

# The Comparasion of Learning Outcomes and Classroom Conditions between Vocational Schools in Two Disaster Risk Categories in West Java

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**Abstract**—The data show that 75% schools in Indonesia were located in disaster prone zone areas and every year there is damage in educational facilities caused by disasters. This study aims to find the differences in learning outcomes and classroom conditions between vocational schools in high disaster risk index regions with medium disaster risk index regions in West Java. The study uses quantitative method and uses total population sampling. The samples used in this study were 280 student learning outcomes data, 267 vocational school classroom conditions data, and 27 disaster risk index data in West Java province. The hypothesis of this study tested by the Spearman Correlation test, T-test, and Mann Whitney U test. The results indicated that: (1) There is a significant correlation between learning outcomes and disaster risk index. (2) There is no significant correlation between classroom conditions and disaster risk index. (3) Learning outcomes in the high disaster risk regions are lower than those in the medium disaster risk regions. (4) The percentage of classrooms damage is higher in the high disaster risk regions compared to in medium disaster risk regions.

**Keywords**—learning outcomes, classroom conditions, disasters

## I. INTRODUCTION

Indonesia was included in 21% of countries that were considered to be in disaster-prone zone areas [1]. The World Bank report entitled "Building Indonesia Resilience to Disaster" stated that 75% of schools in Indonesia were located in disaster-prone zone areas [2]. This is reinforced by the results of recapitulation infographic data from the National Agency Disaster Management (BNPB) that educational facilities damaged by disasters in the last five years are still relatively high with a total of 6,473 damaged facilities.

West Java was ranked 12th out of 34 provinces with a total score of 152.13 according to the BNPB's disaster risk index report in 2018 [3], the calculation of the disaster risk index is derived from the calculation of the multiple disasters that occurred. Natural disasters that occurred in West Java were dominated by earthquakes, tsunamis, volcanic eruptions, hydro meteorological disasters, land fires, and abrasion.

Educational facilities are one aspect that has an impact on learning outcomes. In addition to aspects of the school's physical environment, Darmawan and Permasih [4] stated that there are many other aspects that have an impact on learning outcomes which are divided into two main aspects, namely internal aspects and external aspects. Internal aspects consist of physiological aspects, intellectual aspects, non-intellectual aspects, and psychological aspects. External aspects consist of social aspects, cultural aspects, and spiritual aspects which greatly determine learning outcomes.

Disasters have an impact on learning outcomes can be seen in the research of Pereira, et al [5] who compared learning outcomes before and after the prestige oil spill disaster in a group of teenagers consisting of 147 students that lived near the disaster location. Data on student learning outcomes was obtained from the school during the academic year before and after the disaster occurred. The results of this study indicated that there was an adverse effect of disaster on students in the 15 and 16-year age group. Their learning outcomes decreased significantly after the disaster occurred.

Based on the results of previous studies, there has been no discussion regarding the location of schools in disaster prone areas with learning outcomes and classroom conditions, especially in vocational schools (SMK). This research is very important to do to optimize student learning outcomes and develop the learning process. Therefore, researchers will try to find out whether there are differences in student learning outcomes and the condition of public vocational schools' classrooms in West Java Province which have two different disaster risk categories.

## II. RESEARCH METHODS

This study uses quantitative research methods. Each variable uses descriptive statistical tests and normality tests to determine the hypothesis test used. In this study, the hypothesis was tested by the Spearman Correlation test, the independent T-test and the Mann Whitney U test.

Disaster risk categories in West Java Province are divided into two categories of disaster risk, the high risk category and the medium risk category. Regions included in the high risk category are Garut Regency, Cianjur Regency, Regency, Tasikmalaya, Sukabumi Regency, Subang Regency, Karawang Regency, Bandung Regency, Cirebon City, Cirebon Regency, Pangandaran Regency, Indramayu Regency, Majalengka Regency, Ciamis Regency, Sumedang Regency, Kuningan Regency, and Banjar City. Meanwhile, the Regions included in the medium risk category are Purwakarta Regency, Bogor Regency, Bekasi Regency, Bekasi City, Bandung City, Cimahi City, Tasikmalaya City, West Bandung Regency, Sukabumi City, Depok City, and Bogor City.

