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Emotional Intelligence of Science and Mathematics Teachers: A Malaysian Experience

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This study sought to explore the emotional intelligence of Form One mathematics and science teachers. The emotional intelligence of the teachers was determined using the Emotional Intelligence for Mathematics and Science Teachers (EIMST) survey instrument. It was adapted and adopted from related instruments and then pilot tested for validity and reliability. A total of three hundred and twenty five (325) Form One mathematics and science teachers from two districts in Selangor were involved in this survey method of data collection. Descriptive statistics in the form of frequency and percentage were computed for emotional intelligence. Inferential statistics such as the t-test was used to compare the emotional intelligence between mathematics and science teachers. The findings showed that there was no significant difference in the emotional intelligence between the mathematics and science teachers, though a higher mean value of emotional intelligence was noted for mathematics teachers compared to the science teachers. However, analysis based on the individual subscales of emotional intelligence showed that there was significant difference in emotional intelligence between mathematics teachers and science teachers for the subscale of regulation of emotion. The mathematics and science teachers ranked average in their emotional intelligence. As this research was carried after three years of the implementation of teaching of Form One mathematics and science in English, this could imply that they were still in the process of accepting the changes in the policy of teaching science and mathematics in English.

Key words: Emotional intelligence; Language transition; Utilisation of emotion; Regulation of emotion; Appraisal and expression of emotion; Teaching science and mathematics

Introduction

In the past four years, a paradigm shift in science education portrayed a scenario of multiple interventions seeping into the Malaysian education system. The national education policy introduced the use of English language replacing the Malay language as a medium of instruction for the teaching of science and mathematics. This was in-line with the country's vision of producing a marketable workforce, both locally and internationally. Technology, which served as an enabler in this 'new' language framework was another intervention that teachers had to toil within the teaching-learning process. Though teachers were trained to cope with this change, however pre-survey findings showed that some teachers felt that they lacked proficiency in English. This was the driving force for the researchers to explore the emotional intelligence (EI) of Form One mathematics and science teachers after three years of its implementation. In order to perform effectively, one's knowledge, skills, and overall intelligence must be augmented by the ability to perceive, understand, and regulate emotions (Jaeger, 2003). Thus, the emotional intelligence of the teachers is significant in coping with this transition, thereby influencing the success of the policy implementation. The emotional intelligence of the teachers has to be ascertained as this has 'carry-over' effects on their authentic performance.

Background of the Study

Perspectives of Emotional Intelligence

Weinberger (2004) stated that a wide variety of definitions of emotional intelligence exist ranging from a very broad perspective inclusive of many personality characteristics, to a very narrow restrictive perspective. This area of research is relatively new (since the early 1990s), with most of the work to date definitional in nature. Only very recently has the research moved into how the construct of emotional intelligence have impacted an individual and their relative performance.

Primarily two perspectives of emotional intelligence have emerged over the past decade. The first perspective defines emotional intelligence largely through personality characteristics. The second perspective is ability-based, and defines emotional intelligence as a set of distinct abilities. Since there has been more research in the area of personality characteristics and leadership, this study evaluated the relationships between emotional intelligence from an ability perspective in managing pedagogical processes.

The ability perspective is critical as it determines the success of an individual in coping with change. This change involves every dimension of teaching, and to take on this challenge, teachers have to be prepared emotionally and manage their emotions to face the authentic uncertainties.

Brackett, Mayer and Warner (2004) divided emotional intelligence into four areas of skills. The four-branch model that is being used divides emotional intelligence into four areas: (i) accuracy in perceiving emotions, (ii) using emotions to facilitate thought, (iii) understanding emotions, and (iv) managing emotions in a way that enhances personal growth and social relations. There is a distinction between the second branch (using emotions to facilitate thought) and the other three. Whereas branches (i), (iii), and (iv) involve reasoning about emotions, branch (ii) uniquely involves using emotions to enhance reasoning. Finally, the four branches form a hierarchy, with emotional perception at the bottom and management at the top. This four-branch model serves as a basis of our current reviews of the field.

Emotional and cognitive information differ in the domain of application. Human beings interpret emotional intelligence in many different ways. This implies that there are many different ways of interpreting feelings but more importantly, it helps to know how an individual's reactions compare with how most people would emotionally respond to a situation.

Essential Attributes of Emotional Intelligence

According to Mayer and Salovey (1997), emotional intelligence is the ability of an individual to perceive and identify his or her emotions, using emotions to facilitate thought and understanding, and managing one's emotion by turning the negative ones into positive learning and growing opportunities. The utilisation of emotion, regulation of emotion and appraisal and expression of emotion are essential attributes of the teacher to ensure the smooth implementation of the policy. Teachers, as key players in the pedagogical process should be able to identify their own strengths and weakness to facilitate thought and understanding. This is critical when a second or third language is being used as a medium of instruction and would involve "re-learning" science and mathematics teaching within a new framework. Language acquisition skills coupled with technological competencies for effective delivery of science and mathematics has certainly demanded positive emotional intelligence among teachers. Emotional intelligence is defined as an array of non-cognitive abilities, capabilities, and skills that influence one's capacity to succeed and cope with

environmental demands and pressures (Bar-On, 1997). Thus, for teachers to perform effectively, these non-cognitive abilities need to be augmented by the ability to utilise emotions, regulate emotions and appraisal and expression of emotions. In this context, it is of utmost importance to investigate the emotional intelligence of teachers which is timely in light of the policy change.

Much of the work that has been conducted to-date on emotional intelligence involved scale development in areas such as emotional perception, emotional expression, empathy, and motivation, the constructs that underlie them, and the means by which they operationalised portions of what is thus far known as emotional intelligence (Salovey and Mayer, 1990). Theorists are interested in identifying the mental processes that involve emotional information, including appraising, expressing and regulating emotions in the self and others, and using emotions in adaptive ways.

