Science Teachers Self Perception about Metacognition

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Abstract

Metacognition is a significant part of human abilities. Metacognitive knowledge can be described as what we know about our own cognitive processes (Young & Fry, 2008). This research aims at measuring perception of science teachers about metacognitive awareness. The sample consists of 52 science teachers from six schools in Perak, Malaysia. Metacognitive awareness was measured using Metacognitive Awareness Inventory for Teachers (MAIT) developed by Cem Balcikanli (2011) that consists of 24 items, it has a good validly and reliability indicators. The results reveal that the science teachers have a high level of perception about metacognition. No significant differences found related to teachers gender or age. Although there are no significant differences found related to the teachers' gender, but there is a significant difference found related to the teachers' age and there is an interaction between teachers' age and educational level concerning their c.

Keywords: *Science teachers, Metacognitive, science education.*

1. Introduction

Metacognition is an important aspect of teaching and learning. It is one of the foundation upon which students may become independent learners (Fazal ur Rahman, 2011). In 1971, Flavell used the term metamemory in regard to an individual's ability to manage and monitor the input, storage, search and retrieval of the contents of his own memory. He implied with his statements that metacognition is intentional, conscious, foresighted, purposeful, and directed at accomplishing a goal or outcome. It is one's knowledge, concerning on one's own cognitive process and products or anything related to them. It is where a person is able to identify and aware of his cognitive process (Flavell, 1979).

The concept itself has increased its popularity in almost all disciplines ranging from communication to nursing. This popularity has been materialized with a lot of metacognitive inventories developed in time (Balcikanli, 2011). In the field of education, metacognition is congruent with the learners' need and desire to communicate, explain and justify thinking to organisms as well as to himself (Flavell, 1978). It is where the person needs to be able to identify his need to understand certain things in education and able to make others understand it too.

In research literature, there have been a great number of attempts to conceptualize the construct of metacognition over the last three decades. The literature is replete with definitions of meta- cognition up to date. However, there is no general consensus of the most agreed-upon definition of metacognition as yet (Balcikanli, 2011). "Metacognition" is often simply defined as "thinking about thinking" (Livingston, 1997). Others defined Metacognition as any knowledge or cognitive process, in which there are the assessment, monitoring or cognitive control. Based on a viewpoint, it can be considered as a general aspect of understanding which plays a role in all cognitive activities (Abdi et al. , 2012).

Metacognition is a multifaceted concept. This concept involves the knowledge (beliefs), processes and strategies which evaluate, supervises or control the identification (Abdi et al. , 2012). As the concept of metacognition includes that individual is aware of his own learning and learning process and can give feedback to himself regarding them, the individual should have these abilities. Metacognition takes part between cognition and emotion, plays a key role in self-regulation which is necessary for reaching success in learning and affects a lot of elements such as knowledge acquisition, comprehension, recollection and application (Alkan & Erdem, 2014).

Many researchers stress that metacognition is best defined by recognizing that it is both knowledge about, and control over, thinking processes. Therefore, metacognition could be considered as a three-step process (Fazal ur Rahman, 2011):

(1) Connecting new information to previous knowledge
(2) Deliberately selecting thinking strategies
(3) Planning, monitoring, and evaluating the thinking processes

The purpose of metacognitive prompting is to guide learners in the process of identifying the structure of problems, creating connections with prior knowledge, and selecting learning strategies. It is meant to promote learners' regulation of their knowledge and skills during training rather than awareness of performance alone (Aurah, Cassady, & McConnell, 2014). Fazal ur Rahman (2011) also reported that Hennessey (1999), identified five characteristics of metacognition:

(1) A knowledge of the content of own thinking.
(2) An awareness of own conception.
(3) Monitoring of own cognitive process
(4) Regulation of one's cognitive processes with respect to further learning.
(5) An application of a set of heuristics for helping people organizes their method to solve problems.

Similarly, Hartman (2001) underlined the following points of metacognition:

(1) Metacognition is thinking about thinking.
(2) It enables awareness and control over how teachers think about teaching.
(3) It enables them to self-regulate teaching activities with respect to students, goals and situation.
(4) Some metacognition is domain-specific and some are domain-general
(5) Two general types of metacognition are: executive management strategies that help to plan, monitor and evaluate/revise thinking processes and products, and strategic knowledge about information/strategies/ skills and when, why and how to use them.

