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Development of Learning Tools and Disaster Mitigation Boxes Student Oriented Learning Model in Raising Student Awareness

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Abstract: This study aims to develop disaster mitigation learning tools in raising awareness of students in elementary schools. Research design using 4D models, namely define, design, develop, and disseminate. Disaster mitigation learning tools developed are disaster mitigation boxes, learning implementation plans, student worksheets. The data was collected with questionnaires and tests measuring students' disaster awareness. The testing phase is the stage to find out the effect of the use of disaster mitigation learning tools on increasing student awareness. Student awareness raising is determined based on N-Gain and paired t-test. The results showed the learning tools and disaster mitigation boxes developed were declared valid and reliable, worthy of use in terms of content and construction and influential in raising disaster awareness of learners.

Keywords: Disaster mitigation learning tools; Student oriented learning model; Student disaster awareness.

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Introduction

Disaster is an event or series of events that threaten and disrupt people's lives and livelihoods caused by natural and non-natural factors resulting in fatalities, environmental damage, property losses, and psychological impacts (Diposaptono, 2005). Disasters can happen at any time and no human being can know the time and place (Wibowo & Sudarsono, 2017). Disasters can occur while sleeping, working, worship, playing, and even while studying at school (Daima Ulfa &Mikdar, 2020). Teachers, students and other school devices are people affected in the event of a disaster during the learning process. Disaster preparedness is indispensable for them to reduce the impact of the disaster risk. According to law no. 24 of 2007 on disasters, preparedness is a series of activities carried out to anticipate disasters through appropriate and effective measures. Preparedness in the form of actions that enable governments, organizations, communities, communities and individuals to be able to respond to disaster situations quickly and appropriately (DAPS, 2006).

The school as one of the gathering places of many students is expected to have disaster preparedness programs so that disaster awareness arises for students and other school devices (Ramadhani et al., 2020). Instilling disaster awareness in learners is a process (Ayub, 2019). Disaster awareness is impossible to just appear without proper activities to instill it. The school is one of the places that can be used to instill disaster awareness to students. Learning activities that are done should use props, so as to make students happy to follow the learning. In accordance with the above opinion the learning process using props is believed to be better. Learning by using science kits provides motivation and improves the ability of the student process (Ayub, 2019). The above

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problems should be a means of introspection for teachers. Instropeksi to find the right models, methods and media used in learning (Djamarah, 2005).

One of the efforts to make learning that is able to instill disaster awareness in students is to create a learning medium in the form of a disaster mitigation box. Disaster knowledge is very necessary to be given to students (Suprapto, 2002). Learning tools are the right place to accommodate the ideas, ideas and thoughts above. Disaster mitigation learning tools developed include 5 aspects of disaster that are expected to be able to instill disaster awareness in students. Five aspects of disaster will be given gradually and systematically to students. These five aspects are disaster knowledge (PK), signs of disaster (TB), impact of risk and efforts to reduce (DR), preparedness (KN), and procedures, first aid equipment on victims (AP).

The development of learning tools covering 5 aspects is expected to cause disaster awareness for students. Disaster awareness that arises in students will increase the knowledge, skills, and attitudes of learners in dealing with when disasters occur. According to law no. 24 of 2007, disaster mitigation is a series of efforts to reduce the risk of disasters, both through physical development and awareness and improved ability to deal with disasters.

Disaster mitigation activities include the introduction and monitoring of disaster risk, giving rise to a culture of disaster awareness, the application of physical and non-physical efforts in disaster management arrangements, monitoring the use of technology, monitoring the implementation of spatial and environmental and other. These disaster mitigation activities will be applied to disaster mitigation learning in schools. Observations and interviews with teachers at SD Negeri 6 Mataram found that disaster mitigation learning tools have not been developed at all. This is because until now there is no disaster mitigation curriculum in schools.

Disaster mitigation learning in schools is very necessary in order for students' disaster awareness to increase. Student oriented learning model is a model of discovery (discovery learning) and based on problems. Students in student oriented learning have a major and large role. In this study, students are expected to be able to find problems, submit hypotheses, conduct activities to answer problems and find conclusions and apply them in life. In this study, disaster mitigation learning tools were designed with student oriented learning model in improving students' problem solving skills. The problem is how the characteristics of learning tools developed with student oriented learning are used to improve the problem solving skills of students and learning devices.

