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SCIENCE TEACHERS' CONTINUOUS PROFESSIONAL DEVELOPMENT: NATURE OF IN-SERVICE TRAINING AND ITS IMPLEMENTATION

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Abstract. Poor performance of Malaysian students in the Trends in International Mathematics and Science Study (TIMSS) and Program for International Students Assessment (PISA) indicated that more efforts are needed to be carried out for improvement. Past studies have shown that the students' performances in the subjects are strongly associated with teachers' content knowledge, pedagogical skills as well as pedagogical content knowledge, implying that teachers play vital roles in ensuring the effectiveness of teaching and learning in the classroom. Recently, many issues related to teachers' attitudes, knowledge and skills have come to light. The fundamental aspect that needs to be addressed is teacher's continuous professional development. This study was conducted to identify the nature of in-service training that Malaysian science teachers attend. A descriptive qualitative research design was employed whereby interviews and document analysis served as the primary means of data collection. The objectives were to find out the nature of in-service trainings offered, the impact of those trainings and the actual training needs that Science teachers require for their professional development enhancement. The findings revealed that there exist mismatch between the in-service training courses that have been carried out and the teachers' actual needs. The repercussions include wastage of time, money and other resources as well as the poor perception of school-based in-service training as being insignificant and of little benefit. However, there were also courses valued by science teachers and have had positive impacts towards improvement of pedagogical skills, knowledge in ICT, and understanding of new policies. There is also an emerging need for ICT-based instruction courses as requisite to approach millennial students in more creative and appealing manner. A guideline to assist school management in planning for impactful continuous professional development courses was also put forward.

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INTRODUCTION

Malaysia is a developing country that aspires to achieve the status of a developed country by 2020. One of the efforts to accomplish this vision is by improving the provision of education. Nelson Mandela once said, 'Education is the most powerful weapon which you can use to change the world'. The statement suggests that the power of educating largely lies in the hand of teachers. Not only are they the role model for students, they are also the ones responsible for a range of teaching and learning activities that would unlock students' mind. Thus, one of the government's efforts to improve education provision is through quality teacher education programs, be it for pre-service or in-service teachers.

In-service training focuses on improving the knowledge and skills of existing teachers, particularly with regard to smart school management, skill and technology, information and communication technology; curriculum management; the transformation of curriculum, assessment and evaluation, as well as the latest pedagogical training and mastery learning. The teachers' role is more than teaching it. They need to be good

managers, counselors, event organizers, planners, facilitators, mentors and role models. Teachers, in short, are expected to have extensive knowledge so that they can equip themselves with knowledge, skills, confidence and so forth. Given the ever changing character of students, needs of learning, technology that supports the provision of education and classroom environment, the in-service training plays crucial role in upgrading and ensuring teacher quality, skills and knowledge.

Professional development is a process for teachers to improve their skills, knowledge and attitude. Professional development also improves competency and efficiency of the teachers in their career. The aim of professional development at school is to supply educators with strong continuous practice throughout their career (Mizell, 2010). Generally, the teachers need to be up to date with recent pedagogy, technology, system and policy of education and other aspects related to the functioning of their jobs. Over the years, science teaching and learning has gone through numerous changes with respect to its medium of

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instruction, assessment policies, the focus of learning, examination, and many other things. The erratic change has somewhat contributed to declining learning outcomes as reported in the recent outcomes of Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA). The purposes of this study are to find out the in-services continuous professional development program at school and the impacts of those programs in their teaching field. Specifically, this study was conducted to fulfil the following objectives;

1. To investigate the nature of the training that the in-service science teachers undergo;
2. To find out how the training has impacted on their professional development; and
3. To find out the in-service teachers' actual training needs.

An understanding of science teachers' problems, dilemmas, triumphs and opportunities are deemed necessary if they are to be helped to improve at the workplace. Also, the researchers felt that more systematic help could and should be rendered for the science teachers to more effective in their teaching.

