Received: 05 June 2024; Revised: 15 June 2024; Accepted: 25 June 2024

Implementation of the OrSAEv Learning Model on Tsunami Mitigation Knowledge in Students: A Case Study in Secondary Schools

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ABSTRACT - This study aims to evaluate the application of the OrSAEv (Orientation, Prepare, Action, and Evaluation) learning model in increasing tsunami mitigation knowledge among students at the secondary school level. This research was conducted in one class consisting of 28 students. The main focus of this model is the provision of theoretical knowledge about tsunami mitigation followed by actions in the form of self-evacuation simulations during tsunamis. This study uses a quantitative descriptive method with the measurement of students' knowledge before and after the application of the OrSAEv model. Data was obtained through pre-tests and post-tests related to tsunami mitigation. The results of the study showed a significant increase in student's knowledge after the application of the OrSAEv model, especially after conducting evacuation simulations. Students showed a better understanding of taking action when a tsunami disaster occurred. These findings indicate that the OrSAEv learning model can be an effective alternative in disaster mitigation education in schools, especially in improving students' preparedness and skills in dealing with disaster emergencies.

Keywords: Disaster mitigation, Tsunami, Education simulation, Student knowledge, High school

ABSTRAK – *Penelitian ini bertujuan untuk mengevaluasi penerapan model pembelajaran OrSAEv (Orientasi, Siapsiaga, Aksi, dan Evaluasi) dalam meningkatkan pengetahuan mitigasi tsunami pada peserta didik di tingkat sekolah menengah. Penelitian ini dilakukan pada satu kelas yang terdiri dari 28 siswa. Fokus utama dari model ini adalah pemberian pengetahuan teoretis tentang mitigasi tsunami yang diikuti dengan aksi berupa simulasi evakuasi diri saat terjadinya tsunami. Penelitian ini menggunakan metode deskriptif kuantitatif dengan pengukuran pengetahuan peserta didik sebelum dan sesudah penerapan model OrSAEv. Data diperoleh melalui pre-test dan post-test terkait mitigasi tsunami. Hasil penelitian menunjukkan adanya peningkatan signifikan pada pengetahuan peserta didik setelah penerapan model OrSAEv, terutama setelah melakukan simulasi evakuasi. Peserta didik menunjukkan pemahaman yang lebih baik dalam mengambil tindakan saat terjadi bencana tsunami. Temuan ini mengindikasikan bahwa model pembelajaran OrSAEv dapat menjadi alternatif efektif dalam pendidikan mitigasi bencana di sekolah, khususnya dalam meningkatkan kesiapsiagaan dan keterampilan peserta didik dalam menghadapi situasi darurat bencana.*

Kata Kunci: *Model pembelajaran OrSAEv, Mitigasi bencana, Tsunami, Simulasi evakuasi, Pengetahuan peserta didik, Sekolah Menengah.*

INTRODUCTION

Indonesia is one of the countries that is prone to geological disasters such as landslides, volcanic eruptions, masswasting, earthquakes, and tsunamis. In 2005, Indonesia ranked 7th out of a number of countries most affected by natural disasters (ISDR, 2009). The Indonesian archipelago is located between the Asian Continent and Australia, and is located at the confluence of the world's three main plates, namely the Indo-Australian Plate, the Eurasian Plate, and the Pacific Plate or also known as the ring of fire area (Primus, 2014:1). History records several major tsunami disasters that resulted in material losses and casualties, such as the Aceh tsunami in 2004 and the tsunami in Palu in 2018. This geographical condition demands the importance of disaster mitigation education for the community, especially among students, so that they have adequate knowledge and preparedness in dealing with the threat of natural disasters.

Disaster mitigation education is an important effort in equipping students with knowledge and skills to minimize the impact of disasters. One approach that can be used to improve disaster mitigation knowledge in schools is the OrSAEv (Orientation, Prepare, Action, and Evaluation) learning model. This learning model is designed not only to provide theoretical knowledge about disaster mitigation, but also to involve students in simulation activities, so that they can immediately practice the important actions that must be taken when a disaster occurs.

