USEJ 6 (2) (2017)

Unnes Science Education Journal

http://journal.unnes.ac.id/sju/index.php/usej

THE ANALYSIS OF COSTA AND KALLICK'S HABITS OF MIND ON THE STUDENTS OF PROSPECTIVE BIOLOGY TEACHERS

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Article Info

Received April 2017
Accepted June 2017
Published July 2017

Keywords:
Habits of mind, biology teacher

Abstract

Habits of mind were most important to be had by the science education the students. The prospective science teachers were required to have the skills of self-regulation, creative thinking, and critical thinking. Those three skills were the categories of habits of mind. This study reviewed on how the habits of mind of the students of prospective Biology teachers were, in which category the students' habits of mind were, how the differences in the habits of mind of the male and female the students were, and whether there was any relation between the students' grade points and their habits of mind. The analysis result obtained that 79.7% the students included in the adequate category of habits of mind (N=133). From 16 categories of the habits of mind, the responding with wonderment and awe category had the biggest average score that was 5.69 which meant that most of Science education the students had high enough curiosity in the mystery of nature. There was no difference in the habits of mind had by the male and female the students, and there was no correlation between the habits of mind and the students' grade points.

p-ISSN 2252-6617
e-ISSN 2502-6232

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INTRODUCTION

The learning paradigm in 21st century experienced changes from which it was initially teacher-centered became student-centered where the teachers only worked as the facilitator (Barak, 2017). It caused the teacher and the students required to have high thinking ability. The students of Biology Education Department were the students who are prepared to become teachers, because of that they had to have high skills and habits of mind.

One characteristic of someone with high habits of mind was having the habits of thinking smart. Adam (2006) stated that the habits of mind allowed the students to develop individual skill and self-regulation. This related to the complex problem which the students had to face from time to time. The students of science department often faced with difficult lecture problems, either theoretical or practical. The lecture topics they met required high thinking ability and habits of mind. In addition to having essential habits of mind to reduce student misconceptions, in line with the opinion of Coley (2015), there was a strong relationship between thinking and misunderstanding.

The term habits of mind were first put forward by Costa and Kallick in 1985, in his article on "hierarchy of thinking," further developed by Marzano (1992) and Marzano, Picering, and McTighe (1993). Costa and Kallick expanded the habits of mind into 16 categories while Marzano developed the habits of mind into three groups. Although different in the number of categories nonetheless in principle habits of mind were three habits of thinking in humans that include self-regulation (self-regulation), critical thinking (critical thinking), and creative thinking (creative thinking). All human beings could control themselves like the three categories; it was also agreed by some researchers in the field of psychology such as Ennis (1995), Paul (2002), Costa (1985).

Description of the habits of mind differed this matter because many researchers were developing it. Nonetheless, all the results of development lead to the ability to think intelligently about solving a problem in everyday life. According to Costa and Kallick (2008), "habits of mind were a combination of many skills, attitudes, cues, past experiences, and goals Desired ." It means there was an intellectual, behavioral pattern that a person uses at a particular time.

Education should seek to develop a complete intellectual disposition (Costa and Kallick, 2004). In learning activities both in class and practicum activities experienced by the students, often faced with various problems. Problems faced by the students varying degrees of difficulty, nonetheless basically they were required to had the intelligence of thinking and high-level thinking skills. The ability to think intelligently was needed so that the students could find solutions to solve such problems. Thus the students need to have habits of mind. Having the habits of mind meant having the ability to survive in all difficulties. It was explained by Costa and Kallick (2000a), Costa and Kallick (2000b), and Carter *et al.* (2005), if it had good habits of mind, it means having a character and behaving intelligently (to be had intelligently) when facing an unknown problem or answer. Also (Gormally, 2017), expressed the need for an effort to develop attitudes to achieve success, in his research he revealed that laboratory-based investigation activities successfully develop a positive attitude of the students. The same was also stated by Dasgupta *et al.* (2016), develops the students' attitudes and competencies by experimental design on learning.

Some research related to habits of mind had been widely practiced, such studies carry out various developmental lessons that could shape or improve habits of mind. Anwar's research (2005) found that performance assessment could form a habit of mind in learning environmental concepts. Sriyati' research (2010) found that formative assessment contributed to the formation of habits of mind. Nonetheless, it also explained that habits of mind could be trained. Research on Cheung and Hew (2008) finds the "self-aware" and "open-minded" indicators of habits of mind could be explored through online learning. Burgess (2012) focuses on the impact that habits of mind that children had in their early schools. Duckworth and Seligman (2005) researched self-discipline and student achievement. Through this study, researchers found that highly disciplined teenagers outperform their more impulsive colleagues on every academic achievement.