REVIEW OF RELATED LITERATURE

For teachers, continuous enhancement relating to instructional practices is seen the most crucial professional development aspect. It is generally believed that this skill can be learned through direct training, mentoring and hands-on experiences (Collins, Brown & Newman, 1989). Such activities can provide ample opportunities for the teachers to put the theory they learnt into practice. Lock (1977) suggested that classroom challenges faced by teachers should be given more attention so that information relating to those challenges can further contribute to informed comments leading to better strategies for instructional scaffolding and guidance. Through the said interventions, not only do the teachers' pedagogical knowledge and skills be fostered, but also the classroom challenges they encounter may reduce. Briggs and Richardson (1992) cautioned that the many problems faced by teachers, especially on instructional practices could possibly have been a sign of future conflicts. Similarly, Chan and Leung (1998) advocated that it was necessary to focus on the concerns expressed by teachers, especially novice ones, on school as well as the experiences and challenges they encounter as important aspects to develop.

Teacher Training

As part of ongoing efforts by the Ministry to improve the quality and relevance of education, special education training courses are offered at the Teacher Training Institute or Institut Pendidikan Guru (hereafter known as IPG) and in the Faculty of Education at local universities. The provision of teacher education courses in the institutions are offered for both pre- and in-service teachers, at differing educational levels (Malaysia Education Blueprint, 2013-2025).

Teacher training refers to the processes that teachers undergo in developing and enhancing their pedagogical skills and content knowledge whilst simultaneously shapes their identity as educators. Teachers, however, are expected to engage in continuous, life-long learning activities due to incessant knowledge, environmental and social changes. Teacher training courses are prepared for both pre- and in-service teachers. Pre-service training programs are provided to students who have gone through their matriculation or foundation studies while the in-service training programs are offered to teachers who are currently teaching in schools. The teachers-to-be enroll in the pre-service program at public and private universities as well as IPG. Meanwhile, the in-service training programs are usually carried out in school or at other venues identified by the State or District Education Department.

In pre-service training, trainers will be exposed to theoretical principles and there will be practical for them to practice what they learned and they also have to take an examination (Young, Grant, Montbriand & Therriault, 2001). For in-service training, it could be either formal experiences such as courses, workshop and professional briefing or informal experiences such as in-house training and book review. It is often the case that all teachers undergo both categories of training; the pre-service training involve development of content and pedagogical knowledge as well as basic skills required for them to be able to teach in schools, whereas the in-service training allows for continuous improvement in techniques and strategies related to teaching, assessment of students, managerial knowledge and skills as well as other aspects deemed necessary for effective functioning at the workplace. Occasionally, in-service training involves activities or courses that are more geared towards understanding self and others which may or may not be work-related. Teacher training is a lifetime process and it starts from pre-service and continue until they are in in-service. Therefore, teachers could maintain their professionalism and improve their knowledge, skills as well as teaching approaches.

In Malaysia, there are numerous trainings provided for all academic teachers nationwide. Although the trainings are not restricted to teachers of a specific subject, all eyes are focused on several subjects regarded as critical. Among the subjects include science. The training for science teachers are often divided into three major subjects, namely Physics, Chemistry and Biology (Holman, 2011). However, Holman also revealed that most of science teachers do not teach their main option when they are posted.

Importance of Teacher Training

Training is important in order to achieve specific skills. In order to prepare Malaysian teachers with the relevant knowledge, skills and competencies, they must undergo specialized training. Jamil, Razak, Raju and Mohamed (2011) pointed out that teacher

training is crucial if the country is serious in its effort to enhance the quality of education and in developing sound human capital. Definitely, teacher training can improve teachers' working performance, allow them gain the experiences, build their professional knowledge and prepare them in this globalization era (Saleh & Lokman, 2011).

In addition, from year to year, there are many policy changes and teachers are the ones who execute the school curriculum via the formal education system. Saleh and Lokman (2011) also added that teachers need to be attending training sessions that are in line with current education policy and/or system in order to face the challenges and changes in our education system.