The population determined for this study is data on the results of 280 vocational school students' national exams data, 267 vocational school classroom conditions data, and 27 West Java disaster risk index data. National exams data were obtained from the Ministry of Education, Culture, Research and Technology [6], classroom conditions data were obtained from the Directorate of Vocational High Schools [7], and disaster risk index category data were obtained from the National Agency Disaster Management [8].

Samples of research data were taken from 27 regencies/cities in West Java Province. Sixteen of them are in the high disaster risk category while 11 others are in the medium disaster risk category. The learning outcomes variable has a total sample of 280 which consists of 179 samples of the national competency test results of students from the high disaster risk category regions and 101 data samples from the medium disaster risk category regions in 2019. The classroom conditions variable has a total sample of 267 consisting of 170 samples in the high disaster risk category regions and 97 samples in the medium disaster risk in 2019.

### III. RESULTS AND DISCUSSION

In this study, the hypothesis was tested with the Spearman correlation test between the disaster risk index and the learning outcome and classroom conditions, independent T-test on the sample group for learning outcomes variable, and the Mann Whitney U test on the sample group for the classroom conditions variable. The following are the research hypotheses that will be tested.

- (1)  $H_0$  = There is no significant correlation between the disaster risk index and the learning outcomes of vocational schools' students.  $H_A$  = There is a significant correlation between the disaster risk index and the learning outcomes of vocational schools' students.
- (2)  $H_0$  = There is no significant correlation between the disaster risk index and the condition of the vocational schools' classrooms.  $H_A$  = There is a significant correlation between the disaster risk index and the condition of the vocational schools' classrooms.
- (3)  $H_0$  = There is no significant difference in the learning outcomes of vocational schools' students in the high

disaster risk category regions with the medium disaster risk category regions.  $H_A$  = There is a significant difference in the learning outcomes of vocational schools' students in the high disaster risk category regions with the medium disaster risk category regions.

(4)  $H_0$  = There is no significant difference between the condition of the vocational schools' classrooms in the high disaster risk category regions and the medium disaster risk category regions.  $H_A$  = There is a significant difference between the condition of the vocational schools' classrooms in the high disaster risk category regions and the medium disaster risk category regions.

Hypothesis Test 1: Correlation Test of Disaster Risk Index with Learning Outcomes.

Spearman's nonparametric correlation test was carried out on disaster risk index and learning outcomes. This correlation test was conducted using IBM SPSS 23 which aims to determine whether or not there is a correlation between the disaster risk index and learning outcomes. The data used in the correlation test is the data of disaster risk index score from each regency/city in West Java and the data of students' national competency exam results from each regency/city in West Java.

TABLE I. CORRELATION TEST OF DISASTER RISK CATEGORIES WITH LEARNING OUTCOMES VARIABLE

Spearman's rho		Learning Outcomes	Disaster Risk Index
Learning outcomes	Correlation Coefficient	1.000	-0.584
	Sig (2-tailed)		0.001
Disaster Risk Index	Correlation Coefficient	-0.584	1.000
	Sig (2-tailed)	0.001	

Resource: Research Analysis Results, 2021

In table I, the results of the correlation analysis with SPSS show the value of sig. (2-tailed) is 0.001. In accordance with the provisions of the decision making Spearman correlation test, if the value of sig. (0.001) < 0.05 then the disaster risk index has a correlation with the learning outcomes variable.

The number of Correlation Coefficient is -0.584 which indicates that the level of strength of the correlation between the disaster risk index and the learning outcomes is a strong correlation and also means that if the disaster risk index is higher, the students' learning outcomes will be lower.