Finegan (1998) proposed that possession of emotional intelligence leads to achievement from the formal education years of the child and adolescent to the adult's competency in being effective in the workplace and in society. The ability to assess one's own and another's emotions and to use these processes adaptively are critical aspects of motivation and emotional intelligence. Although Mayer and Geher (1996) suggested that motivation and emotional intelligence are contrasting in nature, an individual must possess the emotional-information processing abilities as well as mental aptitudes in order to solve problems. These abilities in turn help individuals decide upon options for motivating themselves to achieve. Goleman (1995) suggested that emotionally intelligent individuals are more likely to be productive and effective in any endeavor they undertake. In conveying a message about emotional intelligence that illustrates its complexity in achievement, Mayer and Salovey (1997) stated that individuals who are more emotionally intelligent might succeed at making their workers feel better, communicate in interesting ways and design projects that involve infusing products with feelings and aesthetics.

Available Emotional Intelligence Inventories

Mayer and Geher (1996) suggested that recent developments in the use of intelligence scales have led to the expansion of person perception research, including the personality domains related to emotional intelligence. They suggested that the ability to identify emotions from thoughts is central to the empirical measurement of emotional intelligence, and that the ability to

reason about and know another person's emotions are related to other indicators of personality and emotional intelligence, such as empathy, openness, and general intelligence.

The Emotional Intelligence Inventory (EQI) was designed by Tapia and Burry-Stock (1998) to investigate the underlying dimensions of emotional intelligence. The items of the EQI were developed according to the model of emotional intelligence given by Salovey and Mayer (1990) and Mayer and Salovey (1997). The EQI also incorporated the work of a preceding instrument, The Emotional Intelligence Inventory (Acker, Baggett, Davis, Kuhajda, Weaver-Stern and Sutarso et al., 1996).

Weinberger (2004) recommended that future researchers explore the concept of emotional intelligence from a qualitative perspective. However, researchers may encounter difficulty in measuring this construct in the positivistic perspective; a better understanding could be acquired by viewing this construct differently. The nuances around individuals' behaviour and approach to others viewed through this perspective would contribute to the body of knowledge.

The Brackett, Mayer and Warner (2004) model of emotional intelligence begins with the idea that emotions contain information about relationships (Other models of emotional intelligence exist as well; see Mayer, Salovey, and Caruso, 2000, for a review). When a person's relationship with another person or an object changes, so do their emotions toward that person or object. A person who is viewed as threatening is feared, an object that is favored is liked. Whether these relationships are actual, remembered, or even imagined, they are accompanied by the felt signals called emotions. Emotional intelligence, in turn, refers to an ability to recognise the meanings of emotions and their relationships and to use them as a basis in reasoning and problem solving. It further involves using emotions to enhance cognitive activities. This was the basis for exploring the emotional intelligence of mathematics and science teachers in implementing the teaching of mathematics and science in English. The Emotional Intelligence for Mathematics and Science Teachers (EIMST) instrument was developed, piloted and used to measure the emotional intelligence of the Form One mathematics and science teachers. This instrument was based on the Trait Thinking Questionnaire (O'Neil and Abedi, 1996), Metacognitive Awareness Inventory (Schraw and Dennison, 1994) and Metacognitive Operations (Beyer, 1988). For the purpose of this research, it was adapted and subjected

to validity and reliability tests. This instrument is a Likert type questionnaire comprising the subscales of appraisal and expression of emotion, regulation of emotion and utilisation of emotion.

Emotional Intelligence and the Science and Mathematics Teacher

The use of English to teach mathematics and science policy took effect in 2003, and at the time of this research, it had been three years into its implementation. The policy was first implemented at the Primary One, Secondary One and Lower Six levels. The rationale for selecting Form One science and mathematics teachers for this research was on the basis that they had experienced the 'new' phase for the past three years. A point to note is that the Malay language had been the medium of instruction for teacher training courses and professional development courses for the past twenty-five years. It is certainly turning the 'clock back' to the pre-independence era where English Language was the medium of instruction for all subjects at the primary, secondary and tertiary levels. This research explored how teachers were able to cope with the 'change' in teaching science and mathematics in English.

There are distinct differences in science and mathematics teaching. According to Peat (1990), mathematics involves the use of mathematical language in exploring concepts, formulating new conjectures and to establishing truth by rigorous problem solving. Mathematical language is compacted with specialised meanings, mathematical jargon, symbols and technical terms. Mathematics is often associated with codified forms that make it simple to carry out calculations and manipulations, demonstrating proofs and to arrive at conclusions. The linguistic aspect of grammar and sentence construction has minimum demands in mathematics teaching.

In contrast, science refers to the systematic process of acquiring knowledge based on the scientific method. The use of natural language is just as important as the use of technical language in science. The contrasting nature of language in science and mathematics justifies the rationale for exploring the emotional intelligence of science and mathematics teachers. The ability of the teachers to identify their own emotions and use emotions to facilitate thought in implementing science and mathematics in English is critical. The teacher should be able to manage emotions by turning negative ones into positive learning to ensure a smooth adaptation to the challenge. The teaching and learning process should not be interrupted or hindered

due to the teachers' inability to use their own emotions to understand and accept changes. Pedagogical realities require the ingenuity of the teacher to overcome obstacles. Bearing in mind that teacher training had been conducted in the Malay language for the past quarter of a century, and English language was a second language or even a third language to most Malaysians, the teaching of science and mathematics that involves the use of technical terms in English, is certainly foreign to them. This again taps upon the emotional intelligence of the teachers to learn and re-learn, even though it is a tedious process and cannot be perfected overnight. Thus, having given a provision period of three years to stabilise which may be due to other intervening factors affecting the implementation, the researchers chose to embark on this research after three years since it "kicked-off".

Objectives of the Study

This study explored the emotional intelligence of Form One science and mathematics teachers in the light of the policy change in the implementation of Teaching Science and Mathematics in English.

