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The Effectiveness of School-Based Disaster Management Education on Knowledge and Preparedness of D-III Nursing Study Program Students

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Abstract: Various disasters have occurred due to lack of knowledge and unpreparedness of the community in the pre-disaster phase. In fact, preparedness has not become a permanent behavior in society so that if a disaster occurs, it is predicted that they will not take care themselves and others. Nursing students as prospective nursing staff must be equipped with knowledge, attitudes and practices in dealing with disasters. This quantitative research aims to determine the effectiveness of the school-based disaster management education model on the knowledge and preparedness of nursing students. A quasi-experimental method is used in the form of a one group pretest-posttest design on 80 Diploma III Nursing students who were trained by facilitators for 6 months. Data were collected using questionnaires and observations, then analyzed using the Paired t-test and Multiple Linear Regression (95% CI; α=0.05). The results showed that disaster management education model can increase knowledge (p=0.000) and preparedness (p=0.002) in facing disasters. Disaster preparedness is significantly related in predicting disaster knowledge scores (r=0.708). If a disaster occurs, nursing students are able to help themselves and the disaster victims. This model can also be used as an evaluation of learning outcomes for the Disaster Nursing course.

Keywords: Disaster; Education; Knowledge; Nursing; Preparedness

Introduction

Nowadays, the number of natural disasters and casualties due to disaster events has increased around the world (Codreanu et al., 2014; Midtbust et al., 2018). Earthquakes, floods, hurricanes, and other types of disasters occurred across the world (Fahad et al., 2018, 2020; Monteiro, 2020; Woodall, 2020). Several disasters that have occurred in Indonesia such as the 2004 tsunami and flood in Aceh Province, earthquake in Yogyakarta (National Coordinating Agency for Disaster Management, 2007) and the eruption of the Mount Sinabung volcano in North Sumatra Province (Muzani et al., 2022) provide lessons for the people of Indonesia and the world that a large number of casualties and property in these disasters occurred due to lack of knowledge and unpreparedness of the community in anticipating disasters in the pre-disaster phase.

Currently, there are still many people who are not aware of their disaster-prone areas. Diharja et al. (2022) the landslide disaster that killed people occurred due to public ignorance of the type of soil prone to landslides. Karimah et al. (2022) the landslides occurred due to the field of derailment. Palloan et al. (2023) the study investigates physical properties parameters of the soil in landslide prone areas found the permeability values in moderately slow of can stimulate landslides due to gradually accumulation of water in the soils.

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Melanwati et al. (2023) unexpected rainfall is often a challenge for urban areas. Yasper et al. (2023) estimating rainfall accurately is crucial for both the community and various institutions involved in managing water resources and preventing disasters.

Millions of people are affected by disasters or major incidents annually. Disaster preparedness has reached a new level of urgency in the countries around the world (Jennings-Sanders, 2004). Suryanegara et al. (2023) the level of exposure, sensitivity, and response capacity assessed the vulnerability components such as sustainable water management, considering gender roles and conditions in urban environments, especially during disasters. Panjaitan et al. (2023) toddlers are a group that is classified as vulnerable in disaster emergencies. In addition, these disaster events have made many parties aware of the importance of planning and regulation in disaster management (Ministry of Social Affairs, 2014).

Disaster management is an ongoing process by which governments, businesses, and civil society plan for and mitigate the effects of disasters, take action immediately after a disaster occurs, and take steps for recovery. This is an important process in responding to post-disaster action and resolution (National Coordinating Agency for Disaster Management, 2007). Therefore, an integrated and sustainable cross-sectoral process to prevent and reduce the consequences of disasters, includes mitigation, awareness, response to disasters, and recovery efforts (Directorate General of Social Protection and Social Security, 2019).

Indonesia has the potential for disaster emergencies to emerge. However, until now disaster management and efforts to reduce the frequency and magnitude of disasters are still very difficult to do. In addition, the lack of provision of disaster education at various universities is also a factor in the delay in the disaster management system in Indonesia (Ministry of Public Works, 2014). On the other hand, the most likely thing to do to reduce disaster risk is still related to a fast, systematic, and integrated response system, which is intended to reduce the number of fatalities, environmental damage, and property losses caused (Bustami, 2011).

