https://journal.uns.ac.id/ijed/article/view/3250
https://doi.org/10.20961/ijed.v5i1.3250 - (Vol 5, No 1 – 2026)
available at https://journal.uns.ac.id/ijed
e-issn (2829-9140) & p-issn (2829-9418)

THE EFFECT OF DISASTER MITIGATION LEARNING ON TOURISM STUDENTS' DISASTER KNOWLEDGE IN LOMBOK ISLAND, INDONESIA

Mahmudah Budiatiningsih[1]*, Ihyana Hulfa[1], Maulana Malik Irsyad[2]
[1]Diploma Program in Tourism, Faculty of Economic and Business, Universitas Mataram, Mataram, Indonesia
[2]Faculty of Mathematics and Science, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia
*Mahmudahb@unram.ac.id

Received: February 2, 2026 Revised: February 14, 2026 Accepted: April 2026

ABSTRACT

This study aims to explore the effect of disaster mitigation learning on tourism students' disaster knowledge. This quantitative study employs a one-group pretest-posttest quasi-experimental design to evaluate the effect of disaster mitigation education on the knowledge of tourism students. The population of this study consists of all students enrolled in the mandatory Disaster Mitigation course within the Tourism Diploma Program (DIII) at Universitas Mataram. The respondents were 94 college students, sampled by census. The assessments were conducted using a knowledge test questionnaire about disaster knowledge. The Wilcoxon Signed-Rank Test result showed the significance 0.000 that was less than 0.05, indicating a statistically significant difference between pretest and posttest score. The result showed that a semester-long disaster mitigation learning in Mataram University Tourism Study Program was proven to increase students' knowledge about the types of disasters, disaster occurrence, risks in campus buildings and tourism destinations, disaster impacts, actions during disasters, and evacuation requirements. This study contributes to the theoretical understanding of disaster knowledge in vocational education especially in Indonesia's vulnerable island tourism destinations. The findings imply that integrating disaster mitigation content into the tourism curriculum in Lombok is essential, as it significantly improves students' disaster knowledge.

***Keywords**: Disaster Knowledge; Disaster Education; Disaster Mitigation; Disaster Mitigation Learning; Lombok; Tourism Student.*

A. INTRODUCTION

Indonesia's position as a tourism destination is fundamentally shaped by its geography. The convergence of the Pacific, Eurasian, and Indo-Australian tectonic plates beneath the archipelago creates one of the Earth's most seismically volatile regions, presenting unique challenges for sustainable tourism (Setianingsih et al., 2023). This geological reality establishes a pervasive environmental risk, which shown in a frequent catastrophic natural disaster. As noted by Partini & Hidayaht (2024), hazards such as earthquakes, tsunamis, floods, landslides, volcanic eruptions, and extreme weather frequently inflict both material and non-material losses. Consequently, for the tourism sector, this shapes a distinct operational landscape where strategies for economic growth must be continuously adapted against these persistent geological and climatic constraints.

This vulnerability is magnified within the context of island tourism, a predominant model in Indonesia's tourism economy. Island destinations like Lombok face compounded risks due to geographical isolation, concentrated infrastructure, and limited evacuation

options (Lin et al, 2025). The 2018 Lombok earthquake sequence, which caused over IDR 11 trillion in damages and devastated the local tourism economy, serves as a stark case study of this intersection between geological hazard and tourism vulnerability (Hadi, 2019). Such events indicate that disaster resilience is not merely a humanitarian concern but an economic imperative for tourism-dependent regions.