The right learning so that students can recognize potential disasters is to use simulation methods or direct action when faced with a disaster situation (Madlazim, et al., 2019). This is supported by the statement by Steward & Wan (2007) in his research on the role of simulation in disaster management can measure a person's preparedness to face disasters. According to Olson et. Al, (2010) in his research also stated that education about disaster preparedness using simulations in the form of games or games can provide better results than those that do not use simulations. This simulation provides practical experience that can strengthen students' understanding of the appropriate evacuation steps. In this study, the OrSAEv model was applied to a class of 28 students to measure its effectiveness in increasing disaster mitigation knowledge, especially tsunami mitigation.

Based on this background, this study aims This study aims to measure the increase in tsunami mitigation knowledge in students after the implementation of the OrSAEv learning model, which includes a simulation of self-evacuation during a tsunami. The results of this study are expected to contribute to the development of a more effective learning model in the context of disaster mitigation education in secondary schools.

LITERATURE REVIEW

Research on disaster mitigation, particularly tsunami mitigation, has grown rapidly in recent years. Disaster mitigation is the measures taken to minimize the risks and impacts of natural disasters on humans and the environment. In the context of education, disaster mitigation needs to be taught so that students have adequate awareness and knowledge to act appropriately in emergency situations (Indriani, et al., 2024). Indonesia continues to improve itself in disaster management, one of the ways is by instilling disaster management attitudes through the education system. Schools as one of the most effective media of science transformation are expected to be able to absorb and be able to apply knowledge of disaster preparedness by using the right and correct methods, schools need to make disaster prevention one of the teaching and learning activities. This is an important first step in building disaster resilience for the entire community (Nuraeni, et al., 2020).

Disaster Mitigation Education in Schools

Education as a system that plays a role in fostering students to have knowledge. Knowledge is a key factor and is key to preparedness. Knowledge can usually lead to attitudes and concerns to be ready to be on standby in anticipation of disasters (Priyanto, 2006). Preparedness is one part of the disaster management process and in the concept of disaster that is developing today, the importance of preparedness is one of the important elements of disaster risk reduction prevention activities (Primus, 2015). Raser and Morrissey, (2003) found that a better understanding of the psychological response to a natural disaster warning situation will help people feel more confident, better able to control and prepare better psychologically and prepare for more effective emergency planning. The knowledge possessed can usually affect people's attitudes and concerns to be ready and alert in facing disasters, especially for those who live in coastal areas that are vulnerable to natural disasters (LIPI, 2006). Research conducted in New Zealand found that the feeling of being able to prevent the danger of earthquakes can be improved by intervention through filling out a knowledge questionnaire about earthquakes followed by explanations aimed at eliminating gaps or misconceptions about knowledge about earthquakes. The results of the study showed that respondents' knowledge about earthquakes was related to their level of preparedness to face earthquakes. With knowledge, it will increase the ability of residents to prepare themselves better from earthquakes or other disasters (Priyanto, 2006).

According to Adiyoso and Kanegae (2013:58), schools play an important role in building disaster knowledge and awareness in the community. Schools have several functions in disaster risk reduction including facilitating and collaborating with the surrounding environment, one of which is by increasing community knowledge and skills. Schools teach children all forms of education, both academic and non-academic, through subject teachers. Science learning plays an important role in striving for disaster prevention. Disaster mitigation education in schools is very important considering the vital role of students as part of society who must be ready to face disaster risks. According to Mochizuki and Chang (2017), disaster mitigation education in schools can increase the capacity of the community to respond to disaster threats more effectively. In the educational curriculum in disaster-prone countries, such as Indonesia, disaster mitigation materials should be explicitly included to improve students' preparedness for potential disasters in their environment.

