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The Professional Preparation of Malaysian Teachers in the Implementation of Teaching and Learning of Mathematics and Science in English

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Malaysia is in the process of changing the medium of instruction for mathematics and science from Malay to English since 2003. To ensure the success of this transition, teachers have to be professional prepared to teach in English. This research aimed to survey the Malaysian science/ mathematics teachers' perception towards this professional preparation effort. An instrument called "Teachers Perception Towards the Professional Preparation to Teach Mathematics/Science in English" was developed. The samples were 72 Form One mathematics/science teachers in Malaysia. The research revealed that the teachers perceived that their pre-service training (M = 2.90, SD = .57) and the in-service training (M = 2.99, SD = .62) is adequate in their professional preparation. However, the teachers perceived that there is a need (M = 3.18, SD = .82) for enhancing their professional readiness to teach mathematics/science in English. Further analysis revealed that 44.3 % of the sample reported that their pre-service training could not develop their confidence in English speaking and after the in-service training 31.4% of the teachers still reported the same. About 84.7 % of the teachers also reported the need for training on helping students to learn in English. The findings showed that although the teachers perceived they are professionally prepared to teach mathematics/science in English, they still need more preparation in overcoming students' difficulties in learning the subjects in English especially for students who are weak in English or mathematics/science or both.

Keywords: Professional Development, Science, Mathematics, Teachers, Assessment

INTRODUCTION

In recent years, many factors have converged to steadily increase the momentum toward professionalization of the field of teaching mathematics and science. Recently, some of countries were initiating and implementing standards and accountability systems to better monitor the impact of mathematics and science education programs. The programs are being held to higher standards not only as measured by student outcomes but also in terms of program quality indicators. Given the centrality of teacher competence in both measures of program quality and in learning outcomes, many countries are investing in state-wide professional development efforts and some are beginning to experiment with various types of competency and credentialing mechanisms (Parke,

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2000). Professionalization has been defined as the movement of any field towards some standards of educational preparation and competency. The term professionalization indicates a direct attempt to (a) use education or training to improve the quality of practice, (b) standardize professional responses, (c) better define a collection of persons as representing a field of endeavor, and (d) enhance communication within that field (Shanahan, Meehan, & Mogge, 1994).

Teacher education has always been a crucial and symbolically significant field of education development. A country's nation building lies in the hands of its teachers. No matter how good the curriculum, infrastructure or teaching aids, at the end of the day it is the teachers who make a difference. Teachers are valuable human resources that a nation can count upon to mould and nurture its young minds (Syed Azizi Wafa, Ramayah, & Tan, 2003). Teachers are at the heart of the educational process. The greater the importance attached to education as a whole-whether for cultural transmission, for social cohesion and justice, or for human resource development so critical in modern, technology-based economies-the higher is the priority that must be accorded to the teachers responsible for that education (OECD, 1989).

Teaching, like any other profession, has its own unique set of challenges. Many of these challenges exist because teaching and learning is rooted in the human dimension. This means we do not always act rationally, even when it might be in our best interest to do so. In addition, there are so many challenges we face such as, the lack of resources, overcrowded classes, and unmotivated students, uninvolved or over involved parents, unsupportive colleagues and insensitive administrators (Kottler & Zehm 2000).

Teaching is usually seen as a form of professional work, that is, a type of complex work requiring a great deal of specialized knowledge (Sykes, 1990). To become good teachers when facing challenges and complex work as well as constraints, teachers need positive attitude. According to Ferrett (1994), positive work attitude is the key for success at work. Employees with positive attitudes and enthusiasm at work become invaluable to institutions of today that have become more and more service-oriented. People with positive attitudes tend to: (i) have positive feelings about people and situations; (ii) have a sense of purpose, excitement, and passion; (iii) approach problems in a creative manner; (iv) have a resourceful, positive, and enthusiastic air about them; (v) make the best out of every situation; (vi) realize that attitude is a choice; (vii) feel that they have control of their thoughts; and, (viii) feel that they are making a contribution through their work.