Despite this clear and present danger, a significant preparedness gap persists, particularly among those who will be the main actors of the tourism industry. Research indicates that student populations, who are among the most vulnerable during disasters, are frequently overlooked in emergency preparedness planning (Tanner & Doberstein, 2015). Furthermore, studies show that less than half of university students possess adequate disaster knowledge and rescue skills (Tan et al., 2016). This gap is particularly critical for tourism students in destinations like Lombok, who will bear professional responsibility for visitor safety during crises. Research on tourism studies that is focused on disaster risk mitigation education is still rare since the research usually explore about applied research in tourism (Rosanna et al., 2026; Hidayaht et al., 2025; Giffari et al., 2025; Iordanis et al., 2025; Ramos-Ruiz et al., 2025; Majlinda et al., 2025). In the context of Lombok, tourism is vital since its contribution is the second-highest source of Lombok's income (Kurniati and Suryanto, 2023). Unfortunately, the tourism sector is highly vulnerable to crises and disasters, as almost the entire Lombok Island is prone to disaster threats. This situation places people at risk, requiring them to be aware and possess disaster knowledge as part of preparedness efforts, including tourism stakeholders and tourism students. However, tourism students in Lombok have so far focused on management and technical skills in serving tourists but have not yet received much specific education on disaster mitigation.

The student of Tourism Program Study should have adequate knowledge and awareness about disaster mitigation since they will be the main actors in tourism industry in Lombok Island. The sources of these knowledge and awareness can be from experiences and education. The formal education can be a forum for learning disaster risk reduction effort, disaster risk, impact of disaster, prevention, and mitigation effort (Tyas et al, 2025). Learning disaster risk reduction can improve the student’s disaster awareness and preparedness (Chen & Adefila, 2020).

This research aims to contribute to the theoretical understanding of disaster knowledge in vocational education especially in Indonesia's vulnerable island tourism destinations. This

study uses a quasi-experimental design to measure the causal impact of a semester-long course on tourism students' disaster knowledge in Lombok.

Based on the theoretical framework and previous findings, this study hypothesizes that: Tourism students who complete the semester-long disaster mitigation course will demonstrate significantly higher disaster knowledge compared to their baseline knowledge before the intervention.

B. MATERIALS AND METHODS

This study is quantitative research. This study employs a one-group pretest-posttest quasi-experimental design to assess the impact of disaster mitigation education on tourism students' knowledge. The design involves measuring participants' disaster knowledge before and after a semester-long intervention, allowing for within-group comparison of knowledge improvement. This approach is appropriate for educational settings where all students receive the intervention as part of their mandatory curriculum (Creswell & Creswell, 2018). The intervention setting is using case-based learning method by analyzing and reviewing cases of local and national disaster in tourism destination related to the aspects of disaster mitigation. Case based learning is proven to improve cognitive processing, analytical skills, decision-making abilities, and critical thinking (Silitubun et al., 2025; Raza et al., 2020; Zhao et al., 2020; Misnawati et al., 2022; Liao et al., 2020). The limitation of this design is the absence of control group, since the aim is to explore primary data about the effect of structurized learning as an intervention to the respondent’s disaster mitigation knowledge. The limitation is also happened because the intervention was done in natural study setting, in which every student should get the same treatment. Therefore, there is a potential of other confounding variable that explains the results instead of the intervention or known as internal validity issue since there were no control group as comparison.

The research was conducted at the Tourism Diploma Program (DIII) of Universitas Mataram on Lombok Island, Indonesia. The study period was one academic semester from February to June 2025. Lombok represents an ideal research context as it is both a designated "Super-Priority Tourism Destination" and a region with high seismic risk, providing relevant practical applications for disaster education in tourism study program.

The target population for this study comprised all students enrolled in the mandatory Disaster Mitigation course within the Tourism Diploma Program (DIII) at Universitas Mataram. A total sampling approach was employed, whereby all 94 students registered for the course in the academic semester of February to June 2025 were included as participants.

