Level of Metacognitive Awareness Strategies among Technical Students

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Abstract: Metacognitive strategy awareness is important to solve many problems especially in the teaching and learning process as well as in one's career. This survey aims to identify the level of metacognitive awareness strategies among polytechnic students according to demographics, and also the difference between the level of metacognitive awareness strategies based on gender and the field of study of students. The sample of the study consists of 361 students who attended Diploma in Civil Engineering (132 students), Diploma in Electrical Engineering (121 students) and Diploma in Mechanical Engineering (108 students). The design of this study is survey using the quantitative approach. The research instrument used is the Metacognitive Strategies Awareness Inventory (MAI) with two main constructs, knowledge of cognitive and regulation of cognitive. These are used to determine the level of metacognitive awareness strategies. All data was analyzed using SPSS software and presented in the form of mean score, frequency and percentage. The results show that all male and female students have high level in metacognitive strategies awareness. The T-Test analysis shows that there is a significant difference in the level of awareness of metacognitive strategies between male and female students ($\rho = .021 < .05$). Furthermore, the ANOVA test analysis also shows that there is a significant difference in the level of awareness of metacognitive strategies based on the field of study of the students ($\rho = .016 < .05$). Therefore, it can be concluded that the awareness of metacognitive strategies should be applied to students to produce effective teaching and improve students' learning achievement.

Key word: Metacognitive strategy awareness, problem solving

I. INTRODUCTION

The increasingly challenging level of economic performance requires a paradigm shift that will help keep the economy stable and stably in tandem with developed countries (Ibrahim & Iksan, 2017). Therefore, the government has to create a generation that is innovating and competitive in various aspects, especially in education, economy and technology. The change in global education also emphasizes on cognitive strategies to metacognitive strategies has shown an impact on the implementation of teaching and learning (Kassim & Zakaria, 2015). Subsequently, 21st-century learning involves emphasizing

metacognitive strategies (Ibrahim & Iksan, 2017). According to Surat (2013), metacognitive strategies can help students manage learning processes such as monitoring, planning, process evaluation and outcomes of their learning achievement. According to Coffey (2009), this metacognitive strategy can allow students the opportunity to reflect on their learning, through the process of identifying strengths and weaknesses, as well as ways for students to learn, to set goals and to control their way of learning.

Students who master the metacognitive strategy well will be able to solve various problems, dilemmas and questions that are beyond their thinking or habits. This is because, this process will encourage student self-learning and help to acquire good learning among students (Zimmerman & Schunk, 2011). Metacognitive strategies also relate to the process of improving thinking skills through assessment skills, regulation (Surat, 2012) monitor and plan (Sima Khezrlou, 2012). Metacognitive strategies can also help students in controlling their learning and teaching process (Surat, 2013). Metacognitive strategies can provide students with the opportunity and encourage them to learn, understand and recognize the information they receive while the classroom and in their daily lives (Helen, 2009).

II. PROBLEM STATEMENT

Metacognitive strategies are one of the most important learning strategies for determining success in learning, creative and critical thinking capabilities, the level of academic achievement and intellectual skills of a student. The strength of these skills can be demonstrated in an educational system that emphasizes academic achievement as a measure of the success of a person in education. According to Mohamad and Mahamod (2014), students who know to solve a problem but fail to apply it correctly. As a result, students are less likely to apply the knowledge they have learned, the students thinking is evident and fails to think outside the box in a context only, including examinations (Ibrahim & Iksan, 2017). This is because the metacognitive strategy is still under-emphasized and the application among teachers (Based on studies by the Ministry of Education, Malaysia, 2013). The high-level thinking among teachers and students in Malaysia is very inferior (Curriculum Development Division, 2012).

The serious impact of the education system in Malaysia is the failure of teachers in applying students thinking skills, including student achievement in international assessments.

According to Abdullah et. al., (2012), the technical students did not master the metacognitive strategy well. This is because, it is likely that students have little knowledge of the strategies through previous learning and experience but do not know how to apply the strategy correctly and effectively (Mohamad & Mahamod, 2014). In addition, the lessons learned by students in the lecture are insufficient for learning towards thinking skills (Md.Yunos et al., 2011). Thus, students are faced with difficulties in thinking skills due to the lack of detailed information. It is also emphasized by Salihudin (2014) that the observational study found that the application of thinking skills in the classroom was only at a minimum and this proved that the majority of teachers did not understand the method of mixing these thinking skills in teaching

III. OBJECTIVE

i. Identify the level of metacognitive awareness strategies among technical students.
ii. Identify the differences between level of metacognitive awareness strategies based on gender of students.
iii. Identify the differences between level of metacognitive awareness strategies based on the field of study of students.

