Volume: 3 Issues: 15 [June, 2018] pp.57-70
International Journal of Education, Psychology and Counseling
eISSN: 0128-164X
Journal website: www.ijepc.com

MOTIVATION AND LEARNING STRATEGIES OF SECONDARY SCHOOL STUDENTS TOWARDS GENERAL SCIENCE: A PILOT STUDY

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Accepted date: 25 March 2018 **Published date:** 11 July 2018

To cite this document: Fong, L. P., Jiar, Y. K., & Abu, B. (2018). Motivation and Learning Strategies of Secondary School Students Towards General Science: A Pilot Study. *International Journal of Education, Psychology and Counseling*, *3*(15), 57-70.

Abstract: *This study aims to evaluate the 7-point Likert-scaled instrument and Motivated Learning Strategy Questionnaires (MSLQ). This questionnaire is a pre-established instrument which was created by Pintrich and his colleagues to assess motivation orientations and the use of learning strategies. The sample of this pilot study involved 30 Form 2 students from a government secondary school which was not involved in the actual research study. It is a self-reporting tool which consists of 81 items. The motivation section consists of 31 items while the learning strategies section consists of 50 items. The motivation scales were originally divided into three broad areas: (1) value, (2) expectancy, and (3) affect. The Learning Strategies scales are all divided into three broad areas: (1) cognitive, (2) metacognitive, (3) resource management strategies. Cronbach's α (alpha) for the three subscales of motivation range from 0.73 to 0.80. Cronbach's α (alpha) for the three subscales of learning strategies range from 0.71 to 0.88. The reliability of MSLQ instrument is consistent with the original Pintrich's study. In this study, the content validity of the instruments was determined by obtaining content verification from two English teachers and two Science teachers. The mean score of Test Anxiety and Critical Thinking are lower when compared to other subscales. Therefore, future researches can be carried out in these two areas in order to enhance the motivation and learning strategies of students.*

Keywords: *Motivation, Learning Strategies, MSLQ*

Introduction

New Straits Time (2016) reported the number of students to enrolled Science, Technology, Engineering and Mathematics (STEM) program and non-Science, Technology, Engineering and Mathematics program have not met the target ratio, which is 60:40 target ratio. In fact, Malaysia government instituted the first National Science and Technology Enrolment Policy of 60: 40 (Science/Technical: Arts) in 1967 which have yet to be achieved. Global economic giants like the United States, Japan, Singapore and Germany having a solid 30 percent workforce in STEM fields, Malaysia still has a long way to go as it has a STEM-related workforce of only less than three per cent. It has been reported by Ismail (2012) that a steady decline in the number of students who enrolled in Science careers and students view Science as a difficult subject. Looking at this issue from a wider perspective, it can be assumed that students with low motivation and learning strategies from science stream could jeopardize Malaysia's competitiveness in this globalization era.

In Malaysia, a new Secondary School Standard Curriculum (known as Kurikulum Standard Sekolah Menengah, KSSM) was launched in 2017. The KSSM aims to embed a balanced set of knowledge and skills such as creative thinking, innovation, problem solving and leadership (Malaysia, 2016, p32). Science allows students to explore their world and discover new things. According to Yong and Yeo (2012), students who are unable to understand the content delivered by teachers normally feel 'lagging' in class. They feel alone in the class and this lead them to perceive that the others understood the subjects taught in the class well. They are demotivated especially when they are not able to perform tasks or questions assigned by teachers. Such feelings would reduce students' self-efficacy in learning Science and they will disengage from learning. A barrier to learning is created when students are uninterested towards learning. Motivation is crucial for effective learning. Demotivated students became passive learners and would be accustomed to spoon-feeding. They would just follow the instructions of teachers without critically thinking the rationale behind it.

By teaching students appropriate learning strategies, students eventually improve their learning strategies and meet the task requirements. Students that are able to initiate their study activities with self-efficacy and develop applicable self-learning strategies are more likely to progress and achieve better (Pintrich & Schrauben,1992; Zimmerman, 1986). Similarly, Nelson Laird et al. (2014) believed that students can succeed in learning if they are capable of performing the task and possess meaningful learning strategies in their learning processes. The learning strategies that will be highlighted in this study are organization, elaboration, help-seeking, peer learning, control of belief, rehearsal, critical thinking, metacognitive and time and study environment. From this study, the researcher is able to find out learning strategies that are adopted by students to complement their learning.