Hypothesis Test 2: Correlation Test of Disaster Risk Index with Classroom Conditions Variable.

Correlation test was performed with IBM SPSS 23 and this test aims to see whether or not there is a relationship between the disaster risk index and the classroom conditions. The data used in the correlation test is the data of disaster risk index score from each regency/city in West Java and the data of public vocational schools' classroom conditions from each regency/city in West Java.

TABLE II. CORRELATION TEST OF DISASTER RISK CATEGORIES WITH CLASSROOM CONDITIONS VARIABLE

Spearman's rho		Classroom Conditions	Disaster Risk Index
Classroom Conditions	Correlation Coefficient	0.250	1.000
	Sig (2-tailed)	0.209	
Disaster Risk Index	Correlation Coefficient	1.000	0.250
	Sig (2-tailed)	0.209	

Resource: Research Analysis Results, 2021

In table II, the results of correlation analysis using SPSS show the value of sig. (2-tailed) of 0.209. In accordance with the provisions of the decision making Spearman correlation test, if the value of sig. (0.209) > 0.05 then there is no significant correlation/relationship between the disaster risk index and the classroom conditions variable.

#### Hypothesis Test 3: T-test of Learning Outcomes Variable.

The test analysis used on the learning outcomes variable is the independent T-test. This test aims to find out the difference in learning outcomes in the two sample groups, the high disaster risk category and the medium disaster risk category. The data that was used in this hypothesis test has previously been transformed using the Lg10 method.

TABLE III. MEAN OF LEARNING OUTCOMES

Disaster Risk Categories	Learning Outcomes	
	N	Mean
High	179	43.6430
Medium	101	47.4425

Resource: Research Analysis Results, 2021

The statistical result in table III shows that there is a difference in the average of learning outcomes between two sample groups. From this table, it can be seen that the average result of the learning outcomes in the high disaster risk category is 43.6430, lower than the average result of the learning outcomes in the medium disaster risk category 47.4425.

TABLE IV. INDEPENDENT T-TEST RESULT ON LEARNING OUTCOMES VARIABLE

Independent Samples Test	T-test
	Sig. (2-tailed)
Equal variances assumed	0.000013
Equal variances not assumed	0.000066

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The results of the T-test in table IV, show that there is a difference in the two sample groups. It can be seen in the value of sig. (2-tailed) equal variances assumed variable learning outcomes is equal to 0.000013. This finding indicates that there is a significant difference in learning outcomes in the two sample groups when the significance value is lower than 0.05, the results of the T-test analysis show significant difference in learning outcomes in the two sample groups.

#### Hypothesis Test 4: Mann Whitney U Test Classroom Conditions Variable.

The hypothesis test that was used for classroom conditions variable was nonparametric Mann Whitney U test. This method was chosen because one of the requirements for the parametric T-test was not met. Classroom conditions variable data has gone through a data transformation process using the square root/sqrt (x) method but is still not normally distributed. Classroom conditions variable data used in this test is the original data prior to data transformation.

TABLE V. MEAN OF CLASSROOM CONDITIONS VARIABLE

Disaster Risk Categories	Learning Outcomes	
	N	Mean
High	170	26.9817
Medium	97	18.0358

Resource: Research Analysis Results, 2021

Based on table V, the average condition of classrooms in the public vocational schools in the high disaster risk category regions is 26.9817, higher than the average condition of classrooms in the medium disaster risk category regions 18.0358.

TABLE VI. MANN WHITNEY U TEST RESULTS ON CLASSROOM CONDITIONS VARIABLE

	Classroom Conditions
Mann Whitney U	7078.500
Wilcoxon W	11821.500
Z	-2.032
Asymp. Sig. (2-tailed)	0.042

Resource: Research Analysis Results, 2021

In table VI, the results of the Mann Whitney U test on the data show the U value is 7078.500 and the value of sig. (2-tailed) is 0.042. This finding indicates that there is a significant difference in classroom conditions in the two sample groups. This is in accordance with the decision making of the Mann Whitney U test when the significant value is lower than 0.05, then the results of the Mann Whitney U test analysis show a significant difference in classroom conditions in the two sample groups.

