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FIQH OF DISASTER: A DEVELOPMENT OF LANDSLIDE MITIGATION-PREPAREDNESS MODULE BASED ON THE TRANSDISCIPLINARY ISLAMIC APPROACH

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Abstract

The purpose of this research is to create a non-formal module on the fiqh of disaster as part of an effort in landslide mitigation-preparedness using a community-oriented in Indonesian society. Indonesia is strategically placed in the ring of fire, making the main areas vulnerable to natural disasters. As one of the most prominent Muslim organizations in Indonesia, Muhammadiyah, with fiqh of disaster attempts to provide direction for society on disaster management based on Islamic norms and regulations. In this study, we use a transdisciplinary Islamic approach within the key fields of Islamic education, Islamic jurisprudence, and disaster jurisprudence, and physics (inclined plane). The research method used in this study is R&D under the ADDIE model, with five steps: analysis, design, development, evaluation, and analysis. This study included data document evaluation and questionnaires as data collection, whereby content analysis, product development, and product feasibility are all data analysis methodologies. The results showed that the module on landslide mitigation for society is well executed. The material examiner obtained a total score of 22 with a percentage of 91% and rated it "very valid." The subject examiner obtained a total score of 13 with a percentage of 81% and rated it "very valid." This study provides recommendations for further Implementation in the form of the effectiveness of modules for the community based on ADDIE phases. In addition, it is hoped that the study can be developed in the post-disaster stage so that researchers, policymakers, the government, and the community in landslide disaster management can use it.

Keywords: disaster mitigation; fiqh disaster; management disaster; Muhammadiyah; transdisciplinary approaches

Abstrak

Tujuan dari penelitian ini adalah untuk membuat modul nonformal fikih kebencanaan sebagai bagian dari upaya kesiapsiagaan penanggulangan tanah longsor dengan pendekatan community-oriented pada masyarakat Indonesia. Letak Indonesia yang strategis di ring of fire membuat wilayah-wilayah utama rentan terhadap bencana alam. Sebagai salah satu ormas Islam terkemuka di Indonesia, Muhammadiyah dengan fikih kebencanaan berupaya memberikan arahan kepada masyarakat tentang penanggulangan bencana berdasarkan norma dan aturan Islam. Dalam studi ini, kami menggunakan pendekatan Islam transdisipliner dalam bidang-bidang utama pendidikan Islam, fikih Islam, fikih kebencanaan, dan fisika (bidang miring). Metode penelitian yang digunakan dalam penelitian ini adalah R&D dengan model ADDIE, dengan lima langkah yaitu analisis, desain, pengembangan, evaluasi, dan analisis. Kajian ini meliputi evaluasi dokumen data dan kuesioner sebagai pengumpulan data, dimana analisis isi, pengembangan produk, dan kelayakan produk merupakan metodologi analisis data. Hasil penelitian menunjukkan bahwa modul penanggulangan longsor untuk masyarakat terlaksana dengan baik. Penguji materi memperoleh skor total 22 dengan persentase 91% dan dinilai "sangat valid". Penguji mata pelajaran memperoleh skor total 13 dengan persentase 81% dan menilainya "sangat valid." Penelitian ini memberikan rekomendasi Implementasi selanjutnya berupa efektivitas modul untuk masyarakat berdasarkan tahapan ADDIE. Kajian ini diharapkan dapat dikembangkan pada tahap pascabencana sehingga dapat dimanfaatkan oleh para peneliti, pembuat kebijakan, pemerintah, dan masyarakat dalam penanggulangan bencana tanah longsor.

Kata kunci: *mitigasi bencana; bencana fikih; penanggulangan bencana; Muhammadiyah; pendekatan transdisipliner*

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Introduction

The high risk of landslides in Indonesia can endanger human lives and natural resources that have destroyed infrastructure and degraded ecosystems, leading to loss of life and livelihoods (USAID, 2017). According to the Indonesian Disaster Management Agency's (2022) report, landslides are one of the most severe disasters, with 564 landslides occurring during 2022 in Indonesia (BNPB, 2022), with an estimated more than 120 million people living in areas of risk of landslides (Statista, 2022).

However, the diversity of biological and animal nature, as well as the multiculturalism of the Indonesian people, is inversely proportional to the level of education, literacy, and implementation of landslide disaster mitigation, as well as a lack of knowledge and adaptation to natural changes, resulting in high vulnerability and damage caused by landslide disasters. Aside from that, the primary casualty of landslides is the community as a result of various conditions: internal conditions that come from inside oneself, such as the level of knowledge and understanding of the disaster, where the community's low literacy education about landslides makes an area more vulnerable to disasters, and (2) external conditions as a causative factor that comes from outside oneself, such as the location and place of the population affected by the disaster.

Physically, landslides are more likely to occur in areas with low vegetation or vegetation variations humans (Nasiah & Invanni, 2014) that do not match the surrounding circumstances and locations with a more than 40% slope. In addition, the high rainfall that mainly occurs in various parts of Indonesia increases an area's vulnerability to landslides (Departemen Pekerjaan Umum, 2007). Landslides cause physical and psychological damage and the loss of human life, such as building damage, ecosystem destruction, minor and serious injuries to humans and animals, and casualties (Hidayah et al., 2021). However, the cause of the landslide as part of the study of physics is still being discussed in applied science disciplines and has yet to reach edu-religious disciplines.