Thus, nurses need to become involved in disaster management in order to function effectively in these types of situations. Exposing nurses to disaster nursing education may result in positive outcomes for populations involved in a disaster (Jennings-Sanders, 2004). Nurses make up the largest sector of the healthcare workforce and are integral responders to major natural and human-induced disasters. It is essential that nurses have the knowledge and preparation needed to respond effectively, not only for the benefit of health care organizations, but for the safety of the community at large (Baack, 2016).

Disaster management efforts are currently undergoing a paradigm shift as well as action. Disaster management by Law of the Republic of Indonesia No. 24 of 2007 in addition to focusing on community participation in disaster management, also involves the participation of the private sector and educational institutions or schools as actors in disaster management. One of the most appropriate methods in today's disaster management is School-Based Disaster Preparedness (SBDP). SBDP is a school-based program that encourages the empowerment of the capacity of students and teachers to be prepared to prevent and reduce the impact and risk of disasters that occur in their environment. SBDP is applied because students and teachers as parties affected by the disaster must be empowered with adequate knowledge and skills.

Nursing students as prospective nursing staff must be equipped since they are in college so that they have knowledge, attitudes, and actions in dealing with disasters so that when a disaster occurs they are not only able to help themselves but also be prepared to take action to help other victims of other disasters (Langan et al., 2005). In addition, until now, the level of preparedness of nursing students in dealing with disasters is also unknown. According to LIPI-UNESCO/ISDR (2006) there are 5 parameters to measure preparedness in anticipating disasters namely knowledge and attitudes toward disaster risk, policies and guidelines for preparedness, emergency response plan, disaster warning system, and resource mobilization capacity.

Therefore, these nursing students need to be trained in mastering the theory and basic concepts of disaster management which have been compiled in a preparedness module for nursing students in dealing with disasters. This encourages researchers to examine the effect of school-based disaster management education on increasing knowledge and preparedness in dealing with disasters for students of the Diploma III Nursing Study Program.

Method

This quantitative research used a quasi-experimental approach with a one-group pre-posttest design model. The experimental unit was carried out on 80 nursing Diploma III students of the Health Polytechnic of the Aceh Ministry of Health, Banda Aceh City. Respondents are trained by the facilitators for 6 months starting from May to October in the mastery of theory about knowledge of disaster management basic concepts that have been compiled in a school-based disaster management education module. Two

measurements of the average value (mean) of knowledge and preparedness before (pre-test) and after (post-test) intervention for then a comparison is made between the means in the group. The list for assessing knowledge scores uses a questionnaire and preparedness scores uses observation that developed by LIPI-UNESCO/ISDR (2006) on contains Knowledge and Attitude, Policy Statement, Emergency Planning, Warning System, and Resource Mobilization Capacity as measured variables. Furthermore, the research data were processed using the Statistical Package for Social Science (SPSS) computer software version 23.0 for Windows to calculate the distribution of frequencies and their proportions to be presented in a frequency table, as well as the Paired t-Test statistic (95%CI; α=0.05). Ethical approval of the study was also obtained from the Health Research Ethics Commission of the Aceh Health Polytechnic with No. LB.02.03/2979/2018.

Result and Discussion

Disaster Knowledge Level

Figure 1 represents the respondent's level of knowledge about disasters obtained before and after the intervention (in percent).

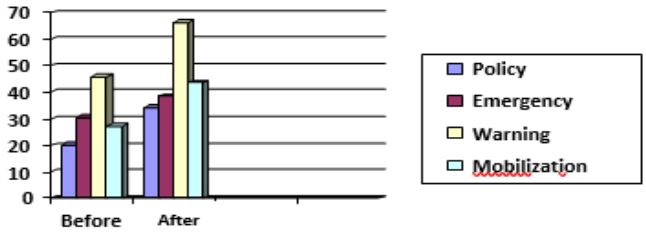

Figure 1. Percentage of disaster knowledge level before and after intervention

The level of knowledge about disasters of nursing students is mostly in the good enough category. The results showed that before the intervention was 55.2% and after the intervention, the percentage level of disaster knowledge rose to 62.9%. This shows that the provision of school-based disaster management education for 6 months can increase the knowledge of nursing students in disaster management. Further data analysis on the total score of nursing students' knowledge values before and after the intervention was carried out using the Paired t-tests as shown in the following table.

