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CRITICAL THINKING SKILLS OF STUDENTS WITH HIGH ACADEMIC ABILITY: PROFILE AND ITS EFFECT ON COGNITIVE LEARNING OUTCOMES

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ABSTRACT
Critical thinking skills (CTS) have been considered as one of the primary competencies of the 21st-Century. The purpose of this correlational research was to map the profile of CTS and examine its relationship to cognitive learning outcomes (CLO) of students with high academic ability. The study was conducted in 2019, involving 35 students from one of the high-quality schools in Malang, Indonesia. Essay tests were used to collect students' CTS and CLO. The instrument developed by Zubaidah was applied to determine the level of CTS. Applied data analysis was means and simple linear regression. The results showed that the students' CTS level was categorized as "moderate," and this skill correlated significantly with CLO. Therefore, the empowerment of CTS needs to be optimized to improve student CLO.

KEYWORDS: Critical thinking skills, learning outcomes, 21st-century skills

INTRODUCTION

Nowadays, critical thinking skills (CTS) are considered as one of the primary competencies that have to be mastered by students. CTS is essential as a part of the 21st Century skill (Binkley et al., 2012; Scott, 2015) highly encouraged to optimally empower the learning process (Abrami et al., 2015; Hamby, 2016; Karimi & Veisi, 2016). Some learning activities suggested to comprehend students' CTS include cooperative learning (Wulandari, Amin, Zubaidah, & Henie, 2017), problem-solving based learning (Masek & Yamin, 2011; Sulaiman & Elnetthra, 2014), or scientific approach learning (Petrella & Jung, 2008; Schmaltz et al., 2017).
The importance of CTS implementation is due to its significant impact on this competency towards other 21st Century competencies (ŽivkoviĿ, 2016). CTS can enhance the learners' ability to evaluate and interpret information (Ali, 2016). Also, CTS is capable of developing problem-solving skills (Belecina & Ocampo, 2018). Furthermore, CTS is also a crucial means for students to adapt quickly to current development (Dwyer, Hogan, & Stewart, 2014).
Furthermore, CTS was also known to have a close correlation to students' ability to solve various problems (Belecina & Ocampo, 2018; Strauss, 2016), so they could easily solve the issues found in the questions. A critical thinker will efficiently process the information he obtains, so he is going to efficiently study the various taught concepts (Lai, 2011a). Also, CTS is included in Higher-Order Thinking Skills (HOTS) (Adams, 2015; Mainali, 2012). They added that students with good HOTS will be easier to comprehend the concepts they are learning. Interestingly, HOTS mastery is reported to have a positive impact on student academic performance (Tanujaya, Mumu, & Margono, 2017).
Theoretically, high academic achievers will have a high CLO level as well. Accordingly, they are also expected to reflect high levels of CTS. Academic competence is closely related to student intelligence. Furthermore, academic competence is also associated with the students' initial knowledge. Both will affect students' academic performance proven by their optimal learning outcomes. Their high cognitive skill is indicated by their high CTS. The reason, as stated earlier, is that CTS is related to cognitive processes such as evaluation (Ali, 2016) and problem-solving (Belecina & Ocampo, 2018).
Several reports examining students' CTS profiles have been carried out in several locations (Elisanti et al., 2018; Fernandi et al.,2017). One previous research found that the CTS profile of students in Malang was still categorized as unsatisfactory (Fauzi, 2019). Nevertheless, the study was merely focused on students of high

academic competence because he examined the effect of class on students' CTS (from grade 7 to 9 junior high students). On the other hand, studies investigating the CTS profile of high school students, especially students with high academic abilities, are still hard to find. Therefore, the purpose of this study is to examine the CTS level of high achiever students in Malang Regency as well as to analyze its relationship with CLO.

RESEARCH METHOD

This correlational study was conducted in 2019. The study population was all students with high academic ability in Malang Regency, Indonesia. The research sample involved 35 students of XI grade of Science, from one of the high-quality schools. They were selected randomly. CTS is situated as a predictor, while CLO is positioned as a criterion. CTS and CLO data were collected using a test instrument. It consists of nine items of essay questions. The questions and the cognitive level of each item were presented in Table 1.