IV. METHODOLOGY

The research design is a survey method that uses quantitative approaches. For the design of the study, researchers conducted surveys to identify the level of metacognitive awareness strategies among technical students in polytechnics. The quantitative approach used by the researcher is a questionnaire. This study was conducted at Polytechnic Melaka and Polytechnic Port Dickson. A total of 361 technical students consisting of boys and girls were randomly selected as respondents.

Table 1: Number of Population and Samples of Study
(Student Affairs Division, 2019)

No	Polytechnic	Population	Sample
1	Polytechnic Port Dickson	4235	268
2	Polytechnic Melaka	1461	93
	Total	5696	361

The questionnaire consisted two parts. Part A is the items on respondent's demographics such as gender and field of study. Part B is a modified Metacognitive Awareness Inventory (MAI) item from Schraw & Dennison (1994). Part B is used to examine metacognitive awareness among technical students in polytechnics. This instrument is divided into two main constructs. The first construct (B1) is knowledge about cognitive divided into three categories namely declarative knowledge, procedural knowledge and limited knowledge. While the second construct (B2) is a regulation of cognitive that is divided into five dimensions namely planning, information management, comprehension monitoring, debugging strategies and evaluation. Metacognitive awareness inventory (MAI) is determined by using incorrect and correct item scores. Table 2 shows the distribution, number and position of the instrument items.

Table 2: Distribution, number and position instrument items

Parts	Aspect of Study	Number of Items	Item Position
A	Demographics	5	5-Jan
B	Metacognitive Awareness Inventory (MAI)		
B1	Knowledge about cognition	17	17-Jan
B2	Regulation of cognitive	35	18 - 52

To analyze the problem of this study, descriptive statistics and inferential statistics are used. Descriptive statistics are used to summarize a set of data, while inferential statistics are used to create a summary of the population's perceptions based on the population sample data (Idris, 2013). For the question of a researcher using a descriptive statistical method to find percentage and frequency values. In this study, the researchers used 51 items as suggested by Schraw and Dennison (1994) as a research instrument. Metacognitive awareness instruments (MAI) are determined by using incorrect and correct item scores. Respondents fill out each answer by filling out (/) in the provided answer box. The scoring guide for the questionnaire is a mark given to the correct answer and the mark is empty on the marked answer. Next, the marks for each dimension on each construct are summed up. The level of metacognitive awareness strategies is measured by the number of mean scores obtained. Table 3 shows the score and mean score for each construct.

Table 3: Score and mean based on construct

No	Parts	Score	Mean Score
1.	B1 : Knowledge about cognition		
	a. Declarative knowledge		/8
	b. Procedural knowledge		/4
	c. Conditional knowledge		/5
2.	B2 : Regulation of cognition		
	a. Planning		/ 7
	b. Information management strategies		/10
	c. Comprehension monitoring		/7
	d. Debugging strategies		/5
	e. Evaluation		/6
	Total mean score		/52

The respondent's level awareness was categorized into three levels, namely low, medium and high levels. The level of interpretation of mean score of awareness of metacognitive strategy is determined as in Table 4.

Table 4: Interpretation level based on mean score (Konting, 2004)

Mean score range	The tendency level
0.00 – 0.33	Low
0.34 – 0.66	Moderate
0.67 – 1.00	High

V. RESULT AND DISCUSSION

In this section, the researcher discusses the findings of the study to answer the three questions of the study.

A. Metacognitive awareness strategy among technical students

The findings of the study were to answer the question of the first study. The mean score, frequency and percentage are used to compare the number of students to the question of this study. Among the level of metacognitive awareness strategies are high levels, moderate and low levels. Based on Table 5, it can be seen that all eight dimensions are at a high level of interpretation. The dimensions under the knowledge about cognitive construct is procedures knowledge (mean score 0.83) are at the highest level. Then followed by conditional knowledge dimension (mean score 0.82) and declarative knowledge (min score 0.79).