In Malaysia. the role of English as a taught subject has been changed into a medium of instruction when the minister of education declared that mathematics and science will be taught in English in all fully aided government schools from 2003 onwards. This change has been implemented in attempting to prepare the generations with the abilities in facing the needs of this global era. The advances in science and technology demand new skills and abilities and have made an impact on the teaching and learning process.

This implementation raised many debates among the general public, parents, political parties and even teachers on the effectiveness as it is still in the transition stage. Many people are skeptical about its success citing reasons such as poor English language proficiency of teachers for these subjects and the lack of student interest towards learning English (Alwis, 2005). While discussions were being held with various groups, the government went ahead with its preparations to implement the policy. The Ministry of Education presented the necessary infrastructure to enable teacher readiness in implementing the change.

Pillay and Thomas (2004) reported that the ministry set up 14 working committees to implement the decision. These committees represented the areas of curriculum, textbooks, teacher training, teaching resources, supplementary resources, ICT, publicity, monitoring, assessment, special education, technical studies, matriculation programmes, promoting English language use and special funding for schools.

One of the major challenges in this implementation is the teacher's ability (Pillay & Thomas, 2004). The teachers involved had varying levels of competency in English as most of them completed their education beginning from the primary right up to the tertiary level in Bahasa Melayu. Starting from 1970, all the Government-aided English Medium schools were replaced by Malay-Medium schools, and by 1982, all national secondary and university education was conducted in the national language (Mauzy, 1985). So, these teachers who went through this education system have inadequate proficiency in English.

To face the problem, the ministry developed a re-training programme to enhance English language proficiency among mathematics and science teachers. It was designed to meet their specific needs and focused on the skills for teaching mathematics and science disciplines in English.

To add to this programme, the ministry also provided the continuous support programme at the school level such as the Buddy Support Programme that stressed the collaboration between Mathematics and Science teachers with their language counterparts. Competent English teachers were appointed as 'Critical Friends' to science and mathematics teachers in school. The teachers were also supplied with self-instructional material to facilitate their own learning.

There are 29 Teacher Education Colleges within Malaysia providing pre-service and –in-service programmes. Most of the Teacher Colleges are generalist in nature, although there are specialist languages institutes, vocational and technical colleges, Religious Colleges, Women's Colleges and one Science College.

There are two main types of pre-service programmes: The Malaysian Diploma of TeachingMDT) and the Postgraduate Diploma of Teaching (PDT). There are also a number of twinning programmes between local and overseas universities where selected students train to be teachers. Across Malaysia, about 4000 teachers graduate each year from the MDT and about 3000 from the PDT.

The curriculum is set nationally and consists of 5 major components namely Teacher Dynamics (English, Moral and Religious Education, Basic ICT etc.), Knowledge and Professional Competency (Psychology and Pedagogy etc.), Knowledge in subject specialization and Option (one major and three other elective areas), Co-curriculum activities; and Practicum. Assessment involves a combination of examinations, coursework assignments, journals and formative and summative evaluation of teaching practice.

The postgraduate diploma of teaching entry requirements include a Bachelors Degree from a local or overseas university or institution of higher learning and a credit in Malay Language at the School Certificate level. Malaysia is in the process of upgrading the qualification of its teachers. By 2005, all secondary teachers are expected be university graduates, and that by 2020 all teachers will be graduates. For teachers who have a three-year teaching diploma based on "O" level educational qualification, the pathway to the degree is through a pre-course 14 week in-service programme in the subject matter plus one full-time year at a teacher training college and three full-time years at a university.

The quality of teacher learning is no less important than the quality of student learning experiences. Teachers need to be rejuvenated with new ideas and challenges to promote renewed enthusiasm in their profession. Professional development should be aimed at meeting the needs of each individual teacher especially when implementing a new policy such as the teaching and learning of mathematics and science in English.