The term "metacognition" is most often associated with John Flavell (Livingston, 1997), he often considered being the father of metacognition. He viewed metacognition as a primarily conscious endeavor; however, he also acknowledged that it may well take place unconsciously. Flavell proposed a formal model of metacognitive monitoring to include four classes of phenomena and their relationships. His four- pronged model of metacognition breaks down into the following categories (Flavell, 1979) (Fouché, 2013):

1. Metacognitive knowledge, which he defined as one's knowledge or beliefs about the factors that affect cognitive activities. The distinction between cognitive and metacognitive knowledge may lie in how the information is used, more than a fundamental difference in processes. Metacognitive activity usually precedes and follows cognitive activity. They are closely interrelated and mutually dependent. Metacognitive knowledge can lead the individual to engage in or abandon a particular cognitive enterprise based on its relationship to his interests, abilities and goals.
2. Metacognitive experiences, it includes the subjective internal responses of an individual to his own metacognitive knowledge, goals, or strategies. Metacognitive experience can also be a "stream of consciousness" process in which other information, memories, or earlier experiences may be recalled as resources in the process of solving a current-moment cognitive problem.
3. Metacognitive goals and tasks are the desired outcomes or objectives of a cognitive venture. This was Flavell's third major category. Goals and tasks include comprehension, committing facts to memory, or producing something, such as a written document or an answer to a math problem, or of simply improving one's knowledge about something. Achievement of a goal draws heavily on both metacognitive knowledge and metacognitive experience for its successful completion (Flavell, 1979).
4. Metacognitive strategies are designed to monitor cognitive progress. Metacognitive strategies are ordered processes used to control one's own cognitive activities and to ensure that a cognitive goal (for example, solving a math problem, writing an effective sentence, understanding reading material) have been met. A person with good metacognitive skills and awareness uses these processes to oversee his own learning process, plan and monitor ongoing cognitive activities, and to compare cognitive outcomes with internal or external standards.

Researchers further conceptualize metacognition by breaking down metacognition into two subcomponents, metacognitive knowledge (knowledge about cognition) and metacognitive regulation (regulation of cognition). These two subcomponents have been theorized to be related to one another, Metacognitive knowledge can be described as what we know about our own cognitive processes. In the category of metacognitive knowledge, researchers suggested subcategories of (Balcikanli, 2011) (Young & Fry, 2008):

- Declarative knowledge, In brief, declarative knowledge refers to "knowing about things"
- Procedural knowledge, procedural knowledge refers to "knowing how to do things", and
- Conditional knowledge. , Conditional knowledge is "knowing the why and when aspects of cognition".

As a whole, our knowledge of cognition refers to what we know about how we learn; what we know about the procedures and strategies that are the most effective for us; and, what we know about the conditions under which various

cognitive activities are most effective.

In contrast to metacognitive knowledge, metacognitive regulation is more related to a set of actions and events so as to facilitate learning than a set of knowledge that shapes how those actions emerge. Metacognitive regulation can be broken down into three component activities. These include:

- Planning involves "the selection of appropriate strategies and the allocation of resources that affect one's learning performance".
- Monitoring involves "one's on-line awareness of comprehension and task performance".
- Evaluating refers to "appraising the products and regulatory processes of one's learning".

Flavell (1979) pinpointed three important implications for this. First, metacognitive experiences have the power of influencing metacognitive knowledge along with a variety of actions including adding, deleting or revising. Second, they can guide learners to recreate new goals and revise them on the basis of old ones. Third, metacognitive experiences can arouse strategies that may be employed in the face of cognitive or metacognitive goals (Balcikanli, 2011).

It stands to reason that if students have well developed metacognitive knowledge and metacognitive regulatory skills and they use their metacognition, they will excel academically (Young & Fry, 2008).

Metacognitive awareness is an important element in learning, it plays a pivotal role in the effectiveness of the learning process, it could be defined as ability of individuals to control his own cognitive process and direct them (Alkan & Erdem, 2014). Studies suggest that metacognition has the potential to affect students' learning across different domains. Flavell emphasized that "metacognition is congruent with the learners" need and desire to communicate, explain and justify thinking to organisms as well as to himself" (Balcikanli, 2011). He acknowledged the significance of metacognition in a wide range of applications that included reading, oral skills, writing, language acquisition, memory, attention, social interactions, self-instruction, personality development and education (Flavell, 1979).