Specifically, the objectives of this study were:

1. To identify the emotional intelligence of Form One mathematics and science teachers; and
2. To compare the emotional intelligence of Form One mathematics and science teachers.

Research Questions

Based on the research objectives, the research questions for this study were:

1. What were the levels of emotional intelligence of Form One mathematics teachers?
2. What were the levels of emotional intelligence of Form One science teachers?
3. Was there any significant difference in emotional intelligence between Form One mathematics and science teachers?

Hypothesis of the Study

Hypothesis for Research Question 3:

H_o: There was no significant difference in the mean of the emotional intelligence between Form One mathematics and science teachers.

H_a: There was a significant difference in the mean of the emotional intelligence between Form One mathematics and science teachers.

Methodology

Sample of the Study

The sample involved 325 Form One mathematics and science teachers. Two districts were randomly selected from nine districts in Selangor for this research. Selangor is a state located in central Peninsular Malaysia. The schools from the two districts were chosen randomly from the official registration list of schools in the state provided by the Selangor State Education Department. Table 1 displays data of the rural and urban categories of the schools in the selected districts involved in this study. The teachers from the selected districts had received training and have been teaching the subject for the past three years. The teachers had easy accessibility to the education ministry and related training centers.

Table 1
Distribution of Sample School Based on Districts

District	School	
	Rural	Urban
Petaling	3	45
Klang	12	36

Data Collection Procedure

The questionnaire was administered to the science and mathematics teachers upon obtaining approval from the Educational Planning and Research Division, Ministry of Education. The researchers personally administered the questionnaire to the teachers. Two research assistants were trained to assist in this study. To ensure anonymity so that the teachers would give their honest and frank responses without worrying about any undesirable consequences the teachers were not required to write their names on the questionnaire.

Instruments

The emotional intelligence of the Form One mathematics and science teachers was ascertained by the Emotional Intelligence for Mathematics and Science Teachers (EIMST) questionnaire. This instrument was based on the Trait Thinking Questionnaire (O'Neil and Abedi, 1996), Metacognitive Awareness

Inventory (Schraw and Dennison, 1994) and Metacognitive Operations (Beyer, 1988).

The Trait Thinking Questionnaire (O'Neil and Abedi, 1996) is composed of four constructs namely awareness, cognitive strategy, planning and self checking, with five items in each construct respectively. An individual's response to intellectual situations with varying degrees of state metacognition can be obtained through this questionnaire. The Metacognitive Awarenesss Inventory (MAI) (Schraw and Dennison, 1994) is a 52-item questionnaire specifically developed to assess an individual's self-understanding or awareness of the metacognitive processes. The two major components measured are knowledge about one's own cognition and regulation of one's own cognition. Metacognitive Process (Beyer, 1988) is viewed from a cognitive science perspective involving state trait and trait metacognition. State metacognition which involves planning, monitoring, cognitive strategies and self-awareness is situation-specific.

For the purpose of this research, it was adapted and subjected to validity and reliability tests. The instrument is a Likert type questionnaire comprising the three subscales utilisation of emotion, regulation of emotion and appraisal and expression of emotion. The utilisation of emotion subscale includes involves using emotions for flexible planning, creative thinking, redirected attention and motivation. It involves items numbered 1, 6, 12, 20, 21, 23, 25, 30, 31, 33, 36, 40, 41 and 45 (Table 4 and 8). The regulation of emotion subscale is conceptualised as the individuals' awareness of their own emotions and their ability to express those emotions. This is inclusive of the individuals' perceptions of and awareness of emotions expressed by others. Regulating emotions is in oneself and in others. It comprises items numbered 2, 5, 7, 10, 11, 13, 14, 15, 19, 29, 35, 39 and 43 (Table 5 and 9). The subscale appraisal and expression of emotion involves the ability to recognise emotional expressions of others and in oneself. The appraisal of emotion can exist in verbal or non-verbal form. It comprises items numbered 3, 4, 8, 9, 16, 17, 18, 22, 24, 27, 28, 32, 37, 38, 42 and 44 (Table 6 and 10).

Reliability and Validity of the Instrument

The face and content validity of EIMST was checked by a panel of experts from the field of psychology as well as mathematics and science education. The instrument was pilot tested before the final version was used in the actual study. The EIMST was pilot tested in six (6) randomly selected schools

in Selangor and Kuala Lumpur. The respondents were Form One mathematics and science teachers. The purpose of the pilot study was to ensure that the teachers were able to understand the items of the EIMST without difficulties. The teachers were requested to underline the words and sentences that they found difficult to understand. Any ambiguities detected in the items of the instruments were rectified. The approximate time required to complete the questionnaire was noted. Since the EIMST instrument was adapted, the findings of the pilot study were used to compute the reliability of this instrument.

The reliability of the EIMST instrument was determined by using the reliability coefficient. The computed Cronbach Alpha was 0.79. Table 2 shows the reliability values of the different constructs. The Cronbach Alpha value for the three constructs exceeded 0.7.

Table 2
Reliability Values for Emotional Intelligence Constructs

Dimensions of Emotional Intelligence	Number of Items	Reliability Values
Utilisation of emotion	14	0.77
Regulation of emotion	13	0.76
Appraisal and expression of emotion	16	0.78

Data Analysis

The data collected were analysed using SPSS Version 13.0 in accordance with the objectives. Data analysis involved computation of descriptive statistics such as frequency, percentages, mean and standard deviations. The results of the study were used to generalise the emotional intelligence of the Form One mathematics and science teachers in the state of Selangor.

Findings

Emotional Intelligence of Form One Mathematics Teachers

Table 3 shows the emotional intelligence of Form One mathematics teachers analysed according to the three subscale. From Table 3, it can be noted that the utilisation of emotion subscale recorded a mean of 3.83 with a standard deviation of 0.42. A mean score of 3.98 with a standard deviation of 0.38 was obtained for the regulation of emotion subscale. The subscale of appraisal and expression recorded a mean of 3.91 with a standard deviation of 0.43.