Table 1. Results of the Analysis of Nursing Students' Knowledge Scores Before and After Intervention

Intervention	Mean	Std. Dev	95% CI for Mean		Min	Max
			Lower	Upper		
Before	208.64	11.97	206.29	210.99	110	230
After	219.56	27.40	212.15	226.97	165	258

p-value= 0.000

Table 1 shown the results that the average score of knowledge about disasters before the intervention was 208.64 and increased after the intervention was 219.56. There is a difference in the mean score of knowledge in nursing students between before and after the disaster management education intervention (p=0.000; 95% CI=0.05). There was a difference in the mean score of knowledge in nursing students between before and after the disaster management education intervention. The knowledge possessed must be proven in their actual actions, but at least it can be known by what plans they have regarding their preparedness.

Disaster Preparedness Level

Figure 2 disaster preparedness level of respondents in percent obtained from before and after an intervention.

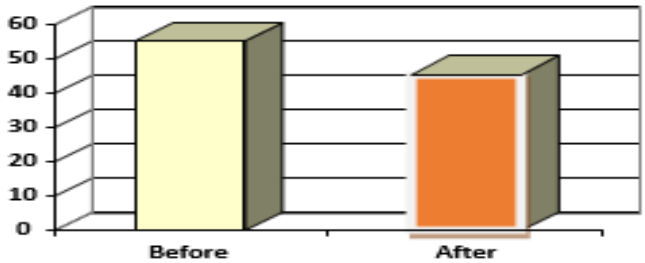

Figure 2. Percentage of disaster preparedness level before and after intervention

The level of preparedness for disasters, the majority of nursing students were in the less prepared category. The results showed that before the intervention was 55.2% and after the intervention, the percentage of disaster preparedness decreased to 45.5%. It can be concluded that the provision of school-based disaster management education for 6 months was able to make these nursing students more prepared by 54.2%.

Further data analysis on the total score of nursing students' preparedness scores before and after the intervention was carried out using Paired t-tests can be seen in the following table.

Table 2. The Result of the Score Analysis of Nursing Students' Preparedness Scores Before and After the Intervention

Intervention	Mean	Std. dev	95% CI for Mean		Min	Max
			Lower	Upper		
Before	173.61	8.648	170.88	176.34	141	191
After	176.07	14.94	173.85	178.30	150	214

p-value= 0.002

Table 2 shown the results that the average score of disaster preparedness score before the intervention was 173.61 and increased by 176.07 after the intervention. There was a difference in the mean score of

preparedness among nursing students before and after the disaster management education intervention (p=0.002; 95% CI=0.05).

Disaster Preparedness Parameter Level

Table 3 below was the percentage of disaster preparedness parameters presented in percentage (%) obtained before and after the intervention.

Table 3. Percentage of Disaster Preparedness Parameters

Preparedness Parameters	Percentage (%)	
	Before Intervention	After Intervention
Disaster Policy	20.4	34.4
Emergency response	30.6	38.6
Disaster Warning system	45.9	66.5
Resource Mobilization	27.3	43.7

The table provides information that the percentage of all disaster preparedness parameters increases after the intervention.

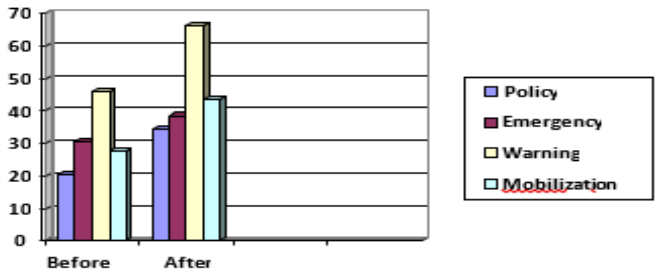

Figure 3. Percentage of disaster preparedness parameters before and after intervention

The illustration from Figure 3 also shown that both before and after the intervention, it is known that the percentage of the Policy component regarding disaster is still very low, while the highest percentage is the component of the Disaster Warning System. All disaster preparedness parameters increased in percentage after the intervention.