Various studies aimed at increasing the habits of mind were important, nonetheless before the research was done it would be better to analyze the habits of mind that previously owned. Research on how the form of habits of mind that was owned by the students, especially prospective

teachers had not been found. Therefore, in this study, the analysis of the habits of mind of prospective teachers, this analysis includes an analysis of how the different habits of mind based on gender and based on the index of achievement. This study aims to find out how the rating scale habits of mind student prospective teachers, how habits of mind seen from gender differences, and whether there was a correlation between habits of mind with IP the students.

METHODS

This research was a survey research. Survey research design was a procedure in quantitative research undertaken to administer a sample to describe attitudes, behaviors, and special characteristics of the population (Creswell, 2014, Creswell, 2015). In this study, the data were obtained by using a questionnaire to trace the habits of mind which had 16 categories based on the habits of mind category of Costa and Kallick.

Participants

Participants in this study were 133 V-semester student candidates in Biology education majors. The students of male gender amounted to 34 people, sex of 99 women. All the students were enrolled as the students in Islamic universities located in western Java. The average student background comes from the normal family both socially and economically, the average income of the parents was the middle to lower class. All participants were not from the same city. Nonetheless, they all come from cities in West Java.

Participants were drawn from the students who were in the semester V, intended to illustrate the ability of their habits of mind as the students who were almost up to the final level could be known. It was related to whether what they get during the previous four-semester lectures had affected their habits of mind. Based on the survey of the lectures they get, all the students who become participants had completed all their courses according to the package set majors. Student achievement index average 3.0.

The lecturers of all participants were asked beforehand how they gave lectures. From limited interviews to lecturers it was known that some lecturers provide lectures with tasks that practice thinking skills, such as practicum and assignment tasks.

Procedures

Participants as many as 133 the students were divided into four classes, all of which get the question in the form of questionnaire search habits of mind. Before the questionnaire, participants were explained how to fill in a questionnaire. Participants were reminded that the questionnaire to be done would not affect their test scores. Participants were asked to fill the questionnaire honestly as it was.

The questionnaire filling took only 25 minutes. The questionnaire habits of mind consisted of 22 questions covered in 16 categories. Kategorihabits of mind referred to the habits of mind category of Costa and Kallick (2000a). The 16 categories were: 1) Persisting (persistent and not easily giving up), 2) Managing impulsivity, 3) Listening with understanding and empathy, 4) Thinking flexibly ((5) Meta-cognizing (6) Striving for accuracy, 7) Questioning and problem posing Knowledge to new situations (9) Thinking and communicating with clarity and precision (10) Gathering data through all sense (giving attention to the surroundings through Taste, touch, smell, hearing, and vision), 11) Creating, imagining and innovating (12) Responding with wonderment and a (13) Taking responsible risk, 14) Finding humor (enjoying unexpected and unexpected), 15) Thinking interdependently (able to work and learn with people Others in a team), 16) Remaining open to continues learning (keep trying to continue to learn and accept when something was not known).

RESULTS AND DISCUSSION

Results

Habits of Mind Student Candidate Teacher

A total of 133 participants who were biology teacher candidates who had lectures of several semesters taken data habits of their minds. The data was taken by spreading the habits of mind search query.

Figure 1, displays a graph explaining the value of the student's habits of mind. 79.7% of prospective science teacher the students belong to the category of habits of mind enough (N = 133). The weak and strong categories were equally balanced by the students. A clearer picture was shown in Figure 2, each category of habits of mind analyzed. Of the 16 categories of habits of

mind, the Responding with wonderment and awe category had the greatest average value of 5.8 meaning that most science education the students had a curiosity about the mystery in nature was enough. For other categories that also had a fairly average value was the category Remaining open to continuous learning (5.8), Thinking interdependently (5.33), and Finding humor (5.26), while the lowest value was the category of creating, imagining and innovating (4.11).

