

Investigating Metacognitive Attitude of High School Biology Teachers

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Abstract

Teacher autonomy in learning is a part of professional accountability. The autonomy includes self-direct teaching as a reflection of the teachers' metacognition in selecting learning strategies, monitoring the accuracy of strategy implementation, as well as evaluating the process. The metacognitive attitude directs the process of constructing knowledge and managing a classroom to meet the standard of the learning process. The objective of the present study is to describe the metacognitive attitude of Biology teachers. The survey research involved 57 Biology teachers in DKI Jakarta Province, Indonesia. The research instrument is the Metacognitive Awareness Inventory Teacher (MAIT) with Cronbach Alpha values $r = 0.86$. The results show that (1) the teacher's metacognitive attitude is high (mean 73.49), and (2) there was no correlation between metacognitive attitude with the school category or gender. This suggests the high performance of Biology teachers in autonomy especially in managing the Kurikulum 2013. This Kurikulum 2013 emphasizes student-centered learning which allows a variety of learning strategies that can be selected by the teacher to achieve a quality result. Male and female teachers both have equal opportunities in achieving their metacognitive attitudes, as well as the school category.

Keywords: Metacognitive Attitude, Biology Teachers, Teacher Autonomy

INTRODUCTION

Teacher autonomy plays an important role and is related to professional accountability (Furlong 2002; Wu, Cheung & Chan 2017; Wermke, Olason Rick & Salokangas 2019). Accountability refers to capability of being responsible for choosing an active learning strategy, the process of constructing knowledge, as well as managing the classroom (Niemi & Kohonen 1995; Šteh & Požarnik 2005; Demir & Doğanay 2019; Franklin & Harrington 2019). The professionalism principle of teaching profession (in service) is a crucial point for professional development programs (Evans 2008; Hargreaves 2001). Various approaches have been reported by researchers in educational context, particularly in the study of teacher professional development program (Blank, de las Alas & Smith 2007; Avalos 2011; Loughran 2014; Valiandes & Neophytou 2018). Teacher education in Finland has used a research-based approach for teaching that may improve teacher professionalism (Westbury et al. 2005; Harrison & Harris 2020). Zulfiani, Herlanti & Sofyan (2016) through Classroom Action Research (CAR), in collaboration with universities and schools, show an effective symbiotic mutualism relationship that improve the learning

process in the class. Through CAR, teachers and prospective teachers gain experience in engaging pedagogical actions in solving problems rationally (James & Augustin 2018; Cain 2011; Edwards-Groves and Kemmis 2016). This approach directly catalyzes effective teacher professionalism (Vaughan & Burnaford 2016; Ulvik & Riese 2016; Qing-li et al. 2019).

Hoyle and John (1995) state that professionalism cover three main factors—knowledge, autonomy, and responsibility. Okas, Van Der Schaaf & Krull (2014) state that the autonomy of an action and authority is very important in applying knowledge, attitudes, and skills in specific work situations. In the context of teaching, the teacher's professional skills and knowledge may be fully expressed if the teacher has the right to make decisions which are efficient in class management (Smith 2003; Jumani & Malik 2017). This includes the selection of methods to obtain goals and standards as the main aspect of teacher autonomy (Lamb 2000; Šteh & Požarnik 2005; Lundström 2015).

Indonesia is not different, the enactment of the Kurikulum 2013 has given teachers the authority to develop their learning democratically. The government composes 8 education standards, including graduate

competency standards, content standards, education and education personnel standards, standards of facilities and infrastructure, management standards, education funding standards, educational assessment standards (INESB 2017). Referring to the education standards that have been decided, the teacher can implement the authority and accountability of education in the school system on a macro and micro basis.

The Indonesian government in implementing the Kurikulum 2013 has provided the step-by-step guidance in accordance to the readiness of the schools and teachers throughout Indonesia. Training, phased implementation, school assistance, and monitoring and evaluation are major in the agenda of the Indonesian government in 2016-2019 (MONE 2017). According to the implementation of the Kurikulum 2013 in several schools, preliminary data on the teacher's metacognitive attitude is required as a teacher's professional self-regulation awareness. The teacher's metacognitive attitude reflects the teacher's professional decision making when managing, learning, constructing knowledge, and ensure that the teacher has the autonomy to develop their learning (Santisi et al. 2014; Moos & Ringdal 2012; Postholm 2012).