OrSAEv Learning Model

The OrSAEv learning model is a natural disaster learning that was developed specifically to increase students' readiness which is supported by the use of action activities in the form of real simulations in each learning activity (Madlazim, et al., 2019). The OrSAEv learning model is supported by current learning theories (constructivism, observational learning, discovery learning, cognitive processes, behavioral learning theory, multirepresentation and scaffolding) (Madlazim: 43, 2019). The OrSAEv Learning Model has four phases, namely: (1) Orientation (Or); (2) Ready to Standby (S); (3): Action (A); and (4) Evaluation (Ev). The instructional impact of the OrSAEv learning model is to improve disaster preparedness, especially disaster knowledge, disaster response attitudes, and post-disaster evacuation skills. The impact that accompanies the OrSAEv learning model is to increase knowledge, awareness and motivation for students who are in the environment and nature in Indonesia that is prone to disasters in particular (Madlazim, et al., 2019).

The OrSAEv (Orientation, Prepare, Action, and Evaluation) learning model is one of the innovations in disaster mitigation learning designed to provide students with hands-on experience on how to deal with disasters. Simulation as part of action learning has been proven to be effective in improving students' understanding of disaster mitigation, especially in responding to critical situations such as tsunamis. According to Lin et al. (2015), simulation-based learning has a significant impact in improving disaster mitigation knowledge and skills in students. This is due to the first-hand experience that students gain through evacuation practices or rescue actions. Simulations provide opportunities for students to train themselves in real disaster situations so that they become more prepared and calm in facing emergencies.

Effectiveness of Simulation-Based Learning

Several other studies have also shown that simulation-based learning can significantly improve students' ability to respond to disasters. For example, Setiawan and Purnama (2016) found that disaster evacuation simulations in schools in Indonesia were able to increase students' preparedness in dealing with earthquakes and tsunamis. In their research, they stated that "regular and structured simulations not only increase students' knowledge but also prepare them to act calmly when disasters occur" (Setiawan & Purnama, 2016, p. 35).

The ability of students to understand the potential for disasters around their residence is very important, this knowledge and skills are very helpful information in the event of a disaster as an early anticipation through attitudes and values that encourage prosocial, educate participants to act responsibly and responsively when their families and communities are threatened (Masitoh, 2018: Supriyono, 2014).

From various studies that have been conducted, it can be concluded that learning models involving simulations such as OrSAEv have great potential to increase students' knowledge and preparedness in dealing with natural disasters, especially tsunamis. This study supports the use of the OrSAEv learning model in the context of disaster mitigation education in secondary schools.

Knowledge

Knowledge is the result of knowledge that occurs through sensory processes, especially eyes and ears towards certain objects (Madlazim, et al., 2019). Knowledge is a very important object for the formation of overt behavior. Behaviors based on knowledge are generally lasting (Sunaryo, 2013). Knowledge related to disaster preparedness in disaster-prone groups is the main focus. Knowledge is a very important domain for the formation of one's actions. Various experiences show that preparedness to face disasters is often neglected in people who have not had direct experience with disasters (Ridha, 2017).

According to Bloom, the educational context in order to develop educational goal tools that are oriented towards behavioral objectives that are observable and measurable scientifically regarding the three categories or "domains" of behavior mentioned above. Broadly speaking, Bloom's behavioral taxonomy includes 1) the cognitive domain, which includes memory or recognition of certain facts, procedural patterns, and concepts that allow the development of intellectual abilities and skills (Huda, 2013:169); 2) the affective realm, the domain related to the development of feelings, attitudes, values, and emotions; 3) the psychomotor realm, the realm related to manipulative activities or motor skills (Degeng, 2013:202). The development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution.

Bloom's taxonomy in 1956 was outlined in a book The Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook I: Cognitive Domain. The book that explains the education classification system is referred to as the Handbook. The handbook was then revised for two reasons: 1) there was a need to redirect educators' focus on the handbook, not just as a historical document, but also as a work that in many ways had "precedes" its time (Rohwer and Sloane, 1994 in 2014). Anderson and Krathwohl, 2010); 2) the need to integrate new knowledge and ideas in a framework for the categorization of educational goals. Advances in this treasure trove of knowledge support the need to revise the Handbook (Anderson and Krathwohl, 2010). From the three domains mentioned above, this study will discuss the cognitive domain consisting of six main categories, specifically discussing the cognitive domains C1 to C6.