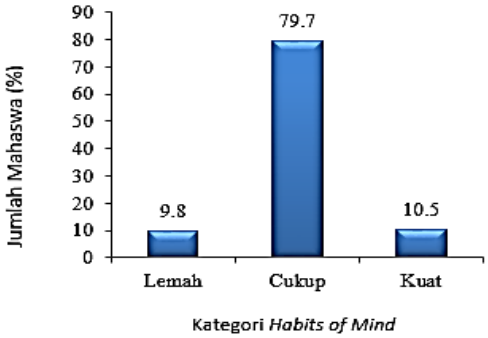


Figure 1. Rating Scale of *Habits of Mind*

Habits of Mind Based on Sex Differences

The students of science teacher candidates who participated consisted of female the students and male the students. Table 1 showed the values of habits of mind that were distinguished in 16 categories viewed by sex differences.

The category of the habit of mind no.12, responding with wonderment and awe, had the highest value held by both men and women (6.06 and 5.69). Category no. 11 was Creating, imagining and innovating was the lowest in women (4.11), whereas in men the lowest value was in the category of Persisting and Applying past knowledge to new situations (4.35). In contrast to males, in the female category persistence had a high percentage (4.73) although both were still included in the sufficient category. Overall both men and women had habits of mind that belong to sufficient criteria (between 4 till 6).

Table 1. Average Habits of Mind Values Different Genders

Habits of Mind	Average Score of *Habits of Mind*		
	Male	Female	Combination
Persisting	4.35	4.73	4.6
Managing impulsivity	4.94	5.13	5.1
Listening with understanding and empathy	5.53	5.39	5.4
Thinking Flexibly	4.97	4.39	4.5
Metacognition	5.44	5.23	5.3
Striving for accuracy	4.62	5.01	4.9
Questioning and problem posing	4.76	4.74	4.8
Applying past knowledge to new situations	4.35	4.39	4.4
Thinking and communicating with clarity and precision	5	4.37	4.6
Gathering data through all sense	4.82	4.88	4.9
Creating, imagining and innovating	4.76	4.11	4.3
Responding with wonderment and awe	6.06	5.69	5.8
Taking responsible risk	5.35	5.15	5.2
Finding humour	4.96	5.26	5.2
Thinking interdependently	5	5.33	5.2
Remaining open to continuous learning	5.76	5.62	5.6

In Figure 3, the graph of habits of mind based on sex was distinguished per category habits of mind. The graphic form shows the value of habits of mind in men and women was not much different. By statistical test using SPSS-16, the data were analyzed using Paired-T Test obtained Sig value 005 was 0. 669. Thus H0 was accepted; therefore, there was no difference in habits of mind between men and women.

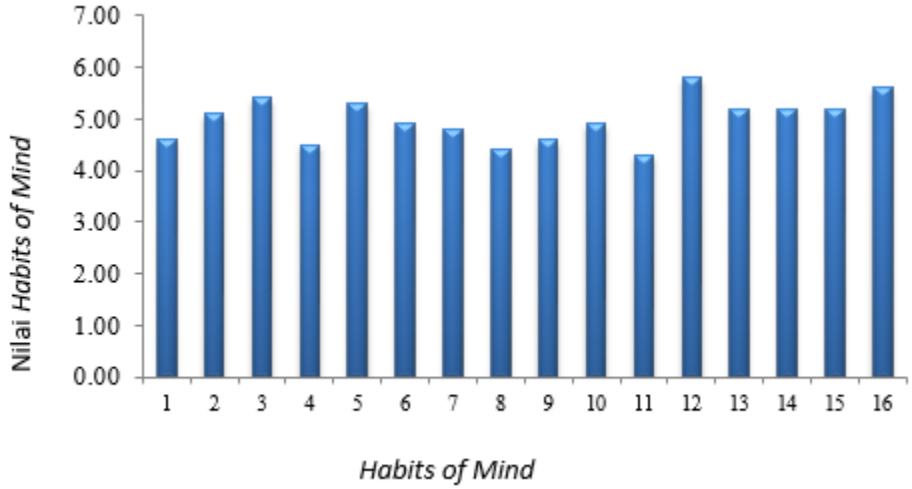
Habits of Mind Value Correlation with the students' Grade Points

Each participant was required to report their GP to find out whether there was a relationship between the students' habits of mind and their academic achievement. Figure 4. Shows a graph

where three achievement criteria were sufficient (GP, 3.0), satisfactory GP ≥ 3 <3.5), and very satisfactory (GP ≥ 3.5).