Disaster problem solving capability is a process of using the ability to answer a disaster problem. Indicators of problem-solving capabilities are (1) understanding problems, (2) planning problem solving, (3) implementing problem solving, (4) re-examining solutions (Sujarwanto et al., 2014). So student oriented learning is learning that is activity-oriented centered on students in finding problems, planning problem solving, carrying out problem solving, finding conclusions and communicating problem solving found (Subrata, 2001). Teachers are only facilitators in this learning. The teacher's explanation is only when needed, for example at the end of this activity the learner formulates a conclusion that means the problems that arise at the beginning of the learning should be answered, but the students still ask a lot to come here and the class is a little noisy. This is a sign that students still do not understand the concept that we teach so it needs a teacher explanation. More details of problem-solving learning structure can be seen in Table 1.

Table 1. Problem solving learning structure

No	Teaching Steps	Teaching Step Objectives
1.	Motivation	Arouse students' interest and curiosity in the subject matter to be taught
2.	Problem description	Formulating a scientific question
3.	Opinion Drafting	Formulation of hypotheses
4.	Planning and Construction	Preparation of the experimental equipment to be used
5.	Experiment	The embodiment of a natural reaction
6.	Conclusion	Conclusion of a troubleshooting procedure
7.	Abstraction	Legitimate scientific results
8.	Consolidation of knowledge through applications and practices	Comprehensive knowledge of natural symptoms and integration of educational outcomes

Klinger, (1997)

The problem is how the characteristics of disaster mitigation learning tools developed with student oriented learning are used to improve the problem solving skills of students and learning devices. Problem solving capability is a process of using the ability to answer a problem. Student oriented learning is learning

that is activity-oriented centered on students in finding problems, planning problem solving, carrying out problem solving, finding conclusions and communicating problem solving found (Ibrahim, 2000). This method has several advantages, including: 1) the development of self-reliance and independent activities of learners; 2) stimulation of the ability to plan, organize and carry out activities; 3) the development of responsibility for an activity, and 4) the introduction of working and thinking methods in the field of research. Discovery learning model positively affects students' learning outcomes (Sahidu et al., 2017).

Problem Based Learning model is problem solving related to learning materials, not how teachers deliver learning materials (Sugiyono, 2013). Problem-based learning models with experimental methods provide an authentic experience that encourages learners to learn actively (Lidiana et al., 2018). This is what encourages researchers to develop learning tools with student oriented learning models applied to disaster mitigation to increase student awareness.

Method

This research uses a type of research and development with 4D research design models namely Define, Design, Develop, and Dissemination At the Define stage, analysis of disaster mitigation materials, analysis of students' abilities, analysis of tasks to be given, concept analysis and analysis of learning objectives of disaster mitigation. The Design stage is carried out the design of learning devices. In the Develop stage, product manufacturing, product expert validation, product revision, testing tools evaluate disaster mitigation capabilities for the awareness of learners, while at the dissemination stage is only done in limited students, namely in class V SD Negeri 6 Mataram. Research data in the form of input data and suggestions from expert validators (qualitative data) and validation data of learning devices and trials of evaluation tools. Data collection tools in the form of expert validation questionnaires and disaster mitigation capabilities. Data analysis using validity test validator using average validator value, like equation (1), that is:

$$NA = \frac{V_1 + V_2 + V_3 + V_4}{4} \quad \text{..... (1)}$$

the results of the average value of validators are consulted in Table 2, the validity assessment criteria (Ratumanan & Laurens, 2011), i.e.

Table 2. Validity Assessment Criteria

Average	Category	Decision
1.00 – 1.75	Not Valid	Total revision
1.76 – 2.50	Fairly valid	Revision
2.51 – 3.25	Valid	Revisions as suggested
3.26 - 4.00	Very valid	No revision required

Expert validation data from disaster mitigation capability evaluation tool trials, analyzed with Percentage Agreement (Borich, 1994), like equation (2), that is:

$$Percentage\ Agreement = \left(1 - \frac{A-B}{A+B}\right) 100\% \quad \text{..... (2)}$$

By criteria, reliabel ≥ 75%, Percentage Agreement is the percentage of agreement between the assessor which is a percentage of the suitability of value between the first and second assessors. Where A is a larger assessor score and B a smaller appraiser score. The improved quality of disaster mitigation is seen from the N-Gain value. According to Halpern, (1998), the N-Gain value is calculated by equation (3), that is:

$$< g >= \frac{S_{post} - S_{pre}}{S_{maks} - S_{pre}} \quad \text{..... (3)}$$

where, $< g >$ is the N-Gain score, S_{post} is posttest score S_{pre} is pretest score, and S_{maks} maximum score.