Therefore, this study uses a transdisciplinary approach to understand the complexities across disciplines, to broaden understanding, focusing on the development of religious studies and other disciplines, particularly between physics and Islamic education.

The transdisciplinary approach also follows the Indonesian Qualification Framework (KKNI) in research (Fitri, Indarti, et al., 2020; Fitri, Nafis, et al., 2020; Menteri Pendidikan dan Kebudayaan Republik Indonesia, 2020). Of course, mitigation is the first step in improving activities and preparedness for disasters, particularly landslides, in terms of preparedness, alertness, and capability to raise public awareness of physical and spiritual understanding of disasters, as well as community knowledge in disaster response (Utia & Fauzi, 2021).

Based on data, Muhammadiyah, as a social, religious, and educational institution, has produced fiqh of disaster as an output in coping with natural catastrophes. Fiqh of disaster analyzes, explain, foresee, and respond to disaster situations based on values, ethics, and ethos found in the Qur'an and Hadith (Shalihin, 2020; The Fatwa and Islamic Research Council and Muhammadiyah Disaster Management Center, 2016). This is based on Muslim perceptions ranging from the general population to some specialists who still regard fiqh as absolute and

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legalistic law. On the other hand, MTT's view of the meaning of fiqh differs from the conventional understanding of traditional fiqh (Fauzi & Ayub, 2019), where some regard fiqh as the foundation of Islamic law guiding worship (Islamic worship principle), *muamalah* (Islamic rulings governing commercial transactions principle), *jinayah* (Islamic criminal jurisprudence), and *siyasah* (Islamic legal jurisprudence) (Islamic political authority jurisprudence). Furthermore, fiqh is at a relative level, therefore, it cannot be made at a superlative level, which causes understanding to differ between experts, although some people still perceive fiqh as at a superlative level (Al-Syakhsiyah & Maqashid, 2021; Iqbal, 2017; Shalihin, 2020). As a result, this study examines fiqh through the lens of Muhammadiyah, which is not someone's authority to be superior to others (Shalihin, 2020). Hence, fiqh becomes one of the strategies for approaching relative law rather than absolute law, which is relevant to global issues. According to Muqtedar Khan (2020), fiqh seeks to reduce the influence of legalism in Islamic thought because it is regarded as the primary cause of the loss of *Ihsan* in fiqh discourse, where Khan defines Ihsan as doing pleasant things(Muqtedar Khan, 2020).

Furthermore, the community's perception of natural catastrophes is still textual, with a negative stigma and social discrimination towards areas and persons impacted by disasters who are "regarded" as a result of sinful conduct and God's judgment. The existence of negative justification and blaming the injured victim area (Parwanto, 2019) or disaster victims by a natural disaster are often termed acts of God (Bradley, 2017) or accept calamity as a given that cannot be prevented (Prihatin, 2018) and tend to come more normative-textual understanding about disaster from Muslim society (Shalihin, 2020), including disasters that are inflicted on people who commit crimes as rebuke and disaster as a means of removing sins and qualifications for faith (Parwanto, 2019). As a result of this pattern, a significant amount of disaster damage is sustained, including loss of life, destruction of infrastructure, and the onset of psychiatric problems like post-traumatic stress disorder (PTSD) (Lindsey et al., 2014; RJ, 2018).

This problem requires an immediate outcome-based transdisciplinary approach, in this case in the form of a non-learning module aimed at improving community understanding of landslide disaster preparedness in scientific and religious approaches.

Nevertheless, Indonesia is home to the world's largest Muslim population (87,2%) (Hackett et al., 2012), where Islam is highly emphasizing to become a human being (*insan kamil*) who has a good relationship with God, self, and the universe based on the Qur'an and Hadith (Harahap & Siregar, 2017). Unfortunately, the large quantity of Muslim population and the high piety of the Indonesian people, with a percentage reaching 99% (Yusuf et al., 2020)) are inversely proportional to the lack of public understanding of disasters and are less likely to take action to reduce their impact, especially regarding landslides. The Center for Volcanology and Geological Hazard Mitigation (PVMBG) of the Geological Agency reported that landslides are the source of fatal geological disasters (2022) (Ahmad Arif, 2022). Meanwhile, the National Agency for Disaster Management reported that landslides highly threaten 40.9 million Indonesians in 2022 (Callistasia Wijaya, 2019).

As human resources in Indonesia are plentiful, Muslims have promising prospects to face future difficulties, especially in the fields of education, research and technology (Shalihin, 2020) in disaster preparedness. Unfortunately, Indonesia often invests minimal resources in scientific

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investigation (Alpay et al., 2014).. This is one of the reasons why Muslims in Indonesia are so regressive, rejecting rationality-empirical approaches to the point of pushing for equality of ideas and being forced to adhere to what they consider to be acceptable behavior (Serageldin, 2008) due to a lack of understanding of various disciplines.