Table 3
Levels of Emotional Intelligence among Form One Mathematics Teachers

Dimensions of emotional Intelligence	Mean	*SD*
Utilization of emotion	3.83	0.42
Regulation of emotion	3.98	0.38
Appraisal and expression of emotion	3.91	0.43

Table 4 shows the distribution of frequencies and percentage of mathematics teachers' responses for the various items in the utilisation of emotion subscale. Of the 14 items, a percentage of less than 10% of the mathematics teachers agreed that they 'very often' designed creative teaching strategies to make the lesson interesting (8.6% - item 12) and given guidance on teaching and learning (9.8% - item 36).

Table 4
Utilisation of Emotion among Form One Mathematics Teachers

Dimensions of Emotional Intelligence		Level of Agreements				
Utilisation of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 1	Solve problems in teaching mathematics in English before start teaching	0 (0.0)	3 (1.8)	20 (12.3)	88 (54.0)	52 (31.9)
Item 6	Plan alternative ways to deliver mathematics concepts in simpler manner	0 (0.0)	0 (0.0)	22 (13.5)	111 (68.1)	30 (18.4)
Item 12	Design creative teaching strategies to make lesson interesting	1 (0.6)	5 (3.1)	72 (44.2)	71 (43.6)	14 (8.6)
Item 20	Plan action if encounter difficulties in teaching mathematics in English	0 (0.0)	1 (0.6)	42 (25.9)	95 (58.6)	24 (14.8)

Dimensions of Emotional Intelligence		Level of Agreements				
Utilisation of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 21	Identify what is required in teaching mathematics in English	0 (0.0)	2 (1.2)	38 (23.5)	95 (58.6)	27 (16.7)
Item 23	Teaching material served as reinforcement to the teaching	0 (0.0)	9 (5.6)	44 (27.2)	84 (51.9)	25 (15.4)
Item 25	Can teach basic mathematics concepts in English easily	0 (0.0)	3 (1.9)	31 (19.1)	90 (55.6)	38 (23.5)
Item 30	Ascertain requirements of the syllabus before teaching	0 (0.0)	2 (1.2)	27 (16.6)	88 (54.0)	46 (28.2)
Item 31	Take extra time to prepare lessons	0 (0.0)	8 (4.9)	56 (34.4)	78 (47.9)	21 (12.9)
Item 33	Acquainted with new techniques in teaching mathematics during training programme	1 (0.6)	8 (4.9)	46 (28.2)	87 (53.4)	21 (12.9)
Item 36	Given guidance on teaching and learning process	2 (1.2)	10 (6.1)	44 (27.0)	91 (55.8)	16 (9.8)
Item 40	School administrator identify teachers' needs	0 (0.0)	9 (5.5)	43 (26.4)	83 (50.9)	28 (17.2)
Item 41	Training programme catered to different competencies in English of the individual teachers	2 (1.3)	14 (8.8)	52 (32.5)	71 (44.4)	21 (13.1)

Dimensions of Emotional Intelligence		Level of Agreements				
Utilisation of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 45	Teaching materials from the Ministry of Education lay foundation in implementing mathematics in English	1 (0.6)	9 (5.5)	38 (23.3)	81 (49.7)	34 (20.9)

Items that were responded to by mathematics teachers with an 'Almost Never' response included item 12; designed creative teaching strategies to make the lesson interesting (0.6%), item 33; acquainted with new techniques in teaching mathematics during training programmes (0.6%), item 36; given guidance on teaching and learning process (1.2%), item 41; training programmes catered to different competencies in English of the individual teacher (1.3%) and item 45; teaching materials from the Ministry of Education lay foundation in implementing mathematics in English (0.6%).

Table 5 shows the percentage distribution of levels of agreements for each of the items for the subscale of regulation of emotion among Form One mathematics teachers. An interesting pattern to note is that 66.3% of the mathematics teachers responded that they 'often' think of how to solve students' problems on the lack of understanding of abstract mathematical concepts (item 5), 64.4% responded that they often change teaching strategies for students who do not understand the mathematics content (item 7) and 62.6% responded that they make an effort to improve their teaching of mathematics in English (item 29). A relatively high percentage of mathematics teachers responded that they 'often' or 'very often' get professional support from the school administrators (65.0% - item 35) and 31.9% of the mathematics teachers responded that they very often get support from peers who are proficient in English (item 43).

Table 5
Regulation of Emotion among Form One Mathematics Teachers

Dimensions of Emotional Intelligence		Level of Agreements				
Regulation of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 2	Draw diagrammatically how to teach the concepts and its relationships using accurate terminologies	1 (0.6)	8 (4.9)	44 (27.0)	84 (51.5)	26 (16.0)
Item 5	Think of how to solve students' problems on the lack of understanding of abstract mathematical concepts	0 (0.0)	1 (0.6)	21 (12.9)	108 (66.3)	33 (20.2)
Item 7	Change teaching strategies for students who do not understand the mathematics content	0 (0.0)	1 (0.6)	27 (16.6)	105 (64.4)	30 (18.4)
Item 10	Choose mathematical concepts relevant for teaching the topic	0 (0.0)	0 (0.0)	18 (11.0)	112 (68.7)	33 (20.2)
Item 11	Think of the goals of the subject matter and what I should do to achieve it	0 (0.0)	2 (1.2)	43 (26.5)	95 (58.6)	22 (13.6)
Item 13	Work hard to teach Mathematics in English in the best possible way	1 (0.6)	0 (0.0)	28 (17.2)	88 (54.0)	46 (28.2)
Item 14	Willing to do extra work to improve my teaching of Mathematics in English	0 (0.0)	1 (0.6)	38 (23.3)	88 (54.0)	36 (22.1)

