



Immersive Pop-Up Books: Enhancing Disaster Awareness in the Merdeka Curriculum

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Abstract: The Understanding by Design (UBD) framework is the preferred instructional model in self-directed learning. The issue addressed in this study pertains to the multitude of disasters occurring in Indonesia, thereby emphasizing the significance of acquiring comprehensive perspectives on disasters and their corresponding management strategies. It remains imperative for students to acquire a comprehensive understanding of disasters and their corresponding management strategies. The research aims to increase students' disaster literacy using the UBD learning model with Pop-Up Book media. The research employed a quantitative methodology. The study population was students from Percobaan Elementary School in Padang, West Sumatra. A total of 42 students were selected as participants and were divided into two groups, a control class, and an experimental class. The outcomes obtained from implementing the UBD model encompass the findings derived from rigorous statistical analysis. The test results indicate a statistically significant impact of the UBD learning model on enhancing students' disaster literacy when combined with Pop-Up Book media. The educator's contribution has yielded practical insights, diverse perspectives, and innovative ideas that enhance the efficacy of utilizing Pop-Up Book media to augment students' disaster literacy. The findings of this study hold significant implications for Indonesia, given its status as a nation characterized by a substantial degree of vulnerability to disasters. The intended outcome is for students to develop improved readiness to respond to disasters and better understand the necessary actions to take during emergencies.

Keywords: learning models, disaster literacy, Pop-Up Book

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Introduction

Responding to a country that has much diversity, starting from its territory consisting of islands, many people, tribes, and cultures are characteristic of the Indonesian state (Mustari et al., 2018; Prasetyo et al., 2021; Syafruddin et al., 2021). The geology of Indonesia consists of islands consisting of the tip of Sabang Aceh to Merauke South Papua. It is riced by two large continents, namely Asia and Australia (Manyoe et al., 2021). Indonesia has an island rounded by oceans that directly intersect with the large ocean, namely the Indian and Pacific oceans (Sciascia & Malufti, 2021). Looking at the geological condition of Indonesia, there are many risks in dealing directly with disasters, ranging from natural disasters (Hidayati et al., 2020; Pramita et al., 2022). In this case, it can be proven from the recording of annual disasters in Indonesia, which tend to increase in the 2018-2020 period of approximately 3,397 events, disasters occur influenced by the tropical region of Indonesia (Rozaki et al., 2021; Sadat, 2016).

Natural conditions in Indonesia, known as tropical regions, are also very potential for disasters caused by natural damage and artificial damage to nature (Anies, 2017; Mbanda et al., 2021). Disasters often hit Indonesia are diverse disasters such as droughts, earthquakes, tornadoes, volcanoes, forest fires, floods, and tsunamis. (Brown et al., 2014; Juhadi et al., 2021). Disasters are the biggest threat to humanity that affect the decline of resilience in an area, such as damage to houses and buildings in the region, declining health rates, increasing mortality, declining economy, and soaring psychosocial

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disorders in areas where disasters occur (Ludvigson et al., 2020; Zhang et al., 2018). It is in line with disaster data from the results of the BPBD report in South Sulawesi recorded starting in 2018. The impact caused by the disaster took 2.045 people to die. The victims displaced as many as 82.775 people, with a calculation that around 10% of the victims who died were children (Syamsidik et al., 2021). According to the results of the BPBD West Nusa Tenggara (NTB) report, around 3.051 classrooms and school infrastructure were damaged, 1.460 of which were severely damaged, making them overwhelmed due to disruption of the education sector because schools were dismissed until the time it was determined (Yadnya et al., 2020).

The potential and impact of disasters that occur so that all Indonesian people must always be on standby starting from all sectors, especially the education sector (Saito et al., 2021; Suherningtyas et al., 2022). Education is one of the important sectors in acting as a facilitator in recognizing, forming, and implementing attitudes that are responsive to disasters (Presidential Regulation No 87, 2020). The purpose of introducing this disaster response attitude is none other than to form educated students who have disaster preparedness competence and are ready to implement whenever needed in society (Baturetno et al., 2023; Rachmawati et al., 2018; Sayekti et al., 2023). The direct appeal stipulated about the education p unit seeks to encourage the continuity of education services in the unit affected by the disaster, which requires handling in emergency and post-disaster situations (Kemendikbud, 2019). It can be started and implemented supportive policies in educating students in schools on how to save themselves in times of threatening disasters and accidents (Sayekti et al., 2023; Utama et al., 2018).