Disaster Preparedness Parameter Level

Based on the multivariate analysis test using the Multiple Regression Linear statistical test on all preparedness variables that are thought to be related to disaster knowledge so that they can predict and describe factors related to disaster knowledge in nursing students.

Table 4. Analysis of Multiple Linear Regressions Knowledge and Disaster Preparedness Before and After Intervention

R	R square	Adjusted R square	Std error of the estimate
.708[a]	.501	.495	18.060

[a].Predictor: (Constant), Score of Disaster Preparedness

Based on the multivariate analysis test using the Multiple Regression Linear statistical test on all The table shows the coefficient of determination (R2) of 0.501. This means that the variation in the value of disaster knowledge among nursing students is 50.10%, or in other words, the disaster preparedness variable is only able to explain the variation in the value of disaster knowledge by 50.10% while the remaining 49.90% is determined by other factors. Statistical data analysis also obtained a p-value=0.000, meaning that at alpha 5% it can be stated that the disaster preparedness variable can significantly be used to predict the value of disaster knowledge (r=0.708). This result is in line with Paschalia et al. (2022) there is a difference in the average knowledge and skills of respondents after being given community-based disaster risk reduction (CB DRR) training. The CB DRR program training influences the knowledge and skills of the community in carrying out disaster mitigation with a changing trend seen from the first measurement to the last measurement.

Education has always been one of the top priorities in global Disaster Risk Reduction (DRR) initiatives (Amri et al., 2017). The DRR agenda itself generally aims to minimize the damage caused by natural hazards (Hicks et al., 2019). It is achieved through a series of Disaster Risk Management (DRM) efforts, which emphasizes the systematic efforts in preventing, analyzing, and reducing the causal factors of disaster risk that can be structured into three different phases, namely action before the disaster, during the disaster, and after the disaster (Hicks et al., 2019; Oktari et al., 2020).

Knowledge is part of the domain of behavior. According to Benjamin Bloom, knowledge is the result of human sensing or the result of someone knowing about objects through their senses (eyes, nose, ears, skin, and taste). Knowledge is a collection of accumulated educational processes undertaken by a person, both obtained formally and informally, and makes a person able to choose various alternative problem solving, and foster creativity, including in completing the work that becomes his profession (Notoatmodjo, 2010). With broad knowledge and high education, it is hoped that a nurse can complete nursing work, especially in disasters as desired. According to Oktari et al. (2020) examples of knowledge management practices are common in a disaster context. However, disaster management is a system with many components, and it is not clear how knowledge management practices can be applied in all major phases of disaster management cycle.

Knowledge is always used as the beginning of one's actions and awareness so that with the capacity of knowledge it is expected to be the basis of one's actions. Knowledge in this study is more about measuring basic

knowledge about natural disasters, such as definitions, characteristics, symptoms, and causes. The experience of the earthquake disaster in Aceh, Nias, and Yogyakarta as well as various disasters that occurred in various other areas provided very meaningful lessons on the importance of knowledge about natural disasters. Knowledge can influence people's attitudes and concerns to be prepared in the face of disasters, especially for those who live in coastal areas that are vulnerable to natural disasters.

The results of research by Magnaye et al. (2011) on 250 nurses in the Philippines, that the majority of nurses equip themselves with knowledge and skills in dealing with real-life situations and conditions. So that every health worker such as a nurse is ready to face the emergency during a disaster, to help individuals and communities affected by the disaster.

Baack (2011) concluded that the knowledge and skills possessed by nurses are important and necessary in responding to emergencies effectively. This is not only useful for the benefit of the organization where he works but also to help the wider community in dealing with the emergency response period during a disaster. Meanwhile, research by Hermawati et al. (2010) found that there was a positive correlation, but a low significant level of perceived perception, experience, education, and training factors with the readiness of nurses' knowledge and skills to face disaster emergencies.

