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Buktidokumenpenelitian704380020076802gasa

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The correlation between students' critical reading ability and their mathematical critical thinking

Wikanengsih, Diena San Fauziya and Rissa San Rizqiya

Institut Keguruan dan Ilmu Pendidikan Siliwangi, Jl. Terusan Jenderal Sudirman, Cimahi 40526, Indonesia

Email: wikanengsih@ikipsiliwangi.ac.id

Abstract. This research aims at describing the relation between students' ability in critical reading and their mathematical critical thinking at Mathematics Education Study Program of IKIP Siliwangi. Critical Reading is one of basic skills for students to comprehend and value information. Reading comprehension skill will affect their study. This research is a descriptive study specifically correlational design. The subject is 40 students of Mathematics Education Study Program who have enrolled the General Indonesian Language subject. The result showed that there was significant correlation between the students' critical reading skill and their mathematical critical thinking skill, with significance value < 0.05 , that is 0.000 and the value of correlation coefficient of 0.774, which means a very strong correlation and positive, indicating a direct relationship. Accordingly, students of Mathematics Education Study Program need to have and practice critical reading to facilitate their mathematical critical thinking.

1. Introduction

Critical thinking and problem solving competency is one of competencies needed in the era of 21 among creativity, communication, and collaboration competencies. These competencies are needed to face the rapid development that encountering several life problems. Facts show Indonesian students competency in critical thinking is low. Critical thinking is one of the part in high order thinking skills. It is needed in making decision. In addition, making decision can be drilled through problem solving activities in schools. To achieve critical thinking skill can be stimulated by critical reading. As stated by Costa [1] that reading activity might be the foundation of high order thinking activity.

High order thinking skills, according to Sani [2], includes critical thinking. To achieve critical thinking, in learning process, students must be able to think logically and reflectively, as well as to have initial ability related to the encountered problem. Therefore, critical reading activity which comprises high order comprehension to process information would get together with critical thinking.

Critical reading, based on Spears, Wallace & Way [3] is the ability to value, evaluate, and think through author's idea thoroughly, along with applying the whys and wherefores. The stages of critical reading as stated by Wallace & Way [3] are: (1) formulate main questions as the purpose of the reading, (2) develop the main questions into detailed questions, and (3) evaluate the text to reach the reading purpose.

Those critical reading stages demand critical thinking activities since they include observing, interpreting, analyzing, concluding, and evaluating. On the basis of the link between critical reading and critical thinking this research was conducted to verify the relation between them in students of Mathematics Education Study Program. The results of the study is expected to become the foundation



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in preparing learning materials of Indonesian Language subject in Mathematics Education Study Program.

2. Method

The method of the search is descriptive correlational aiming at finding the relation between two variables, which are critical reading ability and mathematical critical thinking ability. The research was conducted at Mathematics Education Study Program of IKIP Siliwangi. The sample was students year 2017 class A1 who had enrolled Indonesian Language subject. The sample was chosen through cluster random sampling, consisting 40 students.

There were two instruments used in this research, namely test to check students ability in completing critical reading questions and essay test to check their ability in completing mathematical critical thinking questions. There were 15 critical reading questions and 10 mathematical questions. Those two instruments were used to measure the scores of each variable. The questions were arranged in accordance with critical reading and mathematical critical thinking indicators, which are basic explanation, conclusion, and evaluation. The research design was correlational design to find out the correlation between critical reading and critical thinking competencies. The data gained were O_1 and O_2 , where O_1 was critical reading competency and O_2 was mathematical critical thinking competency.

Data were then processed through correlational statistic by Spearman test in SPSS. Spearman statistical test was used to find out the significance, significance value, and correlation direction so that it can be concluded the relation between students critical reading ability and their mathematical critical thinking. The decision making was based on significance value and correlation coefficient value (r).

3. Result and Discussion

Critical reading test was reading test with stimulus in the form of text in order to be analysed and evaluated. This activity was based the concept of critical reading as a reading activity to evaluate the text [4-7]. Analysing activity as part of critical reading was also based on the concept of critical reading by Kurland [8] stating that analysis as the core of critical reading.

The critical reading test completed by the students were based on Kurland [8], including 1) to see what in the text, that was questions to restate the content of the text or express the main idea; 2) to see what can be expressed by the text, that was questions to describe, give examples, and make comparison; 3) to see what the text convey, that was questions to interpret, analyse, and review overall idea. Those three elements served as the basis of text evaluation.