Self-regulating skills are not regarded as inborn mental skills or obtained learning skills. These are self-directive processes that help students to transform their mental abilities into academic skills (Zimmerman, 1990, 2002). Previous researches have concluded the characteristics of self-regulated learners (Winne, 1995; Zimmerman, 1989, 2002). Firstly, self-regulating learners know how to use a series of cognitive strategies, like, elaboration, organization, highlighting information which help them to organize, transform, recover and elaborate information. Secondly, self-regulating learners know how to use a series of metacognitive strategies. For example, they know how to plan, control and direct their mental processes. Thirdly, self-regulating learners always hold a set of motivational beliefs. In conclusion, self-regulated learning involves metacognition, strategic action and motivation.

Dr. Paul Pintrich had studied the relationship between motivation and cognition. Ramirez-Dorantes et al. (2013) mentioned in his research that Pintrich's main contribution to educational psychology is the proposal of a model of social learning and cognitive contextual skills. One of his enduring legacies to the practice of educational psychology and empirical research on learning and motivation in the college students is the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991,1993). The MSLQ was developed using a cognitively-social point of view of motivation and learning strategies (Pintrich & Garcia, 1991). Initially, the MSLQ is used to measure motivation and the use of learning strategies of college students. Nonetheless, Pintrich and his collaborators had adapted it for the use of late elementary through secondary school students.

A pilot study was performed by researcher evaluate the feasibility of MSLQ and to collect empirical data to perform an iterative and improvement process to MSLQ (Ramírez Echeverry, García Carrillo, & Olarte Dussan, 2016). Through pilot study, the researcher is able to test the adequacy of instrument items, identify the logical problems that may occur and assess the proposed data analysis method. This pilot study involved 30 Form 2 secondary school students at the Johor Bahru state. The reason behind choosing Form 2 students to become respondents of this study is the need for Form 2 students to study general Science as one of their subjects. Form 2 students are Lower Form Secondary School students while Form 4 and form 5 students are Upper Form Secondary School students. The Form 4 and Form 5 students study based on their academic stream, which are Science stream and Art stream. The main subjects studied by Science stream students are Chemistry, Physics, Biology, Additional Mathematics and others. However, Art stream students study Accountancy, Commerce, Geography and Compound Science. Hence, Science stream students tend to prefer Science subjects. The Form 4 and Form 5 students are not suitable to be chosen as respondents for this study because they are studying based on their academic stream, and most probably cannot give a reliable result. Meanwhile, Form 1 students are not suitable to be chosen as respondents for this study too because they are considered beginners in secondary school education. Form 3 students are not suitable to be selected as respondents of this study too because they will sit for the Penilaian Pentaksiran Tingkatan 3 (PT3) at the end of year.

The reliability and validity are two important concepts in research as they are used to enhance the accuracy of the assessment and evaluation of research work (Tavakol & Dennick, 2011, p.53)**.** If the items of instrument do not measure what it is supposed to measure, it is meaningless to our study. Validity is the extent to which an instrument measures what it is supposed to measure and performs as it is designed to perform. Reliability refers to the consistency of the measurement (Shaughnessy, Zechmeister, & Zechmeister, 2012, p.164). A reliable instrument measure is one that yields similar results each time it is administered. So, by conducting pilot study, the researcher is able to enhance accuracy and consistency of the main study later.

Literature Review

Motivation and learning strategies are two elements related to learning process (McKeachie, Pintrich, Lin, & Smith, 1987; Morales Chan, Hernandez Rizzardini, Barchino Plata, & Amelio Medina, 2015). Motivation and learning strategies had been discussed as below.

Motivation

Many definitions were made for motivation. Pintrich (2003) defined motivation as an internal process that activates, guides and mains behavior over time. Similarly, Glynn and Koballa (2006) defined motivation as an internal state that arouses, directs and sustains students' behavior. In the Science education, Bolat (2007) defined motivation towards Science learning as a desire to learn Science.