Dimensions of Emotional Intelligence		Level of Agreements				
Regulation of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 15	Focus attention fully when teaching Mathematics in English	0 (0.0)	0 (0.0)	27 (16.6)	92 (56.4)	44 (27.0)
Item 19	Always think of ways of implementing the teaching of Mathematics in English	0 (0.0)	2 (1.2)	27 (16.6)	105 (64.4)	29 (17.8)
Item 29	Put effort to improve my teaching of Mathematics in English	0 (0.0)	0 (0.0)	23 (14.1)	102 (62.6)	38 (23.3)
Item 35	Get professional support from the school administrators	0 (0.0)	11 (6.8)	43 (26.5)	82 (50.6)	26 (16.5)
Item 39	School administrators give guidance to teachers for successful implementation of teaching Mathematics in English	0 (0.0)	9 (5.5)	48 (29.4)	61 (37.4)	45 (27.6)
Item 43	There is support from peers who are proficient in English	0 (0.0)	4 (2.5)	19 (11.7)	88 (54.0)	52 (31.9)

Table 6 shows the percentage distribution of each item of the appraisal and expression of emotion emotional intelligence subscale. 61.3% of the mathematics teachers responded that they 'often' reflected on the strengths of the lesson. A relatively moderate percentage in the range of 50% was

noted for teachers who often check what has been taught before planning for the next lesson (item 9); 58.6% of the mathematics teachers are often sure of the communication skills of teaching Mathematics in English (item 16). A computed percentage of 57.7% of the mathematics teachers reported that they 'often' believe that their effort in teaching the subject in English is a success (item 27). Teachers who reported that they 'often' questioned themselves on how they can improve their teaching (item 28) recorded a value of 56.4 %.

Table 6
Appraisal and Expression of Emotion among Form One Mathematics Teachers

Dimensions of Emotional Intelligence		Level of Agreements				
Appraisal and Expression of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 3	Evaluate progress in teaching Mathematics in English by getting feedback of the students' understanding	1 (0.6)	2 (1.2)	41 (25.2)	91 (55.8)	28 (17.2)
Item 4	Question myself from time to time on the teaching strategies employed in facilitating students' understanding of Mathematics	0 (0.0)	1 (0.6)	45 (27.6)	85 (52.1)	32 (19.6)
Item 8	At the end of the teaching, I reflect on the strengths of the lesson	0 (0.0)	3 (1.8)	42 (25.8)	100 (61.3)	18 (11.0)
Item 9	Check what has been previously taught before plan for the next lesson	0 (0.0)	1 (0.6)	29 (17.8)	86 (52.8)	47 (28.8)

Dimensions of Emotional Intelligence		Level of Agreements				
Appraisal and Expression of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 16	I am sure that I can acquire the communication skills of teaching Mathematics in English	0 (0.0)	0 (0.0)	29 (17.9)	95 (58.6)	38 (19.4)
Item 17	I predict that I would be able to teach confidently Mathematics in English	0 (0.0)	0 (0.0)	36 (22.2)	93 (57.4)	33 (20.4)
Item 18	Although the teaching of Mathematics in English is complex, I think I will be successful	0 (0.0)	0 (0.0)	31 (19.1)	96 (59.3)	35 (21.6)
Item 22	I am confident in teaching the abstract concepts in a simplified way using English	0 (0.0)	8 (4.9)	57 (35.0)	76 (46.6)	22 (13.5)
Item 24	I ask myself how much I need to learn in order to teach Mathematics in English	1 (0.6)	4 (2.5)	44 (27.0)	81 (49.7)	33 (20.2)
Item 27	I believe my effort in teaching Mathematics in English is a success	0 (0.0)	1 (0.6)	27 (16.6)	94 (57.7)	41 (25.8)
Item 28	I question myself how I can improve my teaching	0 (0.0)	0 (0.0)	33 (20.2)	92 (56.4)	38 (23.3)

Dimensions of Emotional Intelligence		Level of Agreements				
Appraisal and Expression of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 32	I was able to use the results of training in the classroom teaching	0 (0.0)	6 (3.7)	46 (28.4)	89 (54.9)	21 (13.0)
Item 37	I was able to update knowledge on ICT skills	2 (1.2)	7 (4.3)	42 (25.8)	89 (54.6)	23 (14.1)
Item 38	There are opportunities in school to exchange views on experience in teaching Mathematics in English	0 (0.0)	10 (6.1)	32 (19.6)	88 (54.0)	33 (20.2)
Item 42	The activities in the training programme enabled me to improve my knowledge in English language	0 (0.0)	8 (5.0)	37 (23.0)	79 (49.1)	37 (23.0)
Item 44	Evaluation from peers helped me in improving my teaching of Mathematics in English	3 (1.8)	4 (2.5)	24 (14.7)	98 (60.1)	34 (20.9)

Levels of Emotional Intelligence Among Form One Science Teachers

Table 7 shows the level of intelligence analysed according to the three subscales. From the table, it was noted that the utilisation of emotion subscale recorded a mean of 3.82 with a standard deviation of 0.42. A mean score of 3.88 with a standard deviation of 0.41 was obtained for the regulation of emotion subscale. The construct of appraisal and expression of emotion recorded a mean of 3.86 with a standard deviation of 0.43. A detailed analysis

of the utilisation of emotion is depicted in Table 8.

Table 7
Levels of Emotional Intelligence Among Form One Science Teachers

Dimensions of emotional Intelligence	Mean	*SD*
Utilisation of emotion	3.82	0.42
Regulation of emotion	3.88	0.41
Appraisal and expression of emotion	3.86	0.43

Table 8 shows the percentage distribution for each item in the utilisation of emotion subscale. A value of 22.8% was noted for science teachers who responded that they 'very often' solved problems in teaching the subject using English before they started the lesson (item 1). An extremely low percentage (6.3%) was noted for science teachers who responded that they 'very often' designed creative teaching strategies to make the lesson interesting (item 12). 24.1% of the science teachers responded that they 'very often' ascertained requirements of the syllabus before teaching and used the teaching materials provided by the Ministry of Education as resources for implementing Science in English (item 30).