The policy supports a formally formulated program so that the government can act out its function well (Santika, 2021). The principal leads the procedure in the school principal gives an appeal to the teacher, and the teacher implements the request given and applies it in the lesson so that there is a regular linkage top down (Arifin et al., 2021; Arman et al., 2016; Hoa et al., 2021). Ironically, the findings in the field that the implementation of the policies advocated by the government in the education for students in schools are not carried out properly, as evidenced by the level of disaster literacy in disaster education in formal education and the community is still small, low awareness so that it has not prioritized disaster literacy in schools as a means of disaster awareness and prevention. In line with that, the low literacy of disaster mitigation, such as the lack of monitoring and evaluation of the programs implemented and the lack of trained teachers in providing disaster education materials. In line with the previous statement, there is still low disaster literacy in areas with a high level of disaster risk but do not have an awareness of the importance of disaster literacy, making people unprepared for disasters. The point of view of regional communities with low disaster risk levels feels that there is no need for disaster literacy. This finding is in line with several previous studies that some of the problems that exist in the non-implementation of government policies will form behavior that follows expectations (Ali & Abdullah, 2021; Hirmer et al., 2021; Kano et al., 2020; Nurrahim et al., 2018)

This condition indicates the need for innovative treatment to improve student disaster literacy. Hosseini et al. (2019) and Rakhmawati & Mustadi (2022) stated that the development of a comprehensive learning plan necessitates the consideration of various learning approaches, including strategies, models, methods, and techniques that are tailored to the specific conditions and characteristics of the learners. The implementation of contemporary pedagogical approaches within educational settings holds significant importance, as it facilitates students' acquisition of comprehensive knowledge and fosters a deeper level of meaning in the learning process (Dayu & Setyaningsih, 2022; Shi & Gullett, 2018; Suryaman, 2020). Choosing the right learning strategy is closely related to student motivation, which will later impact student learning outcomes (Ali & Poerwanto, 2017; Suwandi, 2020). Hence, engaging in a continuous renewal process is imperative to attain a learning experience responsive to contemporary advancements and challenges. Learning activities encompass individuals' cognitive and physical actions to acquire knowledge, hone skills, and foster personal growth through learning. It aligns with the notion that the instructional enhancements implemented by the educator should effectively guide students towards acquiring knowledge, developing insights, and fostering a comprehensive understanding of learning within the Understanding by Design (UBD) learning model (Hosseini et al., 2019; Ruslanjari et al., 2019; Suwandi, 2020; Syamsi & Dharma, 2023). The UBD learning model is very suitable for teachers to apply disaster literacy activities to students because teachers can design learning activities that adapt to students' character. It is a strong factor in maximizing and increasing the motivation of students to become disaster-literate students. (Anderson, 2022; al-Tonsi, 2019; Winarni & Purwandari, 2020; Yurtseven & Altun, 2017). Some of these descriptions began the emergence of

ideas in conducting studies on innovative learning models for growing students' disaster literacy. The renewal and innovation in this research are collaborating the UBD learning model with disaster mitigation-based Pop-Up Book media in increasing disaster literacy at the elementary school level. This study aims to test the effectiveness of the UBD learning model in increasing disaster literacy using Pop-Up Book media in elementary schools.

Methods

The methodology employed in this research is quantitative. The research design employed in this study was a quasi-experimental design, as it involved utilizing existing classes as research samples. The research methodology employed in this study was a non-equivalent control group design. This study aimed to find out an overview of the influence of the UBD model with media Pop-Up Book to improve the disaster literacy ability of students of Percobaan Padang Elementary School, West Sumatra, presented in Table 1.

Table 1. Design Pretest-Postest Control Group

O ₁	X	O ₂
O ₃		O ₄

Notes:

X is treatment (UBD model with Pop-Up Book media)

O₁ is the pretest result before applying the UBD model with Pop-Up Book media.

O₂ results from the post-test after applying the UBD model with Pop-Up Book media.

O₃ is the result of pretesting the control class without applying the UBD model with Pop-Up Book media.

O₄ is the result of pretesting the control class without applying the UBD model with Pop-Up Book media.

The design of this study consisted of two measurements, namely at the time of the pretest, then given the UBD model treatment using Pop-Up Book media, and the second measurement at the time of the post-test.