Past researchers have shown that motivation to learning Science is a pertinent issue to be highlighted. Poor motivation of students is the major factor leading to poor achievement in Science (Glynn, Taasoobshirazi, & Brickman, 2007). According to Cavas (2011), the major factor that affects students' attitude and achievement in Science is their motivational level. It is argued that students with better motivation usually perform better in school exams (Pintrich, 2003). Williams and Williams (2011) also agreed that motivation is one of the important factors to increase students' interest towards learning. Many researchers agreed that highly-motivated students are more likely to understand learning contents better and able to perform to the task.

In this study, motivation of students can be measured using the 6 sub-scales as described below. They are Intrinsic Goal Orientation, Extrinsic Goal Orientation, Task Value, Control of Learning Beliefs, Self-efficacy for Learning and Performance and Test Anxiety. The definition of each subscale had been listed as below:

i. Intrinsic Goal Motivation

Intrinsic goal orientation concerns the degree to which the student perceives herself or himself to be participating in Science activities for reasons like the challenges posed by the activities, the curiosity and mastery.

ii. Extrinsic Goal Motivation

Extrinsic goal orientation complements intrinsic goal orientation. Extrinsic goal orientation concerns the degree to which students perceives himself or herself to be participating in a Science lesson for reasons like exam scores, awards, competition and others.

iii. Self-efficacy

Self-efficacy assesses two aspects of expectance: expectancy for success and self-efficacy. Self-efficacy is the self-appraisal of one's ability to master a task. In this study, self-efficacy means students believe their ability and are able to perform their tasks. Expectancy for success refers to the performance expectations and relates specifically to task performance. In this study, expectancy for success indicate that students who believe their ability will have positive expectation for success.

iv. Task Value

In this study, task refers to Science lesson. Task value refers to the student's evaluation of the how interesting, how important, and how useful the Science lesson is.

v. Control Belief

The control of learning refers to students' beliefs that the effort put for Science lesson will result in a positive outcome.

vi. Test Anxiety

Test anxiety is defined as an unpleasant feeling or emotional state such as tension, worry or fear of failure displayed by students on tests or other cognitive measures (Pintrich, Smith, Garcia, & McKeachie, 1991; Zeidner, 1998).

Learning Strategies

Learning strategies are methods possessed by students during their learning process. Meyer, Abrami, Wade, Aslan, and Deault (2008) defined learning strategy as a cognitive process performed by a learner to improve his or her learning quality. Learning strategies are essential for Science learning because they assist students in mastering the foundation knowledge necessary to advance within the discipline (Miyake et al., 2010). When students master the effective learning strategy, they will become motivated to learn as motivation is inseparable

with learning strategies. Through methods like rehearsal, elaboration, and critical thinking, the information could be stored in students' associate network and can be retrieved anytime.

In this study, learning strategies indicate students' learning approach to understand information delivered by teacher in the classroom. There are 9 sub-scales under learning strategies. In this study, learning strategies that will be discussed are Rehearsal, Metacognitive Self-Regulation, Elaboration, Peer Learning, Organization, Critical Thinking, Time or Study Environment Management, Effort Regulation and Help Seeking. The definition of each subscale had been listed below.

i. Rehearsal
   Rehearsal strategies involve naming or listing items to be learned. These strategies help students revisit their working memory rather than acquainting new information in long term memory.

ii. Elaboration
   Elaboration strategies include paraphrasing, summarizing, creating analogies and generate note-taking. These help students integrate new information to prior knowledge.

iii. Organization
   Organisation strategies help students to select the appropriate information and organise the information in appropriate ways. Information strategies included clustering, outlining, and selecting the main idea.

iv. Critical Thinking
   Critical thinking refers to the degree to which students are applying previous knowledge to new situations in order to solve problems, make decisions or critical evaluations.

v. Metacognitive
   Metacognitive refers to the awareness, knowledge, and control of cognition. There are three general processes that make up metacognitive self-regulatory activities: planning, monitoring and regulating. Planning activities such as goal setting and task analysis help to activate, or prime, relevant aspects of prior knowledge that make organizing information easier. Monitoring includes self-testing and questioning. Regulating refers to fine-tuning and continuous adjustment of students' cognitive activities.

vi. Time and Study Environment
   Time and study management involved environments that are conducive to learning and time management for study.

vii. Effort Regulation
   Effort regulation is defined as the control of effort, indicating management of effort in learning activities or facing difficulties.

viii. Peer Learning
   Study together with peer, such as friends or classmates will show positive effect on learning. Students can change their idea and learn from mistake by collaborating with each other.

ix. Help Seeking
   Seeking help indicates students getting assistance from others. Students can get help from peers, teachers, families members or friends to facilitate their learning.