Table 8
Utilisation of Emotion Among Form One Science Teachers

Dimensions of Emotional Intelligence		Level of Agreements				
Utilisation of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 1	Solve problems in teaching science in English before starting to teach	0 (0.0)	2 (1.3)	30 (19.0)	90 (57.0)	36 (22.8)
Item 6	Plan alternative ways to deliver science concepts in simpler manner	0 (0.0)	1 (0.6)	53 (33.5)	82 (51.9)	22 (13.9)
Item 12	Design creative teaching strategies to make lesson interesting	0 (0.0)	3 (1.9)	72 (45.6)	73 (46.2)	10 (6.3)

Dimensions of Emotional Intelligence		Level of Agreements				
Utilization of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 20	Plan action if encounter difficulties in teaching science in English	0 (0.0)	0 (0.0)	48 (30.4)	84 (53.2)	26 (16.5)
Item 21	Identify what is required in teaching science in English	0 (0.0)	0 (0.0)	43 (27.2)	89 (56.3)	26 (16.5)
Item 23	Teaching material served as reinforcement to the teaching	0 (0.0)	1 (0.6)	39 (24.7)	86 (54.4)	32 (20.3)
Item 25	Can teach basic science concepts in English easily	0 (0.0)	1 (0.6)	47 (29.7)	83 (52.5)	27 (17.1)
Item 30	Ascertain requirements of the syllabus before teaching	0 (0.0)	1 (0.6)	31 (19.6)	88 (55.7)	38 (24.1)
Item 31	Take extra time to prepare lessons	1 (0.6)	3 (1.9)	58 (36.7)	78 (49.4)	18 (11.4)
Item 33	Acquainted with new techniques in teaching science during training programme	2 (1.3)	5 (3.2)	58 (36.9)	74 (47.1)	18 (11.5)
Item 36	Given guidance on teaching and learning process	0 (0.0)	8 (5.1)	56 (35.4)	77 (48.7)	17 (10.8)
Item 40	School administrator identify teachers' needs	2 (1.3)	6 (3.8)	45 (28.5)	67 (42.4)	38 (24.1)

Dimensions of Emotional Intelligence		Level of Agreements				
Utilisation of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 41	Training programme catered to the individual teacher's competencies in English	3 (1.9)	12 (7.6)	49 (31.2)	62 (39.5)	31 (19.7)
Item 45	Teaching materials from the Ministry of Education lay foundation in implementing science in English	0 (0.0)	4 (2.5)	29 (18.4)	87 (55.1)	38 (24.1)

Table 9 shows the percentage distribution of the emotional intelligence levels specifically for the regulation of emotion subscale. An interesting pattern to note is that 60.8 % of the science teachers responded that they 'often' thought of how to solve the lack of understanding of abstract concepts among students (item 5). A similar percentage was noted for science teachers who responded that they 'often' worked hard to teach Science in English in the best way possible (item 13). 63.9% of the science teachers were of the opinion that school administrators 'often' or 'very often' gave guidance to teachers for successful implementation of teaching Science in English. This was in the form of 'in-house' training conducted as part of the on-going professional development for teachers. The training package incorporated specialised skills and prerequisites for the up-grading of skills and competencies. Teachers used this as a platform to clarify doubts and to adopt coping strategies. This has been an initiative by the school authorities to enable teachers to cope with the demands of teaching. Science teachers expressed that their peers who were proficient in English 'often' or 'very often' gave support. This category (item 43) recorded a high percentage of 82.3%. A 'buddy system' was introduced in the schools whereby English Language teachers were identified to work 'hand-in-hand' with science teachers. In this way, the science teachers had easy accessibility to 'buddy problem-solvers' and immediate assistance was available. This ensured that

the science teachers were not in the dark when resolving issues pertaining to English Language. The cumulative problem in the classroom poses a challenge to the teachers to manage their own emotions by turning the negative ones into positive learning. The synergy of both English Language teachers and science teachers would ensure an effective and efficient delivery process.

Table 9
Regulation of Emotion for Form One Science Teachers

Dimensions of Emotional Intelligence		Level of Agreements				
Regulation of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 2	Draw diagrammatically how to teach the concepts and its relationships using the accurate terminologies	1 (0.6)	3 (1.9)	63 (39.9)	69 (43.7)	22 (13.9)
Item 5	Think of how to solve students' problems on the lack of understanding of abstract scientific concepts	0 (0.0)	0 (0.0)	37 (23.4)	96 (60.8)	25 (15.8)
Item 7	Change teaching strategies for students who do not understand the science content	0 (0.0)	2 (1.3)	53 (33.5)	84 (53.2)	19 (12.0)
Item 10	Choose scientific concepts relevant for teaching the topic	0 (0.0)	0 (0.0)	38 (24.1)	99 (62.9)	21 (13.3)
Item 11	Think of the goals of the subject matter and what I should do to achieve it	0 (0.0)	1 (0.6)	42 (26.6)	93 (58.9)	22 (13.9)

Dimensions of Emotional Intelligence		Level of Agreements				
Regulation of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 13	Work hard to teach Science in English in the best possible way	0 (0.0)	0 (0.0)	36 (22.8)	96 (60.8)	26 (16.5)
Item 14	Willing to do extra work to improve my teaching of Science in English	0 (0.0)	1 (0.6)	53 (33.5)	83 (52.5)	21 (13.3)
Item 15	Focus attention fully when teaching Science in English	0 (0.0)	0 (0.0)	32 (20.3)	88 (55.7)	38 (24.1)
Item 19	Always think of ways of implementing the teaching of Science in English	0 (0.0)	1 (0.6)	47 (29.7)	80 (50.6)	30 (19.0)
Item 29	Put effort to improve my teaching of Science in English	0 (0.0)	0 (0.0)	30 (19.0)	99 (62.7)	29 (18.4)
Item 35	Get professional support from the school administrators	3 (1.9)	15 (9.5)	40 (25.3)	70 (44.3)	30 (19.0)
Item 39	School administrators give guidance to teachers for successful implementation of teaching Science in English	1 (0.6)	11 (7.0)	45 (28.5)	50 (31.6)	51 (32.3)