Consequently, research in Islamic studies requires an outcome-based transdisciplinary approach that means pooling collective knowledge to solve bigger and more complex problems through outcomes that can benefit the community, particularly by improving the understanding of community early mitigation against landslides. The transdisciplinary approach aims to create a new theory or axiom by linking different fields to address the complexity of world problems (Fitri et al., 2020).

Furthermore, the development of modules based on a transdisciplinary approach overcomes the problem of Islamic studies, most of which still adopt a monodisciplinary approach. However, Al-Effendi (2016) stated that we could not Islamicize what others make because it demands significant intellectual resources to produce information from Islam itself (International Institute of Islamic Thought, 2016), thus requiring a transdisciplinary approach.

So far, relevant transdisciplinary studies involving fiqh and physics in this research include; the validity of the integrated physics ebook on landslide disaster mitigation materials based on a problem-based learning model (Utia & Fauzi, 2021), the fiqh of disaster: the mitigation of covid-19 in the perspective of Islamic education-neuroscience (Suyadi et al., 2020), disaster cosmologies in comparative perspective: Islam, climate change and the 2010 floods in Pakistan's Southern Punjab (Ahmad, 2019), Islam and disaster management in contemporary times: a psycho-socio-spiritual response (Fahm, 2019), the use of UAVs for landslide disaster risk research and disaster risk management: A literature review (Garnica-Peña & Alcántara-Ayala, 2021), flood disaster, local belief and Islam-Sufism (Harifuddin, 2017). Although the material has been studied in fiqh, these works are nonetheless normative-deductive in nature. However, physics content is studied using a more scientific method and has not yet progressed to the stage of scientific integration with fiqh, particularly fiqh of disaster.

Therefore, the purpose of this study is to create a module based on transdisciplinary approach for disaster mitigation in landslide-prone areas based on applied science (physics), education, and Islam. In addition, this study does not only change the nomenclature in the integration between science and religion, but also contributes in an applicative way in the community environment in the form of modules. As Anjum (2016) sees it:

> "What is this integration, and where is it going? Or is this a graceful way of ending a project? Otherwise, you become a reformist, an incorrigible reformer, who is constantly trying to fix without actually understanding, and in the end, doesn't inspire" (Saulat Pervez, 2016).

The process of this approach will continue indefinitely and, according to the author, will become an ecosystem in the space of re-nomenclature if it is not accompanied by outcome-based problem-solving that contributes in an applicable manner, especially for the community. In addition, this study aims to improve public education and literacy on landslide disaster mitigation based on socio-religious movements, as well as to develop and strengthen material in fiqh of disaster. According to the author, it is hoped that this research product will serve as a bridge in

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landslide disaster mitigation literacy between scientific aspects that are considered substantive and religious aspects that are considered normative, thereby increasing public understanding of inter-scientific disciplines.

Method

This research uses a five-step model: Analysis, Design, Development, Implementation, and Evaluation (ADDIE). This research was conducted by developing a fiqh of disaster and landslide mitigation non-learning modules based on module principles of independent learning, motivation, collaborative learning, and instructional design (Göksu et al., 2017). This study gathered data from February 2020 through October 2020 utilizing document reviews and questionnaires. As for the analysis technique, it used content analysis, product development, and product feasibility in module development.

Technically, the analysis stage is a research activity that gathers research questions and the conceptual framework for the study (Thaib et al., 2016) as material limitation and development. This study employs two analytical models: (1) performance analysis (Importance Performance Analysis/IPA) and analyzes the fundamental issues encountered in research (Cahyadi, 2019). In other words, compare and contrast expectations and performance that have been carried out and measured concurrently (Pazil & Razak, 2019). IPA is carried out through a documentation study process gathered from the reality of community conditions that are still limited in understanding landslide disasters, requiring self-learning media that is expected to increase disaster mitigation literacy education, and (2) need analysis (Mutlu, 2016; Walter Dick, Lou Carey, 2004) is a continuation of performance analysis via pre-defined fundamental problems (Winarti, 2015) that also carried out through a documentation study process. The need analysis aims to identify the content or materials required in development following the research objective (Cahyadi, 2019; IIng Rika Yanti, 2014) with the need for the development of landslide disaster mitigation materials from fiqh of disaster that consisted of introduction, disaster and landslide mitigation, disaster fiqh, transdisciplinary Islamic approach, slopes and landslides, and landslide mitigation. In addition, this content or material will be further developed in the module.

Second, design is a systematic process that begins with identifying module objectives, designing the module, developing the illustrations, charts, and graphs, and typing, editing, and layout (Tegeh et al., 2015). In addition, the researcher used a questionnaire adapted from (Yusmaliana, 2020) for validation by experts' judgment (Akbar, 2016), module experts, and material experts. This stage is carried out in two ways: (1) the development of content and graphic content of the module and (2) the use of questionnaires that aim to validate the module from two experts the content or material aspect and the writing aspect of the module.