Staff development is more complex than ever before. It will require different techniques and serves a different purpose. What is needed is a dynamic, systematic professional development that is more comprehensive, better organized and more responsive than most of the existing in-service training. The more complex and diversified an educational organization becomes the more important it is to have a systematic in-service professional development because schools can no longer rely on pre-service preparations to develop the needed skills. So, to prepare teachers for implementating teaching and learning of mathematics and science in English, they need to acquire knowledge and skills appropriate with this policy.

According to Pillay and Thomas (2004), the task of re-training for this language conversion exercise was assigned to the Teacher Education Division of the Ministry of Education. The English Language Teaching Centre Malaysia (ELTCM), a teacher training college for in-service teacher development, was appointed to develop a national re-training programme aimed at enhancing English language proficiency of mathematics and science teachers.

ELTCM was thus confronted with this mammoth task of planning a nationwide re-training programme. Planners had to grapple with the reality that, "it is impossible to create a single, centrally administered and planned programme of professional development that will meet everyone's needs and desires" (Clark, 1992). However, despite this awareness, the challenge for ELTCM was just that, which was to develop one national level programme that could cater for all.

The training programme develop by ELTCM is known as English for Teaching Mathematics and Science (ETeMS). The planners had to take into consideration the range of challenges teachers would meet in the changing classroom. The Programme had to incorporate elements of activating teachers' English language proficiency as well as developing a specialist language to cope with teaching mathematics and science in English. Hence the aim of the programme is two-fold:

a. To enhance the English language skills of mathematics and science teachers for effective teaching using English as a medium of instruction.
b. To enhance teachers' continuing professional development.

Among the competencies to be developed in the ETeMS training programme are:

a. Language for accessing information
b. Language for teaching mathematics and science
c. Language for professional exchange.

Apart from the face training sessions, the ETeMS structure also integrates ongoing language support elements, namely, asset of instructional language materials, a teacher support system and programme for teachers with low language proficiency. The related Buddy Support Programme recognized the need for continuous teacher support at school level.

According to Altschuld & Witkin (in Veale, 2002), needs assessment has been defined as "the process of determining, analyzing, and prioritizing needs and, in turn, identifying and implementing solution strategies to resolve high-priority needs". Teacher's needs

assessment includes both what teachers know and can do and what they want to learn and be able to do. Needs assessment of teachers should focus on what teachers want or believe they need to learn (Weddel & Van Duzer, 1997).

Some researchers like Cranton (in Susan, 1994) argued that through needs assessment, information about the amount and type of direction learners require can be obtained. Adults can identify their problem areas in relation to the course topics through needs assessment. It can become a starting point for their learning.

There are several aims of conducting needs assessment. According to Weddel and Van Duzer (1997, p.2):

A needs assessment serves a number of purposes:

- It aids administrators, teachers, and tutors with learner placement and in developing materials, curricula, skills assessments, teaching approaches, and teacher training.
- It assures a flexible, responsive curriculum rather than a fixed, linear curriculum determined ahead of time by instructors.
- It provides information to the instructor and learner about what the learner brings to the course (if done at the beginning), what has been accomplished (if done during the course), and what the learner wants and needs to know next.

There are many ways to assess the needs of teachers. Weddel and Van Duzer (1997, p.3,) described that "…. needs assessments with ESL learners, as well as with those in adult basic education programs, can take a variety of forms, including survey questionnaires on which learners check areas of interest or need, open-ended interviews, or informal observations of performance."

RATIONALE OF THE STUDY

Some emergent concerns within the Asian countries of late are the incorporation of Information and Communications Technologies (ICT) in the provision of education. More specifically, it is the challenge of incorporating ICT into classroom teaching and learning (SEAMEO Library, 2003). With the influence of technology which emphasizes the importance of some aspects of curriculum content and process, this implies that there is a fundamental shift in educational priority, that is from accumulation of knowledge to the management of information. Hence, this suggests that there is an increasing need for citizens who are informed, critical and capable as decision-makers in a technological world.