Table 3. N-Gain Score Criteria

No	N-Gain Score Classification	Category
1	$0.7 < \langle g \rangle \leq 1$	High
2	$0.3 < \langle g \rangle \leq 0.7$	Medium
3	$\langle g \rangle \leq 0.3$	Low

The analysis of pretest and posttest data is statistically analyzed using pair t-test at the level of significance (p-value) of 0.05. Previously tested the normality of the sample. Homogeneity tests are conducted to convince hypothetical tests to be conducted. The research hypothesis tested, namely Ha (student-oriented learning model disaster mitigation learning tool is effective against increasing student awareness), and Ho (student-oriented learning model disaster mitigation learning device is ineffective to increase student awareness).

Result and Discussion

Research products in the form of disaster mitigation boxes, learning implementation plans and student worksheets such as in figure 1 and figure 2.

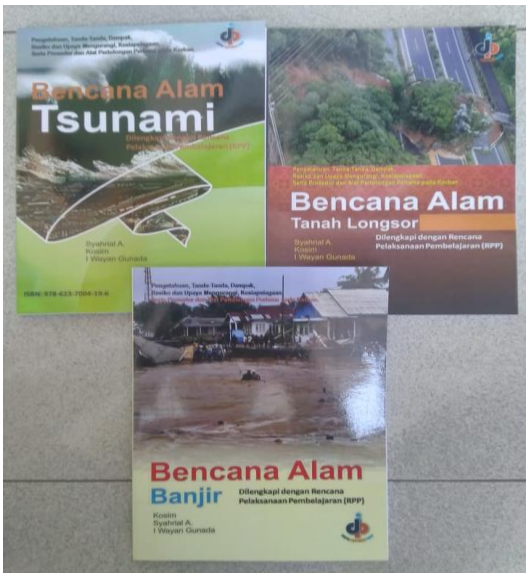

Figure 1. Natural disaster book products containing Learning Program Plan and Student Worksheet (SW)

Figure 2. Disaster mitigation box products

Validation results from disaster mitigation experts and expert lecturers using a scale assessment of 4, against disaster mitigation box props based on image quality, content quality and objectives, learning quality, obtained an average score of 3.56 with a category is very feasible to use. The criteria are very feasible to be used also obtained for Learning Program Plan and Student Worksheet (SW) which get scores of 3.75 and 3.82, respectively. So that overall can be stated box props and disaster mitigation learning devices are very feasible to be used for disaster learning (according to the criteria of assessment validity Table-2).

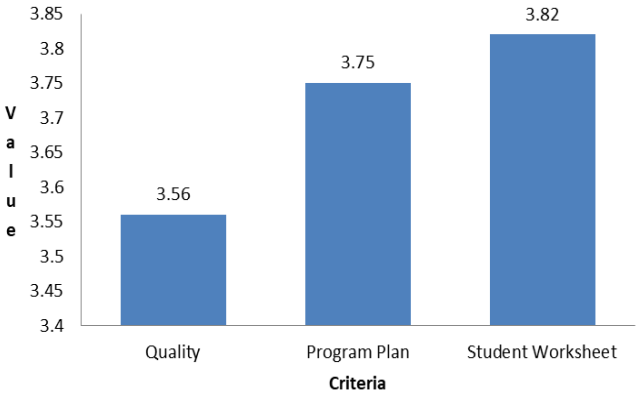

Figure 3. Validation results of learning tools and disaster mitigation boxes

The results of the analysis of percentage agreement (PA) values from validators to student disaster mitigation learning tools can be seen in Table 4.