Third, development aims to develop the conceptual framework of the design stage (Branch, 2010), in this case, the module of fiqh of disaster in landslide mitigation based on a transdisciplinary Islamic approach and physics. After the researcher develops the module, it is then validated by the two experts and the evaluation stage is carried out based on the suggestions, critics, and recommendations given (Kurnia et al., 2019). The implementation stage is not carried out in research due to the following factors: (1) the researcher's limited time in conducting product development up to the evaluation and effectiveness test phase, (2) the

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researcher's low cost in conducting research up to the evaluation, effectiveness, and dissemination phase, and (3) the researcher's limited background in developing products. The module employs two distinct disciplines of science, the humanities, and the exact sciences, with varying degrees of complexity compared to research in Islamic education.

Results and Discussion

Based on the above methods, this research uses a type of R&D research with the ADDIE model consisting of five steps. First, the analysis step consists of two parts: (1) IPA shows the need for a landslide mitigation disaster module, whereas the previous module is still developed in the form of monodisciplines, such as physics in this research includes; the validity of the integrated physics ebook on landslide disaster mitigation materials based on a problem-based learning model (Utia & Fauzi, 2021) or disaster material that is not yet in the form of modules for the community, such as the fiqh of disaster: the mitigation of covid-19 in the perspective of Islamic education-neuroscience (Suyadi et al., 2020), disaster cosmologies in comparative perspective: Islam, climate change and floods in Pakistan's Southern Punjab (Ahmad, 2019), Islam and disaster management in contemporary times: a psycho-socio-spiritual response (Fahm, 2019), the use of UAVs for landslide disaster risk research and disaster risk

management: A literature review (Garnica-Peña & Alcántara-Ayala, 2021), and flood disaster, local beliefs, and Islam-Sufism (Harifuddin, 2017). This IPA process leads to (2) need analysis that requires the development of a landslide mitigation module based on a transdisciplinary approach between physics, Islamic studies, and Islamic education.

The module development carried out is also based on the conditions of Indonesi that is located in the ring of fire, and the tropical climate causes high rainfall in various regions, increasing the risk of landslides due to ubiquitous erosion conditioning factors such as steep slopes, susceptible soils, and high levels of precipitation (Chikalamo et al., 2020). The amount of landslide-prone locations is directly related to the number of casualties and material losses but inversely proportional to the public's comprehension of landslide disasters (Shalihin, 2020).

The second stage is design by identifying previous modules that have not contained landslide disaster mitigation content in a transdisciplinary Islamic approach, module graphic design, writing questionnaires, and writing a questionnaire. The content consisted of introduction, disaster conception, interpreting disaster, perspective on disaster management, and disaster mitigation.

Figure 1. Front and Back Cover Display of Module Landslide Disaster Mitigation

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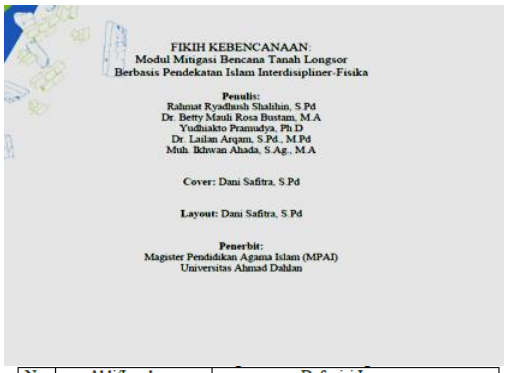
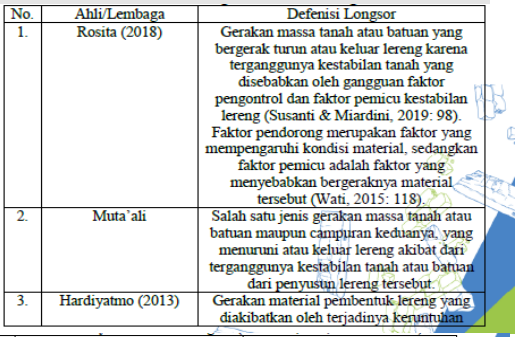
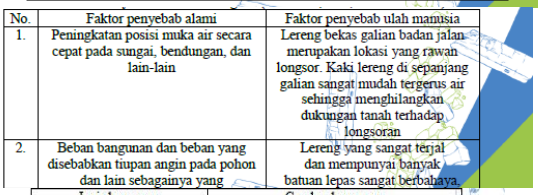
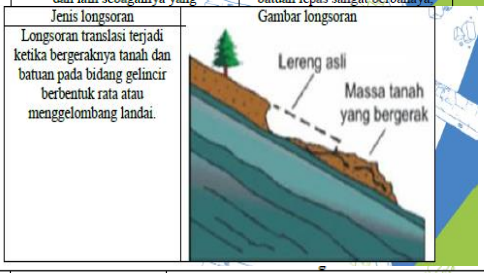
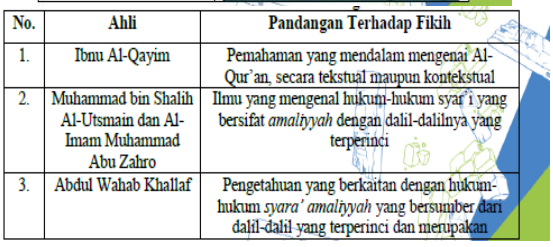
The design includes the following elements; cover (figure 1), list of authors, foreword, contents page, preface, conceptual map, landslide definition, landslides types (BNPB, 2012; Shalihin et al., 2021), fiqh definitions, disaster terms from Islamic perspective, slope classification (table 1).