The population in this study were students in grade III Percobaan Elementary School, which amounts to 42 students of grade III Percobaan Elementary School. The number of 42 people was then divided into two selected groups using a simple cluster random sampling. The group was divided into a control group (without treatment) of 21 people and an experimental group (which was given treatment) of 21 people—the data for this study utilized observation techniques and assessments of learning outcomes. Before utilizing this research instrument, a content validity test was conducted employing the Aiken validity index approach, while reliability was established through inter-rater assessment techniques. The assessment results indicate that all items demonstrate validity, while all instruments exhibit reliability (Creswell, 2009).

The statistical methods employed in this study encompass descriptive statistical analysis as well as inferential analysis through the utilization of a t-test. Before experimenting, a data normality test was performed utilizing the Kolmogorov-Smirnov test with a significance level of $\alpha = 0.05$. Normality tests were conducted on the data from each group in the study, resulting in the calculation of two p-values for each data group, with a significance level set at 0.05. In the context of test criteria, specifically, if the p-value is greater than or equal to 0.05, it can be inferred that the data under consideration follows a normal distribution. Conversely, if the p-value is less than 0.05, the data does not exhibit a normal distribution (Wuryandani & Herwin, 2021).

In this study, the statistic hypothesis is needed to perform parametric statistical analysis to test the effectiveness of the UBD model using Pop-Up Book media in improving the disaster literacy of grade III students. The statistical hypothesis in this study is outlined as follows:

$$H_0 : \mu_1 \geq \mu_2$$

There was no significant change in UBD's learning model for disaster literacy of grade III students.

$$H_1 : \mu_1 < \mu_2$$

There is a significant improvement in UBD's learning model for disaster literacy of grade III students.

μ_1 is the learning outcomes of learners before the application of the UBD learning model.

μ_2 is the learners' learning outcomes before applying the UBD learning model.

Results and Discussion

The implementation of this research is divided into three stages, namely giving pretests, learning processes, and ending with giving post-test. The pretest results determine students' initial ability regarding the material provided, namely about disaster mitigation. In addition, the pretest value is used to determine whether the sample used has a homogeneous initial ability. Pretest data is processed using the SPSS program. The results of the calculation of the difference test of the two average pretest averages can be presented in Table 2.

Table 2. T Test Pretest Data

Group	Average	N	dk	T count	T table	Sig (2-tailed)	Information
Experiment	48.8	21	40	-844	1.303	0.404	No difference (Homogen)
Control	50.8	21					

Based on Table 2. Described with confidence level =95% atau (α)= 0.05, the number of respondents for the experimental class = 21 and the number of respondents for the control class 21, then obtained t table = 1.303. Based on the calculation results of the value obtained, the sig value $0.404 > 0.05$, so H_0 accepted. In other words, it can be concluded that there were no significant student learning outcomes between the experimental and control classes before being given treatment or treatment. This is evidenced by the calculation results of the average experimental class pretest, which is 48.8, while the average value of the control class pretest is 50.8. Thus, there is no significant difference between the experimental and control classes so the research can continue.

Data of Experimental Class Student Scores

The implementation of the research was carried out in the Experimental class in which there was a treatment. The implementation of this research consists of several stages. The first stage for initial data collection is to pretest. This pretest aims to determine students' initial score before treatment or using the UBD model with disaster literacy Pop-Up Book media. The next stage is to provide treatment in the form of an introduction to disaster mitigation using Pop-Up Book media. The last stage is a post-test to determine children's advantages after treatment using Pop-Up Book media. In this study, the score data of this component was obtained from 21 students. The pretest data value of these variables is 21, with a score range of 37 as the minimum score and 60 as the maximum score. The post-test data values of these variables range from 68 as the minimum score to 84 as the maximum score. Descriptive statistical data of measurement results before and after the UBD model application are presented in Table 3.

Table 3. Descriptive Statistical Data of Experimental Class Student Scores

Statistics	Score
Before Model application	
Mean	48.8
Median	48
Mode	56
Standard Deviation	6.6
Minimum	37
Maximum	60
After Model application	
Mean	77.52
Median	78
Mode	80
Standard Deviation	4.23
Minimum	68
Maximum	84

Based on Table 3. It can be defined as the initial ability (pre-test) and the final ability (post-test), which can be a significant difference. There is an increase in the ability of children to understand disaster mitigation materials. It can be depicted in the graphic form in Figure 1.