Table 5: Mean score, standard deviation and interpretation for dimension of metacognitive strategy awareness.

Dimension	Mean skor	Standard deviation	Interpretation
Procedural knowledge	0.83	0.183	High
Declarative knowledge	0.79	0.235	High
Conditional knowledge	0.82	0.203	High
Information management strategies	0.80	0.205	High
Debugging strategies	0.79	0.178	High
Planning	0.79	0.206	High
Comprehension monitoring	0.83	0.197	High
Evaluation	0.82	0.213	High

Meanwhile, for dimensions under the regulation of cognitive construct comprehension monitoring (mean score 0.83) is at the highest level. This is followed by evaluation dimension (mean score 0.82) and information management strategy dimension (mean score 0.80). Finally, the planning dimension (min score 0.79) and the debugging strategies (min score 0.79) under the regulation of cognitive construct is the lowest. Based on Table 6, it is found that the constructs of knowledge about cognitive are higher than the cognitive regulation of constructs. Secondly, for cognitive of knowledge (mean score 0.81), cognitive regulation (mean score 0.80) shows that respondents have high level of interpretation and show the level of metacognitive awareness strategies among technical students in the high level of interpretation.

Table 6 : Mean score, standard deviation and interpretation for cognitive and cognitive knowledge of regulation.

Constructs	Mean	Standard deviation	Interpretation
Knowledge about cognition	0.81	0.163	High
Regulation of cognition	0.80	0.157	High
Level of metacognitive awareness strategies	0.81	0.149	High

The findings show that for knowledge of cognitive, students are more likely to procedural knowledge dimensions, followed by conditional knowledge dimensions and declarative knowledge dimensions. For the procedural knowledge dimensions, students have a high degree of awareness of their intellectual strengths and weaknesses in studying, analyzing and formulating. This is because technical students in polytechnics will be given assignments and practical work to be solved individually or in groups that allow students to reflect on their learning and to identify their strengths and weaknesses (Coffey, 2009). However, students are found to be less able to remember something, and the students likely are trying to understand the learning in the classroom and result in the student's achievement at low-quality level (Baharom, 2012).

For regulation of cognition constructs, students tend to comprehension monitoring dimensions, followed by evaluation dimensions, and information management strategies dimensions and ultimately, the planning dimensions and debugging strategies. For comprehension monitoring dimensions, students are found to be able to change strategies if they fail to understand something, make an evaluation when mistaken and stop and re-read when mistaken. This is because technical students in polytechnics can control their learning process (Surat, 2013) and help students improve their academic performance (Ling, 2010).

B. The difference between the level of metacognitive awareness strategies based on student gender

The T-test (Independent) was used to analyze the study data for this question because the measured data of gender is in the form of nominal. The permissible level in T-test is at a significant level of $\rho = 0.05$. The findings in Table 7, show that there is a significant difference between the level of metacognitive awareness strategies and the gender of students among technical students. The mean score for male students (mean score 0.82) was higher than female students (mean score 0.79). The level of metacognitive awareness of male strategies is higher than that of female students. Similar findings were obtained from the findings of Mohamad et al.,

(2013), which showed that there was a difference between the metacognitive awareness strategies of student and gender factors. This is because, male students have a higher level of monitoring skills than female students. In addition, male students have multiple intelligences in applying various learning strategies to help improve their learning achievement (Mahamod, 2012).

Meanwhile, female students are found to have a higher level of metacognitive awareness than male students from assessing skills and regulatory skills. This is because female students have a high level of intelligence compared to male students (Mohamad et al, 2013). Furthermore, based on Abdul Hamid (2012) study, which found that there were significant differences based on gender in metacognitive strategies in the study of Malay Literature. The difference between gender is also likely to depend on the field of study itself. This can be seen from the findings of this study that male students have a higher level of metacognitive strategies than girls in technical fields. However, the findings of this study are contrary to the findings of Sanip and Che Ahmad (2014), among form four students who take Biology subjects. The study found that the metacognitive awareness that existed in the student did not have a significant difference between the gender. Furthermore, the results of the Ling study (2010) found that the students of Engineering Mathematics showed that there was no significant difference in the metacognitive strategy between male and female students.