In Bloom's taxonomy, the two-dimensional formulation of an objective contains one verb and one noun. Verbs generally describe the cognitive processes expected of learners, while nouns describe knowledge that learners are expected to master or construct (Anderson & Krathwohl, 2010). According to Bloom, cognitive processes are all efforts that involve brain activity. Initially, Bloom's taxonomy only had one dimension, namely the cognitive process dimension which consists of six levels of thinking process, namely: (1) knowledge/memorization/memory, (2) comprehension, (3) application, (4) analysis, (5) synthesis, (6) evaluation (Sudijono, 2011). However, after the revision of Bloom's taxonomy, it is now two dimensions, namely the knowledge dimension and the cognitive process dimension.

In the Revised Bloom Taxonomy, changes are seen in three main departments. These are 1.Terminology, 2. Structure and 3. Emphasis. Terminological changes, Constitutively, statements belonged to Bloom’s six main departments are transformed from noun to verb. Structural changes can be seen as a sharp shift at first glance. The original taxonomy was a one-dimensional form. With the addition of the outcomes, the Revised Bloom Taxonomy has turned into a form of two-dimensional table. Changes in emphasis are placed upon its use as a "more authentic tool in terms of curriculum planning, instructional delivery, and assessment"(Tutkun, 2012).

METHODOLOGY

This study uses a quantitative descriptive approach to evaluate the application of the OrSAEv learning model in increasing tsunami mitigation knowledge in students. The research design carried out is a quasi-experimental research with a one-group pretest-posttest design. In this design, there is a group of students who are given a pretest to measure their initial knowledge about tsunami mitigation, then given treatment in the form of applying the OrSAEv learning model and ending with a posttest to measure the increase in knowledge after the intervention. The subject of this study is students at the high school level which totals 28 students in one class in Panggungrejo district, Blitar Regency which is 2.5km from the beach. The selection of subjects is carried out by purposive sampling, which is based on the consideration that the student is in a disaster-prone area and has followed the relevant curriculum.

This research procedure is carried out through several stages, namely: 1. Orientation: Students are given basic knowledge about tsunamis, their causes, impacts, and mitigation steps that must be taken. 2. Prepare: Students learn more deeply about how to prepare themselves and their families for the threat of a tsunami, such as how to create an evacuation plan. 3. Action: Students simulate self-evacuation when a tsunami occurs. In this stage, students are asked to take part in simulations designed to practice their skills in making decisions and acting quickly when a tsunami disaster occurs. 4. Evaluation: After the simulation, students reflect and evaluate the steps they have taken during the simulation, as well as being given feedback from the teacher to improve their preparedness. The instrument used in this study is a knowledge test about tsunami mitigation.

This test is in the form of multiple choice designed to measure students' understanding of tsunami mitigation concepts before and after learning. This instrument is validated first and tested for reliability. The data in this study was collected through Pretest and Posttest which were carried out before and after the application of the OrSAEv learning model to measure the improvement of students' knowledge. The data obtained were analyzed using descriptive statistical analysis to describe the increase in student knowledge. In addition, a paired t-test was used to test the significant difference between the pretest and posttest values if the data was normally distributed and the Wilcoxon test was used if the data was not normally distributed. Tests were conducted to determine whether the OrSAEv learning model is effective in increasing tsunami mitigation knowledge.

The data obtained were analyzed using descriptive statistical analysis to describe the increase in student knowledge. In addition, a paired t-test was used to test the significant difference between the pretest and posttest values if the data was normally distributed and the Wilcoxon test was used if the data was not normally distributed. Tests were conducted to determine whether the OrSAEv learning model is effective in increasing tsunami mitigation knowledge. The success criteria in this study were determined by a significant increase in the average score of the post-test compared to the pretest. If there is a significant difference between the two values, then the OrSAEv learning model is considered effective in increasing tsunami mitigation knowledge in students.