The students with enough GPs had an average of 5.0 (enough) habits of mind, which had a satisfactory GP had an average of 5.0 (enough) habits of mind, and who had a very satisfactory GP had a habit of mind on average of 5.5 (barely). It meant different student GPs nonetheless the value of habits of mind was included as sufficient criteria.

By using Bivariate Correlation or Product-moment Person Correlation analysis, t calculated 0.273 means bigger than 0.05 meaning there was no correlation / significant relation between habits of mind with student IP value, correlation value was only 9.6% (very low).



Information: 1) *Persisting*, 2) *Managing impulsivity*, 3) *Listening with understanding and empathy*, 4) *Thinking flexibly*, 5) *Metacognition*, 6) *Striving for accuracy*, 7) *Questioning and problem posing*, 8) *Applying past knowledge to new situations*, 9) *Thinking and communicating with clarity and precision*, 10) *Gathering data through all sense*, 11) *Creating, imagining and innovating*, 12) *Responding with wonderment and awe*, 13) *Taking responsible risk*, 14) *Finding humour*, 15) *Thinking interdependently*, 16) *Remaining open to continuous learning*.

Figure 2. Rating Scale of Habits *of Mind*

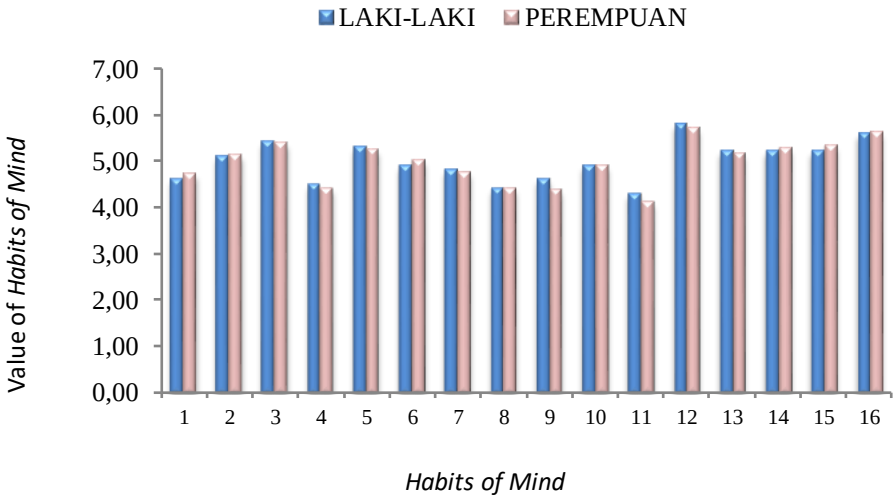
Discussion

Habits of mind were fundamental, especially for the students of science education. Therefore this research was conducted to find out the habits of mind of prospective teachers. Of the 16 categories of habits of mind, which category was the most dominant and the weakest category was owned by prospective science teacher the students.

Of the 133 the students who participated in science teachers, 79.7% had enough habits of mind criteria, 10.5% strong and 9.8% weak. The criteria of having enough dominant habits of mind could already reflect that the average of the students of prospective science teacher had been quite good in his thinking ability. Because the students who become participants were those who were already in the fifth semester, this could be a picture that the lectures they had received had given training so that they gain enough habits of mind. Based on the results Of limited interviews with the lecturers, it was known that the lectures were given both theory and practicum, in addition to the tasks given had been to train the students in developing their thinking skills. Habits of mind was a mental habit that could be trained and developed, one of them through learning as an effort to develop the ability to realize their thoughts, critical thinking, and creative thinking. The practice of developing mental and thinking habits should be repeated in order for the formation of habits of mind to be permanent, some studies had found that thinking skills do not survive if there was no repetition of learning, van Vliet's (2015) study found that repeated use of the collaborative learning strategy - Learning had improved the critical thinking component and it was enduring.

Habits of mind had 36 categories of thinking habits 1) Persisting (persistent and not easily give

up), 2) Managing impulsivity, 3) Listening with understanding and empathy (would to accept the views of others), 4) Thinking Flexibility (5) Meta-cognition (thinking about thinking), 6) Striving for accuracy, 7) Questioning and problem posing, 8) Applying past knowledge to new situations (9) Thinking and communicating with clarity and precision (10) Gathering data through all sense (paying attention to Surroundings through taste, touch, smell, hearing, and sight), 11) Creating, imagining and innovating (had new ideas and ideas), 12) Responding with wonderment and awe, 13) Taking responsible risk, 14) Finding humor (enjoying unexpected and unexpected), 15) Thinking interdependently (working And learning with others in a team), 16) Remaining open to continue learning (keep trying to continue to learn and accept when something was not known). Of the 16 largest average categories were habits of mind category Responding with wonderment and awe (having a curiosity about the mystery in nature), this category was on average owned by the students higher than other categories. The character of science education the students tends to have a higher curiosity about the character of science learning that demands the student to had a high curiosity like a researcher and scientist. Costa and Kallick (2008), basically a human being born with loving learning, happy solving and create problems, had the desire to find out things themselves, and strive to become lifelong learners.