Table 7 : T-test analysis for the different levels of awareness of metacognitive strategies based on student gender

Gender	Sample	Mean	Standard deviation	Significant value
Male	198	0.82	0.121	0.021
Female	163	0.79	0.176	

* Difference at level $\rho < .05$

C. The difference between the level of metacognitive awareness strategies based on the field of study of students

Analysis Of Variance (ANOVA) was conducted to see the significant differences between the level of awareness of metacognitive strategies based on the field of technical student study. The significant levels allowed in the ANOVA test are $\rho = 0.05$. The findings of the study in Table 8 show that there is a significant difference between the level of metacognitive awareness strategies and the field of study of students. Among them are lecturer teaching techniques and learning environment exposure based on metacognitive strategies during the teaching and learning process in the classroom to stimulate and encourage students to review their thinking processes (Ibrahim & Iksan, 2017). According to Che Kob (2016), lecturers should know the appropriate learning strategies for students before starting the teaching process in ensuring the effectiveness and quality of implementation for teaching and learning sessions.

As a result, the student's academic achievement has increased and has a positive impact on the teaching and learning process in the classroom. Furthermore, teaching

and learning activities conducted by lecturers to students in the classroom for a particular field are different and cause the level of awareness of metacognitive strategies different. This is because the different teaching and learning activities in the classroom are able to move the mind process in completing the assignment, oral examination, workshop and practical work, discussion process and brainstorming (Rahayah, 2010). The results of this study were supported by Abu Hassan et al. (2017) that there is a significant difference in the level of metacognitive awareness strategies from the aspect of cognitive awareness in the learning of Islamic Education between the fields of Science and Humanities.

Table 8 : Analysis of ANOVA for the different levels of awareness of metacognitive strategies based on the field of study of students

Field of Study	Sample	Mean	Standard deviation	Significant value, ρ
Electrical engineering	121	0.82	0.137	0.016
Civil engineering	132	0.78	0.160	
Mechanical engineering	108	0.83	0.146	

* Difference at level $\rho < .05$

VI. CONCLUSION AND RECOMMENDATIONS

The result of this study showed that technical students at Melaka Polytechnic and Port Dickson Polytechnic had a high level of metacognitive awareness. Besides, there was a significant difference between the level of metacognitive awareness strategies based on gender and field of study. Consequently, overall students have an active awareness in the regulation of cognition and have knowledge about cognitive in achieving better learning goals. This study can help all parties to know their strengths and weaknesses; and strive to enhance their potential in acquiring high levels of skills and knowledge.

Based on the results of the research, the researcher suggested a few suggestions for improvement purposes for the parties involved. Polytechnics requires to ensure that lecturers apply metacognitive strategies in the teaching and learning process. The polytechnics should publish a module that contains techniques in using metacognitive strategies in teaching and learning as a guide to students. The polytechnics can organize workshops and courses of learning metacognitive strategies in pursuit and learning so that students can learn the right techniques to enhance their metacognitive strategies further. Lecturers need to further extend scientific references and information in learning using metacognitive strategies in teaching and learning. Students should be aware of their level of metacognitive strategy, and indirectly they can identify weaknesses and strengths in learning metacognitive strategies. Therefore, students can improve and improve their weaknesses in order to have right metacognitive strategies in learning.

