure how it will impact on teachers' teaching. In another study conducted by Supramaniam (2002) involving 55 participants from 29 schools who had attended the 14-week In-service Smart School Course, it revealed that 58.2 % of the participants did not conduct the course to the school teacher upon their return from the course as required. Although the majority participants agreed that the Smart School Curriculum is positive to promote students' learning more effectively, they claimed that the course curriculum was heavy and hence, they are not willing to train other teachers in their schools. The duration of the 14-week Smart School Course was later reduced to 8 weeks, subsequently to 4 weeks and finally, the course discontinued in 2010.

The Professional Development Course for Malaysian Master Trainers in Mathematics [Master Trainer Development Programme (MTDP)] was a 4-week course. It was jointly organized by the Teacher Education Division and SEAMEO-RECSAM, Penang. The main aim of the course was to provide the master trainers in mathematics the opportunities to be exposed to the various innovative and effective teaching and learning approaches in mathematics and on the innovative use of Information and Communication Technology (ICT) in the teaching and learning of mathematics. The course content was rather comprehensive: (i) issues and trends in mathematics education for the twenty-first century, (ii) effective and innovative teaching and learning approaches in mathematics, (iii) using ICT in teaching and learning of mathematics, (iv) instruction and instructional materials for innovative and effective teaching and learning in mathematics, and (v) assessment for innovative and effective teaching and learning in mathematics. This course was designed for excellent mathematics teachers and Mathematics Heads of Panel of schools. The MTDP programme was however short lived, started in 2002 and ended in 2004.

As mentioned earlier, the Mathematics curriculum made a drastic transform when the medium of instruction was changed to English in 2003. The *English for Teaching Mathematics and Science* (ETeMS) course was embarked nationwide to support and assist the teachers to be competent and proficient in the language. A hefty sum was set aside to develop mathematics teachers' linguistic skills, curriculum materials, laptops, LCDs as well as an incentive of 5 or 10 % to their basic salary every month. However, due to some weaknesses in the implementation, the reverse of the policy was made despite a huge allocation was spent over the years. With regards to the ETeMS course, Noraini et al. (2007) concurred that though the teachers perceived they are professionally prepared to teach mathematics in English, they still need more preparation in overcoming students' difficulties in learning mathematics in English. Although the mathematics lecturers of teacher education institutes showed high level of confidence to conduct in-service courses

in English, there is a need for continuous professional development among them (Ramlah 2003).

To further support the teaching of Mathematics in English, the Mathematics and Science Trainer Training (MaSTT) course was designed to raise awareness of the role of Content and Language Integrated Learning (CLIL) in the teaching and learning of Mathematics and Science in English. The MaSTT was initiated by the Hongkong and Shanghai Banking Corporation (HSBC) in collaboration with British Council and Teacher Education Division of the MOE in 2005. In line with the Teacher Education Division mission to cater for the continuous professional development of teachers and lecturers, the MaSTT programme was expanded to reach a bigger pool of Mathematics and Science trainers. However, the MaSTT programme was also short lived and ended in 2009. Of late in 2013, mathematics teachers were inducted to Higher Order Thinking Skills (HOTS) 3-day course when the TIMSS 2013 exposed the students' weaknesses in mathematical problem solving and thinking skills. Yet again, the cascade strategy was employed due to logistic and time constraint.

On a different note, the MOE seems to shift the approach of teacher professional development towards school-based under the Malaysia Education Blueprint 2013–2025 (Ministry of Education Malaysia 2012). Experience and excellent teachers were appointed as *School Improvement Specialist Coaches* (SISC+) based at district education offices. The SISC+ main tasks are to assist and coach teachers focusing on teachers' delivery and students' learning in the classroom. This project or initiative is at preliminary stage of the implementation.

6.4 Research-Based Teacher Professional Development

Besides the conventional in-service programmes through courses and workshops organized by the MOE agencies, research-based projects either by a group of teachers or individual for professional development is another strand. Action research, Lesson Study, Professional Learning Communities or any self-initiated school-based professional development activities constitute this strand.

Although action research seems to incline a self-initiative effort for teacher professional development, it was actually promoted by the MOE in 1993. Funded by the World Bank, the *Programme for Innovations*, *Excellence and Research* (PIER) was launched to improve four educational areas: innovations in science and mathematics, small and isolated schools, distance education and educational research. Subsequently, the action research programme was reorganized and restructured by the Education Planning and Research Department (EPRD) under the MOE to focus and make effective impact on teachers' teaching and students' learning. To assist, support and promote action research among school teachers, short courses and workshops on action research were regularly conducted. A national level research seminar was held annually since 1993 to encourage teachers to carry out action research and present their findings (Bahagian

Perancangan Dan Penyelidikan Dasar Pendidikan 2008). Since 2001, the EPRD provided some funding to inculcate action research culture among teachers. However, the action research was faced with its own challenges and obstacles. Kim (1997) in a state-of-the-practice review of action research noted several challenges faced by action research teams in the conduct of their projects. She revealed that many small-scale action research projects were often short lived and did not go beyond two to three years. Subahan et al. (2002) conducted a survey to investigate the constraints faced by teachers who attempted to inculcate a research culture in the schools. The study revealed that teachers were lack in their knowledge and skills in action research as well as using it and disseminating the research findings.

To further promote and inculcate action research among teachers, Action Research Course is included as one of the core components in the Bachelor of Education Degree Programme at the 27 teacher education institutes (Chee 2010). However, the main concern of the action research programme is whether it can be sustainably carried out by teachers at the school level. While there has been concerted efforts both in preservice and in-service training to provide teachers with skills and knowledge of doing action research, there remains many challenges to overcome at school level. Motivating teachers remains a key element besides the teachers' workload of administrative tasks that has yet to be resolved. In short, extrinsic motivation may be provided through various incentives by the MOE but it is only through intrinsic motivation and teacher empowerment that the inculcation of the action research culture can be seen.