In 2003, the Malaysian government had implemented a national policy calling for the teaching of Mathematics and Science in English. This is in line with the increased importance of mathematics and science in the development of knowledge-based economies. Apart from the use of English language for instructional delivery, Mathematics and Science teachers are required to master ICT skills in operating the CD provided by the Ministry of Education during classroom instruction. Hence, educators being the forerunners in executing the national educational policy must abide by the needs to equip themselves with ICT knowledge and to deliver the mathematical and science content knowledge in English.

With the growing emphasis on technology, it is high time to strengthen pre-service teacher training and professional development in the use of ICT in the teaching of mathematics and science. Professional development courses enable Mathematics and Science teachers to develop themselves and be updated on the trends and techniques of integrating ICT in teaching Mathematics and Science. Strategies need to be developed in preparing the Mathematics and Science teachers professionally, and for making available teaching and learning resources which are tailored to teachers' needs (SEAMEO Library, 2003).

The effective use of technology encourages a shift from teacher-centered approaches towards a more flexible student-centered environment. A technology-rich learning environment is characterized by collaborative and investigative approaches to learning, increasing integration of content across the curriculum and a significant emphasis upon concept development and understanding (SEAMEO Library, 2003). Thus, the use of technological tools in teaching Mathematics and Science should enable the teachers and students to learn both these subjects more meaningfully.

Statement of Problem

Most Mathematics and Science teachers who teach in the Malaysian schools were required to attend the professional preparation course to enable them to teach Mathematics and Science in English and to operate the ICT tools effectively. Through informal interviews with the Mathematics and Science teachers from rural and urban schools, it was found that many of these teachers seek longer training in preparing themselves to teach Mathematics and Science in English and in using ICT tools. Teachers who are veterans may have mastered the English language and are competent to deliver Mathematics and Science lessons in English. However, these teachers might not be fully computer literate, thus hindering the use of ICT tools during Mathematics and Science lessons. As a result, though some Mathematics and Science teachers had undergone the training, they did not utilize the ICT tools in executing Mathematics and Science lessons.

Conversely, some teachers who are from the younger generation may be computer literate but may

not be conversant in English. This leads to lack of self-efficacy in handling day-to-day lessons and the feeling of inferiority in handling students who have difficulty in learning Mathematics and Science. As a result, teachers who believe they lack professional preparation will opt to teach Mathematics and Science in English alternately with other languages.

Professional preparation encompasses strategies to equip Mathematics and Science teachers to master the English language and to handle ICT tools effectively. In addition, it also encompasses the strategies for teachers to help the students to learn Mathematics and Science in English more effectively. A general observation of students showed that many Mathematics and Science teachers failed to implement steps to help students in overcoming difficulties in learning Mathematics and Science in English, although some of the teachers did quite well in helping the students.

Objectives

The main objective of this study is to examine the professional preparation of the Malaysian teachers to teach mathematics / science in English. Specifically the study is aimed at:

1. determining the level of pre-service training professional preparation of the Malaysian teachers to teach mathematics / science in English.
2. determining the level of in-service training professional preparation of the Malaysian teachers to teach mathematics / science in English.
3. comparing between the level of pre-service and in-service training professional preparation of the Malaysian teachers to teach mathematics / science in English
4. identifying the level of the various needs teachers have for them to enhance their readiness to teach mathematics / science in English.

Research Questions

The main research questions investigated in this study were:

1. What is the level of pre-service training professional preparation of the Malaysian teachers to teach mathematics / science in English?
2. What is the level of in-service training professional preparation of the Malaysian teachers to teach mathematics / science in English?
3. Is there any significant difference between the level of pre-service and in-service training professional preparation of the Malaysian teachers to teach mathematics/science in English?
4. What are the levels of the various needs teachers have for them to enhance their readiness to teach mathematics / science in English?

METHODOLOGY

Research design: This study used the survey method to answer the research questions.