So far, the correlation between the metacognitive beliefs and students' academic achievement has been studied in a very limited research, but it seems that the metacognitive beliefs have an important impact on the students' academic achievement (Abdi et al. , 2012). Young & Fry (2008), based on their research study where they investigated to reveal the relationship between metacognitive awareness and academic achievement in college students, found out that there are correlations between the MAI (Metacognitive Awareness Inventory) and cumulative GPA (Grade Point Average).

Lee (2009) examined the relationships between metacognition, self-regulation and students" critical thinking skills and disposition, she argued that self-regulation had significant relationships with students" critical thinking disposition (Balcikanli, 2011)

Furthermore, metacognition has been one of the most concentrated concepts among researches because of many reasons (Memnun & Akkaya, 2009):

1. Metacognition is one of the most important factors that affect problem solving behaviors of individuals
2. Metacognition is an extremely important structure, affecting individual learning process
3. Metacognition has a main role in the self-regulation, required to succeed in learning
4. Learners with a certain level of self-regulation and strategy of metacognition get a better academic achievement.
5. Metacognition encourages reflective thinking, provide responsibility, and build self-confidence to make decisions quickly.
6. Metacognition facilitates critical and creative thinking.

Thus, metacognition is important to regulate and improve their cognitive tactics and strategies used in problem solving process. The students with a higher level of metacognitive skills become successful in problem solving (Aurah et al. , 2014).

When students are aware of their learning process they will be able to focus and study better. On the other hand, teachers who are aware of their teaching process and well aware of the students' conditions will be able to have a better control in the learning process.

As certain studies indicate, metacognition is a crucial skill to have since it makes students independent thinkers who control their thinking processes. Using metacognition, learners can have the control over what and how they learn, which can trigger the development of independent learning. What is important is that learners who display more metacognitive skills tend to set clear objectives in the learning process, to define the content, to make a schedule in line with this content, and to select the cognitive and metacognitive strategies. (Balcikanli, 2011).

Various studies have revealed that learning can be enhanced if students use metacognitive processes, i. e. ; they are aware of, monitor and control their own learning. Good learners are metacognitively adept and poor ones metacognitively deficient in how they tackle learning tasks in most subjects (Fazal ur Rahman, 2011).

If it is the aim of education to let learners take charge of their own learning, then they need to be able to plan, monitor and evaluate their learning. In order to do so, they need to be metacognitively aware, students without metacognitive approaches are essentially learners without direction and ability to review their progress, accomplishments and future learning directions (Balcikanli, 2011).

Metacognition plays an important role in teaching, learning, social cognition, attention, self-discipline, problem solving, communication and personality development. An understanding of learning process and learners, will put the teacher in a better position to decide what can be done and how, what will not work and why (Fazal ur Rahman, 2011).

Metacognitive teaching refers teaching with and for metacognition. It means teachers think about their own thinking regarding instructional goals, teaching strategies, sequence, materials, students' characteristics and needs, and issues related to curriculum, instruction and assessment before, during and after lessons. Teaching for metacognition means teachers think about how teaching will activate and develop students' metacognition, or thinking about their own thinking as learners (Fazal ur Rahman, 2011).

Metacognition is important for teachers as they need to handle the students as well as adapting it to the students. In school environment, teachers need to socially interact with their students, collegues, and as well as parents. This is where teachers need to adapt with suitable metacognition in order for them to deal with each people differently. In contrast to the problems and tasks confronted in typical metacognitive interventions, teachers must find a way to effectively communicate and interact with people of different values to make their adaptations successful (Lin, Schwartz, & Hatano, 2005). Metacognition in science teaching and learning includes both aspects teaching for and with metacognition (Hartman, 2001):

1. Metacognition enables teachers to regulate their teaching activities according to students, goals and situation.
2. It help the teachers to plan, monitor and evaluate thinking processes and products, and
3. It also equip the teachers about what information/skills they have, when, why and how to use them.

Teachers need to think metacognitively to effectively run teaching and use instructional techniques strategically. According to the literature on metacognition theory teachers' understanding of metacognition is complex and depends on an interaction between declarative, procedural, and conditional knowledge. The metacognition theory assumes that teachers' conditional knowledge influences procedural knowledge, which in turn also affects declarative knowledge, and further alters their pedagogical knowledge in metacognition. Procedural knowledge directly affects declarative knowledge and pedagogical knowledge. Declarative knowledge builds upon conditional and procedural knowledge and directly influences pedagogical knowledge (Wilson & Bai, 2010).