Dimensions of Emotional Intelligence		Level of Agreements				
Regulation of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 43	There is support from peers who are proficient in English	0 (0.0)	1 (0.6)	27 (17.1)	85 (53.8)	45 (28.5)

Table 10 shows the percentage distribution of each item for the appraisal and expression subscale. From Table 10, it can be seen that 31.6% of the science teachers responded that they 'often' believed that their effort of teaching Science in English is a success (item 27). Only 22.2% of the science teachers responded that they 'often' believed that peer evaluation helped them in improving their teaching of Science in English (item 44). Moderate percentages in the range of 50% were noted for activities 'often' implemented which included evaluation of progress through feedback of the students' understanding (item 3), professional self-improvement (item 42) and peer evaluation (item 44) to enhance English Language proficiency skills in delivering scientific content. Some 67.7% of the science teachers were of the opinion that the courses enabled them to update their ICT skills (item 37).

Table 10
Appraisal and Expression of Emotion for Form One Science Teachers

Dimensions of Emotional Intelligence		Level of Agreements				
Appraisal and Expression of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 3	Evaluate progress in teaching Science in English by getting feedback of the students' understanding	0 (0.0)	3 (1.9)	48 (30.4)	83 (52.5)	24 (15.2)

Dimensions of Emotional Intelligence		Level of Agreements				
Appraisal and Expression of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 4	Question myself from time to time on the teaching strategies employed in facilitating students' understanding of Science	0 (0.0)	3 (1.9)	55 (34.8)	75 (47.5)	25 (15.8)
Item 8	At the end of the teaching, I reflect on the strengths of the lesson	0 (0.0)	0 (0.0)	62 (39.2)	75 (47.5)	21 (13.3)
Item 9	Check what has been previously taught before plan for the next lesson	0 (0.0)	0 (0.0)	46 (29.1)	85 (53.8)	27 (17.1)
Item 16	I am sure that I can acquire the communication skills of teaching Science in English	0 (0.0)	2 (1.3)	37 (23.4)	84 (53.2)	35 (22.2)
Item 17	I predict that I would be able to teach confidently Science in English	0 (0.0)	2 (1.3)	40 (25.3)	85 (53.8)	31 (19.6)
Item 18	Although the teaching of Science in English is complex, I think I will be successful	0 (0.0)	0 (0.0)	43 (27.2)	85 (53.8)	30 (19.0)

Dimensions of Emotional Intelligence		Level of Agreements				
Appraisal and Expression of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 22	I am confident in teaching the abstract concepts in a simplified way using English	1 (0.6)	6 (3.8)	65 (41.1)	62 (39.2)	24 (15.2)
Item 24	I ask myself how much I need to learn in order to teach Science in English	0 (0.0)	2 (1.3)	50 (31.6)	80 (50.6)	26 (16.5)
Item 27	I believe my effort in teaching Science in English is a success	0 (0.0)	1 (0.6)	21 (13.3)	86 (54.4)	50 (31.6)
Item 28	I question myself how I can improve my teaching	0 (0.0)	0 (0.0)	38 (24.1)	89 (56.3)	31 (19.6)
Item 32	I was able to use the results of training in the classroom teaching	1 (0.6)	4 (2.5)	49 (31.0)	81 (51.3)	23 (14.6)
Item 37	I was able to update knowledge on ICT skills	2 (1.3)	0 (0.0)	49 (31.0)	80 (50.6)	27 (17.1)
Item 38	There are opportunities in school to exchange views on experience in teaching Science in English	0 (0.0)	5 (3.2)	48 (30.4)	75 (47.5)	30 (19.0)

Dimensions of Emotional Intelligence		Level of Agreements				
Appraisal and Expression of Emotion		Almost Never	Seldom	Some-times	Often	Very Often
		n (%)	n (%)	n (%)	n (%)	n (%)
Item 42	The activities in the training programme enabled me to improve my knowledge in English language	2 (1.3)	5 (3.2)	40 (25.5)	84 (53.5)	26 (16.6)
Item 44	Peer evaluation helped me in improving my teaching of Science in English	1 (0.6)	3 (1.9)	32 (20.3)	87 (55.1)	35 (22.2)

Comparison of Emotional Intelligence between Form One Mathematics and Science Teachers

Table 11 summarises the t-test findings of emotional intelligence among Form One Mathematics teachers and Form One Science teachers. The utilisation of emotion subscale indicated a t-value of 0.26, which is not significant at the 0.05 level. Thus, it can be concluded that the mathematics and science teachers did not differ in utilising their emotion for the purpose of motivation, creativity, redirected attention and flexible planning. The results on Table 5 and Table 9 displayed a higher mean value for the regulation of emotion subscale among the mathematics teachers compared to the science teachers. A computed *t*-value of 2.33 that is significant at the 0.05 level was obtained. The results indicated that the mathematics teachers are better in regulating their behaviour compared to the science teachers. For the appraisal and expression of emotion subscale, a higher mean was noted for the mathematics teachers than the science teachers. The *t*-value of 1.03 was not significant at the $p<0.05$ level. The results indicate that the mathematics teachers and science teachers did not differ in the appraisal and expression of emotion.