This census method was appropriate as it allowed for the examination of the educational intervention's effect on the entire cohort undertaking the course, maximizing statistical power and representativeness within the institutional context. The sample consisted of 51 male students (54.3%) and 43 female students (45.7%), with ages ranging from 19 to 23 years. All participants were in their fourth semester of the three-year diploma program. Inclusion criteria mandated that participants be actively enrolled in the course, complete both the pre-test and post-test assessments, maintain a minimum attendance of 80% of the instructional sessions, and provide informed consent prior to participation. The participant characteristics can be seen in Table 1 below:

Table 1. The participant characteristics

Characteristic	Category	Total	%
Gender	Male	53	56.4
	Female	41	43.6
Age (Years)	19	27	28.7
	20	51	54.3
	21	11	11.7
	22	4	4.3
	23	1	1.1
Geographical Origin	Lombok Island	88	93.6
	Other parts of West Nusa Tenggara (NTB) Province	6	6.4
Disaster Experience	Has experienced disaster(s)	94	100.0

Source: Analysis Result, 2026

All participants (100%) originated from West Nusa Tenggara (NTB) Province, with 93.6% from Lombok Island and 6.4% from other regions within the province. This homogeneous geographical background is significant as all participants shared exposure to the same regional disaster risks and contexts.

The primary measurement instrument was adapted from a validated questionnaire originally developed by Budiatiningsih et al. (2025) to assess disaster knowledge among beach visitors in Lombok. The instrument consists of 45 dichotomous items with validity score (INFIT MNSQ) of the items ranged from 0.85-1.17 which means that they fit with Rasch Model and valid as a measurement tool. The instrument was modified and contextualized for the specific population of tourism students and the academic setting of this study. The adapted instrument then revalidated by experts in disaster and instrument to ensure that the content and context of the items relevance to measure knowledge about disaster awareness and preparedness in Lombok. The resulting Disaster Knowledge Test (DKT) consists of 26 dichotomous items (agree/disagree) designed to measure

comprehensive understanding across six core domains of disaster awareness and preparedness. The test evaluates the following content domains: (1) types of disasters, (2) disaster occurrence, (3) risks in campus buildings and tourism destinations, (4) disaster impacts, (5) actions during disasters, and (6) evacuation requirements.

C. RESULTS AND DISCUSSION

Validity and Reliability Tests

The instrument validity tests include content and construct validity. Content validity measuring the item relevance to the aims of the research. In this case, content validty ensuring that the instrument can measure knowledge about disaster awareness and preparedness. Construct validity measures how valid the instrument can measure aspects that is measured. In this research the construct validity ensure that the instrument can measure knowledge of the respondents. The content and construct validity were done by expert judgement.

In this study, reliability was assessed through item analysis using QUEST software, which provides sophisticated measurement of dichotomous test items based on Item Response Theory (IRT) principles. Instrument reliability testing is essential to determine the consistency of results when the instrument is administered repeatedly (Arikunto, 2017). This ensures that the measurement tool produces stable and dependable outcomes across different administrations. The analysis yielded a reliability coefficient of 0.85. According to Sumintono and Widhiarso (2015), a reliability coefficient of 0.85 indicates good reliability for research instruments. It confirms that the test items consistently measure the same underlying construct of disaster knowledge.

Normality Test

Prior to conducting parametric statistical analysis, normality tests were performed to determine whether the pretest and posttest score data were normally distributed. Normality was assessed using the Shapiro-Wilk test. The results are presented in Table 2.

Table 2. Normality Test Result using Shapiro-Wilk

Test	Statistic	df	Sig.
Pretest	.885	95	.000
Postest	.823	95	.000

Source: Analysis Result using SPSS, 2026

As shown in Table 2, the Shapiro-Wilk tests yielded significance values (p) of .000 for both variables (pretest and posttest). Since $p < .05$, this indicates that the pretest and posttest

https://journal.uns.ac.id/ijed/article/view/3250
https://doi.org/10.20961/ijed.v5i1.3250 - (Vol 5, No 1 – 2026)
available at https://journal.uns.ac.id/ijed
e-issn (2829-9140) & p-issn (2829-9418)

score data are not normally distributed. Because the normality assumption for parametric testing was not met, subsequent data analysis proceeded using non-parametric tests.