The knowledge that must be possessed by a nurse candidate in disaster management is knowledge of the impact of a disaster and how to manage the disaster, for example, earthquake and tsunami disaster. Jennings-Sanders (2004) stated that the main need for nurses and health professionals is the need to have knowledge of preparedness and work in disaster situations. While the skills that must be possessed in handling earthquake or tsunami victims are triage, airway care, wound care management, mental health care, psychosocial care, spiritual care, and a disaster victim referral system.

Nurses' knowledge and preparedness in dealing with earthquake and tsunami disasters according to Hermawati et al. (2010) includes earthquake and tsunami disaster management, earthquake and tsunami risk analysis, the impact of disasters earthquake and tsunami, skills in dealing with earthquake and tsunami disasters. Putra et al. (2011) stated that training and education, and the experience with disaster event can influence the Public Health Nurses competency in responding to disaster occurrences.

International Council of Nurses (2009) divided the competence of nurses in dealing with disasters into 4 classifications namely mitigation competence, preparedness competence, response competence, and rehabilitation competence. The competence or ability of nurses during emergency response includes nursing skills at the community level, nursing skills at the individual and family level, psychological health nursing skills, and nursing abilities at the level of special populations of vulnerable groups. According to Putra et al. (2011) Public Health Nurses hold major roles in providing health management and assistance throughout the community and public healthcare system during all disaster phases including preparedness, response, and recovery phase.

The knowledge and skills of students as prospective nurses about emergencies in dealing with earthquake and tsunami disasters are urgently needed to improve their understanding and be included in simulations or drills for handling earthquake and tsunami victims. Such knowledge and skills should be given to nurses who deal directly with patients. Mattheus et al. (2023) simulation is a useful tool for increasing school nurses' confidence in responding to emergencies occurring on school campuses.

In the school community, the integration of a disaster preparedness program is known as a school preparedness program. This program is urgently needed especially for those schools located in disaster-prone areas (Sajow et al., 2020). School disaster preparedness refers to the ability of the community or elements in the school is facing and manage disasters (Sujarwo et al., 2018). It reflects the application of responsive mechanisms to overcome and minimize hazardous impacts (Kusumastuti et al., 2021). These capabilities are fulfilled when the school has a disaster management plan (before, during, and after a disaster); logistic availability; safety and comfort in education; infrastructure and emergency systems, supported by knowledge and preparedness; standard operating procedures and early warning systems (Sujarwo et al., 2018).

The teaching system is held interactively by leading students to know and be skilled in handling trauma and disaster emergency patients so that the knowledge learned can be directly applied. This is important to add insight and repertoire of disaster nursing knowledge and student experience to deal with real situations. It is also necessary to develop a disaster learning module that involves lecturers because the research results of Hermansyah et al. (2023) show that the Dengue Hemorrhagic Fever (DHF) module is able to increase elementary school students' knowledge and providing DHF material by teachers through this module to students can increase students' knowledge. Ayub et al. (2019) the level of preparedness of teachers in facing disasters in primary school is 61.71% in the sufficient. Therefore, socialization and knowledge related to disaster preparedness for teachers in primary schools need to be improved.

Disaster education training and meetings or workshops are important strategies to improve the abilities and skills of health nurses to reduce feelings of uncertainty in the face of disasters (Putra et al., 2011). According to LIPI-UNESCO/ISDR (2006) the lack of knowledge to initiate a more institutionalized disaster preparedness movement will increase the number of victims due to the dynamics of ongoing natural processes. Preparedness efforts can minimize the impact of hazards through effective and appropriate preventive actions. Integration of local knowledge, prevailing social structures, and local customs into preparedness efforts. This is a challenge for the government in the future to improve capabilities, especially in the disaster preparedness phase.

Conceptually, disaster preparedness is defined as an intervention developed to effectively equip individuals and communities with the knowledge and skills needed when disaster strikes (Bay, 2020). A disaster preparedness intervention can include efforts to increase the knowledge and capacity of individuals, communities, governments, and non-governmental organizations (Bay, 2020; Kusumastuti et al., 2021).