In recent years, a self-initiative and school-based model of teacher professional development that making its way into the Malaysian scene is Lesson Study. Originated from Japan, Lesson Study as a model of teacher professional development began to gain popularity in the United States since 2000 and thereafter spread to other parts of the world. The growth of Lesson Study should be attributed to research projects led by Prof. Lim Chap Sam of Universiti Sains Malaysia since 2003. Some of the research projects were joint efforts with her colleagues while others with students pursuing their postgraduate studies (such as Goh 2007; Chiew 2009; Ong 2010). These research projects were mainly targeted on mathematics teachers in both primary and secondary schools.

Adopting the model of Japanese Lesson Study, Chiew and Lim (2003) first piloted the Lesson Study with a group of five trainee mathematics teachers who were undergoing teaching practicum in a secondary school. The participants claimed that they gained much confidence and their pedagogical content knowledge was enhanced through Lesson Study process. Encouraged by the positive feedback, as reported in Lim et al. (2005), they initiated a Lesson Study research project in two secondary schools within the same district. The aim was to explore the influence of Lesson Study on mathematics teachers' professional development as well as the feasibility of implementing Lesson Study in the Malaysian context. The findings indicated both positive and negative responses. Among the positive responses were through the group discussions and observing other teachers teach, the participating teachers claimed that they gained and enhanced both their mathematics content knowledge and pedagogical knowledge through their self-reflective practice. In

addition, the participating teachers also expressed that Lesson Study has encouraged a collaborative culture that enhances professional collegial bonds within their mathematics colleagues. Nonetheless, the challenges faced by the participating teachers in implementing Lesson Study were (i) time factor, (ii) heavy administrative workload, (iii) reluctance and shyness to be observed by colleagues, and (iv) teachers' attitude and commitment. In another study, Goh et al. (2007) shared their insights about mathematics teachers engaged in Lesson Study process. Goh taught Mathematics in a Chinese primary school while Tan taught Mathematics in a secondary school. Despite two different contexts, their reflection about Lesson Study was "*It is really not an easy matter to run and sustain Lesson Study but it is worthwhile when we are seeing the result and benefits gained*" (p. 578).

Besides these research projects, two doctoral dissertations (see Chiew 2009; Ong 2010) and one Master degree (see Goh 2007) on Lesson Study were completed. Based on his doctoral study on two groups of eight secondary school mathematics teachers each in two different schools, Chiew (2009) revealed the positive influences of Lesson Study process on teachers' content and pedagogical content knowledge as well as reflective practice. Similarly, Ong's (2010) doctoral study involved ten mathematics teachers in two different schools. Her finding was teachers' questioning techniques were enhanced through the Lesson Study process. Goh (2007) also reported positive outcome from eight mathematics teachers in a school. The study revealed that teachers' subject matter knowledge and confidence in teaching mathematics using English as the medium of instruction were enhanced.

The positive reports from the research projects involving Lesson Study were indeed fruitful when the Teacher Education Division (TED) of the MOE showed strong interest in implementing Lesson Study to improve teachers' teaching. In 2011, the TED selected 289 schools nationwide to carry out Lesson Study in four different subjects: English, History, Science and Mathematics. In the following year, the programme was renamed as *Professional Learning Communities* (PLC) and three other strategies were added besides Lesson Study: *Learning Walks*, *Teacher Sharing Session* and *Peer Coaching*. The PLC programme, monitored by the TED had involved another 107 schools in 2012, 300 schools in 2013 and 394 schools in 2014. Based on the positive outcomes despite several challenges, the TED has been actively promoting the PLC as school-based teacher professional development.

6.5 Implications and Conclusion

Our review thus far indicates that in general, the MOE has acknowledged the importance and significance of teacher professional development to improve teachers' teaching. From our observations, despite the limitation of the cascade strategy, the top-down in-service programmes organized and conducted by the MOE would likely to stay due to time and logistic constraints. Our analysis also suggested that most of the professional development programmes and in-service courses were often short lived due to rapid changes in the mathematics curriculum and education

system. As a result, teachers developed skepticism towards in-service courses that gradually shaped the perception and mindset of the teachers. In addition, the over emphasis on examination in the Malaysian education system is a major issue that yet to be resolved. Consequently, teachers who attend and engage in professional development activities often perceived it as unrealistic and not practical in actual teaching. Moreover, due to situational context, it is difficult to evaluate the effectiveness of any professional development programmes conducted as the nature is rather long term and developmental.

From the evidence-based studies of teacher professional development that relates to effective teachers' teaching and students' learning, Walter and Briggs (2012) summarized the following seven principles of effective professional development: (i) is concrete and classroom based, (ii) brings in expertise from outside the school, (iii) involves teachers in the choice of areas to develop and activities to undertake, (iv) enables teachers to work collaboratively with peers, (v) provides opportunities for mentoring and coaching, (vi) is sustained over time and (vii) is supported by effective school leadership. These principles outlined seem to be consistent with Lesson Study and Professional Learning Communities.

In our opinion, Lesson Study in many aspects is comparable with literatures of effective professional development. In order to encourage and promote Lesson Study as school-based teacher professional development in the Malaysian context, another issue that may arise is the awareness among teachers seeking professional development. The aspects of being voluntary, lifelong learning and self-initiated by the teachers to improve their teaching strategies remain as challenges that are yet to be realized. Hence, more research efforts are needed to explore how Lesson Study could enhance teachers' professional development that ultimately makes an impact on students' learning of mathematics.

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