Experimental test: Contribution of a combined Problem-Based Learning and Studysaster (PBL-S) model in disaster-prone areas and the impact of its implementation

Khusnul Khotimah[1*], Andayani[2], Muhammad Rohmadi[3]
[123]Program Doctor Pendidikan Bahasa Indonesia, Faculty of Teacher Training and Education, Universitas Sebelas Maret,
https://orcid.org/0000-0001-7708-4925
Khusnul Khotimah https://orcid.org/0000-0001-5780-1632

Abstract
Purpose: The implementation of learning at schools must be able to accommodate the needs of students and always consider the situation and environmental conditions in learning. Implementing the independent curriculum for learning in class VII provides ample space for learning outside the classroom. The disaster situation in Indonesia occurs erratically and comes suddenly, so it takes scenarios and accuracy of learning models appropriate to disaster-prone environments. In addition, other problems, such as students' ability in Indonesian language lessons especially writing news material, are low. Seeing these problems, it is necessary to improve students' ability to write news by applying learning models relevant to the independent curriculum and congruent with disaster-prone conditions in highland areas. One of these learning models is *Problem Based Learning and Studysaster* (PBL-S) which is directly applied to help students decipher problems and find solutions. This study recommends that teachers to be able to use the PBL-S model in overcoming learning situations in disaster-prone areas.
Approach: the approach used in this study is quantitative with experimental method. This approach focuses on achieving objectivity, control and accurate measurement. The experimental method was chosen to observe the differences in treatment after applying a model in learning.
Findings: PBL-S provides an accurate picture of the students' and teachers' needs in implementing news text writing materials in disaster-prone areas. It is based on the objectives of the independent learning curriculum applied in class VII junior high school. In addition, the contributions obtained can provide an initial picture related to the occurrence of disasters in the student environment. Information from the text produced by students will be helpful for schools and other parties.
Value: PBL-S is an alternative for teachers to implement innovative learning models according to the needs and situation of the student environment. The relevance of the main point in PBL can make a real contribution to the prevention of sustainable disasters in the school and community environment.

Keywords: disaster-prone, experimental test, PBL-S model, writing material

1. Introduction

The geographical location of Southeast Asia is on a series of paths crossed by volcanoes with an area of 4.493.944 km² consisting of 11 countries. Indonesia is one of the countries located in the Asian region and has a high risk of traditional disasters (Carter, 2008:19). It affects the situation that is vulnerable to disasters. Disasters are a catastrophe that afflicts humans and adversely impact life (Türksever, 2021). (Warbington et al., 2019:57) the occurred disaster affected children and youth in communities around the world. Differences in disaster patterns in each area affect the characteristics of the disaster. Disasters occur due to two factors: natural and man-made (Pinar, 2017:316).

Mountainous areas have a greater risk of disasters since, geographically, it is located in the highlands. Mal et al., n.d.(2018:17) stated that mountainous or upland areas are vulnerable to disasters. Based on the observation of previous studies, losses caused by disasters are increasing (Weichselgartner & Pigeon, 2015: 107). The active mountain that produces hot water that flows in the surrounding area is Mt. Slamet. Mt. Slamet is one of the active mountains in Central Java province and has the highest population density in Indonesia (Dewanti et al., n.d.: 7431). The location is used as a tourist attraction managed by the local government of Tegal Regency. The needs of tourist areas are undoubtedly related to the facilities used by tourists. It certainly affects the stability of the altitude area because tourist facilities and other public facilities are built on land that was previously a water catchment. No wonder those factors cause natural disasters such as avalanches and floods; however, it cannot be denied that natural disasters also occur because of natural activities. The hazards resulting from the disaster are related to the site's physical characteristics, soil conditions, topography, and vegetation. Sandy locations and high water surfaces are likely to be vulnerable to liquidation after earthquakes. In contrast, location close to watercourses or bald land can increase the risk of flooding (Global Program For Safer Schools, 2014: 11). The characteristics of the disaster also occurs in the highland area on the slopes of Mount Slamet or more precisely Bumijawa area, Tegal Regency which has an altitude of 1800 meters high and 500 meters low.