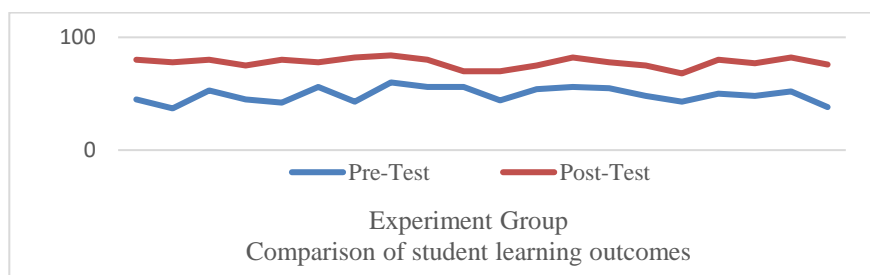


Figure 1. Graph of the distribution line of student scores in the experimental class

Class III A is used as an experimental class in learning in this experimental class using the UBD learning model with Pop-Up Book media. The teacher explained the material about the disaster in Indonesia with a Pop-Up Book media, after which the student's paid attention to what was conveyed by the teacher. Using Pop Up Book media by compiling learning with the Understanding by Design model attracts students' learning interest. Students gain knowledge through visuals. With this UBD learner, it makes it easier for teachers to explain materials about disasters.

Table 3 presents the descriptive statistics indicating that the utilization of the UBD learning model with Pop-Up Book media resulted in higher scores compared to the scores obtained before implementing the UBD learning model with Pop-Up Book media. The mean score of students before implementing the UBD learning model with Pop-Up Book media was recorded as 53.09. However, following the implementation of the UBD learning model with Pop-Up Book media, the mean score of students increased to 66.85, indicating a significant descriptive improvement.

Data of Student Grades in Control Class

The research was also carried out in a control class in which there was no treatment. The implementation of this study consists of several stages, namely the pretest stage and closed with the post-test stage, without any special treatment. The data about the scores of this component was collected from a sample of 21 students. The initial data value for these variables is 21, with a score range of 36 as the lowest score and 64 as the highest score. The minimum score observed in the post-test data for these variables is 40, while the maximum score is 60. Descriptive statistical data of measurement results in control classes are presented in Table 4.

Table 4. Descriptive Statistical Data of Student Grades in Control Class

Statistic	Score
Pretest	
Mean	50.8
Median	52
Mode	44
Standard Deviation	8.94
Minimum	36
Maximum	64
Post-test	
Mean	49
Median	52
Mode	40
Standard Deviation	7.52
Minimum	40
Maximum	60

Based on Table 4. It can be defined as the initial capability (pretest) and the final capability (posttest), which can be the number of unstable differences between the initial and final abilities to understand the disaster mitigation material. It can be depicted in the graphic form in Figure 2.

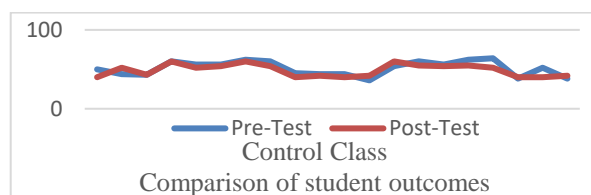


Figure 2. Line Graph of the Distribution of Student Scores in the Control Class

1.1. T-Test Post-test Data

Subsequently, the students in both the experimental and control groups proceeded to conduct the post-test. The post-test assessed potential disparities in student learning outcomes regarding disaster literacy activities among third-grade students at Percobaan Elementary School Padang, West Sumatra. This evaluation aimed to compare the experimental and control classes after the treatment administration. In the experimental class, treatment was given with the UBD learning model with Pop-Up Book media. In the control class, it was treated by not using the UBD learning model or by using conventional methods. Post-test data is processed using the SPSS program. The results of the post-test calculation of the experimental class with the control class are presented in Table 5.