Population and sample: The population of this study was all Form One science / mathematics teachers in Malaysia. The samples selected for this study comprised of 72 teachers teaching Form One science / mathematics. To ensure that the sample will represent teachers teaching Form One science / mathematics in Malaysia, the teachers were selected from schools that were identified based on several criteria. These criteria will ensure that the sample will include teachers from all kinds of schools having the background characteristics representative of schools in Malaysia.

Location: The study was conducted at thirty three secondary schools in Malaysia. All the schools involved in the study are from the fourteen states in Malaysia.

Instrument: The instrument used in this study for the purpose of collecting data is a questionnaire developed by the research team. The questionnaire consists of four main sections: Section A of the instrument collected demographic information of the respondents; Section B comprised eight items where respondents have to respond to a four-point Likert Scale on their perception towards their needs for improving their professional preparation to teach science / mathematics in English; Section C is made up of twelve items where respondents have to respond to a four-point Likert Scale on their perception towards the result of pre-service training in their professional preparation to teach science / mathematics in English; and Section D is made up of twelve items where respondents have to respond to a four-point Likert Scale on their perception towards the result of in-service staff development programme in their professional preparation to teach science / mathematics in English.

Reliability and validity:A pilot study had been conducted to establish questionnaire validity and reliability. Reliability was determined through the reliability coefficient, Cronbach alpha. The Cronbach alpha value for Section B is .88, Section C is .97, and Section D is .91. Other members of the research team validated the instrument.

Data Collection: The data were collected from the samples using the questionnaire. The questionnaire was administered directly to the samples when the research team visited the selected schools from July 2005 to November 2005. The response to the questionnaire

were immediately collected before the research team left the schools.

Data analysis procedure: The data collected from this questionnaire were analyzed using the Statistical Package for Social Sciences (SPSS) Version 13.0 software. Descriptive analysis of mean, frequency and percentage was conducted for all the items in the instruments. T-tests were also conducted for each item to compare the professional preparation from the pre-service courses and the professional preparation from the in-service courses.

RESULTS

This section describes the results obtained from analysis of the data collected from the questionnaire. It is organized into three subsections: first, presentation of results of descriptive analysis on professional preparation of teachers to teach science / mathematics in English from the pre-service and in-service courses; second, presentation of the results of comparison between the professional preparation of teachers to teach science / mathematics in English from the pre-service and in-service courses; third, presentation of the results of descriptive analysis on the training needs of the teachers to teach science / mathematics in English.

Teachers' professional preparation to teach science / mathematics in English

This subsection presents the result of analysis on professional preparation of teachers to teach science / mathematics in English from the pre-service and in-service courses. Table 1 presents the frequencies and percentages for the items on the teachers' professional preparation to teach science / mathematics in English from their pre-service training.

As shown in Table 1, a substantial majority of the teachers agreed that the pre-service training they received had prepared them to speak in English (78.5%)

Table 1. Frequencies and Percentages for the Items on the Teachers Professional Preparation to Teach Science / Mathematics in English from Their Pre-Service Training