The most important role of a teacher is to teach. Thus, it is important for teachers to improve their knowledge of pedagogy so that teaching and learning process are not humdrum. Therefore, teachers must be able to vary teaching strategies according to the topic they are to teach as well as the learning activities based on the capabilities, interest and motivation levels of their learners. In addition, they must also improve their ability to develop suitable teaching aids that will engage learners and make lessons meaningful and beneficial (Saleh & Lokman, 2011).

Present technological landscape demands teachers to be current with changes and to improve their Information and Communication Technology (ICT) skills. One of the benefits of mastering ICT skills is that a person can complete loads of work within a shorter time span than the traditional methods. Hence, teachers too must attend training that can upgrade and further enhance their basic ICT literacy skills (Mahmud & Ismail, 2010). Mahmud and Ismail (2010) discovered that the majority of teachers had average knowledge on ICT and minimal other possesses basic ICT knowledge.

All aspects of training, in other words, are not only important for teachers' personal development, but also knowledge, but also to make teachers to become skilled, knowledgeable and motivated at work (Malaysia Education Blueprint, 2013-2025).

In-Service Training

In-service professional development programs are designed to provide on-the-job training for teachers of primary and secondary schools in order to continuously improve their academic competencies and professional skills.

Radziah (2013) defines in-service teachers as teachers who have taught for at least three years and have been involved in both academic and co-curricular activities. In-service training is imperative for teachers to improve their professional practices and be current with educational issues so that the services rendered to students and other stakeholders are efficient, effective and up to mark.

In principle, there are two categories of training that the Ministry of Education offers: basic extension courses and courses planned by the school:

Ministry of Education's Basic Extension Course

Basic extension course offerings encompass courses that are aligned with the government policies which must be implemented in schools within a month after the school's representative attended the training (Salleh & Mohamad, 2012). The courses are usually organized by the State Education Department or *Jabatan Pendidikan Negeri* (hereafter referred to as JPN) and District Education Office or *Pejabat Pendidikan Daerah* (hereafter referred to as PPD), tend to be centralized and are often conducted at government premises (*Bahagian Pendidikan Guru*, 2012). School representatives are required to conduct subsequent training in schools as soon as possible to avoid weakening of knowledge. Also, all training sessions must be recorded and documented. Examples of such courses include Literacy and Numeracy Screening (LINUS), School Based Assessment, and One Student One Sport program, just to name a few. For functional courses, the principal or headmaster is responsible to ensure all the staffs get the training and gain full information.

Courses Planned by the School

In addition the basic extension courses, professional development activities are also carried out in schools. Due to the huge number of teachers currently servicing Malaysian schools, the Ministry of Education has empowered and made it compulsory for individual schools to carry out the professional development courses in schools. These school-based courses are implemented in a manner that does not affect the teaching and learning sessions. The courses may be carried out with the support JPN or PPD, or they can be organized and planned by the school administrators based on training needs analysis (TNA) (Salleh & Mohamad, 2012).

Once the training needs of the teachers in a particular school have been identified, the school is then expected to plan, implement, observe, evaluate and record the implementation of school-based training programs (popularly known as *Latihan Dalam Perkhidmatan* or LADAP) periodically. After each training conducted, reports need to prepared and documented for audit purposes. The nature of professional development programs that have and are being carried out in schools include courses, workshops, professional briefings, and seminars. The duration for these in-house trainings varies between one day (for a six-hour training) to several weeks depending who organize them. Some common LADAP programs include:

Briefing and Professionalism Talk

The briefing and talk must be planned, implemented, observed and recorded by the organizer.

Book Review

This activity is for teachers who do not meet enough training hours. For the book review, Teachers need to read an educational book and present its content in a sharing-session in school. Each presentation is equal to one day of training. Like other training

sessions, the presentation must be planned in advance. All these must be recorded and a report should be submitted for record keeping.

E-Learning

This school-based self-learning activity allows enhancement of individual teacher's competency. Those who choose this activity also need to plan, implement, give training feedback, report and record the entire learning session.

