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Research Article

Metacognitive awareness components of high-academic ability students in biology hybrid learning: Profile and correlation

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ABSTRACT

Metacognitive awareness has been considered as one of the factors within students that determines learning success. It can be developed through a hybrid learning approach. The purpose of this quantitative research was to examine the metacognitive awareness profile of students with high-academic ability in hybrid learning implementation. The subjects of this study were the students of XI-Science class of state senior high school of Malang. The Metacognitive Awareness Inventory was used as the data collection instrument, while descriptive statistics and Pearson Product-Moment were chosen as the data analysis techniques. The results of the study informed that the students' metacognitive awareness was divided into four categories, i.e. very good (9%), good (43%), enough (46%), and very low (2%). The three components of metacognitive awareness were classified as "enough", while the five components of students were categorized as "good". The eight metacognition components showed significant correlations each other ($r > 0.41$, $n = 55$, $p < 0.01$). It can be concluded that the majority of students' metacognitive awareness was satisfactory even though there were a small proportion of students whose metacognitive awareness was not good.

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INTRODUCTION

Variety of academic abilities is seen as a natural condition that is owned by students (Cimatti, 2016; Farrington et al., 2012). A group of students with above-average academic ability is often classified as high-level academic ability students (Bakken, Brown, & Downing, 2017; Visser, Korthagen, & Schoonenboom, 2018). Before the zoning system was implemented in Indonesia, students with high academic abilities often gathered in top schools (Khair, 2019; Satria, 2019; Viptri, 2019). In addition to teacher factors and school facilities, student tenacity can maintain their motivation and enthusiasm for learning (Jabeen & Ahmad, 2013). The positive competitive attitude in themselves will also increasingly encourage students to improve their learning (Darling-Hammond, Flook, Cook-Harvey, Barron, & Osher, 2019). These conditions seem difficult to occur among students with the low academic ability (Biswas, 2015).

Identifying the mindset of students of high academic ability is possible could to provide information that can improve the overall quality of learning (Beran, Brandl, Perner, & Proust, 2012; Kraft, 2017; Rissanen, Kuusisto, Tuominen, & Tirri, 2019; Taylor & Parsons, 2011). Such studies will provide an overview of the thinking conditions of academic ability students. Through the information, teachers with heterogeneous or low academic ability students can design learning that can direct students accustomed to thinking like students with high academic abilities. One interesting parameter of thinking to study is metacognitive awareness.

Metacognitive awareness has been considered as an essential variable in the learning process (Millis, 2016; Syarifah, Indriwati, & Corebima, 2016; Yanqun, 2019). The variable is closely related to the awareness and ability of a student to monitor the way they think (Patterson, 2011). By having metacognitive awareness, students will be more mindful about what they are doing and know why they are doing (Hussain, 2015; Jankowski & Holas, 2014). They are also accustomed to planning and evaluating the learning experiences and thinking strategies they have chosen (Patterson, 2011; Thomas, 2014). Students with good metacognitive awareness will be able to realize what strengths they have (Husamah, 2015; Pantiwati & Husamah, 2017). They will realize which skills they have mastered and when they need to be used (Chauhan & Singh, 2014). With this kind of awareness, students will be able to maximize their learning process (Chauhan & Singh, 2014; Smith, Black, & Hooper, 2017). Also, they will be able to complete the task well and obtain optimal academic achievement (Abdellah, 2015). Therefore, metacognitive awareness is indicated relating to one's academic ability.

One subject that has the potential to empower students' metacognition is biology. Various studies have also supported the statement. By choosing the right learning model, students' metacognition will be empowered optimally when participating in biology learning. Some of these learning models, including Simas Eric (Darmawan, Brasilita, Zubaidah, & Saptasari, 2018) and guided inquiry (Adnan & Bahri, 2018). In addition, the application of several innovative learning methods and techniques can also improve students' metacognition, such as the application of learning journals (Nurajizah, Windyariani, & Setiono, 2018) as well as self and peer assessments (Pantiwati & Husamah, 2017).