All disaster preparedness activities must be based on knowledge of the disaster itself, the different types of disasters that may occur, and the tendency of impacts on the natural and development environment, households, community institutions, and the community itself. Such knowledge and skills must be continuously developed for prospective nurses, especially for those who are in areas prone to earthquake and tsunami disasters. Education and training need to be designed concerning the type and when the training is carried out, training for personnel who are prepared in emergency conditions is training related to the relief and rescue of disaster victims, which is carried out regularly and in a planned manner.

Implementation of the disaster nursing curriculum and disaster training or simulation (drill) needs to be implemented, as well as the development of school-based management education modules as capacity building for prospective nursing staff who will later serve in disaster areas. This is in line with the results of research by Muzani et al. (2022) which states the existing policies regarding school disaster preparedness and their implementation need to be reviewed by integrating disaster preparedness materials into school subjects, establishing relevant school polies, and designing proper curriculum, the capacity of the school in facing disasters can be gradually improved.

Conclusion

In sum, the level of knowledge about disasters of nursing students is mostly in the category of quite good. There was a difference in the average score of knowledge in nursing students between before and after the disaster management education intervention (p=0.000). The level of preparedness to face disasters, the majority of nursing students are in the category of underprepared. There was a difference in the average score of preparedness in nursing students between before and after the disaster management education intervention (p=0.002). Disaster preparedness variable can significantly be used to predict the value of disaster knowledge (r=0.708). Providing school-based disaster management education can increase nursing students' knowledge in disaster management. The model can useful as an evaluation of learning outcomes for Disaster Nursing Courses. This will be useful when a disaster occurs, they will not only be able to help themselves, but will also be ready to take action to help other disaster victims.

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Author Contributions

Conceptualization, H.M. and M.H.; methodology, H.M. and M.H.; validation, M.Y. and N.H.; formal analysis, H.M. and M.H.; investigation, H.M., M.H. and N.H.; resources, M.H., M.Y. and N.H.; data curation, N.H. and M.H.; writing—original draft preparation, H.M. and M.U.; writing—review and editing, H.M., N.H. and M.Y.; visualization, M.Y. and M.H. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

References

Amri, A., Bird, D. K., Ronan, K., Haynes, K., & Towers, B. (2017). Disaster risk reduction education in Indonesia: Challenges and recommendations for scaling up. *Natural Hazards and Earth System Sciences*, *17*(4), 595–612. https://doi.org/10.5194/nhess-17-595-2017

Ayub, S., Makhrus, M., Gunada, I. W., & Taufik, M. (2019). Analisis Kesiapsiagaan Bencana Pada Guru Sekolah Dasar. *Jurnal Penelitian Pendidikan IPA*, *6*(1), 52. https://doi.org/10.29303/jppipa.v6i1.281

Baack, S. (2016). Nurses preparedness and perceived

competence in managing disasters. *Health Care: Current Reviews*, *04*(07). https://doi.org/10.4172/2375-4273.C1.032

Bay, U. (2020). *Social Work and Disasters: A Handbook for Practice: by Margaret Alston, Tricia Hazeleger, and Desley Hargreaves*. Milton Park: Routledge.

Bustami, D. A. (2011). *Basic Training Module for Disaster Management*. Jakarta: UNDP.

Codreanu, T. A., Celenza, A., & Jacobs, I. (2014). Does Disaster Education of Teenagers Translate into Better Survival Knowledge, Knowledge of Skills, and Adaptive Behavioral Change? A Systematic Literature Review. *Prehospital and Disaster Medicine*, *29*(6), 629–642. https://doi.org/10.1017/S1049023X14001083

Diharja, R., Fahlevi, M. R., Rahayu, E. S., & Handini, W. (2022). Prototype-Design of Soil Movement Detector Using IoT Hands-on Application. *Jurnal Penelitian Pendidikan IPA*, *8*(4), 2245–2254. https://doi.org/10.29303/jppipa.v8i4.1709

Directorate General of Social Protection and Social Security. (2019). Ministry of Social Affairs of the Republic of Indonesia. In *Program Keluarga Harapan (PKH)*. Retrieved from https://kemensos.go.id/program-keluarga-harapan-pkh

Fahad, S., & Jing, W. (2018). Evaluation of Pakistani farmers' willingness to pay for crop insurance using contingent valuation method: The case of Khyber Pakhtunkhwa province. *Land Use Policy*, *72*, 570–577. https://doi.org/10.1016/j.landusepol.2017.12.024