Table 1. Elements of Module

No.	Description	Figure
1	List of authors	
2	Landslide definition	
3	Causes of landslides	
4	Types of landslides	
5	Fiqh definitions	

No.	Ahli/Lembaga	Defenisi Longsor
1.	Rosita (2018)	Gerakan massa tanah atau batuan yang bergerak turun atau keluar lereng karena terganggunya kestabilan tanah yang disebabkan oleh gangguan faktor pengontrol dan faktor pemicu kestabilan lereng (Susanti & Miardini, 2019: 98). Faktor pendorong merupakan faktor yang mempengaruhi kondisi material, sedangkan faktor pemicu adalah faktor yang menyebabkan bergeraknya material tersebut (Wati, 2015: 118).
2.	Muta'ali	Salah satu jenis gerakan massa tanah atau batuan maupun campuran keduanya, yang menuruni atau keluar lereng akibat dari terganggunya kestabilan tanah atau batuan dari penyusun lereng tersebut.
3.	Hardiyatmo (2013)	Gerakan material pembentuk lereng yang diakibatkan oleh terjadinya keruntuhan

No.	Faktor penyebab alami	Faktor penyebab ulah manusia
1.	Peningkatan posisi muka air secara cepat pada sungai, bendungan, dan lain-lain	Lereng bekas galian badan jalan merupakan lokasi yang rawan longsor. Kaki lereng di sepanjang galian sangat mudah tergerus air sehingga menghilangkan dukungan tanah terhadap longsoran
2.	Beban bangunan dan beban yang disebabkan tiupan angin pada pohon dan lain sebagainya yang	Lereng yang sangat terjal dan mempunyai banyak batuan lepas sangat berbahaya.

Jenis longsoran	Gambar longsoran
Longsoran translasi terjadi ketika bergeraknya tanah dan batuan pada bidang gelincir berbentuk rata atau menggelombang landai.	

No.	Ahli	Pandangan Terhadap Fikih
1.	Ibnu Al-Qayim	Pemahaman yang mendalam mengenai Al-Qur'an, secara tekstual maupun kontekstual
2.	Muhammad bin Shalih Al-Utsmain dan Al-Imam Muhammad Abu Zahro	Ilmu yang mengenal hukum-hukum syar'i yang bersifat *amaliyyah* dengan dalil-dalilnya yang terperinci
3.	Abdul Wahab Khallaf	Pengetahuan yang berkaitan dengan hukum-hukum *syara' amaliyyah* yang bersumber dari dalil-dalil yang terperinci dan merupakan

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6 Fiqh of disaster terminologies

No.	Istilah bencana	Defenisi	Ayat Al-Qur'an dan Hadis
1.	*Musibah*	Peristiwa yang menimpa manusia, baik yang berasal akibat dari perbuatan manusia maupun karena alam akibat kekeliruan dari perbuatan manusia itu sendiri	Al-Hadid 22-23, an- Nisa': 79, as-Syura': 30, al-Baqarah: 155-156, HR Muslim No. 2999
2.	*Bala*	Ujian atau cobaan bagi manusia untuk meningkatkan keimanan kepada Allah SWT, baik berupa kesengsaraan maupun kebahagiaan	al-A'raf-168, an-Naml: 140, al-Baqarah:155-157, al-Maarij: 19-21, Yusuf: 53, al-Anbiya': 35, H.R Ibnu Majah No. 4031

7 Slope classification

Kelas	Kemiringan Lereng (%)	Slope °	Klasifikasi
I	0-2	0-1.15	Datar (*flat to almost flat*)
II	2-7	1.15-4	Agak landai (*gentle sloping*)
III	7-15	4-8.5	Landai (*sloping*)
IV	15-30	8.5-16.7	Agak curam (*moderately steep*)
V	30-70	16.7-35	Curam (steep)
VI	70-140	35-54.5	Sangat curam (*very steep*)
VII	>140	>54.5	Curam ekstrim (*extremely steep*)

The results of the development stage in this research include the creation or concretization of the material, a literature study of the material, the creation of charts, graphs, plots, relevant illustrations, typing, information, and technical improvements, as well as module content.

Table 2. Expert validation results of module and material components

No.	Module components	Scoring scale			
		1	2	3	4
1.	Format				✔
2.	Attractiveness			✔	
3.	Font Size				✔
4.	Space				✔
5.	Organisation			✔	
6.	Consistency				✔
Average		24			
Total score		22			
Amount		3,6			
Percentage		92%			
Category		Very valid			
No	Material components	Scoring scale			
		1	2	3	4
1.	Sequencing			✔	
2.	Synthesizing			✔	
3.	Attractive				✔
4.	Concistency			✔	
Average		16			
Total score		13			
Amount		3,25			
Percentage		81%			
Category		Very valid			

The module was then validated by experts judgment and improved by the researchers under the experts' recommendations (table 2). Finally, the module is evaluated from the expert's judgment. The module components from expert who assigned a total score of 22 ("very valid" out of a maximum score of 24), an amount rating of 3.6 (representing 92% of the maximum

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amount rating of 4). Though material expert give it a grade of 13, placing it in the "very good" category of a average 16, with an amount rating of 3.25 and a percentage of 81% of the maximum average rating, 4. Therefore, the module assessment results from judgment experts are very valid, scoring between 76% and 100% (table 3).

