A Descriptive Analysis on Mathematics Learning Environment and Metacognitive Awareness Among Secondary School

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Abstract
Students spend a lot of time interacting between friends and teachers in the classroom environment of learning. The learning environment is an essential element in shaping a conducive learning environment and promoting creative and critical thinking. A conducive learning environment can also help to create the comfort of teaching and learning while maintaining the focus and interest of students in mathematics. The classroom environment and psychosocial interactions of students can bring about changes towards achieving teaching and problem solving goals. The aim of this study is to identify the level of learning environment and metacognitive awareness among secondary school. A total of 420 form four students in Masjid Tanah Melaka were randomly selected as respondents for the study. This study is a survey study using instruments consisting of two parts. Part A is a student demographic, part B is a questionnaire related to the learning environment (WIHIC) and metacognitive awareness. The data were analyzed descriptively using frequency, percentage and min. The findings showed that mathematical learning environment and metacognitive awareness were at moderate level. This study provides an important indicator as it demonstrates that the importance of the learning environment is noted by the teacher as it is capable of raising metacognitive awareness and improving students' mathematical problem solving skills.

Keywords: Learning Environment, Metacognitive Awareness, Problem Solving Skills

1.0 Introduction

Mathematics is an important subject in schools all over the world. Mathematics can produce competent people with knowledge in their everyday life and enhancing their problem solving skill and critical thinking. Metacognitive is a process in which an individual thinks about his / her own thinking during cognitive activity. It is a high-level thinking that involves the process of managing and controlling his own mind (Flavell, 1979). The learning environment has a very strong relationship in building critical thinking as compared to the skills (Cheng & Wan, 2017) and supports student creativity as well as enhance the student metacognitive level (Liu et al, 2012). The study by Mazlini et al (2014) also shows the relationship between learning environment and achievement as well as learning environments with metacognitive awareness (Nurulhuda 2016). Effective learning can be achieved with metacognitive skills, while metacognitive awareness is needed to develop metacognitive skills. With metacognitive awareness students can build a more in-depth understanding of concepts (Nik Nur Fadillah, 2012).

2.0 Problem Statement

The comparison of Malaysia's position in the PISA test compared to other countries places Malaysia in the third group below among 74 countries. Nearly 60% of 15-year-olds participating in the PISA 2009 failed to achieve a minimum level of math skills (Ministry of Education, 2015). Issues of TIMMS and PISA put Malaysia among medium achievers. This decision also illustrates that students in Malaysia cannot perform well in terms of cognitive skills, apply knowledge in problem solving and ability to solve problems. Less attention to the needs of pupils mastering various cognitive skills such as problem solving, reasoning and creative thinking and innovative causes students to be less incapable of applying knowledge and thinking creatively beyond the academic context. Conventional teaching methods such as "chalk and talk" alone are also less relevant to current developments. Additionally, teachers emphasize the practice of drilling and formulas without understanding the concepts (Abdul Razak Idris & Noor Asmah Saleh, 2010; Kheong 2011).

Marzita et al (2014) conducted a study on the climate learning environment in schools. This study finds that thermal comforts are important as the basis for improving the quality of education and the effectiveness of classroom teaching and learning. Mazlini et al (2014) found that student achievement was influenced by the learning environment. This is supported by the findings of Ernest et al (2013) whose interesting learning environment can be the key to success of students. The study by (Cheng & Wan, 2017) found that the learning environment had a very strong relationship with students' curricular thinking. High metacognitive awareness factors are influenced by the level of intelligence in which gifted students have a higher level of metacognitive awareness than non-gifted students (Sarıcam & Ogurlu, 2015)The study conducted by Idris et al. (2015) to identify the relationship between metacognition awareness and concept understanding in solving problems. The findings showed that students 'metacognition awareness was moderate and students' understanding of the concept was low.While Suzana (2015) study found that the metacognitive behavior exhibited by excellent, moderate and weak students varies.

3.0 Research design

The objectives of this research were to examine the level of mathematics classroom environments and metacognitive awareness among secondary schools students.

3.1 Population and sampling method

This study involved a total of 420 form four students in Masjid Tanah Melaka area. The student's are from eight secondary schools of 420 respondents. This study involved 155 male students and 264 female students. This study was quantitative using survey method by using questionnaire. Rivera and Ganaden (2001) stated that there are advantages to conducting research through questionnaire as the learning environment information is based on the vast experience of the students as long as they attend school while the findings from observations are for a certain period of time.