#### A. Discussion

This study aims to determine the differences in students' learning outcomes and the classroom conditions of the West Java public vocational high school in 2019 between the two disaster risk categories. Based on the results of the research analysis, the researchers conducted the following discussion.

#### B. Learning Outcomes Variable

Based on the results of hypothesis testing using T-test, learning outcomes variables have significant differences in the two sample groups. This study answers the research question that there are differences in the learning outcomes of vocational

school students based on school locations in disaster-prone areas in 2019. In addition, the correlation test shows that the learning outcomes variable has a strong correlation and is not in line with the disaster risk category.

These findings in terms of learning outcomes and disasters have results that are in line with the results of previous research conducted by Sulistyaningrum, "The Impact of Earthquake on Child Test Score" [9] which shows that:

"The earthquake affected all children in the area where the earthquake occurred, both those who said they were affected and those who said they were not affected by the earthquake. Children affected by the disaster had lower test scores than children who were not affected but also lived in the disaster area. Moreover, children who took exams right after the disaster occurred had lower test scores than children who took exams more than a year after the disaster occurred."

The findings of this study are also in line with the results of research conducted by Pereira, et al [10] regarding the comparison of learning outcomes before and after the Prestige oil spill disaster. The results showed that the learning outcomes of adolescent students decreased significantly after the disaster occurred.

In terms of differences in learning outcomes based on the geographical location of schools, this study has similarities with research conducted by Meyzilia, et al [11] regarding the relationship between school location and teacher teaching methods and the results of the geography national exam where there is a positive correlation between school locations in urban and rural areas. This is similar to the research of Nieto, et al [12] which also shows that there are differences between student learning outcomes in urban and rural areas. In addition, Koroye [13] stated that the geographical location of the school has an influence on the test results of English language, mathematics, social studies, basic science and agricultural science. As well as research by Agbaje and Awodun [14] and research by Owoye and Yara [15] which indicate that the geographical location of the school has an influence on the results of the West African Senior School Certificate Examination (WASSCE). However, this study has different research results in terms of learning outcomes based on the geographical location of the school with research conducted by Essien [16] where the results of the study indicate that school location is not significantly related to learning achievement taken from the value of social science subjects.

### *C. Classroom Conditions Variable*

Based on the results of hypothesis testing for the variable condition of the classroom with Mann Whitney U, there are differences in the condition of the classroom between the two sample groups. This study answers the research question that there are differences in the condition of public vocational schools' classrooms based on school locations in disaster-prone areas in 2019. Based on the Spearman Correlation test, it is stated that there is no significant relationship between classroom conditions and the disaster risk index.

Based on the results of accumulated damage to the highest heavily damaged class room per regency/city, Sukabumi City is in the top position with a classroom damage value of 58 percent. After that, it was followed by Sumedang Regency with a classroom damage value of 57 percent. This shows that regencies/cities that have the highest classroom damage in the heavily damaged category are in the medium disaster risk category.

From the distribution frequency of classroom conditions, it can be seen that most of the data are in the 0-10 percent class range. This can indicate that after the disaster occurred the school immediately rehabilitated the affected classrooms, so that when reporting data on the main data page the percentage of damaged classrooms was only slightly. In addition, there is a possibility if the data reporting on the condition of the classroom is not optimal, so that the data contained on the main data page has a higher percentage of damaged classes 0-10 percent.

The results of this study are in line with the annual report published by the Asian Disaster Preparedness Center (ADPC). The results of a survey conducted by Rego, et al [17] proved that almost half of the 92 schools as a sample were physically affected by the flood disaster. About 20 percent of schools have severe floor damage each year, 10 percent have wall damage, and eight percent have roof damage. In general, not all of the equipment in schools was damaged by the flood. Only eight percent of schools reported having damaged desks and chairs, and about 12 percent experienced window damage each year.