RESULT AND DISCUSSION

Result

Data from this study was obtained through pre-test and post-test activities using questions that were prepared to measure students' knowledge. The following is presented data on the results of the pre-test and post-test of grade VII students of Secondary Schools in Blitar Regency, namely SMPN 2 Panggungrejo

Table 1. Data on the Results of the Student Knowledge Test

NO	Student	*X pre*	*Xpost*	*X post- X pre*	*Xmax- Xpre*	*N-Gain*	Category
1	AK	41,7	66,7	25	58,3	0,43	Medium
2	AS	50	83,3	33,3	50	0,67	Medium
3	AI	41,7	75	33,3	58,3	0,57	Medium
4	ATSW	50	66,7	16,7	50	0,33	Medium
5	AFW	16,7	58,3	41,6	83,3	0,50	Medium
6	BAB	75	91,7	16,7	25	0,67	Medium
7	DD	41,7	75	33,3	58,3	0,57	Medium
8	EN	58,5	75	16,5	41,5	0,40	Medium
9	FAI	50	91,7	41,7	50	0,83	High
10	HAR	25	66,7	41,7	75	0,56	Medium

NO	Student	*X pre*	*Xpost*	*X post- X pre*	*Xmax- Xpre*	*N-Gain*	Category
11	JDA	33,3	66,7	33,4	66,7	0,50	Medium
12	LS	16,7	66,7	50	83,3	0,60	Medium
13	MNA	50	66,7	16,7	50	0,33	Medium
14	MAP	41,7	83,3	41,6	58,3	0,71	High
15	MAM	16,7	50	33,3	83,3	0,40	Medium
16	MHN	50	83,3	33,3	50	0,67	Medium
17	NRH	41,7	66,7	25	58,3	0,43	Medium
18	PS	50	91,7	41,7	50	0,83	High
19	RS	33,3	50	16,7	66,7	0,25	Low
20	RSA	41,7	66,7	25	58,3	0,43	Medium
21	RA	41,7	66,7	25	58,3	0,43	Medium
22	RYA	16,7	66,7	50	83,3	0,60	Medium
23	SCS	50	66,7	16,7	50	0,33	Medium
24	SEP	41,7	50	8,3	58,3	0,14	Low
25	SMP	41,7	75	33,3	58,3	0,57	Medium
26	VTA	41,7	58,3	16,6	58,3	0,28	Low
27	WH	50	75	25	50	0,50	Medium
28	YI	33,3	75	41,7	66,7	0,63	Medium
			Average			0,51	Medum

Description: Xpre: Pretest score; Xpost: Posttest score

Based on the results of the N-Gain analysis in Table 1. Students experienced an increase in knowledge in the medium category. This shows that the learning tools developed with the OrSAE model are effective in improving students' knowledge.

Knowledge mastery was also analyzed for each category of cognitive level and knowledge dimension of students. The data on the percentage of completeness of the cognitive level of students at each cognitive level is shown in Figure 1.

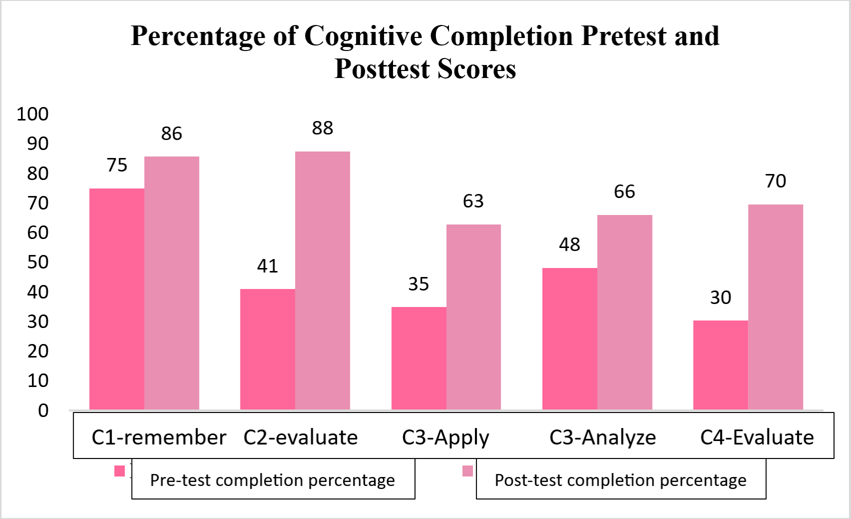

Figure 1. Graph of the percentage of completeness of students' knowledge at each cognitive level