Short (four hours or less) Training

The training can be scheduled and carried out on weekdays. It is often conducted by teachers who underwent the basic extension course or other centralized CPD training outside of school. The main purpose is to disseminate knowledge and information acquired in the earlier course to their colleagues via in-house training.

Long (more than four hours) Training

It refers to program organized either by the school management or other organization. Often, trainings are carried out on Saturdays. Each of these programs usually takes more than four hours to teacher to achieve the objective of the program.

Sharing Session in Meetings

The sharing-session is considered as one training day if it takes six hours to complete. All CPD implementation mechanisms stated above are coordinated by the Teacher Education Division (TED). This decision of TED acting as coordinator for the implementation of training in-service trainings was documented and endorsed on 22 August 2007 in a Special Council Professional Meeting (Bahagian Pendidikan Guru, 2012). Accordingly, all training record keepings like the training attended by a teacher, duration of program attended, and other related information must be submitted to TED.

METHODOLOGY

This study employed the descriptive qualitative research design whereby data was obtained via the use of interview and document analysis. Since the aim of the study is to provide thick descriptions of the nature of training, the impact of training and the actual training needs that in-service science teachers undergo and require, it is only apt that qualitative research design is used because it allows for the acquisition of rich data and information. A set of guidelines on what should be asked to the research participants were prepared before the interview process begins. The target population is science teachers in secondary schools around the state of Selangor. This research used purposive population sampling. Data was obtained from a total of twenty science teachers who were willing to participate in the study. All interviews were audio recorded, and later transcribed for analysis purposes.

FINDINGS AND DISCUSSION

In this section, the discussion focuses on the three objectives outlined earlier.

- a) The nature of in-service programs that science teacher attended

As previously mentioned, the main goal of continuous professional development (CPD) practices is to improve teacher quality (Greene, Lubin, Slater & Walden 2012; Halim, Osman & Meerah, 2004) via enhancing their competencies across all knowledge and practical aspects of teaching in schools. The study found science teachers have to attend varying programs organized by the school, the Ministry of Education or other independent parties. The following are the programs that the research participants attended:

TABLE 1
Continuous Professional Development Programs Attended

Organizer	Programs
JPN/PPD	<ul style="list-style-type: none"> • Kursus Transformasi Penggunaan ICT dalam pembelajaran dan pengajaran (Transformation Course Use of ICT in learning and teaching) • Taklimat Pentaksiran Berasaskan Sekolah (PBS) (Briefing on School-based Assessment) • Pelan Pembangunan Pendidikan Malaysia (Education Development Plan Malaysia) • Pedagogi/Dasar – dasar Pendidikan (Pedagogy / Basic - Basic Education) • Integriti Dalam Perkhidmatan Awam (Integrity in Public Service) • JSU-I-Think / HOTS • Transformasi Dalam Pendidikan (Transformation in Education) • I-THINK seminar • Team –building • Pengajaran dan pembelajaran Berkesan (School of Management and IT) • Pengurusan Sekolah dan IT • Lawatan Penanda Aras ke Bandung (Benchmarking Visit to Singapore) • Bengkel Bina Upaya Guru (Workshop on Capacity Building of Teachers) • Bengkel Seminar Keibubapaan (Parenting Seminar Workshop) • LADAP – Ketahanan Fizikal (LADAP - Physical Security) • Perhimpunan Rasmi Hari Isnin (Official Rally Monday) • Komunikasi Berkesan (Effective Communication) • Kursus 'Filing' (The course 'Filing') • Halatuju kerjaya guru (The Direction of a Teacher's Career) • Sukaneka Sekolah (School Sports) • How to teach effectively

Based on the listed courses attended, it can be noted that courses are generally meant to address science teachers' general need for better functioning in schools. However, there were not clear indications that specific trainings leading towards significant enhancement of science teaching repertoires such as enhancement of science content knowledge; safety, health and laboratory management; contextual and inquiry based teaching approaches; authentic assessments for science learning, just to name a few, are offered.