Comparison of Disaster Knowledge Before and After Learning

Given the non-normal distribution of the data, hypothesis testing to examine differences in disaster knowledge before and after the learning intervention was conducted using the Wilcoxon Signed-Rank Test. The analysis results are presented in Table 3 and Table 4.

Table 3. Wilcoxon Signed-Rank Test Result

		N	Mean Rank	Sum of Rank
Posttest-Pretest	Negative Ranks	0[a]	.00	.00
	Positive Ranks	69[b]	35.00	2415.00
	Ties	25[c]		
	Total	94		

a. Posttest < Pretest; b. Posttest > Pretest; c. Posttest = Pretest

Source: Analysis Result using SPSS, 2026

Table 4. Wilcoxon Signed-Rank Test Statistics[a] Result

	Posttest - Pretest
Z	-7.313[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed-Rank Test; b. Based on negative rank

Source: Analysis Result using SPSS, 2026

The Wilcoxon Signed-Rank Test (Table 4) yielded significance 0.000 that is less than 0.05, indicating a statistically significant difference between pretest and posttest knowledge scores. Examination of the ranks (Table 3) revealed that 69 participants (73.4%) achieved higher posttest scores, while no participants showed decreased performance. The remaining 25 participants (26.6%) maintained identical scores. Collectively, these findings provide evidence that the semester-long disaster mitigation learning program effectively enhanced tourism students' disaster knowledge in Lombok. Table 5 provides a complete descriptive summary of the pretest and posttest scores.

Table 5. Comparison of Disaster Knowledge Before and After Learning

Statistic	Pretest	Posttest	Gain
Median	18	25	+7
Range	8-26	14-30	
Minimum Score	8	14	
Maximum Score	26	30	
Percentage Showing Improvement			73.4%

Source: Analysis Result, 2026

A semester-long disaster mitigation learning in Mataram University Tourism Study Program is proven to increase students' knowledge about the types of disasters, disaster occurrence, risks in campus buildings and tourism destinations, disaster impacts, actions during disasters, and evacuation requirements. These findings are in line with other research that the integration of disaster mitigation in learning can improve the student's disaster knowledge (Wedyawati et al., 2017; Rifai, 2018; Achmad, 2020) and improve the problem-solving ability regarding disaster mitigation (Nurcahyo & Winanti, 2024).

Respondents or students that analized as ties or have the same scores between before and after learning as much as 26.6% can be explained by prior knowledge perspective. The student that has high prior knowledge before treatment may not showing improvement in post-test because the knowledge that was tested is already mastered prior to the test. If students have prior knowledge, they may be able to develop it and integrate new information into their existing knowledge framework. However, when students already mastering all the knowledge on a topic, the learning intervention may yield a zero effect, resulting in no improvement from pretest to posttest scores (Tobler, 2024). In the context of this study, the 26.6% of participants who maintained stable scores may reflect this precise phenomenon—a ceiling effect among some high-achieving students or prior mastery of the assessed content.

The high prior knowledge of the respondents can be related with their experience on being victims of disasters. Research from Havwina et al. (2017) shows that experience in facing disaster affect the student's awareness and preparedness knwoledge. This case also confirmed by the respondents that is residents of Lombok Island who experienced big earthquake in 2018 that leave trauma in their mind. Based on the complementing data by interview, some of the respondents are victims of disaster who were strongly affected such as having thier home destroyed. This experience prepared them to having more knowledge in case the disaster occurs. The high knowledge restructuring that could happen after learning in student with prior knowledge can't be measured with a simple multiple-choice instrument.

D. CONCLUSIONS

This study showed that a structured, semester-long disaster mitigation learning program with case-based method can produce statistically significant improvements in tourism students' knowledge of disaster risk mitigation. For disaster-vulnerable destinations such as Lombok, where tourism is a critical economic sector, the study program for future actors in mitigating disaster is crucial. Integrating disaster mitigation and risk reduction into the core

curriculum of tourism and hospitality education will be a practical investment in long-term destination resilience, sustainability, and competitive advantage. However, the research design that did not employ control group for comparison resulting in a possibility of other confounding variables affecting the result.