Fahad, S., & Wang, J. (2020). Climate change, vulnerability, and its impacts in rural Pakistan: a review. *Environmental Science and Pollution Research*, *27*(2), 1334–1338. https://doi.org/10.1007/s11356-019-06878-1

Hermansyah, Ismail, Munazar, & Halimatussakdiah. (2023). DHF Learning Module Design for Elementary School Teachers Within the Region Kuta Raja District, Banda Aceh City. *Jurnal Penelitian Pendidikan IPA*, *9*(11), 9749–9755. https://doi.org/10.29303/jppipa.v9i11.4861

Hermawati, D., & Hatthakit, C. (2010). Nurses' Preparedness of Knowledge and Skills in Caring for Patients Attacked by Tsunami in Indonesia and Its Relating Factors. *The 2nd International Conference on Humanities and Social Sciences, April 10th*. Retrieved from http://kb.psu.ac.th:8080/psukb/handle/2010/8519

Hicks, A., Barclay, J., Chilvers, J., Armijos, M. T., Oven, K., Simmons, P., & Haklay, M. (2019). Global Mapping of Citizen Science Projects for Disaster Risk Reduction. *Frontiers in Earth Science*, *7*(226). https://doi.org/10.3389/feart.2019.00226

International Council of Nurses. (2009). ICN Framework of Disaster Nursing Competencies. In *ICN and WHO Western Pacific Region*. Geneva Switzerland.

Jennings-Sanders, A. (2004). Teaching disaster nursing by utilizing the Jennings Disaster Nursing Management Model. *Nurse Education in Practice*, *4*(1), 69–76. https://doi.org/10.1016/S1471-5953(03)00007-6

Karimah, K., Susilo, A., Suryo, E. A., Rofiq, A., & Hasan, M. F. R. (2022). Analysis of Potential Landslide Areas Using Geoelectric Methods of Resistivity in The Kastoba Lake, Bawean Island, Indonesia. *Jurnal Penelitian Pendidikan IPA*, *8*(2), 660–665. https://doi.org/10.29303/jppipa.v8i2.1414

Kusumastuti, R. D., Arviansyah, A., Nurmala, N., & Wibowo, S. S. (2021). Knowledge management and natural disaster preparedness: A systematic literature review and a case study of East Lombok, Indonesia. *International Journal of Disaster Risk Reduction*, *58*(102223). https://doi.org/10.1016/j.ijdrr.2021.102223

Langan, J. C., & James, D. C. (2005). *Preparing Nurses for Disaster Management*. Upper Saddle River, N.J: Pearson Prentice Hall.

LIPI-UNESCO/ISDR. (2006). *Study of Community Preparedness in Anticipating Earthquake and Tsunami Disasters*. Jakarta: Deputy for Earth Sciences, Indonesian Institute of Sciences.

Magnaye, B., Lindsay, M. S., Ann, M., Gilbert, R., & Heather, J. (2011). The Role, Preparedness, and Management of Nursing During Disaster. *E-International Scientific Research Journal, Lyceum of the Philippines University*, *3*(4), 269–294. Retrieved from https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=82f4af57dc8e297274327e849431cb314fd4489d

Mattheus, D., Fontenot, H. B., Lim, E., Owens, M., & Wong, L. (2023). Increasing the Self-Confidence of School Nurses to Respond to Emergency Situations. *Journal of Continuing Education in Nursing*, *54*(2), 71–77. https://doi.org/10.3928/00220124-20230113-06

Melanwati, R. L., Sumarminingsih, E., & Pramoedyo, H. (2023). Reconstruction of Rainfall Patterns with the SpVAR Method: Spatial Analysis in DKI Jakarta. *Jurnal Penelitian Pendidikan IPA*, *9*(12), 10909–10915. https://doi.org/10.29303/jppipa.v9i12.4895

Midtbust, L. G. H., Dyregrov, A., & Djup, H. W. (2018). Communicating with children and adolescents about the risk of natural disasters. *European Journal of Psychotraumatology*, *9*(sup2). https://doi.org/10.1080/20008198.2018.1429771

Ministry of Social Affairs. (2014). *Ministry of Public Works the Republic of Indonesia*. Jakarta: Directorate

General of Human Settlements.