Table 11
Comparison of Emotional Intelligence between Form One Mathematics and Science Teachers

Categories			Dimensions of Emotional Intelligence							
			Utilisation of Emotion		Regulation of Emotion		Appraisal and Expression of Emotion		Total	
	N	df	*T*	Sig	*T*	Sig	*T*	Sig	*t*	Sig
Mathematics	163									
Science	158									
		319	.26	.79	2.33	.02	1.03	.30	1.22	.22

Discussion and Conclusion

The findings show that there is no significant difference in the emotional intelligence between the mathematics and science teachers, with $t(319)=1.22$, $p>.05$ though a higher mean value of emotional intelligence was noted for mathematics teachers (Mean=3.90, $SD=0.38$) compared to the science teachers (Mean=3.85, $SD=0.40$). Thus, it can be concluded that the Mathematics teachers and Science teachers did not differ in their overall emotional intelligence in coping with the change.

However, analysis based on the subscales of emotional intelligence revealed that there is a significant difference in emotional intelligence between mathematics (Mean=3.98, $SD=0.38$) and science (Mean=3.88, $SD=0.41$) teachers for the regulation of emotion subscale, with $t(319)=2.33$, $p<.05$. Mathematics teachers are able to regulate their emotions better compared to the science teachers. The regulation of emotion encompasses the ability of the mathematics teachers to express emotions, awareness of emotions expressed by others, able to regulate their emotions both in oneself and in themselves and in others and to utilise their emotions compared to science teachers. The mathematics teachers often think how to solve students' problems on the lack of understanding of abstract mathematical concepts and often change strategies for students who do not understand the mathematical content. The regulation of emotion subscale differs between the mathematics and science teachers. Though the mathematics and science teachers did not differ in the overall emotional intelligence, however, they differed in their regulation of emotions, as mathematics teachers were able to regulate their emotions better than the science teachers.

Findings revealed that less than 10% of science and mathematics teachers 'very often' designed creative teaching strategies to make the lesson interesting. This could be expected as mathematics teachers (70.6%) and science teachers (79.2%) 'often' and 'very often' agreed that the teaching materials from the Ministry of Education laid the foundation for implementing science and mathematics in English. In response to the guidance given on the teaching and learning process, 59.5% of the science teachers agreed that guidance was 'often' and 'very often' given. Similarly, 65.6% of the mathematics teachers agreed that guidance was 'often' and 'very often' given. The science teachers and mathematics teachers utilised their emotions to focus on the teaching and learning process. The emotional intelligence, which encompasses the utilisation of emotions did not differ between the mathematics and science teachers.

Although the teaching of science in English is complex, 72.8% of the science teachers were 'often' and 'very often' confident that they would be successful. A similar pattern was noted for 80.9% of the mathematics teachers. Science teachers were confident in teaching the abstract concepts in a simplified way using English (54.4%), thus indicating that they are able to appraise their own emotion in the teaching of science. A percentage of 60.1% of the mathematics teachers, were able confident in teaching the abstract concepts in a simplified way using English.

The ability of the teachers to identify their own emotions and using emotions to facilitate thought in implementing science and mathematics in English is critical. The teacher should be able to manage emotions by overcoming obstacles to ensure a smooth adaptation to the challenge. The Malay Language was the medium of instruction for teacher training for the past quarter of a century, and English Language was a second language or third language to most Malaysians. Thus, it is obvious that the teaching of science and mathematics which involves the use of technical terms in English, is certainly foreign to the teachers. Science teachers expressed that their peers who were proficient in English 'often' or 'very often' gave support. This category recorded a high percentage of 82.3%. A 'buddy system' was introduced in the schools whereby English Language teachers were identified to work 'hand-in-hand' with science teachers. In this way, the science teachers had easy accessibility to 'buddy problem-solvers' and immediate assistance was available. This ensured that the science teachers were not in the dark when resolving issues pertaining to English Language. The synergy of both

English Language teachers and science teachers would ensure that the delivery process is efficient and effective.

Technological courses conducted simultaneously with English Language proficiency courses were held by the Ministry of Education. In addition to this, at the institutional level, courses were organised by the school management as a 'follow-up' to enhance skills in pertinent areas. The courses conducted included the use of MS Word, MS PowerPoint, Internet and the prepared courseware designed specifically for the teaching-learning process by the Ministry of Education. The user-friendly courseware was a facilitating tool. Teachers used this courseware as an aid to increase their proficiency in English, for example grammar, pronunciation, terminology and other related linguistic aspects. Altogether 17.1% of the science teachers were of the opinion that the courses enabled them to update their ICT skills, and 63.9% of the science teachers were of the opinion that school administrators often or very often gave guidance to teachers for successful implementation of teaching Science in English. This was in the form of 'in-house' training conducted as part of the on-going professional development for teachers. The training package incorporated specialised skills and as well as prerequisite skills and competencies for the smooth transition. Teachers used this as a platform to clarify doubts and to adopt coping strategies. This has been an initiative by the school authorities to enable teachers to cope with the demands of teaching.

Technological skills and competencies integrated with English Language proficiency courses created multiple innovative frameworks for teaching science and mathematics. Technological courses conducted simultaneously with English Language proficiency courses were conducted by the Ministry of Education. In addition to this, at the institutional level, courses were organised by the school management as a follow-up to enhance skills in pertinent areas. The courses conducted included the use of MS Word, PowerPoint, Internet and the prepared courseware designed specifically for the teaching-learning process by the Ministry of Education. The user-friendly courseware was a facilitating tool. Teachers used this courseware to aid in their English proficiency for example grammar, pronunciation, terminology and other related linguistic aspects.

The mathematics and science teachers ranked average in their emotional intelligence. As this research was carried after three years of the implementation of teaching of Form One mathematics and science in English,

this could imply that they are still in the process of accepting the changes in the policy of teaching science and mathematics in English. As a follow-up of these research findings, customised programmes would be designed to address this issue which has carry-over effects in the successful implementation of this policy.

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