Table 3. Criteria for validator assessment results, modified by researchers (Rahayu et al., 2012; Sari et al., 2017)

Score	Percentage	Category
1	1%-25%	Invalid
2	26%-50%	Not valid
3	51%-75%	Valid
4	76%-100%	Very Valid

Evaluation of the results of the distribution of module components received a score of 3 for attractiveness and organization (75%), and 4 for the format, font size, space, and consistency (100%). With a score of 3 totaling 2 times and 4 totaling 4 times (table 4).

Table 4. Frequency distribution of assessment results (module)

Score	Category	Frequency	Percentage(%)
1	Invalid		
2	Not valid		
3	Valid	2	75%
4	Very valid	4	100%

Meanwhile, the evaluation of the material expert validation results received a score of 3 on the sequencing, synthesizing, and consistency components (75%) and a score of 4 on the attractive component with a percentage of 100%. As a result, the frequency of assessment from material experts with a score of 3 is counted three times, and a score of 4 is counted once (table 5).

Table 5. Frequency distribution of assessment results (material)

Score	Category	Frequency	Percentage(%)
1	Invalid		
2	Not valid		
3	Valid	3	75%
4	Very valid	1	100%

The findings of the expert validation assessment are adjusted to the level of product validity, as shown in table 6.

Table 6. Validity level, modified by researchers (Rahayu et al., 2012; W. Sari et al., 2017)

Score	Percentage	Validity
1	1%-25%	Invalid
2	26%-50%	Not valid
3	51%-75%	Valid
4	**76%-100%**	**Very valid**

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Data analysis was performed on the percentage level of product validity in the two validator assessments based on data from the two experts. To begin, the level of validity in evaluating module expert can be calculated as follows (Gitnita et al., 2018):

$$P = \frac{f}{N} x\ 100\% \qquad (1.1)$$

P = final score

f = score

N = maximum score

$$P = \frac{22}{24} x\ 100\% = 92\%$$

The module expert evaluation resulted in a score of 92%. The generated product category, "*Fiqh Disaster: Landslide Disaster Mitigation Based on Transdisciplinary Islamic Approaches and Physics*," falls into the "very valid" category since the level of validity of module. However, there are suggestions from expert on how to enhance the module, and those will be considered during the revision process. Then, the reliability of the evaluation of the module content can be determined by the following formulas:

$$P = \frac{13}{16} x\ 100\% = 81\ \%$$

The material expert evaluation resulted in a score 81%. Since the established product category, "*Fiqh Disaster: Landslide Disaster Mitigation Based on Transdisciplinary Islamic Approaches and Physics*," falls into the "very valid" category and the module content has no changes or updates are necessary.

Discussion

The Muhammadiyah Council of Tarjih and Tajid, as a social and community organization, focuses on disaster management and management from a theoretical and practical perspective, including the development of disaster jurisprudence through the integration of reactive and preventative measures. Practically, Muhammadiyah's preventive-applicative strategy established in this study focuses on lowering the impact of landslide natural catastrophes as the first step in disaster management, and on long-term risk reduction efforts (Q.S Yusuf: 47-49) and disaster preparedness measures (Surah Ali-Imran: 200). Overall, disaster mitigation aims to prevent loss of life, lessen the impact on infrastructure, property, the environment, and economic resources lost, alleviate human suffering, educate and inform the community and connected parties about catastrophe risks, and control the use of natural resources (The Fatwa and Islamic Research Council and Muhammadiyah Disaster Management Center, 2016).

More specifically, the disaster risk (R), potential disaster hazard or hazard assessment (H), vulnerability factor (V), and capability to deal with disasters (C) are all essential parts of landslide disaster mitigation (Intarti et al., 2013; The Fatwa and Islamic Research Council and Muhammadiyah Disaster Management Center, 2016; UNISDR, 2004) based on the Regional Regulation of the Head of BNPB No. 4 of 2008 can be formulated as follows:

$$R = (H \times V) : C \qquad (1.2)$$

R = disaster risk

H = possibility of hazard/hazard threat

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V = vulnerability factor
C = capacity to deal with

Perka No. 2 of 2012 on General Guidelines for Disaster Risk Assessment draws on this formula to conclude that the levels of regional danger (H), vulnerability in the area threatened by disaster (V), and capacity in the area under threat (C) are highly correlated with disaster risk (R). First, the potential for disasters that cause damage or loss, in this case landslides, is known as disaster risk (R) (Law No. 27 of 2007). The Disaster Threat Index categorizes potential landslide damage as "low," "medium," or "high" danger. Existence, susceptibility, and preparedness for disasters all play a role in estimating the potential for catastrophic loss (BNPB, 2012).