Self-regulating Skills

Learning, in this current study, is based on social-cognitive theory. Social cognitive theory is generally credited to Albert Bandura and his research on social behaviours. Social cognitive theory stressed on the complexities of our mental processes, social influences and the role of individuals in the learning process (Wolters & Taylor, 2012). The conceptual framework of social cognitive theory assumes a triadic reciprocally among behaviours, personal factors such as cognition, and environmental variables (Bandura, 1986, 2001; Zimmerman & Schunk, 2004). Self-regulation learning is grounded in social-cognitive theory (Wolters & Taylor, 2012).

According to Pintrich (2000), self-regulated learning is "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate and control their cognition, motivation and behavior, guided and constrained by their goals and the contextual features in the environment. Zimmerman (1986) defines self-regulated learning as "the degree to which learners are metacognitively, motivationally and behaviorally active participants in their own learning process (p. 309)".

Pintrich (2000) presents the four-phases of self-regulation. The first phase is forethought, planning and activation, the second phase is monitor, the third phase is control and last phase is reacting and reflect. The forethought phase concerns students' knowledge, goals, planning, efficacy judgments and task value beliefs. The monitoring phase considers students' metacognitive reflections on the learning process. The control phase involved students' selection and the use of appropriate learning strategies. The reaction and reflection phase consider student's task evaluation of the learning process and possible adjustments (Walters & Taylor, 2012).

Through the learning of self-regulation strategy, students will master learning strategies to plan their appropriate strategies to achieve their goals.

Objective

The main objectives of this study are to determine:

1. the reliability of subscale of motivation and learning strategies.
2. the content validity of Motivated Learning Strategy Questionnaire (MSLQ).

Methodology

McKeachie, Pintrich, and Lin (1985) had presented the general theoretical frame work underpinning MSLQ. Then, Pintrich and other researchers have further refined items in MSLQ (Pintrich, 1988;1989; Pintrich & Garcia, 1991; Pintrich & DeGroot, 1990) to ensure the validity and reliability of MSLQ. MSLQ had been used as the instrument to evaluate students' motivation and the use of different learning strategies for certain subject. Moreover, MSLQ is a valid instrument (Pintrich et al., 1993) which has been extensively used by other researchers in many countries (Lee & Recker, 2017; Uffler, Bartier & Pelaccia, 2017; Keyser, 2016; Li & Lynch, 2016). In Malaysia, MSLQ had been widely used to measure students' motivation and learning strategies in different fields as well. For example, Raoofi, Binandeh and Rahmani (2017) use MSLQ to investigate motivation of university students in writing strategies and writing proficiency; Garshasbi (2016) used MSLQ to evaluate the impact of a cooperative learning model on students' self-motivation and academic performance in high school. Yong (2012) had used MSLQ to examine students' motivation and learning strategies before and after intervention of History subject.

The MSLQ consists of 81 items which are divided into two categories: motivation and learning strategies. There are 31 items in the motivation section, 31 items of different cognitive and metacognitive strategies, and 19 items concerning student management of different resources (Pintrich et al., 1991, p.5). There are six subscales under motivation. Subscales of Motivation are Intrinsic Goal Orientation (item1, item 16, item 22 and item 24), Extrinsic Goal Orientation (item7, item11, item 13 and item 30), Task Value (item 4, item 10, item 17, item 23, item 26 and item 27), Control of Leaning Beliefs (item 2, item 9, item 18 and item 25). Self-Efficacy for Learning and Performance (item 5, item 6, item 12, item 15, item 20, item 21, item 29 and item 31) and Test Anxiety (item 3, item 8, item 14, item 19 and item 28). There are nine subscales under Learning Strategies. Subscales of Learning Strategies are Rehearsal (item 39, item 46, item 59 and item 72), Elaboration (item 52, item 62,item 64, item 67, item 69 and item 81), Critical Thinking (item 38, item 47,item 51,item 66 and item 71), Metacognitive Self-regulation (item 33, item 36, item 41,item 44,item 54, item 55, item 56, item 57, item 61, item 76, item 78 and 79), Time/Study Environment Management (item 35, item 43, item 52, item 65, item 70, item 73, item 77 and item 80), Effort Regulation (item 37, item 48, item 60 and item 74), Peer Learning (item 34, item 45 and item 50), Help Seeking (item 40, item 58, item 68 and item 75), Organization (item 32, item 42, item 49 and item 63).