In addition, learning that designed in hybrid learning approach is also possible to have an influence on students' metacognitive awareness (Adnan & Bahri, 2018; Husamah, 2015). Hybrid learning has advantages because in addition to using a face to face approach, this approach also uses ICT, both mobile and non-mobile technologies. This innovation can enhance teaching and learning effectivity (Chafiq et al., 2014; Kiviniemi, 2014; Ramakrisnan, Yahya, Hasrol, & Aziz, 2012).

In connection with the importance of metacognitive awareness, various studies on metacognitive awareness have been conducted in Indonesia. The most common study is the study of the effect of learning on the level of metacognitive awareness of students (Haryani, Masfufah, Wijayati, & Kurniawan, 2018; Husamah, 2015; Nunaki, Damopolii, Kandowangko, & Nusantari, 2019). Other study has focused their studies on the metacognitive profile of students in terms of their skills (Fauzi & Sa'diyah, 2019). On the other hand, studies that focus their studies on the metacognitive awareness profile of students with high academic abilities that following hybrid-learning have never been done. This kind of study will be able to reveal a variety of valuable information which can be used as a basis for designing learning. The information can also be an evaluation of how optimal the empowerment of metacognitive awareness of students with high academic ability in Indonesia. The impact of implementing hybrid learning in facilitating students to become cognitive-aware learners can also be evaluated. Therefore, the purpose of this study was to examine the profile of students with high academic ability in hybrid learning approach at the Malang city-East Java Province. The correlation of each metacognitive awareness was also investigated in this study.

METHOD

This research is a quantitative descriptive study conducted in 2019. The research was conducted at State Senior High School (SSHS) 3 of Malang, which is the first top high school in Malang city-East Java Province, Indonesia. The subjects of this study were 55 students from two classes of XI-Science, they take the learning carried out with hybrid learning approach (using face to face, mobile learning, offline learning, and online learning). Data collected in the form of metacognitive awareness data for all students from the two classes. Metacognitive Awareness Inventory (MAI) developed by Schraw and Dennison (1994) used as a data collection instrument. This instrument is composed of 52 question items in eight metacognitive components, namely: 1) Declarative Knowledge; 2) Procedural Knowledge; 3) Conditional Knowledge; 4) Planning; 5) Information Management Strategies; 6) Comprehension Monitoring; 7) Debugging Strategies, and 8) Evaluation. All items consist of a Likert scale with a scale of 1-5. Instrument distribution was distributed directly to research subjects. Students were allowed to complete the questionnaire for 2 X 45 minutes.

After the data was collected, data analysis was carried out. Data analysis includes calculation of percentage, average, and standard deviation. Various descriptive statistical analyzes were intended to reveal the distribution of students' metacognitive awareness levels, identify student profiles in each component of metacognition, and identify the most optimal and minimum metacognitive awareness indicators achieved by students. The mean obtained was then matched to the metacognition level category presented in Table 1. Also, the correlation test using Pearson Product Moment was used to analyze the existence of the relationship between each component of metacognition.

Table 1. The categories of metacognition level

Scores	Categories
86-100	Very good
76-85	Good
60-75	Enough
55-59	Low
0-54	Very low

RESULTS AND DISCUSSION

Based on the results of this study, only a small proportion of students have a low category of metacognitive awareness (2%). The majority of students have metacognitive awareness with the categories "enough" (46%) and "good" (43%), while the rest are categorized as "very good" (9%). In more detail, the distribution of students' metacognitive awareness levels is presented in Figure 1.