Metacognitive attitude discloses a metacognitive knowledge and regulatory knowledge. This domain of knowledge was developed by Schraw & Dennison (1994) on a student as a subject, and developed by Balcikanli on teachers. Metacognitive Awareness Inventory Teacher (MAIT) is an instrument that helps teachers realize the level of metacognitive teaching (Balcikanli 2011). Research on metacognition in students, pre-service, and non-teacher students has been widely reported, but research that reveal the metacognitive awareness of teachers (Kallio et al. 2017) has been lacking. Uncovering the teacher's metacognitive attitude is important to disclose the level of consciousness or even the teacher's metacognitive attitude. This instrument will show the way of the teacher's professional level is specifically related to their responsibilities in learning. Sense of responsibility for the appropriate learning in the classroom will lead to compliance with the standards of the Kurikulum 2013 learning process occurs at the school. The formulation of the present research is to find answers of the following queries:

1. What is the metacognitive attitude of the Biology teachers on metacognitive knowledge dimension and self-regulation?

2. Is there any correlation between metacognitive attitude with gender and differences in school categories?

METHOD

The present research utilizes the survey method (Cohen, Manion & Morrison 2002). The objective of the study is to obtain empirical data on metacognitive attitude of 57 Biology teachers from 30 high schools in DKI Jakarta Province.

Participant

The selection of teacher sample was performed by stratification, with the following stages: (1) the determination of schools is based on five regions (Jakarta Barat, Jakarta Timur, Jakarta Utara, Jakarta Selatan, Jakarta Pusat), (2) determining the school category of high-low-middle based on the score of the 2016 national passing grade for each school in DKI Jakarta Province in the 2016 New Student Enrollment (PPDB) process (PPDB 2016), (3) there are 114 schools in DKI Jakarta Province, Indonesia, which are subsequently sorted according to the two groups above. Further, a random sampling of two schools per category (high-medium-low) per region was performed. Accordingly, each region has 6 schools as research samples. The MAIT instruments were distributed to 2 teachers per school. There were 16% of

male teachers and 84% of female teachers.

Instrument of Metacognitive Attitudes

The metacognitive attitude instrument utilized in this research is the Metacognitive Awareness Inventory Teacher (MAIT) adapted from Balcinkali (2010). MAIT indicators include planning, monitoring, evaluation, declarative knowledge, procedural knowledge, and conditional knowledge. This instrument has been through a process of adaptation and validation by a cognitive psychologist from Universiti Malaya, Malaysia. Meanwhile, the MAIT reliability test was performed on 40 teachers which resulted in Cronbach Alpha $r = 0.860$. The Cronbach Alpha value suggested a reliable questionnaire and that the questionnaire is reliable as an instrument for collecting data from the original 24 questions into 20 valid questions. The metacognitive attitude is scored based on the Likert scale with description 1 = occasionally, 2 = sometimes, 3 = often, 4 = very often. The maximum score of metacognitive attitudes is 80 with a score classification of low (score 1-26), moderate (score 27-53), and high (score 54-80).

Data Analysis

Metacognitive attitude data is processed through the descriptive statistics and inference. The mean,

standard deviation of the metacognitive attitude, and classification of categories were calculated. Mann Whitney U Test and ANOVA Test were also conducted to determine the effect of metacognitive attitudes based on gender differences and school categories. All inferential statistical tests utilized the Statistical Package for the Social Sciences (SPSS) tool Version 22 for Windows.

RESULTS AND DISCUSSION

The mean score for teacher's metacognitive attitude is 73.49 with SD 6.36 (high). 98% is within the high range (score 54-80) and 2% is within the medium range (score 27-53). The overall response of the teacher's metacognitive attitude data is summarized in Table 1.

Table 1 Response of Teacher's Metacognitive Attitude

Variables	Responses							
	Rarely		Sometimes		Often		Very Often	
	N	%	N	%	N	%	N	%
Planning	1	1	1	2	11	19	45	78
Monitoring	0	0	2	3	11	20	44	77
Evaluation	0	1	2	3	17	29	38	67
Declarative Knowledge	0	0	1	1	15	27	41	72
Procedural Knowledge	0	1	1	2	15	27	40	70
Conditional Knowledge	0	0	1	2	14	25	41	73

Based on the teacher's metacognitive attitude response in Table 1, the results show that each component of the metacognitive attitude is positive, with the response is dominated by "very often".

Gender Differences

This study intends to identify whether gender influences the differences in metacognitive attitudes. The Mann Whitney test was used with the assumption of an ordinal metacognitive attitude measurement scale. The U-test results are summarized in Table 2.

Mann Whitney U test results with a value of 150 and $p = 0.147 > 0.05$ or

H_0 are accepted. Therefore, gender difference does not influence metacognitive attitudes.

Metacognitive Attitude Differences in School Categories

To identify the differences in metacognitive attitudes in terms of school categories (high-medium-low), an ANOVA test was conducted. The ANOVA test results obtained a value of $F = 0.687$ with a significant value = 0.507, with a value of $p > 0.05$, indicating that there is no difference in metacognitive attitude in terms of school categories in Table 3.