Table 4. Reliability Analysis of Expert Validators

Products	PA Value of Validator (%)						V	Description
	V_{12}	V_{13}	V_{14}	V_{23}	V_{24}	V_{34}		
Box	98	93	100	90	95	100	96	Reliabel
Learning Program Plan	100	98	93	98	96	91	96	Reliabel
SW	94	90	98	88	100	100	94	Reliabel
Assay	96	98	94	99	97	100	97	Reliabel

Disaster awareness in this study, including disaster knowledge (PK), disaster signs (TB), risk impacts and efforts to reduce (DR), preparedness (KN), and procedures, first aid equipment on victims (AP) (Ayub, 2019). The pretest includes the 5 disaster awareness knowledge and skills outlined above. Problems that meet the requirements are used to measure the learner's initial ability. After the pretest, then conducted disaster mitigation learning as many as 5 meetings. The five meetings were 1) PK, 2) TB, 3) DR, 4) KS, and 5) AP. Posttest was conducted at the sixth meeting using improved pretest questions. Pretest and posttest results shown in Figure 4.

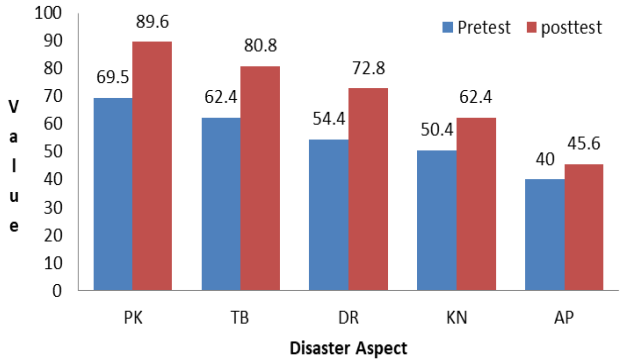

Figure 4. Pretest graph and Posttest Results of Learning disaster mitigation and Aspects of Bencan Awarenessa

Pretest and posttest data used to calculate N-Gain in Table 5.

Table 5. Data Gain Score of each Aspect of Disaster Awareness

AKB	Initial Test	Final Test	Gain Score	Criteria
PK	69.60	89.60	0.89	High
TB	62.40	80.80	0.62	Medium
DR	54.40	72.80	0.49	Medium
KN	50.40	62.40	0.29	Low
AP	40.00	45.60	0.11	Low

Table 5 is an indicator that learning tools and disaster mitigation boxes can be used for disaster learning in primary schools. Gain Score of disaster awareness learning results shown in Figure 5.

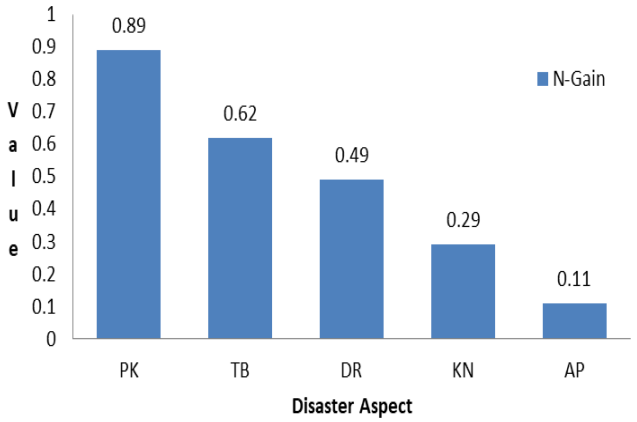

Figure 5. Graph of Gain Score of Disaster Awareness Learning Results

The response of students to learning with disaster mitigation box props was 83.5% of students expressed delight, 73.6% of students expressed easy understanding and 81.43% expressed useful.

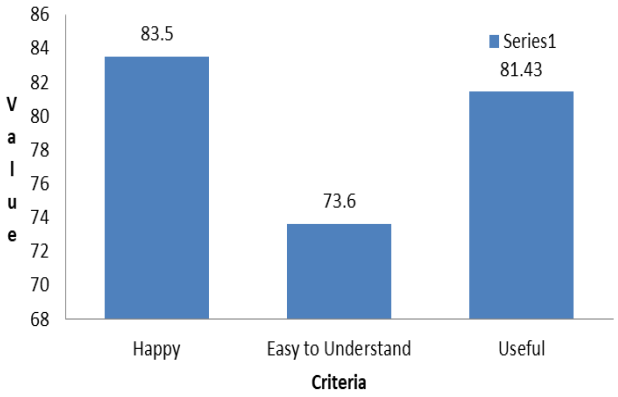

Figure 6. Student Response to Learning with Disaster Mitigation Box

Assessment of the learning process conducted by observers obtained results, aspect 1) learning preparation obtained a score of 3.85 with excellent criteria, aspect 2) the implementation of learning obtained a score of 3.91 with excellent criteria, and aspect 3) the activities of learners in learning obtained a score of 3.89 with very good criteria. Overall, according to observers disaster learning goes very well.