3.2 Reasearch Instrument

According to Cresswell (2008), some alternatives need to be considered taking into account existing instruments that can be used to measure the study variables or make judgments to modify existing ones. In this study, instruments are drawn from existing sources of learning environment and metacognitive awareness.

A mathematics classroom environment questionnaire was constructed based on existing instruments *What is Happening in This Classroom* (WIHIC) (Chionh & Fraser, 1998; Fraser et al., 1996). There are 39 items for the components of the learning environment. The metacognitive awareness questionnaire was adapted from Affandi (2003) modified from the *State Metacognitive Inventory* (Oniel & Abedi, 1996) and the Trait Thinking Questionnaire (O'Neil & Schacter, 1997) metacognitive component. Distribution of items to measure 3 aspects of metacognitive awareness with 24 items.

The Cronbach Alpha reliability index for the three instruments is between 0.70-0.96. According to Mohd Majid (2005) and Hair et al (2010), the value of Cronbach Alpha is good and acceptable. This study involves descriptive statistics. Descriptive analysis uses mean, percentage, and standard deviation. The level of mean score shown in the table 1.

Table 1: Mean score

Mean score	Level of students perception
1.0 – 2.33	Low
2.34 –3.66	Moderate
3.67 – 5.00	High

4.0 Finding

4.1 Learning environment levels for student cohesiveness, teacher support, involvement,cooperation and equity

Table 2 shows the level of learning environment for student cohesiveness, teacher support, involvement, cooperation and equity.

Table 2: Level of learning environment for student cohesiveness, teacher support, involvement and cooperation and equity

Subscales	Mean	Standard Deviation	Level
Students Cohesiveness	3.95	0.62	High
Teacher support	3.56	0.79	Moderate
Involvement	3.18	0.61	Moderate
Cooperation	3.54	0.74	Moderate
Equity	3.50	0.68	Moderate
Overall	3.55	0.69	Moderate

Descriptive analysis in table 2 shows that the learning environment for student cohesiveness is at a high level with mean score of 3.95 and sd = 0.62. Teacher support aspect was moderate with mean = 3.56 and sd = 0.79. For the aspect of student cohesivenss was at a moderate level of mean 3.18 and sd = 0.61. Cooperation are also in moderation with mean = 3.54 and sd = 0.74. Next to the equity aspect, the mean is at a moderate level of min = 3.50 and sd = 0.68