REFERENCES

1. Abdul Hamid, S. (2012). *Amalan Meta Kognitif Dalam Kalangan Murid Ketika Belajar Komponen Sastera.* Kertas Projek Sarjana Pendidikan. Fakulti Pendidikan, UKM Bangi.
2. Abdullah, A. G. K., Ismail, A., Abdullah, M. H. & Purba, M. (2012). Acquired And Required Competencies In Manufacturing Sector Graduates From Employers' And Employees. *Perspective : The Malaysia Case Educ. Res. 2013, 3*(2) : 126-136.
3. Abu Hassan, K., Hamzah, M. I., & Lubis, M. A. (2017). Tahap Kemahiran Metakognitif Murid Sekolah Menengah di Kawasan Felda dalam Pembelajaran Pendidikan Islam. *ASEAN Comparative Education Research Journal On Islam and Civilization. 1(1),* 94-106.
4. Baharom. S., Hamid, R., & Hamzah, N., (2012). Development of a Problem Based Learning in Concrete Technology Laboratory Work. *Procedia-Social And Behavioural Sciences 60.9 (2012)*, 8-13.
5. Che Kob, C. G. (2016). Amalan Gaya Pembelajaran Pelajar Cemerlang Di Politeknik Seberang Perai: Kajian Pelajar Malaysia Berdasarkan Model Felder Silvermen. *Malaysian Journal of Society and Space 12 issue 3* (181-191) 181.
6. Coffey, H. (2009). *The relationship between metacognitive and writing in sixth grade mathematics.* Unpublished Doctoral Dissertation, Walden Universiti, Walden.
7. Helen, N. (2009). Metacognitive Strategies on Classroom Participation and Student Achievement in Senior Secondary School Science Classrooms. *Science Education International, 20*(1), 25-31.
8. Ibrahim, N. H., & Iksan, Z. (2017). Strategi metakognitif untuk kemahiran berfikir aras tinggi dalam proses pengajaran dan pembelajaran. *Simposium Pendidikan diPeribadikan: Perspektif Risalah An-Nur (SPRiN2017).*
9. Kassim, N., & Zakaria, E. (2015). Integrasi Kemahiran Berfikir Aras Tinggi dalam Pengajaran dan Pembelajaran Matematik: Analisis Keperluan Guru. *Proceeding book Education Gradute Regional.* Conference in Counseling Centre Profesional Counselor Education Laboratory in the State University of Medan. Jan 2015, p. 60-67.
10. Ling A. Y. L. (2010). Kemahiran metakognitif pelajar kejuruteraan dalam menyelesaikan masalah matematik kejuruteraan. *Jurnal Sains Dan Matematik. 2(2)(2010)* : 75-84.
11. Mahamod, Z., Abdul Hamid, S., Timbang, T., Haron, A. R. & Muhamad, Z. (2012). Amalan Meta Kognitif dalam Kalangan Murid Ketika Belajar Komponen Sastera. *Proceedings International Seminar Educational Comparative Competency Based Curriculum Between Indonesia and Malaysia*, 157-172.
12. Mohamad, N. A. & Mahamod, Z. (2014). Tahap Kemahiran Metakognitif Murid Tingkatan Empat dalam Pembelajaran Bahasa Melayu. *Jurnal Pendidikan Bahasa Melayu. 4(1),* 41-47.
13. Md Yunos, J. (2011). *Technical & Vocational Education & Training (TVET) from Malaysia Perspective*. 2nd International TT-TVET EU-Asia-Link Project Meeting, VEDC Malang, Indonesia.
14. Rahayah, S. & Azaheen, N. (2010). Kemahiran Pemikiran Kritikal Dan Penyelesaian Masalah Pelajar -Pelajar Sains. *Prosiding Seminar Kebangsaan Pendidikan Negara Kali Ke-4.*
15. Salihudin, M.S. (2014). Penguasaan pelajar dalam kemahiran berfikir aras tinggi dengan pembelajaran kaedah Socratik. *Konvensyen Antarabangsa Jiwa Pendidik. 2014*.
16. Sanip, F. A., & Che Ahmad, C. N., (2014). Penilaian Kesedaran Strategi Metakognitif Dan Kemahiran Berfikir Aras Tinggi Dalam Kalangan Pelajar Biologi. *Jurnal Penyelidikan Pendidikan (KPM) Jilid 15*.
17. Sima Khezrlou (2012). The Relationship Between Cognitive and Metacongnitive Strategies, Age and Level Of Education. *The Reading Matrix 2012. 12(1), April 2012*.
18. Surat, S., Ramli, S. & Rahman, S. (2013). Sumbangan Elemen Metakognitif Terhadap Pencapaian Penulisan Karangan. *Jurnal Pendidikan Bahasa Melayu*. 3(2), 79-91.
19. Surat, S., (2012). *Keberkesanan strategi 4-Meta dalam aktiviti penulisan Bahasa Melayu pelajar Tingkatan 4* (Tesis Doktor Falsafah). Fakulti Pendidikan, Universiti Kebangsaan Malaysia, Bangi.
20. Zimmerman, B. J., & Schunk, D. H. (2011). Self-Regulation of Learning and Performance. *International Journal of Technology and Design Education*, *23*(3), 489-517.

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