The results of the study on the variable condition of the classrooms have similarities with the research conducted by Anas, et al "Villages and Cities in Portraits of Education" [18] in terms of classroom conditions and school geographical conditions that:

"There are problems with gaps in school infrastructure in rural and urban areas. There are still educational facilities in schools that are not suitable to be used as educational facilities. Especially in rural areas where many school buildings are damaged and are no longer suitable for use."

The results of the study on the classroom conditions variable indicate the importance of the school improvement program, especially in the classroom conditions. Improving the condition of classrooms can improve the quality of education. In addition, improvements in classroom conditions that are carried out evenly can eliminate the gap in school facilities and infrastructure based on the geographical location of the school.

The results of this study also show the importance of disaster management programs to reduce the impact of disasters that occur. Many school facilities and infrastructure, both formal and non-formal, do not yet have disaster safety standards [19]. One of the programs to overcome this problem is the Disaster Safe Education Unit (SPAB) program of the Ministry of Education, Culture, Research and Technology and the National Agency Disaster Management, so it is hoped that

the learning process can take place comfortably and safely before, during, and after a disaster occurs.

Disasters do not only affect learning outcomes and the physical condition of schools. Based on previous research, the 2009 L'Aquila Italy earthquake disaster had an impact on the probability of students graduating on time at the University of L'Aquila whose buildings were damaged by 70% [20]. In addition, disasters have an impact on the learning process over a short period of time [21].

#### IV. CONCLUSION

(1) There is a strong and non-unidirectional significant correlation between the disaster risk index and learning outcomes based on the spearman correlation test. This means that if the index value of the disaster risk category is higher, the learning outcomes will be lower. (2) There is no significant correlation between the disaster risk index and the classroom conditions based on the spearman correlation test. (3) There are differences in student learning outcomes between the two sample groups which were tested using T-test, where the learning outcomes of public vocational high school students in the high disaster risk category regions were lower than student learning outcomes in the medium disaster risk category regions. (4) There are differences in the classroom conditions in the two sample groups. Based on the hypothesis test using Mann Whitney U, where classrooms in the high disaster risk category regions have a higher percentage of damage compared to classrooms in the medium disaster risk regions in West Java Province.

The focus of this research is to find out the differences in learning outcomes and classroom conditions between two regions that have different disaster risk categories. The results of this study have confirmed the research hypothesis that there are differences in both the learning outcome variables and the classroom conditions variables in the two sample groups. The existence of this significant difference indicates that the problem of the learning outcomes gaps and classroom conditions has not been handled properly in disaster mitigation management policies in West Java Province.

The arguments of the results of this study have similarities and differences with the results of previous studies. However, this research can complement the previous studies and confirm that the problem of educational disparities between schools in urban and rural areas can be exacerbated by disasters.

In previous studies, there was a statement that disasters had an impact on the education process until the post-disaster period. Based on the results of previous studies and the results of research regarding the correlation between the disaster risk index and learning outcomes, it can be emphasized that the problem of education gaps in the research location does not only occur at the time the research is conducted, but also this problem has an impact on the future educational conditions of students on research locations.

The existence of a gap between education in high disaster risk and medium disaster risk regions in the results of this study can provide information to policy makers to realize the urgency of implementing a policy that can minimize the impact of disasters.

The results of the study which show that there are differences in learning outcomes between the two sample groups and the correlation between the disaster risk index and learning outcomes will provide awareness to the school about the relationship between disasters and student learning outcomes which can encourage schools to realize the need for planning the learning process and teaching by considering the disaster risk category at the school location.

The results of the study which show that there are differences in classroom conditions between the two sample groups can provide awareness for policy makers of the importance of planning and implementing the construction of school buildings.

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