In fact, general knowledge like courses on understanding millennial learners, how to overcome stress, managing emotional intelligence and other people and situational-related knowledge that can help teachers to manage self and others better were also missing. Furthermore, document analysis of how the courses are planned showed no systematic planning to help address the participants' CPD. Without proper planning and direction, one could expect poor overall improvement of the science teachers' professional development.

b) The impact of in-service program on science teacher

With regards to the influence of in-service trainings, it was found that the research participants encountered problems achieving the objectives of the programs. While the main purpose of the programs is to help enhance teacher professionalism, leading towards improved practices and to make certain that new policies developed by the Ministry of Education are adhered to, the majority of the participants appear disinterested and have little appreciation of the new information. One possible reason echoed by them has to do with the manner in which knowledge and information were propagated, as indicated by the following:

"...Bosan la asyik team -building je..." Teacher 8

(...boring, it is always team building)

"...bosan la juga, kalau asyik-asyik ceramah ja, saya tak dapat nak dapat semua maklumat yang disampaikan." Teacher 13

(...it is pretty boring. Always attend talks only and I am not able to get all the information they are trying to disseminate)

"...talk concept of the program, cannot focus because one way learning process, this due to long time to listen to the talk..."

Teacher 6

There were also teachers who felt that the CPD programs offered did not help them in any aspect in their work as a teacher. In fact, having to attend these programs only add on to their existing workload and seen as a burden:

"...the LADAP program for me is wasting time, the teacher just comes to that program because do not have choice, but they do not learn anything at that program..." Teacher 1
 "Some of the program does not give any impact for me, especially when the presenter is really boring and the program is only one way communication." Teacher 4

"...LADAP program like Baking Class just for fun and release tension, do not give any good impact at teacher performance in school..." Teacher 17

The above responses clearly show that the planned trainings neither provided worthy knowledge for them to put into practice nor attract the participants. Also, certain programs like baking class can be considered as activities which do not fulfil the primary objectives of in-service training. Other somewhat unhappy accounts related by the research participants on the CPD programs they attended include courses being delivered not by the 'real experts' as indicated below:

"The CPD program I had is at school, which is in house training and LADAP. Which all the instructor is experienced teacher at my school that go to the CPD programs and share their knowledge in there. Do not get any special presenter..." Teacher 7

"...I just had in the house sharing from an expert teacher to get knowledge about teaching and learning process, for one hour per session and other program is about team building and life skill..." Teacher 9

"...instructor (teacher is same school) also one of the aspect should be considered in the CPD courses, sometimes I feel that the instructor just in the same level of me, but them to one want to teach in the courses, this same like we also lack of experience but try to teach in class. For example, if the program about the ICT, I cannot get all the information on that program because the instructor also not good in ICT..." Teacher 3

Also, a couple of the research participants pointed out that the CPD programs failed to meet their actual needs related improving teaching and learning:

"...most of the CPD program at school just to give guideline about the new curriculum be implemented and new methods of teaching skills be introduced, like SBA, I-THINK and KBAT. But mostly the courses are presented by expert teacher that already go to the real course outside the school not from KPM..." Teacher 14

"Most of the CPD course that I attend is good and helpful in certain aspect only, especially for implementing new systems like SBA and Frog VLE, but for teaching and learning process in the class still lack." Teacher 15

While a number others indicated the venue where the programs were held were not quite conducive for them to take in the disseminated information

"...time constraint and venue affect my learning process in CPD courses at school." Teacher 18

"...the program is done at the school, all the facilities being provided by the school, therefore, the facilities not enough to me and other teachers to comfortably learn during LADAP programs..." Teacher 2

Nonetheless, with respect to management and managerial skills, some of the teachers indicated they benefited from those programs. In the Malaysian context, teachers usually are required to do more than teaching in class. They are expected to handle

various other activities including managing students' co-curricular activities, help oversee school facilities, develop networking with stakeholders and handle students' money. Those who noted the courses they attended were helpful had this to say: "...Yes, LADAP could improve knowledge, idea, the ways of completing the task and in line with PPPM. You know... the PPPM. It is Pelan Pembangunan Pendidikan Malaysia. Besides, it could trigger some ideas in innovation at school level..."