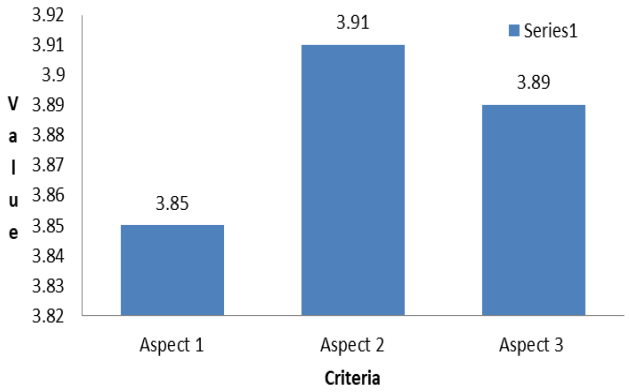

Figure 7. Observer's Assessment of the Learning Process

Based on the data of disaster awareness learning outcomes and improved scores of learning outcomes illustrated that learning with disaster mitigation box props affects the disaster awareness of learners.

Normality tests, t-tests and homogeneity tests are conducted using SPSS 23.0. The paired t-test used is a different parametric test on two paired data. In accordance with this understanding, this test is intended for different tests or comparative tests on average two pairs of samples. The two samples in question are the same sample but have two data. Paired t-test is part of parametric statistics, therefore as the rules of parametric statistics research data must be distributed normally. Normal distributed means that pretest and posttest scores have the appropriate proportions between high, medium, and low scores. The score is not concentrated on high, low, or moderate scores only. Kolmogorov-Smirnov normality test can be seen in Table 6.

Table 6. Pretest and posttest normality test results

Criteria	Unstandardized Residual
Kolmogorov-Smirnov Z	0.739
Asymp. Sig. (2-tailed)	0.646

The Kolmogorov-Smirnov normality test is part of a classic assumption test that aims to find out if the residual value is normally distributed or not. A good regression model is to have residuals that are normally distributed. The hypothesis formulation on the normality test is, Ho; normally distributed residual

values, and Hi; residual value is not nomal distributed. The basis for conclusion, if the significance value (sig.) > 0.05 then Ho is accepted, Hi is rejected meaning the residual value is normally distributed. If significance (sig.) < 0.05 then Hi is accepted, Ho is rejected meaning the residual value is not normally distributed. Kolmogorov-Smirnov's normality test results showed a value of 0.649 greater than 0.05, meaning that the pretest and posttest in this study were normally distributed. After the normality test is conducted, a paired t-test is conducted to determine the effectiveness of the use of learning devices and disaster mitigation boxes. The results of the paired t-test can be seen in Table 7.

Table 7. Paired t-test pretest and posttest test results

Criteria	t	df	Sig. (2-tailed)
pretest - posttest	-11.299	24	0.000

The basis of decision making test results paired t-test is; 1) if the value is Sig. (2-tailed) < 0.05, then there is a significant difference between pretest and posttest; 2) if the Sig. (2-tailed) value > 0.05, then there is no significant difference between pretest and posttest. Table 6 showing Sig values. (2-tailed) 0.000 < 0.05, it can be concluded that there is a significant difference between pretest and posttest in learning using disaster mitigation devices and boxes at SD Negeri 6 Mataram. This indicates the effectiveness of the use of learning devices and disaster mitigation boxes to the awareness of learners.

The learning structure of disaster mitigation model of student oriented learning consists of 3 main stages of learning, namely initial activities, core activities and stabilization activities. Each of the main stages has a purpose. The initial activity is intended to motivate students and make students interested and long for learning. If this has been achieved, it is easy for teachers to achieve their learning goals. The core activities are characterized by problems raised by students through teacher guidance. The teacher formulates and notes on the board. Problems should not be answered directly by the teacher. Teachers are expected to only ask for temporary answers (hypotheses) from students. The hypothesis presented by the students should not be blamed or justified by the teacher, just accommodated because it is expected that later at the end of the core activities will be answered by themselves from the activities carried out. Furthermore, the teacher accompanies the students to do activities in answering the problems that have been formulated. Through activities, observations, discussions and based on the basis of appropriate theory, it is expected that with the facilitation of teachers, students are able to get their own conclusions. Finally, the teacher explains the application of concepts that have been found in life. We recommend that examples of application exist in the environment of the learners taught.