Description: 1) *Persisting*, 2) *Managing impulsivity*, 3) *Listening with understanding and empathy*, 4) *Thinking flexibly*, 5) *Metacognition*, 6) *Striving for accuracy*, 7) *Questioning and problem posing*, 8) *Applying past knowledge to new situations*, 9) *Thinking and communicating with clarity and precision*, 10) *Gathering data through all sense*, 11) *Creating, imagining and innovating*, 12) *Responding with wonderment and awe*, 13) *Taking responsible risk*, 14) *Finding humour*, 15) *Thinking interdependently*, 16) *Remaining open to continuous learning*.

Figure 3. *Habits of Mind* based on sex

The average lowest score was the category of Creating, imagining and innovating, this was a drawback that needs attention. Science majors the students should have great inventiveness and innovation. If the ability of creativity, imagination, and innovation were less, then there would be weaknesses also regarding meeting the criteria of an educator. Therefore, based on the results of this research, it was necessary to increase the weaknesses of the students of science teacher candidates. One way to improve the students' thinking ability was to provide formative assessments, many studies. Supported the view that formative assessment was a force in the learning of teachers in the classroom (Marzano, 2006, Marzano, 1992). Also, learning that fosters intrinsic motivation to the students was indispensable. People who were intrinsically motivated find ways to solve creative, imaginative, and innovative problems (Costa and Kallick, 2009).

When the habits of mind were viewed by sex differences, the results show that the common habits of mind of male the students were higher than the habits of mind of female the students,

except for the category of Persisting, Managing impulsivity, Striving for accuracy, Finding humor. However, statistically (through paired t-test) the difference in habits of mind values between male and female the students was not different, in general, all had the same habits of mind ability for each category.

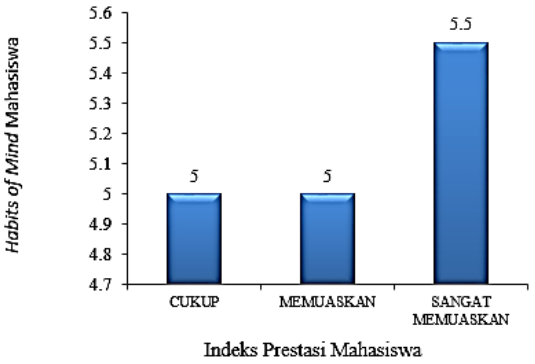


Figure 4. Habits of mind based on GPA

Student Achievement Index of student teacher candidates was divided into three groups: the students who had achievement indexes were sufficient, satisfying, and very satisfying. The students who had a very satisfactory achievement index also had the highest habits of mind, although still included into the criteria enough. By using correlation test, it could be concluded that there was no correlation between achievement index and habits of mind value. Student achievement index could be influenced by other factors, one of which was the understanding of the concept owned by the students. However, that does not mean habits of mind thus no meaning because the habits or character of the students in thinking would be the capital for the students in understanding the concept. From the results of this study, it should be done research that correlates between the habits of mind with the understanding of the students. Efforts to improve the habits of mind should also be accompanied by efforts to improve understanding of the students.

CONCLUSION

Habits of Mind are important habits of mind owned by prospective teachers and other the students in general. Student prospective teachers on average had habits of mind that belong to enough criteria. Category Responding with wonderment and awe (having a curiosity about the mystery of nature), owned by college the students higher than other categories. Both male and female the students had habits of mind criteria not much different. Thus it could be said that their habits of mind were insignificant.

There was no correlation between habits of mind and Student Achievement Index, although the students who had high achievement index had higher habits of mind compared to the students who had achievement index below them.

This research still had some limitations, among them was that the research only focuses on the student science teacher candidates and participants all come from one generation as the students who sat in semester five. Suggestions for other researchers to be able to add the number of participants into different types either from different department background or age and student force at a college.

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