Table 2. Test Results on U Calculation of Metacognitive Attitude score on Gender

	N	Mean	Mean Rank	Sum of Ranks	U	p
Male	9	71	21,67	195,00		
Female	48	73,95	30,38	1458,00	150	0,147

Table 3. ANOVA Test of Metacognitive Attitudes towards School Categories

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	50.218	2	25.109	.687	.507
Within Groups	1974.028	54	36.556		
Total	2024.246	56			

The results based on Table 1 show the high category of Biology teacher's metacognitive attitudes, including planning, monitoring, evaluating, declarative knowledge, procedural knowledge, and conditional knowledge. These results are in line with Ciascai's (2016) who used the MAIT instrument and obtained high metacognitive awareness in 29 Master's students at Babes-Bolyai University Romania. The obtained results correspond with the high level of teacher's metacognitive awareness. The MAIT Questionnaire item refers to the teaching experience of each teacher respondent.

Husamah (2015) reinforces the role of metacognition as an intermediary for the success of the learning process. Tosun & Senocak (2013) state that higher metacognitive awareness is better in planning, managing information, monitoring, debugging, and evaluating than individuals with low metacognitive awareness.

Based on Table 2 and Table 3, the results show there is no correlation of metacognitive attitudes toward gender or school categories. Lima Filho & Bruni (2017) identify elements that show the influence of age and gender variables in the metacognitive level of 851 professionals in the Bahia Regional Administration Board. From the Structural Equation Modeling, the results show that the sex variable does not show a significant relationship with the metacognitive profile. The implications of this study provide empirical conclusions that can help entrepreneurs, companies, tertiary institutions to understand the metacognitive aspects that affect entrepreneurial behavior more systematically.

Stewart, Cooper & Moulding (2007) examined the development of metacognition in 214 preservice and experienced teachers, and the results obtained metacognition increased

significantly with age and with their teaching experiences. There is no significant difference in metacognition based on gender and different levels of a teacher.

Professional teachers work with the learning process in their daily activities. The process of curriculum development and teaching in class involve the works of metacognitive processes, such as class management, delivery of material, giving an assessment, evaluating student progress. The teacher thinks of the progress of the students, which indirectly increases their sensitivity regarding their metacognitive awareness. These is a part of an increase in an individual's metacognitive that contributes to the performance of performance at all ages.

The same pattern reported by Mai's (2015) study of 52 teachers in Malaysia using the MAIT instrument revealed that Science teachers had a high level of metacognition perception, and there was no significant difference related to gender. Therefore, both male and female have equal opportunities in achieving their metacognitive attitudes, as well as for the school categories.

CONCLUSION

The metacognitive attitude of Biology teachers in DKI Jakarta Province, Indonesia, is high. Thus, the performance of teacher autonomy is also

high, especially in managing learning in the Kurikulum 2013. The autonomy of teachers plays an important role and related to professional accountability. The autonomy of teacher professionalism in the classroom is in line with the principle of developing the Kurikulum 2013, which creates space for the teacher autonomy to creatively develop learning process that is in accordance with the talents and interest of the students. The analysis results show that both male and female have equal opportunities in achieving their metacognitive attitudes, as well as for the school categories.

SUGGESTIONS

The above results also suggest the teacher's professionalism in making decisions in managing learning, constructing knowledge, and evaluating the learning process. Thus, based on the above results, the Biology teachers in DKI Jakarta Province, Indonesia, have acquired the autonomy and sense of responsibility to develop relevant learning in line with the Kurikulum 2013's mission.

Autonomy and responsibility, according to Hoyle and John (1995), have been emphasized in terms of teacher professionalism in addition to the knowledge aspect. Teacher autonomy plays an important role and is

related to accountability for the selection of active learning, meaningful knowledge, and autonomy among students (Niemi and Kohonen 1995; Šteh and Požarnik 2005; Helgøy & Homme 2007). Likewise, Herianto (2016) states that teacher autonomy also provides flexibility in designing learning, developing creativity using media and strategies, while also evaluating student's learning outcomes (Md-Ali & Veloo 2017).

Seraphin et al. (2012) studied the impact of professional development on metacognition and learning in science education with the MAIT instrument. The results showed that the ability to evaluate strengths and cognitive weaknesses is high for both teachers and students, where they can learn to use that knowledge strategically. Both beginner and experienced teachers reap the benefit from scientific investigations that focus on metacognition studies in their professional development. The results also showed that teachers need to be supported in metacognitive development. There are advantages in developing the metacognitive attitude, one of them is improvement in teachers' ability to evaluate the selection of learning strategies, and to evaluate the feasibility of the strategy in learning implementation. Likewise, teachers are the central component in improving the

quality of education (Budi et al. 2014; Rahayuni 2016; Darussayamsu et al. 2019).

The metacognitive attitude of the MAIT instrument is limited to evaluation and reflection of the planning and implementation of the learning process without revealing the assessment aspects. Therefore, the results of this study are preliminary on teacher autonomy profiles related to learning. It is necessary to examine the autonomy of the teacher in the aspect of assessment, which is an integral unity with the planning and implementation of learning.

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