Table 1: Subscale and items' number of MSLQ

Scales	Dimensions	Items' Number	Total Items
Motivation	Test Anxiety	3,8,14,19,28	4
	Extrinsic goal Orientation	7,11,13,30	4
	Task Value	4,10,17,23,26,27	6
	Control of learning Beliefs	2,9,8,25	4
	Self-efficacy	5,6,12,15,20,21,29,31	8
	Intrinsic Goal Orientation	1,16,22,24	5
Learning Strategies	Rehearsal	39,46,59,72	4
	Elaboration	52,62,64,67,69,81	6
	Critical Thinking	38,47,51,66,71	5
	Metacognitive Self-regulation	33,36,41,44,54,55,56,57,61,76,78,79	12
	Time/Study Environment Management	35,43,52,65,70,73,77,80	8
	Effort Regulation	37,48,60,74	4
	Peer Learning	34,45,50	3
	Help Seeking	40,58,68,75	4
	Organization	32,42,49,63	4
	Total		81

Researchers will find out reliability of each subscale of Motivation and Learning Strategies through SPSS. Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group (Cronbach, 1951). The value of Cronbach's alpha is increased if the items in a MSLQ are correlated to each other. The Cronbach's alpha is also affected by the length of the test. If the test length is too short, the value of Cronbach's alpha is reduced. Thus, to increase Cronbach's alpha, more related items testing the same concept should be added to the test (Takavol & Derrick, 2011). In 1986, MSLQ was developed formally by Pintrich et al. They had collected data from three different institutions. The first data collection is carried on during 1986, which involved 326 students. The second data collection is carried out during 1987, which involved 687 students. The last data collection is carried out during 1988, which involved 758 students. The researcher analysed the data, rewrote items, and refined the conceptual model underlying the instrument (Pintrich et al., 1991). The MSLQ was verified through the process of proof-read by a few teachers from secondary school. They are expert teachers from Science and English departments. Two Form 2 Science teachers and two English teachers will read through the MSLQ revised version. They will confirm the appropriateness of the contents in MSLQ, for example, the word and the language in MSLQ.

The MSLQ is given in class and students take 35 minutes to complete it. Students rate themselves on a 7- point Likert scale, from 1 (not at all true of me), 2 (mostly true of you), 3 (somewhat not true of you), 4 (neither true or not true of you), 5 (somewhat true of you), 6 (mostly true of you) to 7 (very true of me). Scores for the individual scales are calculated by computing the mean of the items. For example, the intrinsic goal orientation scale consists of 4 items. Therefore, the researcher will find out the sum of these 4 items and compute the mean and reliability data to determine the appropriateness for using the instrument.

Result

The tables below show the total respondents of MSLQ, ethnicity of respondents, mean score and Cronbach's alpha for each subscale of Motivation and Learning Strategies.

Table 2: Number of Respondents

Gender	Frequency	Percent
Male	18	60.0
Female	12	40.0
Total	30	100.0

There are 30 respondents participating in this study and they consist of 18 male students and 12 female students.

Table 3: Ethnicity of Respondents

Ethnic	Frequency	Percent
Malay	19	63.3
Chinese	8	26.7
Indian	3	10.0
Total	30	100.0

The total respondents involved in this survey are 30 students. They consist of 19 Malay students, 8 Chinese students and 3 Indian students. Malay students are 63.6% out of 100% of students. This indicate that the majority of respondents are Malay students.