Based on the data presented in Figure 1, the C3-Apply knowledge domain is the indicator with the lowest mastery, which is 63% in the posttest score. The completeness of the knowledge dimension is presented in Figure 2 as follows.

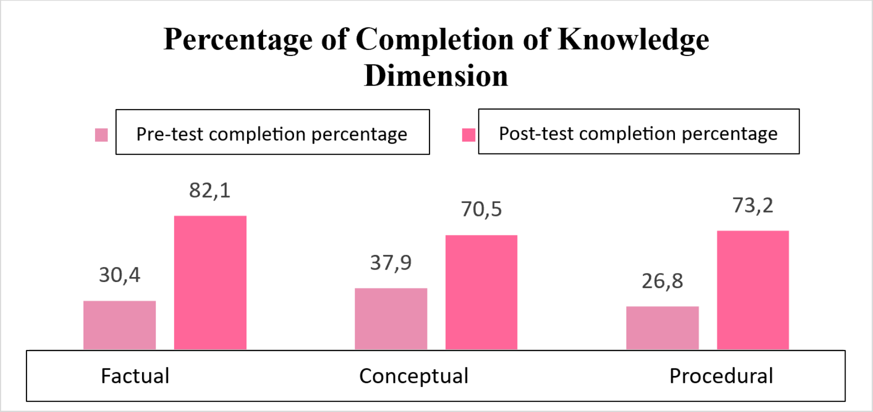

Figure 2. Graph of the percentage of student completion for each dimension of knowledge

It is essential to conduct a sensitivity analysis of the test items to evaluate their effectiveness in distinguishing between students who have undergone instruction and those who have not. In other words, this analysis serves to measure the degree to which the test items are responsive to the instructional process. Table 2 provides the detailed results of the sensitivity analysis for the test items.

Table 2. Results of the Sensitivity Analysis on Test Items

No	Cognitive domain	Dimension	Rb	Ra	%Rb	%Ra	Sensitivity	Category
1	C1	Conceptual	20	27	71,4	96,4	0,3	Sensitive
2	C2	Factual	3	23	10,7	82,1	0,7	Sensitive
3	C3	Conceptual	6	14	21,4	50,0	0,3	Sensitive
4	C3	Conceptual	6	18	21,4	64,3	0,4	Sensitive
5	C4	Conceptual	11	19	39,3	67,9	0,3	Sensitive
6	C3	Procedural	13	22	46,4	78,6	0,3	Sensitive
7	C3	Konceptual	6	15	21,4	53,6	0,3	Sensitive
8	C4	Factual	14	23	50,0	82,1	0,3	Sensitive
9	C2	Conceptual	18	26	64,3	92,9	0,3	Sensitive
10	C3	Procedural	17	25	60,7	89,3	0,3	Sensitive
11	C5	Conceptual	2	20	7,1	71,4	0,6	Sensitive
12	C5	Conceptual	14	21	50,0	75,0	0,3	Sensitive

Description

Rb : Number of students answering correctly in the pretest

Ra : Number of students answering correctly in the post-test

Based on Table 2, the test items used in the learning process to measure students' knowledge are categorized as sensitive. This indicates that the developed test items are effective for assessing students' knowledge after the implementation of the OrSAEv learning model.

To further validate that the OrSAEv learning model contributes to the improvement of students' knowledge, a statistical test is performed to determine the effect of using the OrSAEv learning tools. If the data follow a normal distribution ($p > 0.05$), a paired t-test is conducted. If the data are not normally distributed, a non-parametric statistical test using the Wilcoxon test is applied. The normality test in this study employs the Shapiro-Wilk method, as the number of students involved as research subjects is fewer than 50. The results of the normality test for students' pretest and posttest are presented in Table 3.