Item No.	As a result of the pre-service training,	Strongly Disagree	Disagree	Agree	Strongly Agree
1.	I am ready to speak in English	5 (7.1%)	10 (14.3%)	33 (47.1%)	22 (31.4%)
2.	I feel confident to speak in English	3 (4.3%)	28 (40.0%)	31 (44.3%)	8 (11.4%)
3.	I am ready in understanding science / mathematics reading materials in English	1 (1.4%)	9 (12.9%)	42 (60.0%)	18 (25.7%)
4.	I am ready in writing science / mathematics instructional materials in English	2 (2.9%)	19 (27.1%)	41 (58.6%)	8 (11.4%)
5.	I am ready in constructing test items in English	3 (4.3%)	16 (22.9%)	41 (58.6%)	10 (14.3%)
6.	I am ready in delivering instruction of science / mathematics in English	1 (1.4%)	16 (22.9%)	42 (60.0%)	11 (15.7%)
7.	I am ready in guiding students to use English in learning science / mathematics	1 (1.4%)	12 (16.7%)	44 (62.9%)	13 (18.6%)
8.	I am ready in enabling students to understand my science / mathematics teaching.	1 (1.4%)	13 (18.8%)	41 (59.4%)	14 (20.3%)
9.	I feel confident in teaching science / mathematics in English	4 (5.7%)	21 (30.0%)	34 (48.6%)	11 (15.7%)
10.	I am ready in ensuring the science / mathematics instructional objectives are achieved	1 (1.4%)	5 (7.1%)	51 (72.9%)	13 (18.6%)
11.	I am ready to pose questions to students in English	1 (1.4%)	7 (9.7%)	48 (68.6%)	14 (20.0%)
12.	I dare to answer students' questions in English	2 (2.9%)	13 (18.6%)	45 (64.3%)	10 (14.3%)
13.	I am ready to handle learning problems of students who are weak in science / mathematics to learn science / mathematics in English	4 (5.7%)	19 (27.1%)	39 (55.7%)	8 (11.4%)
14.	I am ready to handle learning problems of students who are weak in English to learn science / mathematics in English	5 (7.1%)	21 (29.2%)	36 (50.0%)	8 (11.4%)

and to understand the science / mathematics reading materials in English (85.7%). They also reported being ready to pose questions to students in English (88.6%) and to answer students' questions in English (78.6%). However, a considerable percentage of teachers reported that their pre-service training had not made them feel confident to speak English (44.3%) and to teach science / mathematics in English (35.7%). They also reported that they are not prepared to write science / mathematics instructional materials in English (30.0%), and to construct test items in English (27.1%). About 36.3% of the teachers disagreed that the pre-service training had prepared them to handle learning problems of students who are weak in English to learn science / mathematics in English.

Table 2 presents the frequencies and the percentages for the items on the teachers' professional preparation to teach science / mathematics in English from their in-service training. As shown in Table 2, a significantly large majority of the teachers agreed that the in-service training they received had prepared them to speak in English (82.1%) and to understand the science / mathematics reading materials in English (89.6%). They also reported being ready to pose questions to students in English (83.6%) and to answer students' questions in English (80.6%). A lower percentage of teachers reported that the in-service courses had not prepared them professionally to teach science / mathematics in English. However, there are still some teachers reporting that the in-service training they received had not made them feel confident to speak English (31.4%) and to teach science / mathematics in English (32.9%). They also reported that they are not prepared to write science / mathematics instructional materials in English (21.4%), and to construct test items in English (19.4%). About 35.8% of the teachers do not agree that they are prepared to handle learning problems of students who are weak in English to learn science / mathematics in English even after the in-service training.

Table 2. Frequencies and Percentages for The Items on the Teachers Professional Preparation to Teach Science/Mathematics in English from Their in-Service Training

Item No.	As a result of the in-service training,	Strongly Disagree	Disagree	Agree	Strongly Agree
1.	I am ready to speak in English	1 (1.5%)	11 (16.4%)	33 (49.3%)	22 (32.8%)
2.	I feel confident to speak in English	1 (1.5%)	20 (29.9%)	33 (49.3%)	13 (19.4%)
3.	I am ready in understanding science / mathematics reading materials in English	1 (1.5%)	6 (9.0%)	40 (59.7%)	20 (29.9%)
4.	I am ready in writing science / mathematics instructional materials in English	1 (1.5%)	14 (20.9%)	37 (55.2%)	15 (22.4%)
5.	I am ready in constructing test items in English	2 (3.0%)	11 (16.4%)	42 (62.7%)	12 (17.9%)
6.	I am ready in delivering instruction of science / mathematics in English	2 (3.0%)	8 (11.9%)	40 (59.7%)	17 (25.4%)
7.	I am ready in guiding students to use English in learning science / mathematics	2 (3.0%)	7 (10.4%)	43 (64.2%)	15 (22.4%)
8.	I am ready in enabling students to understand my science / mathematics teaching.	2 (3.0%)	9 (13.4%)	41 (61.2%)	15 (22.4%)
9.	I feel confident in teaching science / mathematics in English	2 (3.0%)	18 (26.9%)	31 (46.3%)	16 (23.9%)
10.	I am ready in ensuring the science / mathematics instructional objectives are achieved	2 (3.0%)	7 (10.4%)	44 (65.7%)	14 (20.9%)
11.	I am ready to pose questions to students in English	1 (1.5%)	10 (16.4%)	41 (61.2%)	15 (22.4%)
12.	I dare to answer students' questions in English	1 (1.5%)	12 (17.9%)	38 (56.7%)	16 (23.9%)
13.	I am ready to handle learning problems of students who are weak in science / mathematics to learn science / mathematics in English	3 (4.5%)	17 (25.4%)	34 (50.7%)	13 (19.4%)
14.	I am ready to handle learning problems of students who are weak in English to learn science / mathematics in English	3 (4.5%)	21 (31.3%)	32 (47.8%)	11 (16.4%)