Table 4: Mean Score and Reliability of Each Subscale

Scales	Dimensions	Total Items	Mean	Reliability
Motivation	Intrinsic Goal Orientation	4	5.32	0.73
	Extrinsic goal Orientation	4	5.32	0.79
	Task Value	6	5.33	0.74
	Control of learning Beliefs	4	5.28	0.75
	Self-efficacy	8	5.18	0.76
	Test Anxiety	5	4.81	0.80
Learning	Rehearsal	4	5.49	0.71
Strategies	Elaboration	6	5.36	0.83
	Critical Thinking	5	4.93	0.77
	Metacognitive Self-regulation	12	5.20	0.73
	Time/Study Environment Management	8	5.44	0.75
	Effort Regulation	4	5.38	0.86
	Peer Learning	3	5.39	0.75
	Help Seeking	4	5.52	0.88
	Organization	4	5.49	0.80

Mean value of Motivation is Test Anxiety which is 4.81, while the mean value of Learning Strategies is 4.93. The researcher will further discuss these two subscales in next chapter. Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group (Cronbach, 1951). The value of alpha is increased if the items in a MSLQ are correlated to each other.

Discussion

A pilot study is conducted to collect empirical data and then perform an iterative and improvement process of initial MSLQ. According to Creswell (2012), it is a cardinal rule pre-testing or 'trying out' of a particular research instrument before suiting it in research study (p.189). The purpose of study is to test the reliability and validity of the MSLQ. Besides, the pilot study is to detect any mistakes in MSLQ and to correct them before the main study. The MSLQ had been revised. Therefore, by piloting the MSLQ, it helped researcher to certify the appropriateness of the terms that had been revised in MSLQ. Based on the result of pilot study, the researcher is able to make changes that help to minimize the confusion among respondents. Based on the result, Cronbach's alpha of all subscales of Motivation range from 0.73-0.80, while Cronbach's alpha of all subscales of Learning Strategies range from 0.71-0.88. Result showed that the items of MSLQ are reliable. Nonetheless, Cronbach's alpha value of Rehearsal is 0.71, but Tavakol and Dennick (2011) stated that $0.7 \leq \alpha < 0.8$ is acceptable. Moreover, Nunnally and Bernstein (1967) stated that Cronbach's alpha values over 0.60 are considered acceptable and values higher than 0.85 are considered excellent. Overall, the Cronbach's alpha values are acceptable, thus, there is no need to increase Cronbach's alpha by adding related items testing the same concept. These results suggested the MSLQ relatively had good reliability which is in line with the reliability reported by Pintrich and others (1991, 1993).

Validity refers to 'the best available approximation to the truth or falsity of propositions' (Cook & Campbell, 1979, p.37). To determine the validity of MSLQ, the researcher had sent MSLQ to two Science teachers, and then sent the revised version again to two English teachers. These experts had read through the MSLQ and will rate the MSLQ in the Research Instrument Validity From provided by researcher. The wording of MSLQ was changed based on the correction obtained from English teachers and Science teachers. The new item wordings still focused on achieving a proper meaning adaptation instead of following the original items exactly. Ramirez-Dorantes et al. (2013) had mentioned in their Psychometric Validation of MSLQ, the content is more in keeping with the circumstances of the study population school, and essentially mirrors the content of the original items. English teachers suggested to change some words to suit the secondary school students' understanding, for example, changing words like 'instructor' to 'teacher', and 'course' to 'Science'. There are 5 items having minor correction. There are illustrated in Table 5 below.

Table 5: Correction of Items

Nu.	Item	Revised Item
15	I'm confident I can understand the most complex material presented by the instructor in this course.	I'm confident I can understand the most complex material presented by the ***teacher*** in this Science subject.
22	The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.	The most satisfying thing for me in this ***Science subject*** is trying to understand the content as thoroughly as possible.
32	When I study the reading for Science, I outline the material to help me organize my thoughts.	When I study for Science, I outline the material to help me organize my thoughts.
56	I try to change the way I study in order to fit the Science requirements and the instructor's teaching style.	I try to change the way I study in order to fit the Science requirements and the ***teacher's*** teaching style.
58	I ask the instructor to clarify concepts I don't understand well.	I ask the ***teacher*** to clarify concepts I don't understand well.

Besides, two students had written in the feedback form, stating that they feel uncomfortable because they always need to flip to page one to read 7-point Likert scale rating, from 1 (not at all true of me) to 7 (very true of me). Therefore, researchers had to state the Likert Scale rating

on every page of the questionnaire. When the feeling of discomfort arises, the results of the questionnaire may be affected. The researcher wants to diminish the possible factors that may influence the results of questionnaire. Furthermore, a student wrote in the feedback form that the questionnaire consists of too many questions, and that the time is not really enough. The answering time suggested by Pintrich's MSLQ manual is 30-40 minutes. Based on that, the researcher had adjusted the time to answer questionnaire to 40 minutes to make sure all respondents are able to finish all items in questionnaires.