Table 3. Test of Normality of pretest dan posttest

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Nilai	Statistic	df	Sig.	Statistic	df	Sig.
Results of student knowledge	Pre-test	,241	28	,000	,894	28	,008
	Post-test	,201	28	,005	,920	28	,034

a. Lilliefors Significance Correction

Based on the data presented in Table 3, the significance value of students' knowledge results is less than 0.05 (sig < 0.05), indicating that the data are not normally distributed. Consequently, the Wilcoxon non-parametric test is applied.

The Wilcoxon test is conducted to determine whether there is a significant difference between the pretest and posttest results, which implies whether the implementation of the learning tools and activities using the OrSAEv model has an impact. The results of the Wilcoxon test are presented in Table 4.

Table 4. Wilcoxon Test

Ranks				
		N	Mean Rank	Sum of Ranks
Post-Test - Pre-Test	Negative Ranks	0[a]	,00	,00
	Positive Ranks	28[b]	14,50	406,00
	Ties	0[c]		
	Total	28		

a. Post-Test < Pre-Test b. Post-Test > Pre-Test c. Post-Test = Pre-Test

Based on Table 4, it can be observed that the negative ranks, or the negative differences between pretest and posttest knowledge assessment results, are all zero for N, Mean Rank, and Sum Rank. This value of zero indicates that there was no decrease in the scores from the pretest to the posttest. Positive ranks, or the positive differences between pretest and posttest knowledge assessment results, show that 28 participants (N) experienced an increase in their scores, meaning all 28 students improved their knowledge scores from the pretest to the posttest. The Mean 14.50. Ties, which represent the equality between pretest and posttest scores, are recorded as 0. This indicates that no participant had the same score for both the pretest and posttest. The basis for decision-making in the Wilcoxon test is that if the Asymp. Sig. value is less than 0.05, the hypothesis is accepted. The decision-making results from the Wilcoxon test are presented in Table 5 below.

Table 5. Test Decision Making Wilcoxon

Test Statistics[a]	
	Post-Test - Pre-Test
Z	-4,636[b]
Asymp. Sig. (2-tailed)	,000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Based on Table 5, the Asymp. Sig. (2-tailed) value is 0.000. Since 0.000 is less than 0.05, it can be concluded that the hypothesis is accepted, indicating a significant difference between the pretest and posttest knowledge scores. Therefore, it can also be concluded that the use of OrSAEv learning tools has an effect on the knowledge test results of 7th-grade students in secondary schools in Blitar.

Discussion

The knowledge assessment test is used to evaluate students' mastery of the material on the subtopic of tsunamis. The indicators developed from the specified basic competencies must be achieved. The knowledge assessment test consists of 12 multiple-choice questions ranging from cognitive levels C1 to C5, applied through pretest and posttest activities. The pretest and posttest scores obtained by the students were analyzed to determine the improvement in their knowledge using the gain score. The average gain score was 0.51, categorized as medium. The increase in scores from the pretest to the posttest indicates that the teaching implemented was effective in enhancing students' knowledge.

The analysis of item sensitivity is crucial to determine whether the questions are sensitive or responsive to the effects of the OrSAEv learning model implemented, as it helps in measuring the improvement in students' knowledge. The item sensitivity values for the knowledge test from the first trial ranged between 0.3 and 0.7. An item is considered sensitive if its sensitivity value is ≥ 0.3. Therefore, it can be concluded that all of the knowledge test items implemented in this study are sensitive and can be used to assess students' knowledge. For students to be actively involved in various processes of information collection, evaluation, argumentation, and reasoning, science learning is not only taught as knowledge material but is more conveyed through active learning by the opinion of Pambudi et al., 2019