Based on data obtained from the Regional Disaster Management Agency (BPBD) of Tegal Regency, Central Java Province, Indonesia, it is illustrated that avalanches occupy the highest intensity of disasters. At the same time, broken bridges and tornadoes are the lowest intensity. The impact disrupted the survival of the surrounding community normally. The type of disaster spread in that area is characteristic of highland disasters. Every disaster will impact humans, either through building damage or material losses and moral losses. The following is disaster-affected data in the highlands of Tegal Regency in one year, which describes the damage and victims in general.
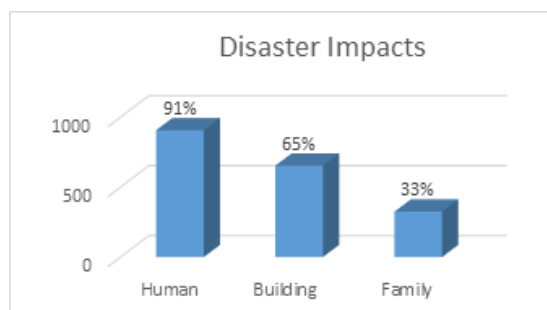
Figure 1. Disaster Impacts

From the data above, it is clear that people in the highlands have a significant disaster risk. The data obtained recorded that 653 buildings were damaged, 907 impacted humans and losses and 325 affected families. Warbington et al. (2019) stated that natural disasters significantly affect children, adolescents, education and the wider community. The field of education is one of the real impacts and requires

interference from the government, policymakers and the community. In addition to the damage caused, the most crucial factor is the influence experienced by a person on the damage (Sun et al., 2014).

Schools have an essential role as part of prevention so that disasters that occur are not sustainable— the school functions as an institution responsible for educating and providing information trusted by the community. Mutsau & Billiat (2015:163) revealed that schools are responsible for developing attitudes, knowledge, behaviour and skills. A few schools should be closed for safety reasons if a disaster happens. School closures can disrupt students' learning process and suspend school services that should be taking place (Report to Congressional Committees, 2022). (Nuryana & Suyadi, 2019:219) stated that disaster management-related curriculum is able to provide skill and knowledge in early age students to reduce the risk of disaster. In this case, teachers have a vital role in developing learning plans and scenarios in the disaster risk area. Teachers must always be critical in preparing the lesson plan for disaster situations (Şeyihoğlu et al., 2021: 782). Moreover, teachers as educators must be able to give a deep impression of the material, not only the knowledge that is highlighted but also the way to introduce knowledge meaningfully (Alan Crawford, n.d.: 10). (Rose & Bimm, 2021:3) in their research they concluded that education played a critical role as post-disaster recovery effort for children and teachers.

In this case, one of the subjects related to disaster phenomenon is writing news material on Indonesian Language subjects. Other problems encountered in junior high school also showed that the ability to write news texts for students is low. They are still struggling in expressing writing ideas; furthermore, the grammar and sentences used are also incorrect. Writing news text is included in the independent curriculum for class VII of the Indonesian Language subject. In addition to appropriate materials, learning models that support these materials also need to be considered. One of the models that can be used in this situation is *Problem Based Learning* (PBL). Problem-based learning is one of the models used in learning activities, and the problems encountered are the starting point of the learning process (de Graaff & Kolmos, n.d.). Kilroy (2004:411) states that experts who agree with this learning model hope that PBL can improve learning related to the environment to increase knowledge and be used as a basis for learning.

To date, PBL, which was initially only used in medicine has now begun to expand in the field of education (Hung et al., n.d.:486). The relevance of applying the independent learning curriculum in disaster situations proposed by the Ministry of Education and Culture presents the pursuit of interest-based learning on talent that focuses on student competencies. In line with the curriculum goal, the PBL model has the main objective of leading students to learn from problem investigation and student-centred learning process (Evensen, 2000: 3). PBL is enabled as a learning model to overcome local problems and relate them scientifically (Huysken et al., 2019:8). (Mcintosh & Student, 2001:67) while solving the problem in group, students directly use their experience-based lesson and reflection to help improving disaster awareness and recovery. Seeing the effectiveness of PBL for problem solving in learning, there is a possibility that teachers can implement to see the real impact of the changes shown by students after the application of one of the PBL model called *Studysaster*. The combination of studysater becomes a novelty that can be applied in writing news texts learning. *Studysaster* enables real impact for students and society at large. This is because students often face natural disasters occur in the mountains. Puspitarini (2021:2) mentioned that the studysaster learning model is a learning model aims to educate students about disasters and produce the products. The potential expected from the implementation of the new curriculum 2022 makes it a benchmark that students do not only learn the material from teachers. One of the advantages of this curriculum is that it can accommodate students' learning needs that align with its relevance when applied in disaster situations. Different disaster conditions in each region demand flexible scenarios and learning patterns. The learning objective of Indonesian Language