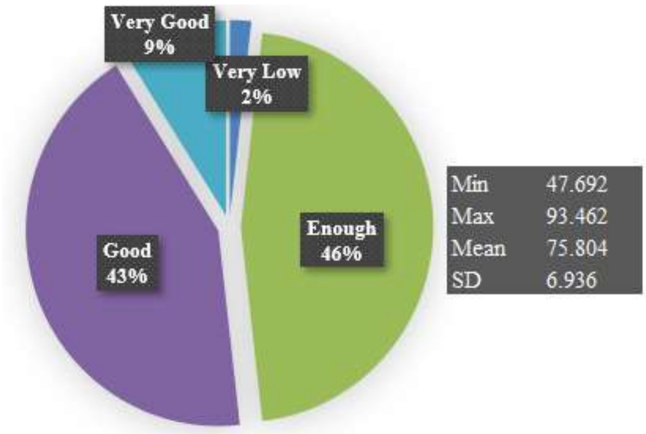

Figure 1. The profile of students' metacognitive awareness (min = minimum score, max = maximum score, SD = standard deviation)

Furthermore, this study also informs that there are variations in the level of metacognition between one component of metacognition and other components. In general, out of the eight metacognition components studied, three metacognition components are classified as "enough" while the other five components are categorized as "good". Of the eight components, debugging strategies are the highest achieving components of metacognition. In more detail, variations in the level of metacognitive components obtained in this study are presented in Figure 2.

Students with high academic ability are indicated to have the good level of metacognitive awareness (Abdellah, 2015; Dang, Chiang, Brown, & McDonald, 2018; Nurajizah et al., 2018; Öz, 2016). The good level of metacognitive awareness of students in this study is in line with several previous studies that also examined the level of metacognition of students in Indonesia. Some of these studies, including studies involving high school students in other cities (Amin & Sukestiyarno, 2015) and college students (Erlin & Fitriani, 2019).

In addition, the application of hybrid-learning is also able to further optimize the empowerment of metacognitive awareness of students with high academic abilities. This statement is based on a number of previous studies which have examined hybrid learning. Some of these studies include studies that examine the effects of hybrid project-based learning (Husamah, 2015) and the use of Google Classroom in hybrid learning (Susilo, Kartono, & Mastur, 2019).

Figure 2. The profile of students' metacognitive awareness in each component

Furthermore, to access more in-depth metacognitive awareness profiles of students with high academic ability, the highest and lowest metacognitive awareness indicators achieved by students were identified in this study. The five highest indicators are presented in Table 2, while the five lowest indicators are presented in Table 3. There is interesting information from the identification results. By Figure 1, debugging strategies are the metacognition component with the highest average; however, based on Table 2, the indicators with the highest mean are not derived from debugging strategies. There are only two indicators of debugging strategies that appear in the list in Table 2. Furthermore, based on Table 3, the lowest indicator comes from the information management system component. This component is related to a person's skill to process information more efficiently.

Table 2. The five highest metacognitive awareness indicators achieved by students

Indicators	Mean
I can learn better when I understand what I am going to learn	90.182
I learn more if I am interested	89.818
I reduce the speed of reading if I find important information	86.909
I stop and re-read if I'm still confused	85.818
Before answering, I considered various possible answers	83.273

Table 3. The five lowest metacognitive awareness indicators achieved by students

Indicators	Mean
I made a summary after I studied certain material	65.818
I understand the structure of the textbook first, so it is easy to learn	64.727
I know what the teacher hopes for me	64.364
I regularly stop to check my understanding	64.000
I make drawings or diagrams to facilitate understanding	62.909

Debugging strategies are one component in the domain of regulation of cognition (Feiz, 2016; Sevimli, 2018; Sungur & Senler, 2009). Debugging strategies are done when a student improves their comprehension and performance during learning. Students with good debugging strategies will realize what they will do when they do not understand the concepts they are learning. On the other hand, evaluation is also a component in the domain of regulation of cognition. Evaluation refers to the ability of students to analyze the effectiveness of their strategies and ways of learning after they learn a particular topic (Schraw & Dennison, 1994). Evaluation is also an implementation of the reflection activities carried out by students.