Furthermore, to show that learning with the OrSAEv model applied is a factor in increasing students' knowledge, a statistical test with SPSS version 22.0 was carried out to find out if there was an influence on the use of OrSAEv learning tools. If the data is normally distributed, a paired t-test is performed. The data is normally distributed if the p> value is 0.05. If the data is not distributed normally, a non-parametric statistical test is carried out with the wilcoxon test. The normality test for the data in this study uses the Shapiro-Wilk equation because the number of students who are used as research subjects is less than 50 students. The results of the data normality test showed that the data was not normally distributed, which means that there were some steep data in the pretest and postest scores of students so that they were tested using the nonparametric wilcoxon test. The nonparametric wilcoxon test was carried out to determine whether there was a difference in the learning outcomes of the pretest and posttest, which means whether there was an influence on the application of learning tools and activities with the OrSAEv model. From Table 5, it can be concluded that the hypothesis is accepted, which means that there is a difference between the results of the knowledge score for the pretest and the posttest, so it can also be concluded that there is an effect of the use of the OrSAEv learning tool on the results of the knowledge test of high school grade 7B students in Blitar Regency. Such results mean that the stages in OrSAEv learning are proven to support efforts to increase students' knowledge in dealing with disasters and minimizing disaster risks. Students who can understand the lesson will eventually get good learning results (Slameto, 2010).

Individual completion results are achieved if the value obtained by students reaches the standard of the school, which is 75. In the pretest results, none of the students achieved completion, while in the posttest the percentage of student completion was 43% and 57% were not complete. Although in general the knowledge of students has not yet reached individual completion to the maximum, the learning that has been done can increase the knowledge of students.

Based on the increase in student test results, it can be said that learning with the OrSAEv device is effective to implement. These results are by the opinion of Madlazim et al. (2019) that to improve knowledge and increase students' insight in understanding disasters, the right learning device is accompanied by disaster mitigation simulations or in the sense that students take real action to respond if a disaster is about to occur (Madlazim et al., 2019). Widodo (2020) explained that disaster simulations that are carried out regularly can form a vigilant attitude and increase public understanding of disaster prevention and management efforts. In addition, this activity also serves to evaluate existing preparedness and identify potential weaknesses in the disaster management system. Iskandar (2019) showed that disaster simulation allows policymakers and the public to test how effective the contingency plan has been prepared, as well as improve existing operational procedures. In addition, according to Susilowati, et al. (2019) organizing tsunami disaster preparedness training can improve tsunami disaster preparedness. The results of Chairummi's research (2014: 69) also stated that student knowledge influences disaster preparedness, if students understand what actions to take before, during and after a disaster, students will know the right actions to deal with it and can increase student awareness of disasters. Therefore, preparing knowledge about disasters early on for communities vulnerable to disasters is very important to avoid or minimize the risk of becoming victims (Khairuddin, et al., 2011).

According to cognitive theory, different individuals can construct different understandings even when they interact with identical environmental conditions (Moreno, 2010). The strategic goal of mitigation is to develop resilient communities that have the following characteristics: (1) understand the nature of tsunami hazards. (2) have the tools needed to reduce tsunami risks, (3) disseminate information about tsunami hazards, (4) exchange information with others in risk areas, and (5) institutionalize planning for tsunami disasters (Bernard, 2005:16).

CONCLUSIONS

This study shows that the implementation of the OrSAEv (Orientation, Preparedness, Action, and Evaluation) learning model significantly improves tsunami mitigation knowledge in high school students. The results of the analysis using the Wilcoxon test indicate a significant increase in knowledge scores after students underwent learning interventions, which included evacuation simulations as practical experiences. The OrSAEv model has proven to be effective in integrating theory and practice, providing students with the opportunity to learn through direct experience in emergency situations. Evacuation simulations not only enhance students' understanding of disaster mitigation measures, but also equip them with essential skills to deal with emergencies. This study is in line with previous findings showing that action-based learning can improve students' preparedness and engagement in disaster mitigation education.

The results of this study suggest that the application of the OrSAEv learning model in the context of disaster mitigation education can be an effective strategy to prepare students for natural disaster risks, especially in tsunami-prone areas. This increase in knowledge is expected to have a positive impact on public awareness and preparedness in facing future disaster threats.

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