Monteiro, N. (2020). *10 biggest natural disaster of 2020 that shook the world costing money & lives'*. Mumbai: Curlytales.

Muzani, M., Fatimah, A. N., Imsa, M. A., & Casmana, A. R. (2022). The obstacles hierarchy of school disaster preparedness implementation in Mount Sinabung area, Indonesia. *Frontiers in Education*, *7*(842990). https://doi.org/10.3389/feduc.2022.842990

National Coordinating Agency for Disaster Management. (2007). *Introduction to Disaster Characteristics and Mitigation Efforts in Indonesia*. Jakarta.

Notoatmodjo, S. (2010). *Health Promotion and Health Behaviour*. Jakarta: PT. Rineka Cipta.

Oktari, R. S., Munadi, K., Idroes, R., & Sofyan, H. (2020). Knowledge management practices in disaster management: Systematic review. *International Journal of Disaster Risk Reduction*, *51*(101881). https://doi.org/10.1016/j.ijdrr.2020.101881

Palloan, P., Ansar, N. A., Sulistiawaty, & Susanto, A. (2023). Analysis of Soil Physical Parameters in Landslide Prone Areas in West Battang Village, Palopo City as Early Mitigation of Landslide Disasters. *Jurnal Penelitian Pendidikan IPA*, *9*(11), 10230–10235. https://doi.org/10.29303/jppipa.v9i11.3031

Panjaitan, H. C., Sumardiyono, & Anantanyu, S. (2023). Analysis of the Relationship between Nutritional Behavior in Emergency Conditions and the Nutritional Status of Toddlers: The Case of the Semeru Eruption in Lumajang Regency. *Jurnal Penelitian Pendidikan IPA*, *9*(12), 11218–11230. https://doi.org/10.29303/jppipa.v9i12.5645

Paschalia, Y. P. M., Doondori, A. K., Sekunda, M. S., & Budiana, I. (2022). Revitalization of Disaster Mitigation Management and Community Empowerment Through Community-Based Disaster Risk Reduction (CBDRR). *Jurnal Penelitian Pendidikan IPA*, *8*(5), 2563–2574. https://doi.org/10.29303/jppipa.v8i5.2368

Putra, A., & Petpichetchian, W. (2011). Review: Public Health Nurses' Roles and Competencies in Disaster Management. *Nurse Media Journal of Nursing*, *1*(1), 1–14. https://doi.org/10.14710/nmjn.v1i1.742

Sajow, H. S., Water, T., Hidayat, M., & Holroyd, E. (2020). Maternal and reproductive health (MRH) services during the 2013 eruption of Mount Sinabung: A qualitative case study from Indonesia. *Global Public Health*, *15*(2), 247–261. https://doi.org/10.1080/17441692.2019.1657925

Sujarwo, Noorhamdani, & Fathoni, M. (2018). Disaster Risk Reduction in Schools: The Relationship of Knowledge and Attitudes Towards Preparedness from Elementary School Students in School-Based Disaster Preparedness in the Mentawai Islands, Indonesia. *Prehospital and Disaster Medicine*, *33*(6), 581–586. https://doi.org/10.1017/S1049023X18000778

Suryanegara, E., Herdiansyah, H., & Asteria, D. (2023). Women's Vulnerability on Household Water Management During COVID-19 Pandemic. *Jurnal Penelitian Pendidikan IPA*, *9*(7), 4885–4893. https://doi.org/10.29303/jppipa.v9i7.3662

Woodall, M. (2020). *What we're watching: Weekly disaster update'*. Washington, DC: The Center for Disaster Philanthropy.

Yasper, A., Handoko, D., Putra, M., Aliwarga, H. K., & Rosid, M. S. R. (2023). Hyperparameters Optimization in XGBoost Model for Rainfall Estimation: A Case Study in Pontianak City. *Jurnal Penelitian Pendidikan IPA*, *9*(9), 7113–7121. https://doi.org/10.29303/jppipa.v9i9.3890