Researchers focus on subscale of Motivation, which is test anxiety and subscale of Learning strategies, which is critical thinking. Among many factors proposed to explain the low enrolment in Science was the interaction between emotions and learning (Kuan & Tek, 2007). The result in this study is consistent with earlier findings by Mallow (1981). Mallow (1981) purported that this fear could result in students becoming frustrated, denying competence in Science, and ultimately disliking and avoiding anything scientific. This is defined as test-anxiety. Equally, Pintrich et al. (1991) defined test anxiety as an unpleasant feeling or emotional state such as tension, worry or fear of failure displayed by students on tests or other cognitive measures.

All students will be sitting for many tests and examinations throughout the year. Students' grades depend on how well they perform on these tests. This had a dramatic impact on the lives of children and their parents. As a result of the attention focused on passing important tests throughout one's educational career, a great deal of pressure is added to achievement and grades (Morris, 2010). Students become anxious when presented with tests. As Zeidner (1998) pointed out, test-anxious students tend to be easily distracted during an exam, experience difficulty in comprehending relatively simple instructions, and also have difficulty organizing or recalling relevant information during the test. This type of negative attitude is a serious hurdle and may be debilitating to the point that students are unable to perform well in any courses. It might even affect their academic performance which they have achieved previously (Anderson & Clawson, 1992).

Based on the findings from this study, several implications for educational practice are proffered for consideration. The mismatch between teaching methods used in Science courses and students' level of intellectual development might give rise to Science anxiety. In the classrooms, students get bored while static and similar learning process is carried out repeatedly every day. In order to present students' boredom in Science classroom, students should be more engaged to the lesson. Therefore, classroom activities can be designed based on different teaching methods whereby students can have a chance to participate in the lesson actively (Cetin, Erduran & Kaya, 2010; Kaya, 2013). Moreover, Kuan and Tek (2007) suggested that tests should not focus on calculations and memorization, but also on the comprehension at a level appropriate to the students' cognitive development. Many students think that Science is memorizing facts. Students are not thinking out of the box. Indeed, students need this skill, which is the critical thinking skill. These skills can be taught.

A new Secondary School Standard Curriculum (also known as Kurikulum Standard Sekolah Menengah, KSSM) was launched in 2017. The KSSM aims to embed a balanced set of knowledge and skills such as creative thinking, innovation, problem solving and leadership (Malaysia, 2013, p.32). Malaysia has to face the challenge of the advent of information and communication technology and globalization. Therefore, it is crucial that students be equipped with critical thinking skills in order to function and cope successfully in the challenging world. In other words, Malaysia needs 'thinking' students who can incessantly thrive towards fast-changing world (Vijayaratnam, 2012). However, the finding of this study indicated that some

students are not equipped with critical thinking skills. Empirical evidence indicated that students' critical thinking skills in Malaysia public institutions of secondary and higher learning were below the expected proficiency level (Nagappan, 2001; 2010). Thinking requires motivation and effort (Row, Subramaniam & Sathasivam, 2016). So, the finding of this study suggests that there is an immediate move to stimulate and instill students' critical thinking skills in Science learning.

Conclusion

Pilot study is a crucial element for a good research design. Through this study, the researchers had identified potential practical problems and had find out the solutions as well. Well-designed and well-conducted pilot studies can inform us about the best research process and occasionally about the likely outcomes (Van Teijlingen, & Hundley, 2001). To summarise, the purpose of the present study was to examine the reliability and validity of MSLQ. Based on the results obtained in the study, it can be concluded that in general, the MSLQ seems to represent a useful, valid yet reliable means for assessing secondary school students in Malaysia. Finally, the current research also points to the need for further investigations concerning test anxiety and critical thinking of secondary school students towards Science learning.

Acknowledgement

This work was supported by research grant from the Research University Grant of Universiti Teknologi Malaysia (RUG): PY/2017/00835ijepc-2018297Q.J130000.2631.13J98.

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