Second, the possibility of hazard assessment (H) of natural occurrences or human actions that may destroy buildings, disturb economic and environmental stability, and result in human harm and death (Islam & Siwar, 2012). At this point, it will generate a map of landslide risk, which is crucial for planning emergency response measures. Third, V, or the vulnerability factor, refers to the community's physical, social, and economic factors that make it susceptible to landslides (UNISDR, 2004). The level of vulnerability is governed by the following factors: (1) social vulnerability is related to demographic, social, and cultural conditions; and (2) economic vulnerability is related to economic conditions (Faizana et al., 2015) as well as social sensitivity status. This vulnerability index is calculated using the average weighted population density (60%) and vulnerable groups (40%) consisting of the sex ratio (10%), poverty ratio (10%), individuals with disabilities ratio (10%), and age group ratio (10%) as specified by Perka No. 2 of 2012. (2) Economic vulnerabilities associated to productive land and GRDP (Gross Regional Domestic Income) per sector as community economic activities to satisfy everyday life, such as residents' efforts to use land for production and construction of economic infrastructure that is prone to landslides (Faizana et al., 2015). The size of the land area is determined by land use maps/districts/districts, while the GRDP is determined by sector/district reports. (BNPB, 2012), (3) physical vulnerability is related to the layout of structures and infrastructure in the region (building materials, building age, building area), as well as geographical characteristics (open space, slope, and buffer zone), all of which are determinants of landslide catastrophe vulnerability factors (Faizana et al., 2015; Jeong & Yoon, 2018). The components used are the availability of houses, buildings, and critical facilities, as well as (4) ecological vulnerability related to the balance and quality of the regional environment, which aims to measure the damage to an environment caused by landslides using various variables such as land area ranging from forests, rice fields, meadows, gardens, and more (Faizana et al., 2015). Forest types such as state-protected, naturally-occurring, mangrove, shrub, and swamp are utilized as criteria (Usup et al., 2019). As a means of mitigating the effects of landslides, each component can be improved in accordance with the requirements of individual regions. Since each area has its own unique inventory and set of resources, a thorough practical analysis of mitigation progress is essential. Therefore, it can be argued that the severity of the effects of landslides, such as the number of lives lost, increases as the class of the vulnerability parameter does (Muktaf, 2017), structural damage, physical abilities, post-traumatic stress disorder, and other forms of vulnerability that might trigger a vulnerability index conversion (BNPB, 2012).

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Last but not least, disaster-response capability (C), which is about people's talents, abilities, and skills when it comes to utilizing human resources (HR), communities, and systems (Dewald, 2011) to cope with landslides. With measures like a landslide warning system, education and evacuation system, and infrastructure spatial planning in place, this step will ensure that communities are as safe as possible against landslides of all types. The disaster risk is thus reduced by measures to lessen regional hazards, shrink the number of locations in danger, and fortify the resilience of those areas (BNPB, 2012). If the formula is executed correctly by considering numerous elements, there will be more excellent public knowledge and preparedness for coping with catastrophes, especially landslides in disaster-prone areas. Therefore, the ability to handle landslides and save lives increases with the capacity of an individual or society to respond to disasters (C) (C > H + V).

Furthermore, this research uses disaster fiqh, which incorporates structural mitigation, non-structural mitigation, and cultural mitigation, as the mode of implementation for landslide mitigation. First, structural mitigation entails the actual building of safeguards against landslides, such as embankments, streams, landscape terraces, slope conservation, and technological application. Building this structure is also motivated by a desire to reduce the destructive power of landslide events. There is a wide range of options for structurally minimizing the effects of landslide disasters. However, in the grand scheme of things, there are a few critical elements to keep in mind, such as the activity of collecting data on potential landslide susceptibility in a region or places through the construction of a database of prospective landslide danger locations. Regional maps, rainfall maps, and disaster-prone-area maps are just some of the data sets that can be visualized. There is a specific purpose for each type of database. A geographical unit's description of a region on a map (PP No. 8 of 2013 Article 1).

Furthermore, structural mitigation also includes conservation design for the sloped area. An essential part of preventing landslides on steep, high-sloped terrain is decreasing the amount of precipitation that reaches the soil surface. The geometry of slopes must be altered to increase their stability; lowering the pitch with measures like bench terraces, drainage and seepage control (especially of surface and subsurface drainage), stabilization of buildings, demolition, and removal of material in landslide-prone areas, and surface protection are all viable options. Furthermore, developing an early warning system is crucial as a preventative strategy in lowering the impact of landslides. Early warning technologies are installed in all potentially landslide-prone areas to forewarn residents of impending changes.

Second, avoiding landslide-prone areas, and raising community awareness of landslides through education, training, and socialization, focusing on disaster fiqh, are all examples of non-structural mitigation strategies that aim to lessen the societal impact of landslides without resorting to more permanent physical measures. Laws and regulations, spatial management, and mapping of disaster risk or hazard threats are all examples of non-structural forms of mitigation (Triana et al., 2017). Non-structural disaster prevention measures include; (1) raising public awareness through posters and signs about the need for prevention measures. For the safety of the community as a whole, it is essential to regularly reproduce and update these posters and signs warning of the potential dangers of landslides, (2) socialization in landslide-prone areas to raise community awareness about the importance of disaster mitigation through material such as an introduction to landslide disasters, landslide disaster mitigation efforts, and what the community

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does before, during, and after a landslide disaster occurs; and (3) simulations of landslide disasters to better prepare the community for actual conditions in the affected area, (4) provide disaster literacy education from religious perspectives in order to increase community understanding of disasters and reduce negative thinking about disaster areas (which are often seen as punishments from God or immoral places), and (5) provide compassion and emphasis to the broader community on disaster mitigation in religious life by reading the qunut nazilah prayer during every fardhu prayer in the last rak'ah (bow) after praying the prayer which carrying out by Muhammadiyah.