material in junior high school is an example of the implementation. The learning objective is to improve Indonesian Language skills and create works through fun activities. This goal will be realized if teachers and students understand the essence of the freedom of learning. Disaster research encompasses various disciplines, such as geology, medicine, management and education. When educational research is associated with disasters, research focuses on solutions that must impact learning continuity (Ozturk Tasci & Oguz Unver, 2017: 167). (Gökmenoğlu et al., 2021:23) disaster prevention effort application at school is part of critical process in overcoming the impacts following the disaster.

Overall, this research section will discuss the problems for junior high school students affected by the disaster in Bumijawa plateau area, Tegal Regency and the role of students in contributing to the school. What is the effectiveness of using the combined PBL-S model in disaster-prone areas in news text writing material? 2) What is the contribution of learning to write news texts using PBL-S as prevention in disaster-prone areas?. This study aims to explain the teacher's actions delicately in implementing learning with highland background and prone to disaster situations. The main objective is to explain the role of educational institutions in preventing sustainable disasters in specific disaster-prone areas of the highlands.

1.

2. **Method and Data Collection**

The method used in this study was experimental. This type of method focuses on the results of differences after learning treatment (Creswell, 2009:29). Experimental method known as research used in social and behavioural sciences. Experimental method has two characteristics: systematic and controlled (Leavy, 217:94).

Data collection was carried out in pre-test and post-test and the test result was analysed by statistical test. If the groups tested are different, it can be concluded that there is difference caused by experimental treatment or independent variable (Burke, 2014:95) The next step after collecting the data is to analyse that the researcher formulates a conclusion that is not absolute. Conclusion statement is scientific. It means that the conclusion contains actual possibilities. In this case, the researcher used the significant level (t.s) and the degree of freedom (d.f). If the researcher determines a significant level (t.s) of 5%, this means that the researcher can still accept the conclusion of the study even though there is a 5% population misses the conclusion. The subject of the research was students at SMP N Bumijawa, Tegal Regency, Central Java. The research was conducted in three disaster-prone schools from January to October 2023. Before conducting the t-test, a prerequisite test is carried out which includes :

a) The normality test of data distribution was obtained from the pre-test and post-test of students' understanding about nationalism in the control group and the experimental group. The researcher used the Kolmogorov-Smirnov test with the IBM SPSS Statistics 21.0 application to prove whether the data distribution was normally distributed or not. A data condition is normally distributed if the value of sig (2-tailed) calculation is greater than the alpha level of 5% (sig (2-tailed) > 0.050).

b) The variant homogeneity test in this study used the Levene Statistical test with the IBM SPSS Statistics 21.0 application. The variance condition is said to be homogeneous if the significance value is greater than 0.05. The research instrument used was a type of written test. This is intended to find out students' understanding of nationalism.

c) The Balance Test compares the value of a dependent variable between groups determined

by the category of an independent variable. This analysis aims to determine whether there is significance between the groups. The dependent variable compared is the test value, while the independent variable categorizes is the type of test. To see whether two groups have different variables, a t-test is chosen where each group only receives one treatment of the independent variable. The type of t-test used is called the independent sample t-test. Independent sample t-test to see the comparison of mean scores (VanderStoep, 2009:122). The instrument chosen to see the results of students' skills is a written test. In addition, the balance test is a one-way ANOVA test with unequal cells. The statistics test used were the F test at the significance level $\alpha = 0.05$. One-way ANOVA test with unequal cells used to compare two groups (groups A and B). In line with the description above, the data analysis technique in this study used one-way ANOVA (Sudjana, 1989: 302-307). The follow-up stage after analysing the data was the determination of effectiveness using the PBL-S model in writing news texts material.

3. Result And Discussion

3.1. The Effectiveness of Using the PBL-S Model in Disaster-Prone Areas in Writing News Text Material in Junior High School

The results of calculation using the IBM SPSS Statistics 21.0 application obtained the following data:

a) Normality test

Normality test is used to test whether the data is normal or not. For this test, the Lilliefors (Lo) test technique was used at the significance level of $a = 0.05$ (Sudjana, 1996: 446- 448) using the IBM SPSS Statistics 21 application. A data is said to be normally distributed if the Significant value is greater than 0.05 (Sig. > 0.05).