Comparison between the professional preparation of teachers to teach science / mathematics in English from their pre-service and in-service training courses

This subsection presents the *t*-test results of the comparison between the means of the professional preparation of teachers to teach science / mathematics in English from their pre-service and in-service training courses. From the t-test, the results show that differences between the professional preparation of teachers to teach science / mathematics in English from their pre-service training courses (M=2.89, SD=.56) and from their in-service courses (M=3.01, SD= .63) is significant, t(65)=-2.69, p<.01.

Table 3 presents the t-test results of the comparison between the means of the items in the questionnaire on the professional preparation of teachers to teach science / mathematics in English from their pre-service and in-service training courses.

As shown in Table 3, the *t*–test results show a significant difference at the level of p<.01 between the professional preparation of teachers to teach science / mathematics in English from their pre-service and in-service training courses for Item 2, Item 4 and Item 6. Table 3 also shows a significant difference at the level of

Table 3. The t-Test Results on the Professional Preparation of Teachers to Teach Science / Mathematics in English from Their Pre-Service And In-Service Training Courses by Items of the Questionnaire

Item No.	As a result of the training,	Pre-service		In-service		*t*-test	
		Mean	SD	Mean	SD	*T*	*p*
1.	I am ready to speak in English	3.00	.88	3.14	.74	-1.59	.118
2.	I feel confident to speak in English	2.61	.74	2.86	.74	-4.14	.000
3.	I am ready in understanding science / mathematics reading materials in English	3.11	.66	3.18	.65	-1.06	.279
4.	I am ready in writing science / mathematics instructional materials in English	2.77	.68	2.98	.71	-2.90	.005
5.	I am ready in constructing test items in English	2.82	.72	2.95	.69	-2.01	.049
6.	I am ready in delivering instruction of science / mathematics in English	2.89	.66	3.08	.71	-3.00	.004
7.	I am ready in guiding students to use English in learning science / mathematics	2.97	.63	3.06	.68	-1.43	.159
8.	I am ready in enabling students to understand my science / mathematics teaching.	2.98	.67	3.03	.71	-.554	.581
9.	I feel confident in teaching science / mathematics in English	2.74	.77	2.91	.80	-2.176	.033
10.	I am ready in ensuring the science / mathematics instructional objectives are achieved	3.08	.56	3.05	.67	.444	.658
11.	I am ready to pose questions to students in English	3.08	.59	3.05	.67	.406	.686
12.	I dare to answer students' questions in English	2.89	.66	3.03	.70	-2.01	.049
13.	I am ready to handle learning problems of students who are weak in science / mathematics to learn science / mathematics in English	2.73	.76	2.86	.78	-2.12	.038
14.	I am ready to handle learning problems of students who are weak in English to learn science / mathematics in English	2.67	.79	2.77	.78	-1.84	.070

$p<.05$ for Item 5, Item 9, Item 12 and Item 13. The *t*-test results show that the difference between the professional preparation of teachers to teach science / mathematics in English from their pre-service and in-service training courses for Item 1, Item 3, Item 7, Item 8, Item 10, Item 11 and Item 14 are not significant.