Table 5. T-Test Post-test Data

Class	Mean	N	dk	T test	T tabel	Sig (2-tailed)	Information
Experiment	77.5	21	40	15.128	1.303	0.000	there are differences
control	49	21					

Based on Table 5, with confidence level= 95% or (α) = 0.05, the number of respondents for the experimental class was 31 people, and the number of respondents for the control class was 31 people, so it was $t_{tabel} = 1.303$. From the above data, it can be known that $t_{test} = 15.128$. So $t_{test} > t_{table}$ that is $15.128 > 1.303$, and the significance value obtained is $0.007 < 0.05$. Then it was concluded that H_0 was rejected, and H_a was accepted, which means that there are differences in student learning outcomes in grade III disaster literacy at Percobaan Elementary School, between experimental classes that use the UBD learning model with Pop-Up Book media and control classes that do not use the UBD learning model or by using conventional models. In the calculation results, the average data of the experimental class value was 77.5, higher than the average score in the control class, which was 49. This shows that providing treatment in experimental classes using the UBD learning model with Pop-Up Book media effectively improves disaster literacy skills in grade III students.

1.2. Result from analysis class experiment

Based on the analysis results, it can be inferred that there are discernible variations in student scores between the control and experimental groups in this study. The UBD learning model with Pop-Up Book media was implemented in the experimental group, and the subsequent outcomes were evaluated. The findings from the descriptive analysis indicated that implementing the UBD learning model, in conjunction with the utilization of Pop-Up Book media, has proven to be an effective strategy for enhancing disaster literacy and student learning outcomes. The correlation between implementing the UBD learning model with Pop-Up Book media and the subsequent improvement in student scores is evident. Following the successful demonstration of the efficacy of the UBD learning model utilizing Pop-Up Book media, the subsequent area of inquiry pertains to ascertaining the effectiveness of the UBD learning model when applied in conjunction with inferential Pop-Up Book media. This study aims to demonstrate the importance of utilizing the UBD learning model in conjunction with Pop-Up Book media to enhance students' disaster literacy. To prove it, both data groups in the test used a t-test. However, before conducting inferential analysis, the data is first tested for data normality as a condition for using the parametric statistic presented in Table 6.

Table 6. Experimental Class Data Normality Test Results

Group	Value Sig KS	α	Conclusion
Before UBD	0.085	0.05	Normal distribution
After UBD	0.261	0.05	Normal distribution

From the results presented in Table 6, the following presents the test results obtained information, namely in the data group before the application of the UBD learning model with Pop-Up Book media, the sig Kolmogorov-s Smirnov coefficient is 0.2, and the coefficient is greater than the significance level of 0.05 so that the data for the norm group is distributed. In the data group, after applying the UBD learning model with Pop-Up Book media, the coefficient Kolmogorov-s Smirnov is 0.2, which is greater than the significance of 0.05, so the data for the group can be declared normally distributed.

Following the completion of the Kolmogorov-Smirnov test, as outlined in the preceding presentation, an additional aspect of the normality of the data within the two groups of variables is the visual representation of a normality graph. The normality graph aims to examine the data distribution of a linear graph generated from the z-scores. The graph in Figure 3 depicts the results of the data normality test.

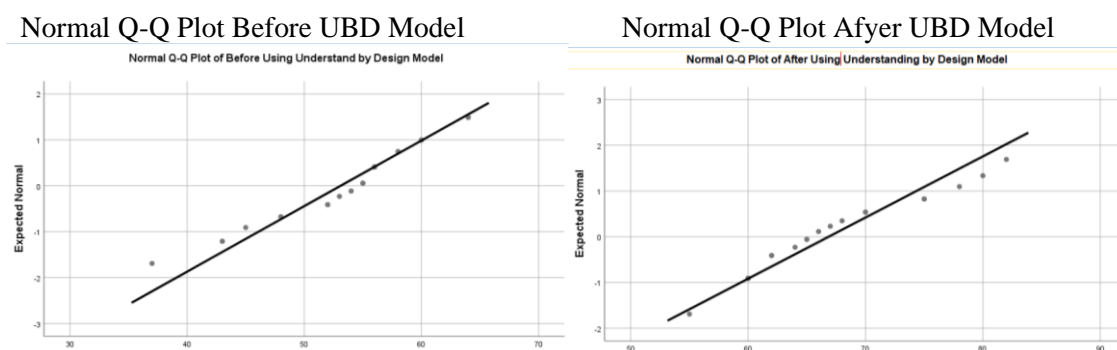


Figure 3. Graph of the Normality of Both Data Groups

Based on the findings presented in Figure 3, it can be observed that a linear relationship exists between the z-score and the data distribution for both groups of data. These groups include the data collected before the implementation of the UBD learning model using Pop-Up Book media and the data collected after the implementation of the UBD learning model using Pop-Up Book media. This indicates that the data within both groups of data exhibit a normal distribution.