Teaching is a profession where teachers or educators need to engage with a variety and diversity of students. Thus, it makes the teaching profession as one of the most challenging profession. In everyday teaching lesson, teachers need to be able to vary their teaching methods as well as lesson in order to attract the students' attention. The teaching process will become harder once the teachers have to deal with different level of students in the classroom. This is where metacognition is important for teachers to be adapted in their teaching. It is because "successful teaching can benefit from what we call adaptive metacognition, which involves change to oneself and to one's environment, in response to a wide range of classroom social and instructional variability profession" (Lin et al. , 2005).

There are many problems regarding the issue of teaching. However, when it comes to problems or students' low performance, teachers are among the first people that will be questioned. One of the major problem faced by the pre-service teachers is the ability to view the importance of seeing different educational theories related to real instructional problems. Teachers play the important role in educating and as well as to teach the students. Teachers need to know their strength and weaknesses in teaching and always try to improve them. It is highly believed that knowing what teachers know about their own teaching should be a starting point for a change in teacher development (Balcikanli, 2011).

Therefore, metacognitive awareness of teachers is regarded as an important factor in increasing of their career's success, their creative and critical thinking, and building self-confidence. Consequently, it has very critical importance to determine the level of metacognitive awareness of teacher. The aim of this study is to determine the levels of metacognitive awareness of primary science teacher, and examine whether these levels change according to some variables such as gender or class levels.

2. Research Questions

A detailed study of teachers' pedagogical understandings of metacognition requires that teachers have declarative, procedural, and conditional knowledge. Declarative knowledge is a teachers' knowledge of what they should teach.

Procedural knowledge is knowledge of how a teacher teaches something. Conditional knowledge is the understanding that the teaching of metacognitive strategies is dependent on the situation and that particular situations require the use of particular strategies.

The research questions under investigation for this study are as follows:

1. What are the science teachers' perception about metacognitive awareness?
2. Is there a significant difference among scores of metacognitive awareness of science teachers according to their gender, age and educational level?

3. Method

3.1 Participants

The sample of this research consists of 52 primary school science teachers in Ipoh-Malaysia. Around 40% of them are males and 60% are females. 71% of male teachers are 41-40 years old, while 45% of female teachers are 31-40 years old. The majority of the sample (78. 8%) has bachelor (66. 7% of males and 87. 1% of female teachers. See table 1.

3.2 Materials

This study intends to investigate teachers' metacognitive awareness in teaching. In this study, the researcher adapted an inventory Metacognitive Awareness Inventory for Teachers (MAIT) by Balcikanli (2011). This inventory comprises of two aspects that are metacognitive knowledge and metacognitive regulation. In metacognitive knowledge, there are three strategies that completed it. It consists of the strategies of declarative knowledge, procedural knowledge and conditional knowledge. Meanwhile, in metacognitive regulation, there are three strategies included in this part that are planning, monitoring and evaluating. It includes two parts. Part one contains demographic questions. Part two is the Teachers' Metacognition Scale (TMS) with 24 Likert- Scale questions.

The inventory was modified to a 5 point Likert- Scale ranging from (1) "strongly disagree" to (5) "strongly agree". There are six sub-items in the inventory that can be divided into two aspects, which are metacognitive knowledge and metacognitive regulation. In metacognitive knowledge, there are three sub categories are, declarative knowledge, procedural knowledge and conditional knowledge. In metacognitive regulation, the three-sub cognition are, planning, monitoring and evaluating. In the inventory, in the six subs cognition in metacognitive knowledge and metacognitive regulation there were four items each developed from them. Thus, the four items in the six subs cognition was sum up to 24 items that were designed for the inventory.

Since the instrument has not been used in the Malaysian cultural background before, the researcher retest the reliability using Cronbach's Alpha internal consistency coefficient and split-half coefficient. The results of Cronbach's Alpha internal consistency coefficient for the scale indicate that the overall scale had an alpha of 0. 880 and 0. 852 of split-half coefficient. This means that the instrument has a good reliability and can be used to measure the science teachers' perceptions about metacognition.

4. Results

The main aim of this study is to measure science teachers' perceptions about metacognition. Also,if there are a significant difference among scores of metacognitive awareness of science teachers according to their gender, age and educational level.