However, although each component of metacognition has varying levels, the Pearson Product Moment test results inform that one component of metacognition with other components has a significant relationship ($r > 0.41$, $n = 55$, $p < 0.01$). Summary of the correlation test results is presented in Table 4. The existence of a significant correlation between one component with another component indicates that an increase in one component of metacognition will be able to affect other components of metacognition. The existence of a significant correlation in each component can be used as a basis that the components in the regulation of cognition have a strong relationship with the domain of knowledge about cognition. As is well known, planning, information management strategies, comprehension monitoring, debugging strategies, and evaluations are components in the dominance of regulation of cognition. On the other hand, declarative, procedural, and conditional knowledge are the three components of knowledge about cognition. Related to the low level of some metacognition indicators, teacher actually could empower those indicators using effective learning model that reported could to improve students' metacognition. Due to each metacognition components correlated each other, if teacher can empower one of metacognition component, the other component will also increase.

Table 4. The summary of Pearson Product Moment Test

	DK	PK	CK	PK	IMS	CM	DS	E
DK	1	.588**	.669**	.592**	.573**	.593**	.369**	.467**
PK	.588**	1	.732**	.647**	.654**	.618**	.578**	.599**
CK	.669**	.732**	1	.639**	.579**	.625**	.540**	.510**
PK	.592**	.647**	.639**	1	.538**	.622**	.626**	.522**
IMS	.573**	.654**	.579**	.538**	1	.462**	.542**	.498**
CM	.593**	.618**	.625**	.622**	.462**	1	.413**	.593**
DS	.369**	.578**	.540**	.626**	.542**	.413**	1	.586**
E	.467**	.599**	.510**	.522**	.498**	.593**	.586**	1

**. Correlation is significant at the 0.01 level (2-tailed)
(DK = Declarative Knowledge, PK = Procedural Knowledge, CK = Conditional Knowledge, P = Planning, IMS = Information Management Strategies, CM = Comprehension Monitoring, DS = Debugging Strategies, E = Evaluation)

Empowerment of metacognitive awareness is an effort to improve the quality of learning (Beran et al., 2012; Miller, 2017). The results of this study indicate that the majority of metacognitive awareness of students with high academic ability is not included in the low category. According to Abdellah (2015) this fact can strengthen the urgency of metacognition-based learning Teachers are encouraged to apply various learning models that can improve students' metacognition, including biology teacher. Based on the present study, some students still have very low metacognition awareness although they categorized as high-academic ability students and following hybrid learning. Therefore, beside applying hybrid learning, implementing learning form that reported could empower metacognition optimally are highly recommended.

Based on several previous studies, various learning models and strategies are reported to be able to empower metacognition optimally. Some of these learning models and strategies, including problem-based learning (Haryani et al., 2018; Kevin, 2011; Kuvac & Koc, 2018; Siagian, Saragih, & Sinaga, 2019), project-based learning (Husamah, 2015; Sart, 2014; Tumewu, Wulan, & Sanjaya, 2017), learning with learning-journal implementing (Nurajizah et al., 2018), using critical analysis (Lukitasari, Hasan, & Murtafiah, 2019), classroom-based learning communities and self-assessment (Siegesmund, 2016), learning with self and peer assessment (Pantiwati & Husamah, 2017), and inquiry-based learning (Nunaki et al., 2019). In addition to the application of these various learning models, teachers must also implement an assessment process that supports the improvement of students' metacognition. To achieve these targets, teachers must have a proper understanding of what, why, and how metacognition-based learning is applied.

CONCLUSION

Metacognitive awareness is indicated to have a relationship with one's academic achievement. The results of this study inform that the majority of students with high academic ability in metacognitive awareness is satisfactory. Of the eight metacognitive components examined, debugging strategies and evaluations are the components with the highest and lowest average performance, respectively. Despite having different mean achievements, all metacognition components are concluded to have significant relationships with each other.

In connection with the results of the research obtained, the empowerment of metacognitive awareness during learning in students of low or moderate academic ability is highly recommended. The empowerment of these competencies is expected to encourage the development of their academic achievements.

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