No	Group	Significance Level		Results
		Pre-test	Post-test	
1	Control Class SMPN1 Bumijawa	0.143	0.153	Normal
2	Experimental Class SMP N 1 Bumijawa	0.200	0.099	Normal
3	Control Class SMP N 3 Bumijawa	0.149	0.101	Normal
4	Experimental class SMP N 3 Bumijawa	0.200	0.071	Normal
5	Control Class SMP N 4 Bumijawa	0.200	0.200	Normal
6	Experimental Class SMP N 4 Bumijawa	0.063	0.176	Normal

From the table above, it can be said that the significance level for all groups is greater than the significance level of 5% (0.05) which means that the data is normally distributed.

b) Homogeneity Test

Hypothesis should be prepared to know the assumption to find out whether the three existing sample groups have the same variant (homogeneous) can be accepted or not. Homogeneity test is used to test the similarity of variants between two or more groups which are compared. In addition, this test aims to test the validity of the assumptions of ANOVA, whether the sample has the same variance or not. To test the homogeneity of population variants, a homogeneity test was conducted by using the IBM SPSS Statistics 21 application at *a significance level of a = 0.05* (Sudjana, 1996: 261-263).

No	Group	Significance Level	Description
1	Control Class SMP N1 Bumijawa	0.078	Homogeneous
2	Experimental Class SMP N 1 Bumijawa	0.155	Homogeneous
3	Control Class SMP N 3 Bumijawa	0.219	Homogeneous
4	Experimental Class SMP N 3 Bumijawa	0.549	Homogeneous
5	Control Class SMP N 4 Bumijawa	0.145	Homogeneous
6	Experimental Class SMP N 4 Bumijawa	0.349	Homogeneous

From the table above, it can be concluded that the significance level for all groups is greater than the significance level of 5% (0.05) which means that the data is normally distributed.

c) Balance Test

Based on the results obtained in the ANOVA test, it can be seen that the probability value is 0.000 < 0.05. Thus the null hypothesis (Ho) is rejected.

No	Group	Significance Level	Description
1	Control Class SMP N 1 Bumijawa	0.000	There is a difference
2	Experimental Class SMP N 1 Bumijawa	0.000	There is a difference
3	Control Class SMP N 3 Bumijawa	0.000	There is a difference
4	Experimental Class SMP N 3 Bumijawa	0.000	There is a difference
5	Control Class SMP N 4 Bumijawa	0.000	There is a difference
6	Experimental Class SMP N 4 Bumijawa	0.000	There is a difference

This shows that there is a difference in the average of the initial and final test results. In addition, using the calculation of *the Independent Samples t-test with the* IBM SPSS Statistics 21 application, almost the same data can be seen in the table below:

No	Group	Sig. (2-tailed)	Description
1	Control Class SMP N 1 Bumijawa	0.000	There is a difference
2	Experimental Class SMP N 1 Bumijawa	0.000	There is a difference
3	Control Class SMP N 3 Bumijawa	0.000	There is a difference
4	Experimental Class SMP N 3 Bumijawa	0.000	There is a difference
5	Control Class SMP N 4 Bumijawa	0.000	There is a difference
6	Experimental Class SMP N 4 Bumijawa	0.000	There is a difference

This shows that there is a difference in the average of the initial and final test results.

Determination of data analysis

From the data on the calculation of the ANOVA test and the independent *Samples t-test* with the IBM SPSS Statistics 21 application, it was concluded that there were significant differences in the average pre-test and post-test values in each group of learning models. From the three testing learning models carried out (PBL-S, PBL and conventional test) at each school, the average results are as follows:

No	Group	Average score		Difference
		Pre-test	Pos-test	
1	Control Class (conventional model) SMP N 1 Bumijawa	63.72	81.38	17.66

2	Experimental Class (PBL-S model) SMP N 1 Bumijawa	63.75	84.59	20.84
3	Control Class (conventional model) SMP N 3 Bumijawa	73.83	81.77	7.93
4	Experimental Class (PBL-S model) SMP N 3Bumijawa	75.90	83.40	7.50
5	Control Class (conventional model) SMP N 4 Bumijawa	72.63	81.68	9.05
6	Experiment Class (Assignment model) SMP N 4 Bumijawa	71.37	82.26	10.89

From the table above, it can be seen that the highest is the post-test average value in the PBL-S learning model (experimental class) with the average value of 84.59 and the lowest average value of 63.72 in the pre-test value of the control class. Thus, it can be concluded that the use of the PBL-S learning model in writing news texts in disaster-prone areas effectively improves learning outcomes.