5. Findings of Descriptive Analyses

The second section of the survey asked science teachers to report their perceptions about metacognition. Table (2) includes the means and standard deviations about teachers perceptions about metacognition. The results show that science teachers have good perceptions about metacognitionis (M = 96. 15, SD = 6. 26) with 80% of mean. All the 6 sub categories nearly get 80% of mean. The mean ranged from 15. 8-16. 15 with standard deviation between 1. 08 to 1. 3. Those results reveal that science teachers have a good perception about knowledge and regulation of metacognition.

For more details, results in table (3) showed that the lowest items in kowledge of metacognition are items 11 and 11 with 76-78% of mean,those items are about (I find myself assessing how useful my teaching techniques are while I

am teaching, and I ask myself if I could have used different techniques after each teaching experience). Both of them are about the usfulness of the techniques and the possibility of using different techniques. On the other hand, the highest items are 8, 2, 10 respectively. Those items got percent of mean ranged from 53-86%, they are about reasons for choosing each teaching technique, using teaching techniques that worked in the past, and setting teaching goals before start teaching.

With regard to the other part "regulation of metacognition", the lowest items are 20 and 21 with percent of mean between 69-75%. Those items are about "using helpful teaching techniques and effective teaching technique". The highest items with percent of mean around 82% are items number 15, 18, 19, and 22. The highest items are about using different teaching techniques, teach in more effective way next time, knowing what expected to teach and organizing teaching time.

In general, these results indicate that science teachers have good perceptions about metacognitionis. They are aware about reasons for choosing each teaching technique, using teaching techniques that worked in the past, and setting teaching goals before start teaching. They also think about using different teaching techniques, teach in more effective way next time, knowing what expected to teach and organizing teaching time.

6. Findings of Multivariate Analysis

Are there any significant difference among scores of metacognitive awareness of science teachers according to their gender, age and educational level? Considering the different perceptions between teachers according to their gender, age and educational level, and testing the interaction between the independent variables, the researcher used a multivariate analysis, the results included in table 4.

Table 4 shows the main 3-way ANOVA summary results. The main effect of gender was not significant, F (1, 41) = 0. 289, p = . 594. While, the main effect of educational level was significant, F (1, 41 = 12. 141, p = . 001) and the main effect of age was also significant, F (2, 41 = 6. 757, p = . 003). Regarding the interaction between the independent variables, it was not significant for Gender * Educational level, F (2, 41) = 0. 771, p = 0. 385, and Gender * Age, F (2, 41) = 0. 497, p = 0. 612, and Gender * Educational level * Age, F (2, 41) = 0. 078, p = 0. 782. However, the interaction effect between Educational level * Age was significant, F (2, 41) = 17. 524, p = 0. 001. The plot of the mean " perceptions about metacognitionis " score for each combination of groups of " Educational level " and "Age" is plotted in a line graph, as shown in figure 1, and the results of the Multiple Comparisons (Scheffe test) presented in table (5).

Figure 1 shows that the teacher age interacted with their educational level to explain their perception of metacognition. The teachers aged 20-30 with diploma have higher perception than teachers aged 20-30 with bachelor. This result as same as of teachers aged 41 years old and above with bachelor degree. On the opposite, the teachers aged 31-40 with bachelor have higher perception than teachers aged 31-40 with diploma have.

The results of the Multiple Comparisons (Scheffe test) presented in table (5) showed that there is a significant differences between teachers according to their age. Teachers aged 20-30 have higher perception towards metacognition than both of teachers aged 31-40 and teachers aged 41 years old and above do.

7. Conclusion

Metacognitive is a term that is widely discussed in the field of education. However, there is only little research in this issue happened in Malaysia. There are many literature reviews from Flavell (1971) until Balcikanli (2011) that studies on metacognition. It shows that metacognition plays a very important role in education. It does not only work for the students but it helps the teachers to improve their teaching skills. Many researches show that students that are able to aware of the metacognitive have a better opportunity in learning compared to those who do not. In relation to teaching, it is important for teachers to be able to measure their level of awareness in metacognitive knowledge and regulation in order for them to apply and eventually teach the right metacognitive knowledge and regulation that best suits their students.