Future research should be done to explore the effects of structured learning program to disaster risk mitigation knowledge with more rigorous experimental designs which employing randomized control group. Another aspect should also be explored such as assessing long-term knowledge retention, evaluating the transfer of learning into practical competencies and decision-making to the students of tourism program study. Different learning methods and media can also be explored further as an intervention in affecting disaster risk mitigation knowledge in tourism studies.

REFERENCES

Achmad, V. S. (2020). Pengaruh pendidikan bencana gempa bumi terhadap peningkatan pengetahuan dan sikap siswa smk karya bangsa kota tangerang. *Jurnal Medikes (Media Informasi Kesehatan)*, 7(2), 297–304. https://doi.org/10.36743/medikes.v7i2.248

Arikunto, S. (2017). *Pengembangan instrumen penelitian dan penilaian program*. Yogyakarta: Pustaka Pelajar.

Budiatiningsih, M., Hulfa, I., Rojabi, S. H., Putri, C. A., & Jumiarti, S. (2025). Profile of The Visitors' Knowledge Related to Disasters at Kuta Mandalika Beach, Central Lombok Regency. *Journal of Indonesian Tourism, Hospitality and Recreation*, 8(1), 15-24. https://doi.org/10.17509/jithor.v8i1.76238

Chen, Y. F., & Adefila, A. (2020). Enhancing school safety through university engagement in DRR education. *International journal of disaster risk reduction*, 44, 101386. https://doi.org/10.1016/j.ijdrr.2019.101386

Creswell, J.W. and Creswell, J.D. (2018) *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage, Los Angeles.

Dharmawi, H. R. (2023). Pengaruh buku digital materi mitigasi bencana dalam pembelajaran geografi terhadap hasil belajar peserta didik kelas XI SMAN 54 Jakarta. *Edu Geography*, 11(3), 79-82. https://doi.org/10.15294/edugeo.v11i2.76777

Febrianto, A. D., Purwanto, P., & Irawan, L. Y. (2024). Pengaruh penggunaan media Webgis Inarisk terhadap kemampuan berpikir spasial siswa pada materi mitigasi dan adaptasi bencana. *Jurnal Pendidikan Geografi: Kajian, Teori, dan Praktek dalam Bidang Pendidikan dan Ilmu Geografi*, 26(2), 2. https://dx.doi.org/10.17977/um017v26i22021p073

Ferianto, K., & Hidayati, U. N. (2019). Efektifitas pelatihan penanggulangan bencana dengan metode simulasi terhadap perilaku kesiapsiagaan bencana banjir pada siswa sman 2 tuban. *Jurnal Kesehatan Mesencephalon*, 5(2). https://doi.org/10.36053/mesencephalon.v5i2.110

Giffari, M.A., Febriamansyah, R. and Yuerlita, (2025). Transformation of Coastal Village on Pahawang Island, Lampung, Indonesia: From a Fishing Village to a Marine Tourism Village. Tourism in Marine Environments, 20(3), 235-256. https://doi.org/10.3727/216901925X17513682158305

Hadi, S. (2019). Learning from the legacy of post-disaster recovery in Indonesia for the acceleration of post-disaster recovery in Lombok. *Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning*, 3(1), 14–31. https://doi.org/10.36574/jpp.v3i1.56

Hariyanto, S., & Kurniawati, K. (2019). Pengaruh metode simulasi bencana banjir terhadap tingkat kesiapsiagaan mahasiswa program studi ilmu keperawatan fik unipdu jombang. *Journals of Ners Community*, 10(1), 67–73. https://doi.org/10.55129/jnerscommunity.v10i1.848

Havwina, T., Maryani, E., & Nandi, N. (2017). Pengaruh pengalaman bencana terhadap kesiapsiagaan peserta didik dalam menghadapi ancaman gempabumi dan tsunami. *Jurnal Geografi Gea*, 16(2), 124-131. https://doi.org/10.17509/gea.v16i2.4041