3.2. Learning Contribution of Writing News Texts with the Combined PBL-S Model as Disaster Prevention.

The manifestation of the contributions made by students to the community through the results of work in the form of news texts can provide benefits. The benefit in question is the access to current information that students have collected along with teachers in implementing learning using the PBL model by the concept of an independent learning curriculum. The figure below systematically illustrates the procedure of learning activities by implementing the PBL model and the role of an independent curriculum in the resulting students' work which is beneficial for the community.
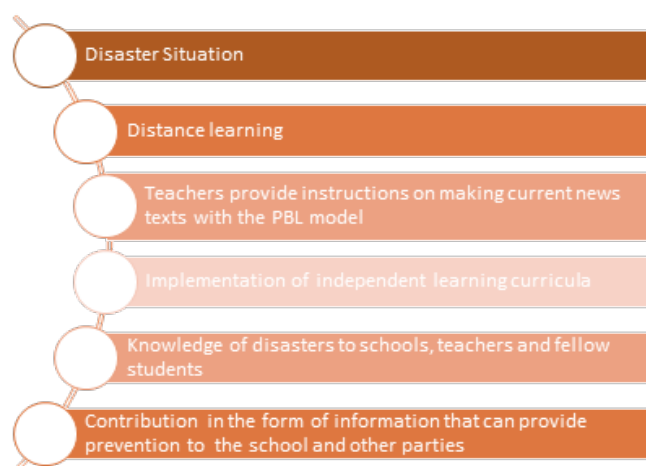

Figure 5.

The overview of the student contribution process in sustainable disaster prevention

The six stages above can provide an overview that learning materials by applying the PBL model can make a real contribution to the prevention of sustainable disasters in the highlands. The following will be explained the contribution concerning other parties. First, for schools, learning activities can still be run safely and maximally at home. It is seen that the decision will impact the safety of students, teachers and all school parties during a disaster. However, schools still have to provide targets to teachers and students in learning responsibilities.

This research contributes to teachers that the agility of teaching and learning can be done online and in a structured and effective way, such as by connecting learning with a problem-based learning model and adjusting the independent learning curriculum directly. The implementation referred to is the existence of student-centred learning by prioritizing the problems faced as a source of learning. The second contribution of this research is to students. By implementing online learning and applying

relevant models to the situation, students can study safely at home and learn from problems related to writing news in accordance with the current conditions and situation. Thus, the contribution of disaster prevention in the highlands can be minimized by the education obtained by students. The last contribution is to other related parties, such as local governments. The existence of structured learning applied by teachers, the concern for the presence of victims in disasters and the occurrence of advanced disasters can be minimized. Apart from that, the most important thing to do is to have good coordination between schools and local governments regarding preventive steps that can be taken from information investigated by students in their respective areas when studying online.

4. Conclusion

Based on the formulation of problems and research objectives referred to the literature review, research methods, and research results described previously; the researchers can draw the conclusion that: (1) From the results of the calculation of values in each study group, the significance level for all groups is greater than the significance level of 5% (0.05) which means that the data is normally distributed.; (2) From the results of the value calculation in each study group, the significance level for all groups was greater than the significance level of 5% (0.05), which means that the data is homogeneous and can be continued with one-way ANOVA calculations; (3) in the one-way ANOVA test and the independent sample t-test for the probability value and Sig (2-tailed) obtained the value is $0.000 < 0.05$, which means that there is a significant difference between the pre-test and post-test.; (4) The PBL-S learning model proved to be more effective compared to other models, this was due to the average post-test value in the experimental class with the highest application of the PBL-S model compared to other models. When there is severe disaster that require students and teachers conduct online learning, PBL-S can be applied comprehensively in the subject of writing news texts. In relation with the diversity of disasters, it requires teachers to make improvements in choosing a learning model aligned with the independent learning curriculum.

Notes on the author
Khusnul Khotimah, M.Pd. has been a lecturer in Indonesian language education from 2013 until now. She teaches strategies and learning models of the Indonesian Language subject. In addition, she also conducts research and community service related to models and strategies for teaching Indonesian. She is currently listed as a tenured lecturer at Universitas Pancasakti Tegal, Central Java, Indonesia.

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