Teacher 12

"...After finishing the course at PPD, I need to do in-house training. I had done it the other day; this can give me the skill to manage the program at school..." Teacher 3

"...some of the programs help me in managing the file and manage students program outside the class." Teacher 18

"...some programs teach me the proper way to manage the time in preparing to teach in the class and to handle or manage work outside the class..." Teacher 19

Although the majority of the teachers reported not being utterly satisfied with the CPD courses they attended, some remained positive about efforts to improve themselves. A number of younger teachers took to task learning from the senior teachers. They would either seek advice or pick up teaching and learning points via observing their experienced colleagues., as highlighted in the following interview excerpts:

"Mostly use my senior colleague's assessment to give to my students... not creative enough to plan a variety of teaching methods and assessment..." Teacher 7

"I follow the way of experience teacher in my school teach in the class, and I also used most of the assessment from her..." Teacher 17

"...I think I've been using the same pedagogy and teaching methods. I've forgotten all the methods that I've learned. Maybe I'm not creative enough..." Teacher 20 "...hard to attract students to be active in learning and to focus on class when I teach and give explanation" Teacher 1

"...sometime, I have problem to motivate my students..." Teacher 4

Hence, from the responses, it could be said that CPD programs held in schools impacted the research participants positively and negatively, depending individual expectations. What is clear is that there are still lots to be done if CPD programs were to really help improve teacher effectiveness in schools.

c) The actual needs of in-service programme for science teachers.

In the previous section, it has somewhat become apparent that the CPD programs implemented did not quite address the science teachers' needs.

Having specialized programs and courses that focus on helping science teacher to improve their pedagogical and content knowledge and skills; understanding and handling of students; diagnosing and evaluating science learning; managing a science-related facilities and equipment and integrating of multimedia technology are deemed crucial (Halim, Osman & Meerah, 2006).

As such, the actual needs of these science teachers must be identified.

When the participants were asked what courses they would find useful and would be interested to attend, they indicated:

"...I think the courses should two way communications and the participant can participate in those programs. For example, for me, I like more learning in ICT based programs; therefore, the program should give the opportunity to try those techniques being taught." Teacher 15

"...I like to have more ICT-based program" Teacher 18

"Before this I attend the short course on the state level for my subject, this short course is attended by all the teachers in this subject and we share and discuss about the best technique and method to teach the subject.

All the experience teacher also shares about techniques regarding marking of papers. But to apply this kind of program at school is quite difficult because LADAP need to involve all teachers and all subjects..." Teacher 1

"...we need a specific training and guidelines on how to conduct science classroom in laboratory." Teacher 12

"...In my opinion, we need some training on classroom management because students nowadays are really challenging." Teacher 19

In general, most of the teachers in this study would like to know more about specific activities associated with science teaching and learning activities. In particular, a majority insisted that ICT knowledge is important possibly as a means of attracting existing high school learners who are more IT savvy.

CONCLUSION

This report is part of a bigger study looking into the nature of in-service training that science teachers in Malaysian schools attended. Also investigated were the impact of in-service training towards the teachers and the actual CPD needs. Several implications that could be forwarded based on the findings include:

- There is a need to match the actual needs of the science teachers to what schools conduct as CPD program;
- The state and district education offices to perhaps play a more active role in organizing CPD courses so that science teacher within a district or in a state can actually convene to share and discuss issues relating to science learning. It is rather difficult for schools to actually focus on specific aspects of teaching and learning on the only Science subject in school due to the small number of science teachers; gathering they would be more cost- and content-effective;
- Schools to relax into courses held, but deemed ineffective; and
- TED to develop a more systematic framework on how CPD trainings should be carried out.

If Malaysia is serious about improving science teaching and learning in schools, the relevant authorities need to give the above suggestions due consideration and action. Only then could

the teachers generate positive results in improving their knowledge, skills and attitude; help reduce wastage in terms of public money, time and other resources and achieve results that are comparable to those in developed nations.

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