Table 1. Indicator and cognitive level of test items

No	Indicator	Cognitive Level
1	Students are able to evaluate phenomenon based on scientific methods and attitude	C5
2	Students are able to analyze the cell position in the organizational level of life	C4
3	Students are able to evaluate the virus role in human life	C5
4	Students are able to evaluate the role of mushroom in human life	C5
5	Students are able to evaluate the equilibrium of ecosystem component	C5
6	Students are able to evaluate the impact of human activities on environmental damage	C5
7	Students are able to evaluate the living creatures role in the ecosystem	C5
8	Students are able to evaluate the limitation factor required by humans	C5
9	Students are able to evaluate the accuracy of the C5 evolution theory	C5

The students' answers were evaluated using two rubrics: CTS and CLO rubrics. The rubric developed by Zubaidah et al. (2015) is used as a scoring guide for students' CTS. The rubric uses a scale of 0 to 5 to assess the accuracy of the concept, the existence of arguments, the accuracy of the flow of thought, the correctness of grammar, and the completeness of the answers. On the other hand, the CLO rubric uses a scale of 0 to 3 (0 = no answer, 1 = incorrect answer, 2 = less correct answer, 3 = correct answer). CTS and CLO data were analyzed using descriptive statistics to assess students' CTS and CLO profiles. The determination of the two levels is based on the competency level categories presented in Table 2. After that, the two data were analyzed using a simple linear regression test to determine the existence and the direction of the relationship between the two variables. The data analysis used a significance level of 5%.

Table 2. Category of student's competence level

Category	Interval
Very Good	86-100
Good	76-85
Moderate	60-75
Low	55-59
Very Low	0-54

RESULT AND DISCUSSION

CTS is a thinking skill that needs to be optimally empowered in all schools in Indonesia. The distribution of the number of students based on their CTS and CLO level is presented in Figure 1, while the results of the descriptive statistical analysis of the two data are shown in Table 3. Both of the analysis results can be used to determine the profile of CTS and CLO levels of students with high academic ability in Malang Regency.

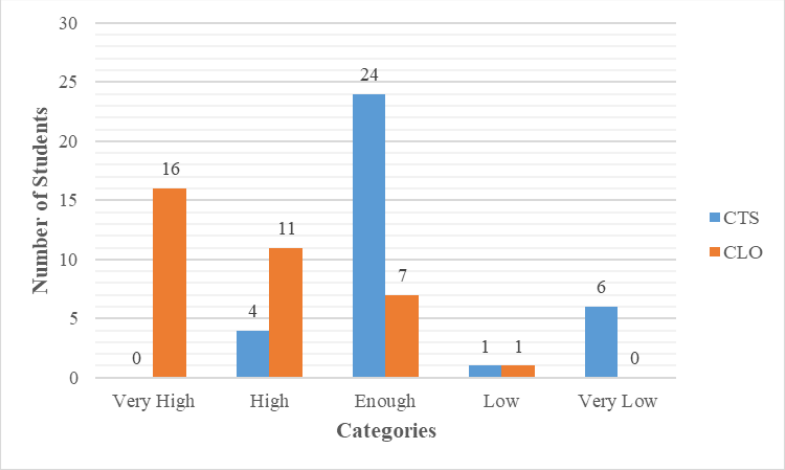

Figure 1. Distribution of students in each competency level

Table 3. Category of student's competence level

Parameters	**CTS**	**CLO**
Mean	66.03	82.54
Standard deviation	9.06	9.19
Range	40.00	40.74
Min	44.44	59.26
Max	84.44	100.00

Based on Figure 1, it can be seen that there are six students with "very low" CTS and one student with "low" CTS. These results are different from the students' CLO profile, where none of them belonged to the "very low" category, and only one student was under the "low" category. While the majority of students' CLS are classified into the "moderate" category, the majority of students' CLO is under "very high" category. These results show that the students' CLO profile is better than their CTS. In line with this statement, the results in Table 3 also show that the mean of students' CTS (66.03) is lower than their CLO (82.54). Based on these average scores, it can be seen that the CTS of students with high academic achievement in Malang Regency belongs to the "moderate" category. However, their CLO is under the "good" category.

The low level of the students' CTS in Malang Regency reported in this study is in line with the findings of previous research that examines CTS in Malang City (Fauzi, 2019). The research found that junior high school students in Malang (from grades VII, VIII, to IX) had "very low" CTS. Another study that examined students' CTS in tertiary institutions also reported that students from four tertiary institutions in Makassar, Indonesia, showed a low level of CTS (Amin et al., 2017). The other study examining high school students in Kediri, Indonesia, also reported similar results (Elisanti et al., 2018).