Hidayaht, A.N., Partini, D., Kurniawan, N. and Scorviana, N., (2025). Analysis spasial and mapping of the tourism potential of the Dieng Kulon Banjarnegara. *IOP Conference Series. Earth and Environmental Science*, 1462(1), pp. 012029. https://doi.org/10.1088/1755-1315/1462/1/012029

Iordanis, K., Papatheodorou, A., Doumi, M. and Nicholas, K., (2025). Drivers of Efficient Destination Management in Times of Transition: Key Findings for Destination Development Management and Marketing Organisations (DDMMOs). *Tourism and Hospitality*, 6(5), 244. https://doi.org/10.3390/tourhosp6050244

Junianto, D., & Hendriani, D. (2023). Pengaruh model simulasi bencana terhadap nilai sikap kesiapsiagaan siswapada mata pelajaran ilmu pengetahuan sosial. *CENDEKIA*: *Jurnal Penelitian Dan Pengkajian Ilmiah*, 1(1), 47-55. https://doi.org/10.62335/k0zhsw43

Kurniati, P.S., and Suryanto, S., (2023). Tourism development policy based on digital economy in Lombok national tourism destination. Journal of Eastern European and Central Asian Research, 10(1), https://doi.org/10.15549/jeecar.v10i1.1074

Kusnandar, D., Suprapto, P. K., & Surahman, E. (2020). Pengaruh model pembelajaran problem based learning (PBL) terhadap hasil belajar kognitif dan motivasi belajar pada materi lapisan bumi dan bencana. *Journal of Geography Education*, 1(1).

Lestari, T., Shobirun, S., & Sulistyowati, D. I. (2023). Pengaruh media pembelajaran komik siaga bencana dengan kesiapsiagaan bencana banjir. *Juru Rawat. Jurnal Update Keperawatan*, 3(2), 31-36. https://doi.org/10.31983/juk.v3i2.10925

Liao, Y., Wang, S., Weng, D., Han, T., Yang, Y., Chen, R., & Sun, X. (2020). Impact of a Case-Based–Team- Based Learning Model on Critical Thinking and Self-Efficacy of Nursing Undergraduates in China. *Indian Journal of Continuing Nursing Education*, 21(2), 159–165. 10.4103/IJCN.IJCN_51_20

Lin, Y.-M., Lin, B.-C., & Lee, C.-H. (2025). Enhancing resilience in isolated island communities: A disaster adaptation framework using importance-performance analysis. *Natural Hazards*, 121, 8327–8346. https://doi.org/10.1007/s11069-024-07103-0

Majlinda, G., Romina, M., Tea, T. and Kozeta, S., (2026). Guest Acceptance of Smart and AI-Enabled Hotel Services in an Emerging Market: Evidence from Albania. *Tourism and Hospitality*, 7(1), 14. https://doi.org/10.3390/tourhosp7010014

Misnawati, M., Pilu, R., & Astri, Z. (2023). Legal Case-Based Reading to Promote Critical Thinking for Law Students. *20th AsiaTEFL-68th TEFLIN-5th INELTAL Conference (ASIATEFL 2022)*, 418–431. https://doi.org/10.2991/978-2-38476-054-1_37

Nurcahyo, A. D., & Winanti, E. T. (2024). Pengaruh model Problem Based Learning terintegrasi pendekatan induktif terhadap kemampuan berpikir spasial dan

pengetahuan siswa pada materi mitigasi bencana. *Jurnal Pendidikan Geografi: Kajian, Teori, dan Praktek dalam Bidang Pendidikan dan Ilmu Geografi*, 26(1), 4. https://dx.doi.org/10.17977/um017v26i12021p041

Partini, D., & Hidayaht, A. N. (2024). Disaster risk reduction efforts through education in Indonesia: A literature review. *IOP Conference Series.Earth and Environmental Science*, 1314(1), 012049. https://doi.org/10.1088/1755-1315/1314/1/012049