Table 8. learning structure of student oriented learning

Main Stage	Learning Stage	Alternative Activities
Early activities	- Introduction	- demo tools brought by teachers - video playback - storytelling/events - sing - review - observe the environment - phenomenon - aperception
Core activities	- Problem formulation	- formulate questions and be written
	- Activities to answer problems	- practice/experimentation - game/simulation - grouping - check disaster mitigation tools - check technical tools - first aid to the victim
	- Observation	- make as many observations as possible
	- Troubleshooting	- student explanation (guess-guess-discussion) - the foundation of thought
	- Conclusion	- learners formulate conclusions
Stabilization Activities	- Teacher Explanation (when required)	- application - answer questions - create a summary - homework

(Ayub, S. 2019)

The student-oriented learning structure in table 8 was developed from the SEQIP training program to improve the teaching quality of teachers in elementary schools. This structure is applied to the development of learning implementation plans and student worksheets as well as disaster mitigation boxes. The disaster mitigation box contains; 1) book of natural disasters earthquakes, tsunamis, landslides and floods containing 5 aspects of disasters, Learning Program Plan and Student Worksheet (SW); 2) aspects of disaster awareness containing disaster knowledge (PK), disaster signs (TB), impact of risks and efforts to reduce (DR), preparedness (KN), and procedures and tools of first aid to victims (AP). The application of learning tools and the student-oriented learning model disaster mitigation box is effective in increasing Raising Student Awareness. This is in line with the findings (Widodo, E., 2014) that teachers and students respond very well to disaster mitigation learning tools, and Suhardjo, D., (2011), explaining disaster mitigation education in the context of DRR (Disaster Risk Reduction) as Following this, it must be done through formal education in the National Education System (Diknas) program with a curriculum design from the National Education Standards Agency (BSNP). Then, Ayriza, Yulia. (2011) concluded that there is a significant increase in teacher skills in implementing personal-social guidance services with the aim of increasing students' psychological readiness in dealing with natural disasters between before and after training in implementing guidance modules, both in helping students understand the ins and outs of natural disasters, managing student affections, at the time before and after a disaster, as well as the skills to guide students in mastering various procedures and skills to save themselves in disaster situations. Tohani, E. (2019), this research results in findings that social capital makes a positive contribution to developing disaster-resilient communities even though its existence is not realized in social life. Dwiningrum, A.,I.,S., (2020), The resilience of students should be understood by the teacher. Teacher efforts to build and develop personal resilience because they are needed to build more effective school resilience. Resilience has the readiness to play a role in disaster mitigation. Disaster mitigation requires social synergy between the roles of principals, teachers, and students in order to build strong social cohesion. Wedyawati, N. (2017), there is a significant difference in student learning outcomes in the experimental class and the control class. The results of the questionnaire data analysis show that the integrated science learning model for disaster mitigation is very strong. Muhammad A., (2019), concluded that, the PAI learning material in the 2013 Curriculum has a subject/sub-topic that can be integrated with the insight into natural disaster mitigation. Agustiana, T., (2013) found that the understanding and stress resistance of students who were taught with the disaster mitigation learning model was better than the understanding of students taught with the conventional learning model. A. Rusilowati, (2012), products of five features of learning models such as: syllabus, lesson plans, learning methods, teaching materials, as well as techniques and types of assessment developed including science material for grades IV, V, VI of elementary school and VII, VII, IX of junior high school. The results of the dissemination show that the learning tools developed are appropriate for giving to students, and can improve students' understanding in disaster and environment. Yerizon, (2020), the development of learning tools based on discovery learning models oriented toward natural disaster mitigation, can be a solution to introduce junior high school/MTsN students about natural disaster mitigation. The research results presented earlier show that learning tools and disaster mitigation tools make a significant contribution to the knowledge, skills, and attitudes of students in disaster mitigation, so that they are expected to be able to raise students' disaster awareness.

Conclusion

Learning tools and disaster mitigation boxes developed are declared valid and reliable, worthy of use in terms of content and construction and influential in raising awareness of disaster learners.

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