The reasons underlying the low level of students' CTS needs further examination. One possible reason is that students are not used to participating in CTS-based learning. Another reason is that students are not well trained in CTS-based learning assessments. Both of these reasons are based on the previous study, which found that teacher-centered learning still dominated the teaching and learning process in Indonesia (Irawan et al., 2017). As a result, students' responses to questions aimed at exploring their CTS are below the expectation. In the case of this study, the majority of students with high academic ability were able to answer questions correctly. However, their answers do not reflect the answers of a critical thinker.

Table 4. Summary of ANOVA test results to determine the predictability of the results of the regression analysis of CTS and CLO

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	2467.781	1	2467.781	203.023	.000[b]
	Residual	401.120	33	12.155		
	Total	2868.901	34			

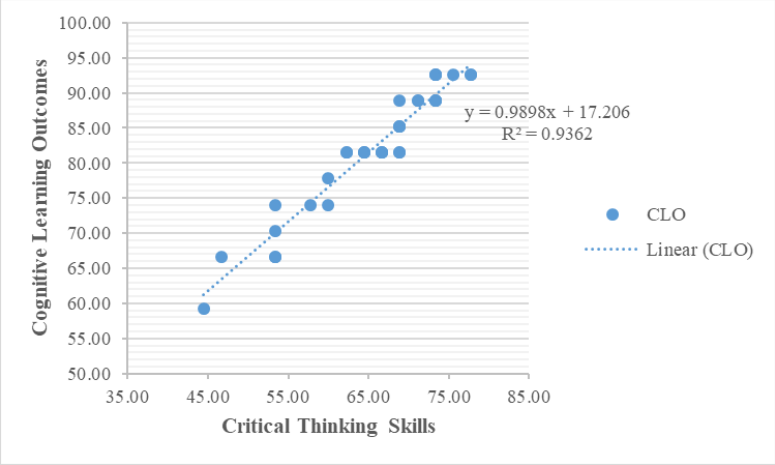

Figure 2. Regression graph for CTS and CLO in students with high academic ability

Based on the results of the regression analysis, CTS has a significant relationship with CLO (R = 0.927). Table 4 indicates that CTS can predict CLO levels. The results of the regression analysis presented in Figure 2 show that the higher the students' CTS, the higher their CLO. The regression equation obtained is y = 0.9898x + 17,206. The equation suggests that with a one-point increase in CTS scores, the student CLO will increase by 0.9898. Besides, the R^2 value is 0.9362. The value indicates that the students' CTS can influence their CLO achievement by 93.62%, while the remaining 6.38% is influenced by other variables not examined in this study.

The significant influence of CTS on the students' CLO achievement reported in this study is in line with several previous studies. One previous study found that critical thinking and metacognitive skills had a relationship with cognitive learning outcomes of high school students in biology learning (Wicaksono, 2014). Other study involving high school students in Malang also showed a significant correlation between CTS and students' biology learning outcomes (Mite & Corebima, 2017). CTS is also reported to have a substantial relationship to the understanding of the concepts of Basic Physics courses among college students (Alatas, 2014). The students in the three studies were in different conditions because each used different learning models. However, the three aforementioned studies have similar findings to this current study.

CTS can be a predictor of CLO due to several reasons. First, CTS is closely related to students' cognitive processes (Ali, 2016; Belecina & Ocampo, 2018). Second, CTS has a significant relationship with other factors (i.e., metacognitive skills) that also influence student-learning outcomes. A student with good metacognitive skills has the ability to be a good independent learner (Lai, 2011b; Smith et al., 2017), which helps him optimize his learning achievement (Abdellah, 2015). Therefore, empowering CTS is of high importance because, in addition to assisting students to prepare for the challenges of the 21st Century, a high level of CTS can increase CLO.

CONCLUSION

Based on the results of the analysis, it can be concluded that students with high academic ability in Malang Regency have a "moderate" CTS level. This study also revealed that CTS has a significant correlation to students' CLO. The low level of CTS of students with high academic abilities needs critical attention so that the empowerment of these competencies becomes more optimal. Besides, further studies examining the relationship between CTS and CLO in students with low academic levels need to be conducted to investigate the consistency of CTS influence on CLO.

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