Lastly, Metacognitive Awareness Inventory for Teachers (MAIT) is use in order to see the effectiveness of this inventory towards the primary school science teachers in Ipoh. Results indicated that science teachers have good perceptions about metacognitionis. They are aware about choosing the appropriate and effictive teaching technique, and setting teaching goals before start teaching. And they also think about using different teaching techniques and organizing teaching time. The results of multivarite analysis showed the interaction effect between Educational level * Age , the teachers aged 20-30 with diploma have higher perception than teachers aged 20-30 with bachelor. On the opposite, the teachers aged 31-40 with bachelor have higher perception than teachers aged 31-40 with diploma have. Regarding the

teachers age, teachers aged 20-30 have higher perception towards metacognition than both of teachers aged 31-40 and teachers aged 41 years old and above do.

References

Abdi, H. M. , Bageri, S. , Shoghi, S. , Hosseinzadeh, a, Branch, R. , & Branch, S. (2012). The Role of Metacognitive and Self-Efficacy Beliefs in Students ' Test Anxiety and Academic Achievement, *6* (12), 418–422.

Alkan, F. , & Erdem, E. (2014). The Relationship between Metacognitive Awareness, Teacher Self-efficacy and Chemistry Competency Perceptions. *Procedia - Social and Behavioral Sciences*, *143*, 778–783. doi: 10. 1016/j. sbspro. 2014. 07. 475

Aurah, C. M. , Cassady, J. C. , & McConnell, T. J. (2014). Predicting Problem Solving Ability from Metacognition and Self-Efficacy Beliefs on a Cross Validated Sample. *British Journal of Education*, *2* (1), 49–72. Retrieved from http: //www. eajournals. org/journals/british-journal-of-education-bje/vol-2-issue-1march-2013/predicting-problem-solving-ability-metacognition-self-efficacy-beliefs-cross-validated-sample-2/

Balcikanli, C. (2011). Metacognitive awareness inventory for teachers (MAIT). *Electronic Journal of Research in Educational Psychology*, *9* (25), 1309–1332.

Fazal ur Rahman. (2011). *Assessment of Science Teachers Metacognitive Awareness and Its Impact on the Performance Assessment of Science Teachers Metacognitive Awareness and Its Impact on the Performance of STUDENTS*. ALLAMA IQBAL OPEN UNIVERSITY.

Flavell, J. (1979). Metacognition and cognitive monitoring: a new area of cognitive developmental inquiry. *American Psychologist*, *34* (10), 906–917.

Fouché, J. (2013). *THE EFFECT OF SELF-REGULATORY AND METACOGNITIVE STRATEGY INSTRUCTION ON IMPOVERISHED STUDENTS' ASSESSMENT ACHIEVEMENT IN PHYSICS*. Liberty University.

Hartman, H. E. (2001). *Metacognition in learning and instruction: Theory, research and and practice.* Netherland: Kluwer Academic.

Lee, S. (2009). *Examining the relationships between metacognition, self- regulation and critical thinking in online socratic seminars for high school social studies students. Unpublished Master's*. University of Texas.

Lin, X. , Schwartz, D. L. , & Hatano, G. (2005). Toward Teachers' Adaptive Metacognition. *Educational Psychologist*, *40* (4), 245–255. doi: 10. 1207/s15326985ep4004_6

Livingston, J. A. (1997). Metacognition: An Overview. *The American Journal of Pharmacy Education*, (1). Retrieved from http: //www. ncbi. nlm. nih. gov/pmc/articles/PMC1847545/

Memnun, D. S. , & Akkaya, R. (2009). The levels of metacognitive awareness of primary teacher trainees. *Procedia - Social and Behavioral Sciences*, *1* (1), 1919–1923. doi: 10. 1016/j. sbspro. 2009. 01. 337

Wilson, N. S. , & Bai, H. (2010). The relationships and impact of teachers' metacognitive knowledge and pedagogical understandings of metacognition. *Metacognition and Learning*, *5*, 269–288. doi: 10. 1007/s11409-010-9062-4

Young, A. , & Fry, J. D. (2008). Metacognitive awareness and academic achievement in medical students. *Journal of the Scholarship of Teaching and Learning*, *8* (2), 1–10. doi: 10. 3109/0142159X. 2010. 487711

Tables

Table 1. The sample

	Male	Male	Female	Female		Total
	Count	%	Count	%	Count	%
20 - 30 years	5	23. 8%	5	16. 1%	10	19. 2%
31 - 40 years	15	71. 4%	14	45. 2%	29	55. 8%
41 and above	1	4. 8%	12	38. 7%	13	25. 0%
Diploma	7	33. 3%	4	12. 9%	11	21. 2%
Ijazah	14	66. 7%	27	87. 1%	41	78. 8%
	21	40. 4%	31	59. 6%	52	100. 0%

