Waste phenomenon learning: is there a relationship between the critical thinking of students and their learning resources?

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Abstract. The goal of this research is to examine the relationship between the skill of students’ critical thinking and their learning resources they used. This paper collected data using questionnaire which related to the kind of information they gained on waste phenomenon topic on integrative science course. The Spearman Rank Test showed that the relation of these variables was not significant ($R_s = 0.519; p = 0.05$). The paper examines the students learning resources such as books, internet and other resources. The future research needs to consider the appropriate learning resources for supporting students’ critical thinking skill.

1. Introduction

The newest curriculum of Indonesia tends to develop the higher order thinking skills as a learning outcome [1]. It is addressed to enhance the capability of the students in combating so many problems that they face in their daily basis. Furthermore, the higher order thinking skills will train the students to think deeper before they act so that it would improve their way to think. The ability to solve the daily problems is required in order to assist the society in combating the problems. It has a positive impact because students can give the real contribution when they are in the community where they are living.

Critical thinking is one of the higher order thinking skills that is needed by students to tackle the problems. Students will be able to use the information to think about the way they need to do when facing problems [2]. It is useful because they will be faced with several issues about their real environment and ask them to think about how to solve it. Also, the critical thinking skill is needed, not only to solve the problems but also to increase their ability to argue about their environment. Due to the urgency of critical thinking skill, schools must have the strategy to suggest the teachers in teaching students to think critically, and it is believed that critical thinking can be taught [3].

One issue that urgent to solve today is a waste phenomenon. The waste is a problem that needs to be tackled due to the accumulation of it in the environment. In developing country, the waste is usually is stored to the garbage shelter then transfer to the free space. It makes the waste accumulate in one spot and cause several problems not only for the environment but also human. It would be a very crucial problem, because others may transfer their wastes to the ocean [4]. Based on several problems
that we found regarding the waste phenomenon, this paper will discuss the relationship between the students’ critical thinking and learning resources. This paper investigates whether more learning resources will make students think critically to respond to the social phenomenon in their society, particularly in waste problems.

2. Experimental Method

2.1. Sample
The total sample of the research was 65 students from various backgrounds. The participants were undergraduate students in the science education department on integrated science course.

2.2. Method
The data were collected from the posttest of students’ critical thinking on waste phenomenon topic, which includes the indicator of critical thinking skills. Meanwhile, the learning resources data were captured by the questionnaire that was given after the posttest which consists of the type of learning resources that they used in the classroom during the classes were running. Then, the two variables (critical thinking and learning resources) as can be seen in Figure 1, were analysed by non-parametric Spearman’s correlation test due to the data were not normally distributed. There are three questions related learning resources which consist of the condition of students during the learning process whether they used a book or online resources only, book and online resources or book, online and others.

![Figure 1](image.png)

*Figure 1. The primary data of the research of critical thinking and learning resources of students*

3. Result and Discussion

3.1. Result
The posttest of critical thinking indicates the ability of students to think critically, while the questionnaire tends to observe the variety and or the number of learning resources that were used by students. The maximum score of critical thinking is 100, which indicates the students can answer all of the questions. Meanwhile, the rubric is used to examine the learning resources data, which is based on the particular criteria. From the graph in Figure 2, the higher critical thinking does not make the score of learning resources high. For instance, when students have a score 92.00 in critical thinking, there are a few students that reach 0.00 in their learning resources score. It means that the high score of students’ critical thinking does not determine whether students use various type of learning resources or even not at all. All of the scores which were gained by many students have a different score of critical thinking (see Figure 2).

The further information was gained with the same instrument, which shows that the combination of book and online resources have the most significant portion in the types of learning resources the students used (about 46%). The second most significant portion of students using the book, online and other resources as media to learn about the course material (about 45%). Only 4 % of students used book only and 5% of students used online resources only to learn the course materials (see Figure 3).
It is clearly shown that today, students tend to choose several types of learning resources to assist them in their course.

![Graph](image)

**Figure 2.** The number of scores of students’ critical thinking in specific learning resources scores

![Pie Chart](image)

**Figure 3.** The proportion of student’s learning resources based on the type that students used

The parametric Spearman’s correlation test was used to analyse the correlation between the scores of students’ critical thinking and the learning resources scores. The use of the test due to the data which were not normally distributed and the data were not homogenous. The correlation coefficient value based on the test is 0.081 which means that the correlation is extremely weak. It also shows that the sig. (2-tailed) value is more than the critical value (0.05) where the sig. Value is 0.519. From the
result, it can be inferred that there is no significant correlation between the score of students’ critical thinking and the learning resources score.

| Critical Thinking | Learning Resources |
|-------------------|--------------------|
| Spearman’s rho    |        |
| Correlation       | Coefficient | Sig. (2-tailed) | N | Correlation | Coefficient | Sig. (2-tailed) | N |
| Critical Thinking | 1.000      | .              | 65 | 0.081       | 0.519       | .              | 65 |
| Learning Resources| 0.081      | 0.519          | 65 | 1.000       | .            | 65             |

### 3.2. Discussion

The research focused on the students’ critical thinking and the learning resources score. It is formerly predicted that the higher score of learning resources will make the students’ critical thinking higher too. However, the data has not met the expectation, which the scores of learning resources were not associated with critical thinking. From this finding, the questionnaire can be a reason about the result of this research, where it lacks question that asks about the detail of learning resources that they used and how long those resources exposed them. The learning resources are essential to be assessed before they are used because they have a framework to be built [5].

The weak correlation on this research shows that learning resources are not the primary factor affecting the critical thinking of the students. We need to find the reason why learning resources do not affect students’ critical thinking and search the other factors that can influence students to think critically. In this research, the waste phenomenon was studied at the end of the environmental pollution chapter. The leaning processes using discovery learning that require students to find the concept by their self. To enhance the students’ capability to think critically, the using of various media can assist them to reach the goal, not only where they gain the information. When the learning resources are combining with the multimedia consistently [6], it will have a positive impact [7].

The questionnaire was only asking about the type of learning resources without exploring the detail information about what types of media they experienced. The further research needs to put additional questions related to this matter including how many time do students spend on gaining information. They may be asked about everything related to waste phenomenon every time because the learning processes are not always fit with the concept sequences [8]. In the future, students need to be directed into particular learning which intense with the environment education [9] which involves any combination of the types of learning resources. Not only book and online resources that can be used by students, but also to the variety of multimedia such as videos or movies, digital articles and digital news with the additional activity like visiting the real place where the phenomenon happened. The habituation of the learning is also vital [10] to make the students comfort and familiar when they are converting the new learning processes.

The contextual concept needs to be used in learning processes, for instance, the waste needs to be utilised in other forms so that there is an effort to reduce the accumulation of wastes. Eco-friendly example of the waste alternative solution is converting some organics materials into biogas form [11]. This example can be conveyed to students using the combination of several types of media as an effort to enhance the ability of students to think critically. Also, so many other phenomena related to science that can be used to be infused into learning that potentially stimulates students critical thinking such as energy transformation and energy alternatives.

### 4. Conclusion

The critical thinking is sometimes difficult to be taught because some people believe that it is a gift. However, the experts said that critical thinking could be taught to our students. Regarding this research, it is a vast opportunity to find out factors that influence critical thinking in order the solutions can be generated to boost the quality of students’ critical thinking. Learning resources as the material
of learning do not significantly contribute to the students’ critical thinking. It informs us that further research with the more in-depth analysis needs to be conducted.

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