After descriptively proving the effectiveness of improving student disaster literacy, the next thing to do is to test and prove the effectiveness of using the UBD learning model with Pop-Up Book media inferentially. This verification aims to compare two groups of data using t-tests related to that in this study. One hypothesis was tested, namely the effectiveness of the UBD learning model with Pop-Up Book media to improve student disaster literacy. If it is presented in the form of a statistical hypothesis, then the statistics tested in this study are $H_0 : \mu_1 \geq \mu_2$ dan $H_1 : \mu_1 < \mu_2$.

The statistical hypothesis of this study shows that H_0 means no change in the UBD learning model with Pop-Up Book media on student disaster literacy. In contrast, H_1 means a change in UBD's learning model with Pop-Up Book media on students' disaster literacy ability. To test the research hypothesis requires inferential statistical analysis (t-test). The hypothesis testing criterion is to reject H_0 if $P\text{-Value} < 0.05$ and the contrary. The inferential statistical analysis using the t-test revealed that the t-coefficient value was 19.252, with 20 degrees of freedom and a p-value of 0.00. The coefficient demonstrates a p-value less than 0.05. Therefore, it can be inferred that the H_0 is rejected or the H_1 is accepted. The present evidence demonstrates the substantial impact of UBD's learning model on enhancing students' disaster literacy by utilising Pop-Up Book media.

Based on statistical data in the results section, it can be described that this study shows that the UBD learning model using disaster mitigation Pop Up Book media can increase students' disaster literacy. Based on the results of statistical data, the value of H_0 is rejected, and H_a is accepted if it is converted as a positive coefficient which can be described that disaster literacy will increase. Applying the UBD learning model with Pop-Up Book media is even better. The observation results of applying

the UBD model to class III students of Percobaan Padang Elementary school can be described by applying the UBD learning model with a real advantage in its learning flow. Know and help determine the learning focus by providing trigger questions to improve students' thinking skills. The second step is finding evidence of assessment. In this case, the teacher wants to prove that students have achieved their desired goals. To prove this, students are asked to work on a group test. This is useful to help them analyze and compare learning topics, thereby measuring students' understanding. The final stage is planning the lesson; after the teacher identifies and analyzes the level of understanding of students, then the teacher plans to learn by arranging to learn so that it becomes effective.

Furthermore, it aligns with Sari's (2019) research on applying UBD in Newton's law material, which has similarities in preparation for learning, namely providing an initial assessment to determine students' abilities to develop effective learning in the future.

In addition, the implementation of this research shows that students' disaster literacy has increased. This can be proven from students' enthusiastic responses in learning activities when using media designed by the teacher, which adapts to the three syntaxes described previously. Based on the results of interviews with students, they are happy when reading Pop-Up Book media. Students become easy to understand learning material through Pop-Up Book media. Some students are new to this Pop-Up Book media, so it can be concluded that it not only provides cognitive understanding but also has the advantage of providing new insights into learning innovations. In line with the research of Arip & Aswat (2021) and Hasanudin et al. (2021), which state that innovation is the main thing in learning, innovation and renewal can arouse students' interest in learning, not only that learning becomes meaningful. Besides that, it is in line with the research of Soleha et al. (2022), Pambudi (2019), and Hasanudin et al. (2021) that Pop-Up Book media helps teachers in delivering material and makes learning easy and meaningful.

Conclusion

Based on the results and discussion above, it can be concluded that using Pop-Up Book media in the UBD learning model leads to a noteworthy enhancement in disaster literacy skills. The utilization of this model has the potential to enhance disaster literacy skills among elementary school students involved in disaster response efforts. The observed improvement in student learning outcomes scores supports the effectiveness of this learning model. The findings of this study proved that the UBD learning model using Pop-Up Book media is effectively applied to improving disaster literacy skills in the classroom.

The results of this study researchers suggest and recommend that teachers apply the UBD learning model using Pop-Up Book media. This is evidenced by the cheerful response of students and enjoying learning activities with Pop-Up Book media. In addition, applying the UBD learning model supports teachers in preparing learning media by paying attention to the characteristics of students, classroom management procedures to provide support, and great positive things for applying the UBD learning model in disaster literacy activities to the maximum.

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