The score results showed that students' critical reading level varied but still in a close range, that were 50 to 80. The mean score was 65. In the scale 100, this score is in the category of fair, although it is not good enough. It was supposed because the test was only conducted once and was not within the limits for further efforts. In the meantime, Priyatni [9] suggested critical reading program to be continuum.

In addition, test of mathematical critical thinking was in the form of mathematical stories to be completed as a part of mathematical thinking. Abdullah [10] concluded mathematical thinking as mental activity in the process of doing math or mathematical task. Mathematical thinking questions given to the students were categorized as high order mathematical thinking since they were not formula reiteration, yet required the students to comprehend and formulate the problem, gather and analyse information, formulate prediction and hypothesis, test the hypothesis logically, conclude, evaluate, make decision, and predict. The test was in the form of stories with the topics of functions, line equation, and two-variable linear equations system with variety of difficulty levels, ranging from easy, moderate, and difficult. The test was arranged specifically to measure mathematical critical thinking level by a lecturer for Mathematics Education Study Program.

According to the score processing, it was ranging from 50 to 90 with the mean score of 72. The comparison between critical reading and mathematical critical is shown in the Figure 1.

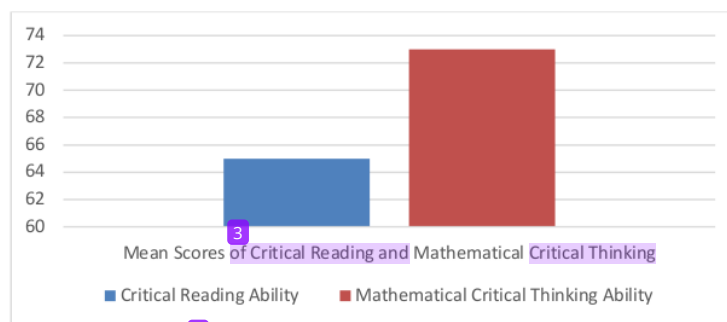


Figure 1. Mean scores of students' critical reading and mathematical critical thinking

Figure 1 shows the comparison of mean scores between students' critical reading and mathematical critical thinking. However, it has not answered whether there was correlation or not. Therefore, correlation statistical test was conducted. Spearman test through SPSS is shown in Table 1.

Table 1. Results of critical reading and mathematical critical thinking correlation test

			Critical Reading	Critical Thinking
Spearman's rho	Critical Reading	Correlation Coefficient	1.000	0.774**
		Sig. (2-tailed)	-	0.000
		N	40	40
	Mathematical Critical Thinking	Correlation Coefficient	0.774**	1.000
		Sig. (2-tailed)	0.000	-
		N	40	40

** . Correlation is significant at the 0.01 level (2-tailed).

According to the statistical results in Table 1, it is shown the sig value (2-tailed) 0.000. With reference to the basis of testing $\text{sig} < 0.05$, it shows that there was a significant relationship between students' critical reading skills and mathematical critical thinking skills. The data also shows that critical reading skill can serve as a reference to predict students' mathematical critical thinking skill.

Table 1 also shows the value of correlation coefficient 0.774**. With reference to the guideline, 0.777 is categorized as a very strong correlation. It confirms the relation between students' critical reading and mathematical critical thinking competencies is 0.774 or very strong.

The value of correlation coefficient showing positive 0.774 demonstrates the relation between the two variables is direct correlation. Therefore, this positive value shows that the higher students critical reading, the higher mathematical critical thinking. This is in line with Jones in [11] that reading activity can stimulate critical thinking ability. Hence, high level of critical reading affects high level critical thinking.

In relation with critical reading theory, Hermida [12] suggested high level critical reading skills reflects that students comprehend and interpret the text they are reading, so that according to Muttaqin & Sopandi [1] students tend to learn in High Order Thinking. This shows that in making problem solving decisions, teachers need to have critical reading skills to achieve high-level thinking, one of which is the critical thinking ability [13-17].

4. Conclusion

Descriptive research to find out the correlation between critical reading competency and mathematical critical thinking competency has been resolved and it can be concluded that 1) there is a significant

correlation between critical reading competency and mathematical critical thinking competency with significance value of 0.000; 2) the correlation level between critical reading competency and mathematical critical thinking competency is very strong with the value of correlation coefficient 0.774; 3) the correlation between critical reading competency and mathematical critical thinking competency is positive, that is the higher the level of critical reading, the higher the level of mathematical critical thinking. As a result, in relation to the conclusion of the research it is recommended to develop students' critical reading with the purpose of increasing their mathematical critical thinking competency. This effort is an assignment for lecturers and students, especially in General Indonesian Language subject to focus on critical reading activity accompaniment.

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