Training needs of the teachers teaching science / mathematics in English

This subsection presents the result of descriptive analysis on training needs of the teachers teaching science / mathematics in English. Table 4 presents the means, standard deviations, frequencies and percentages for the items on the teachers' professional preparation to teach science / mathematics in English from their pre-service training.

As shown in Table 4, the teachers reported they need training on all aspects of teaching science / mathematics in English. For every item in the questionnaire, Table 4 shows that the mean is greater than 3.00. Table 4 also shows that most teachers reported that they need training on speaking English (85.9%), training on conducting question and answer session with students in English (84.5%) and training in guiding students to use English in learning science / mathematics (87.1%). A large majority of the teachers reported they need training on writing science / mathematics instructional materials in English (77.4%), training on constructing test items in English (80.2%), and training on various strategies to teach science / mathematics in English (80.3%).

Our research has shown that the training for teachers involved in implementing the teaching of science / mathematics in English needs to be reviewed for greater efficacy. The need to improve teachers' ability in dealing with students who are weak in English is a priority. Further research with a bigger sample would help to confirm these findings. However, this preliminary study enables educational policy specialists to identify the present shortcomings in teacher professional preparation for the teaching of science / mathematics in English in Malaysia.

DISCUSSION AND CONCLUSION

This study has shown that the majority of Malaysian teachers are satisfied with the pre-service training they had received for preparing them to teach science and mathematics in English. The majority of teachers are also satisfied with the in-service training they had received for preparing them to teach science and mathematics in English.

However, at the 5% significance level, there is significant difference in the level of satisfaction towards the pre-service training as compared to the in service training for the following aspects of the teacher preparation: to feel confident to speak in English; be ready in writing science / mathematics instructional materials in English; be ready in constructing test items in English; be ready in delivering science / mathematics instruction in English; be confident in teaching science

Table 4. The Means, Standard Deviations, Frequencies and Percentages for The Items on the Training Needs of the Teachers Teaching Science / Mathematics in English

Item No.	Aspects of training	Not needed	Less Needed	Need	Very Needed	Mean	SD
1.	Training on speaking in English	5 (7.1%)	5 (7.1%)	22 (31.4%)	38 (54.3%)	3.33	.90
2.	Training on understanding science / mathematics reading materials in English	10 (14.1%)	10 (14.1%)	21 (29.6%)	30 (42.3%)	3.00	1.07
3.	Training on writing science / mathematics instructional materials in English	7 (9.9%)	9 (12.7%)	28 (39.4%)	27 (38.0%)	3.06	.95
4.	Training on constructing test items in English	4 (5.6%)	10 (14.1%)	29 (40.8%)	28 (39.4%)	3.14	.87
5.	Training on delivering instruction of science / mathematics in English	5 (6.9%)	7 (9.9%)	27 (38.0%)	32 (45.1%)	3.21	.89
6.	Training on conducting question and answer session with students in English	5 (7.0%)	6 (8.5%)	31 (43.7%)	29 (40.8%)	3.18	.87
7.	Training on various strategies to teach science / mathematics in English	3 (4.2%)	11 (15.5%)	27 (38.0%)	30 (42.3%)	3.18	.85
8.	Training in guiding students to use English in learning science / mathematics	4 (5.7%)	5 (7.1%)	25 (35.7%)	36 (51.4%)	3.33	.85

/ mathematics in English; be ready to answer students' questions in English; be ready to handle learning problems of students who are weak in science / mathematics in learning the two subjects in English.

The study also found that many teachers perceived they still need more training in preparing themselves to teach science and mathematics in English especially in: speaking in English; delivering instruction of science / mathematics in English; conducting question and answer session with students in English; devising strategies for teach science / mathematics in English; and guiding students to use English in learning science / mathematics.

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