Ramos-Ruiz, J., Guzmán-Dorado, L., Ferreira-Gomes, P. and Algaba-Navarro, D., (2026). Expanding Motivational Frameworks in Sports Tourism: Inclusiveness, Digital Interaction and Runner Segmentation in the Half Marathon Magaluf (Mallorca, Spain). *Tourism and Hospitality*, 7(1), pp. 13. https://doi.org/10.3390/tourhosp7010013

Raza, S. A., Qazi, W., & Umer, B. (2020). Examining the impact of case-based learning on student engagement, learning motivation and learning performance among university students. *Journal of Applied Research in Higher Education*, 12(3), 517–533. https://doi.org/10.1108/JARHE-05-2019-0105

Rifai, M. H. (2018). Pengaruh penggunaan media audio visual terhadap pemahaman konsep mitigasi bencana pada mahasiswa pendidikan geografi. *Edudikara: Jurnal Pendidikan Dan Pembelajaran*, 3(1), 62–69. https://doi.org/10.32585/edudikara.v3i1.79

Rosianna, S., Juliana, J., Hubner, I.B., Lemy Diena M. and Amelda, P., (2026). Empowering Local Communities Through Homestay Management: An Innovative Strategy for Sustainable Rural Tourism in Yogyakarta. *Societies*, 16(1), pp. 34. https://doi.org/10.3390/soc16010034

Setianingsih, D., Utami, S., & Itsna Nur'aini. (2023). The Correlation Between Knowledge and Earthquake Preparedness Level Based on Implementation of Disaster Curriculum at Senior High School 2 Klaten. *E3S Web of Conferences*, 468, 09004. https://doi.org/10.1051/e3sconf/202346809004

Silitubun, E., Mustaji, Dewi, U. (2025). The effectiveness of case-based learning in enhancing students' critical thinking skills. *Journal of Neonatal Surgery*, 14 (2), 136-141. https://doi.org/10.52783/jns.v14.1844

Sumintono, B dan Widhiarso, W. (2015): *Aplikasi Permodelan Rasch pada Assessment Pendidikan*. Cimahi: Trim Komunikata.

Tan, M. L., Prasanna, R., Stock, K., Hudson-Doyle, E., Leonard, G., & Johnston, D. (2016). Mobile applications in crisis informatics literature: A systematic review. *International Journal of Disaster Risk Reduction*, 31, 1–16. https://doi.org/10.1016/j.ijdrr.2016.06.009

Tanner, A., & Doberstein, B. (2015). Emergency preparedness amongst university students. *International Journal of Disaster Risk Reduction*, 13, 409–413. https://doi.org/10.1016/j.ijdrr.2015.08.007

Tobler S. (2024). Context matters: Interpreting effect sizes in education meaningfully. *MethodsX*, 13, 103023. https://doi.org/10.1016/j.mex.2024.103023

Tyas, R. A., Wilujeng, I., Rosana, D., Kuswanto, H., & Purwasih, D. (2025). A review of disaster risk reduction education implementation: Integration, trends, and trajectories. *Social Sciences & Humanities Open*, 12, 102015. https://doi.org/10.1016/j.ssaho.2025.102015

Wedyawati, N., Lisa, Y., & Selimayati, S. (2017). Pengaruh Model Pembelajaran IPA Terintegrasi Mitigasi Bencana terhadap Hasil Belajar. *Edukasi: Jurnal Pendidikan*, 15(2), 261–273. https://doi.org/10.31571/edukasi.v15i2.636

Zhao, W., He, L., Deng, W., Zhu, J., Su, A., & Zhang, Y. (2020). The effectiveness of the combined problem-based learning (PBL) and case-based learning (CBL) teaching method in the clinical practical teaching of thyroid disease. *BMC Medical Education*, 20, 1–10. https://doi.org/10.1186/s12909-020-02306-y