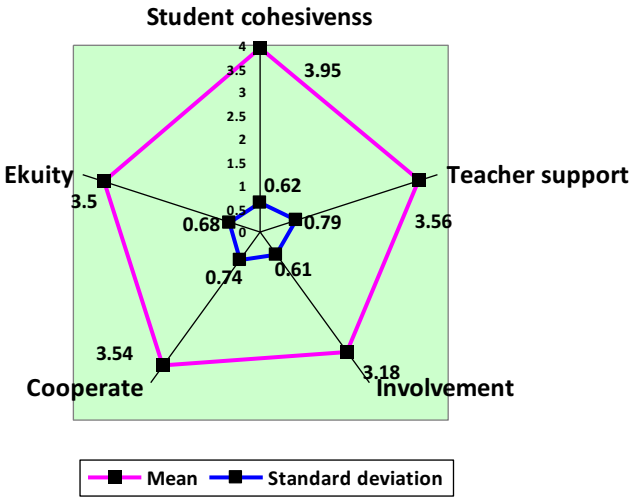


Figure 1: Mean and standard deviation of learning environment

4.2 Metacognitive awareness level for planning, self checking and cognitive strategies

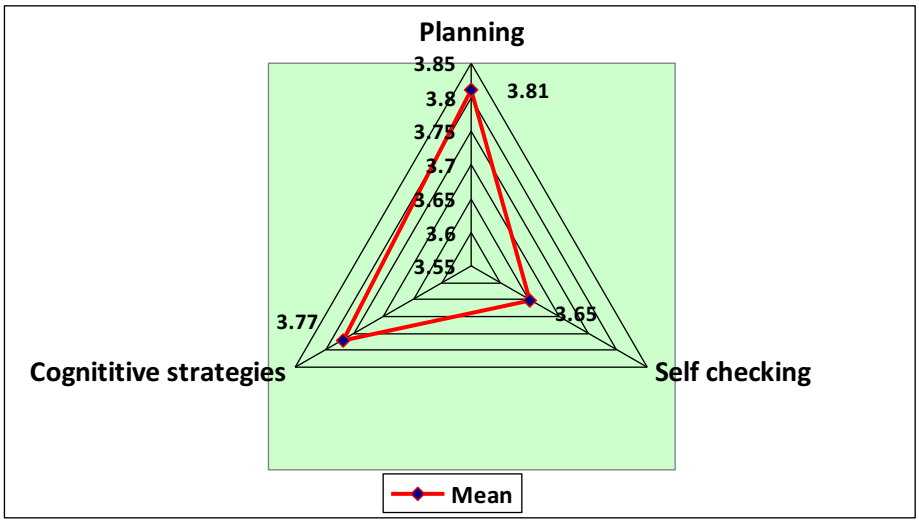
Descriptive analysis involving mean and standard deviation is carried out to determine the level of student metacognitive awareness. The results of the descriptive analysis are as follows.

Table 8: Metacognitive Awareness Level

Scale	Mean	Standard deviation	Level
Planning	3.81	0.74	High
Self checking	3.65	0.63	Medium
Cognitive strategies	3.77	0.69	High
Total Mean	3.81	0.74	High

Descriptive analysis of metacognitive awareness on planning, self-assessment and cognitive strategies as a whole showed mean = 3.81 and sd = 0.74. The scale of the highest mean is planning with mean = 3.81 and sd= 0.74 and the lowest mean = 3.65 and sd= 0.63 is self checking. Cognitive strategies also shows high level with mean= 3.77 and sd= 0.69

Figure 2: Analysis of Metacognitive Awareness



5.0 Discussion

5.1 Learning Environment Level

The matehematics learning environment of the secondary school in this study is at a moderate level. The findings of this study show that the learning environment for student cohesiveness is at high level. This finding is consistent with the study of Mazlini et al (2014) and Brok et al (2008). However, this finding is contrary to Murugan's (2013) findings where the level of student integrity is moderate. This finding also shows students feel their classroom atmosphere has a conducive environment and allows them to be close friends and work together.

While the student environment for teacher support, student involvement, cooperation and equity is only at moderate level. This is in line with the study of Arba'at Hassan, Sabri Ahmad, Bacho Abdul Karim and Jumat Sulaiman (1997) which found that 58.77% of the students sample considered mathematical teaching and learning was boring and 51.97% of students thought the physical environment of the school was less encouraging their mathematical learning. Generally, students can learn better when their classroom environment provides satisfying, challenging, positive interaction with other students and teachers as well as given the opportunity to make a

decision, as well as provided with clear borders and organizations (Walberg & Greenberg, 1997).

This means that there are ongoing efforts to improve the aspects studied such as teacher support, student engagement, collaboration and equity to provide a good learning environment and to enable students to learn better. In general, many studies have found that higher learning outcomes if a classroom is considered by students with a sense of belonging, satisfaction and direction and disagreement and conflict (Fraser, 1991).

5.2 Metacognitive Awareness Level

Descriptive analysis of metacognitive awareness on the aspects of planning and cognitive strategies are at high levels. The findings of this study are contrary to the findings of the previous study which indicate that students with the knowledge needed to solve problems but fail to apply them correctly because they fail to implement metacognitive processes or lack of metacognitive skills (Idris et al., 2015). However, this finding is consistent with the findings of the study by Effandi, Zainah and Sabri (2009); Hafizah (2012) found that the level of metacognitive awareness of students was high. Some important aspects such as planning and strategy have been applied to students in mathematical learning. This shows that metacognitive awareness has attracted attention amongst students and is important in improving students' skills and performance in problem solving (Desoete, 2003).

While metacognitive awareness for self-help aspects is only at moderate level. According to Noor Erma and Leong Kwan Eu (2014), one of the factors of decline in mathematical examination results is from the student's own attitude. There are many students who do not really answer questions and are too confident with their answers until they do not check the answers back. This is because many students who consider this assessment are not important. Students are also aware of the steps taken but are weak in re-evaluating the work. It will cause repeated errors to affect their metacognitive awareness.

Learning environment is an essential element in shaping a conducive learning environment and promoting creative and critical thinking. As the study shows that students' perception of the learning environment is moderate, further studies have to be carried out to determine the causes of this phenomenon. Teachers play an important role in contributing to a conducive learning environment and contributing to excellence.

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