Table 2. The mean and Std. Dev. about teachers Perception of metacognition (N=52)

	Mean		Std. Deviation
declarative knowledge	16. 1538	81%	1. 30436
procedural knowledge	15. 9423	80%	1. 30479
Conditional knowledge	16. 0385	80%	1. 11955
planning	16. 2115	81%	1. 39096
monitoring	15. 8077	79%	1. 48243
evaluating	16. 0000	80%	1. 08465
Metacognition	96. 1538	80%	6. 29467

Table 3. The mean and Std. Dev. about teachers Perception of metacognition (N=52)

	Mean	%	Std. Deviation
1. I am aware of the strengths and weaknesses in my teaching.	4. 019	80%	0. 420
2. I try to use teaching techniques that worked in the past.	4. 212	84%	0. 498
3. I use my strengths to compensate for my weaknesses in my teaching.	4. 154	83%	0. 460
4. I pace myself while I am teaching in order to have enough time.	3. 981	80%	0. 577
5. I ask myself periodically if I meet my teaching goals while I am teaching.	4. 038	81%	0. 593
6. I ask myself how well I have accomplished my teaching goals once I am finished.	4. 135	83%	0. 715
7. I know what skills are most important in order to be a good teacher.	4. 019	80%	0. 610
8. I have a specific reason for choosing each teaching technique I use in class.	4. 308	86%	0. 466
9. I can motivate myself to teach when I really need to teach.	4. 019	80%	0. 610
10. I set my specific teaching goals before I start teaching.	4. 173	83%	0. 474
11. I find myself assessing how useful my teaching techniques are while I am teaching.	3. 885	78%	0. 615
12. I ask myself if I could have used different techniques after each teaching experience.	3. 808	76%	0. 525
13. I have control over how well I teach.	3. 981	80%	0. 505
14. I am aware of what teaching techniques I use while I am teaching.	3. 981	80%	0. 542
15. I use different teaching techniques depending on the situation.	4. 096	82%	0. 358
16. I ask myself questions about the teaching materials I am going to use.	3. 942	79%	0. 366
17. I check regularly to what extent my students comprehend the topic while I am teaching.	3. 904	78%	0. 534
18. After teaching a point, I ask myself if I'd teach it more effectively next time.	4. 096	82%	0. 534
19. I know what I am expected to teach.	4. 135	83%	0. 444
20. I use helpful teaching techniques automatically.	3. 442	69%	0. 574
21. I know when each teaching technique I use will be most effective.	3. 769	75%	0. 425
22. I organize my time to best accomplish my teaching goals.	4. 115	82%	0. 471
23. I ask myself questions about how well I am doing while I am teaching.	3. 981	80%	0. 420
24. I ask myself if I have considered all possible techniques after teaching a point.	3. 962	79%	0. 194

Table 4: Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	994. 032a	10	99. 403	3. 969	. 001
Intercept	164294. 253	1	164294. 253	6560. 650	. 000
Gender	7. 240	1	7. 240	. 289	. 594
Educational level	304. 038	1	304. 038	12. 141	. 001
Age	338. 428	2	169. 214	6. 757	. 003
Gender * Educational level	19. 307	1	19. 307	. 771	. 385
Gender * Age	24. 867	2	12. 434	. 497	. 612
Educational level * Age	877. 665	2	438. 833	17. 524	. 000
Gender * Educational level * Age	1. 943	1	1. 943	. 078	. 782
Error	1026. 737	41	25. 042		
Total	482790. 000	52			
Corrected Total	2020. 769	51			
a. R Squared = . 492 (Adjusted R Squared = . 368)					

Table 5: The results of the Multiple Comparisons (Scheffe test)

(I) Age		Mean Difference (I-J)	Sig.
20 - 30 years	31 - 40 years	8. 431*	. 001
	41 and above	6. 722*,b	. 037
31 - 40 years	20 - 30 years	-8. 431*	. 001
	41 and above	-1. 709b	. 527
41 and above	20 - 30 years	-6. 722*,c	. 037
	31 - 40 years	1. 709c	. 527

Figure 1: mean of perceptions about metacognitionis for each combination of groups