اَللّٰهُمَّ اِنِّىْ اَعُوْذُبِكَ مِنْ جَهْدِالْبَلَاءِ وَدَرْكِ الشَّقَاءِ وَسُوْءِ الْقَضَاءِ و شَمَاتَةِ الْاَعْدَاءِ

"O Allah, we seek refuge in You from the weight of the calamity that cannot be endured, the coming causes of destruction, the bad consequences of what has been destined, and the joy of the enemy over the suffering that befalls." (HR. Bukhari)

Third, cultural mitigation, also called local knowledge, experience, and awareness of social-system landslide disasters (Q.S al-Maidah: 2). Most Indonesians are essentially already aware of information concerning future natural disasters. This is because of the geographical characteristics in Indonesia, which have provided local communities with essential knowledge, allowing for local expertise on mitigation in each location to engage directly with the ecology (Triana et al., 2017); basic information about the impending tsunami has already reached coastal communities, while details about landslide disasters has reached populations in hilly places. With regards to landslide disaster relief, Muhammadiyah has the WHO-verified Muhammadiyah Disaster Management Center (MDMC) (Suwaryo et al., 2020); in order to assess and manage landslide catastrophe prevention in an efficient, effective, and precise manner, MDMC has engaged in a wide range of operations that are grounded in a religiously informed scientific-technology approach. MDMC, established in 2007, coordinates Muhammadiyah's efforts in the event of a landslide disaster. This organization emphasizes the spiritual dimensions of disaster relief by highlighting the importance of values, compassion, care, and community empowerment as manifestations of trust in Allah SWT. Muhammadiyah has used this strategy extensively as an element of catastrophe management, both conceptually and practically in social life, and has applied it in several different parts of Indonesia.

Conclusion

Based on the data and study findings, it is possible to infer that the developed research product, *the landslide natural disaster mitigation module based on the transdisciplinary Islamic approach and physics*, is ready for use. The ratings of the validators corroborate this, with module experts receiving a score of 22 and a percentage of 91% and material experts receiving a score of 13 and a percentage of 81%. Both assessments are said to be very valid. The following landslide disaster mitigation module based on a transdisciplinary Islamic perspective and physics is recommended for use; (1) the research development stage is still very limited to the model at four stages without implementation, so it is strongly recommended to continue for further research/researchers, (2) the module can also be developed at the next level in the Muhammadiyah management flow, namely disaster emergency response and post-disaster

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(recovery), and (3) for the community, the module, it has been pronounced valid and feasible for more comprehensive community implementation. This study has limitations on the implementation stages that were not applied due to various circumstances, as mentioned in the previous section, thus providing further recommendations for future research. In addition, this study has limitations on the focus of landslide disaster research on the mitigation stage so that future research can focus on the disaster and post-disaster stages. In the end, this landslide mitigation module is highly implementable, especially for communities in landslide-prone areas and improving disaster literacy education.

References

Ahmad, A. N. (2019). Disaster cosmologies in comparative perspective: Islam, climate change and the 2010 floods in Pakistan's Southern Punjab. *Journal of Historical Sociology*, *32*(3), 311–330. https://doi.org/10.1111/johs.12235

Arif, A. (2022). *Longsor, Bencana Geologi Paling Mematikan pada 2022*. Kompas.

Akbar, T. (2016). Pengembangan Multimedia Interaktif Ipa Berorientasi Guided Inquiry Pada Materi Sistem Pernapasan Manusia Kelas V SDn Kebonsari 3 Malang. *Jurnal Pendidikan - Teori, Penelitian, Dan Pengembangan*, *1*(6), 1120–1126. https://doi.org/10.17977/jp.v1i6.6456

Alpay, S., Maxton, J., Clarke, L., Eryetli, H. H., & Selcuuk, Z. Z. (2014). *The Atlas of Islamic World Science and Innovation: Final Report*. https://royalsociety.org/topics-policy/projects/atlas-islamic-world/final-report/

Al-Syakhsiyah, A.-A., & Maqashid, A.-Q. (2021). Menuju Dasar-dasar Baru Fikih Islam: Kajian Konseptual Ilmu Fikih. *Maqashid*, *4*(2). http://ejournal.alqolam.ac.id/index.php/maqashid

BNPB. (2012). *Buku Saku: Tanggap Tangkas Tangguh Menghadapi Bencana*.

BNPB. (2022). *Geopartal Data Bencana Indonesia*.

Bradley, M. (2017). More than misfortune: Recognizing natural disasters as a concern for transitional justice. *International Journal of Transitional Justice*, *11*(3), 400–420. https://doi.org/10.1093/ijtj/ijx024

Branch, R. M. (2010). Instructional design: The ADDIE approach. In *Instructional Design: The ADDIE Approach*. Springer US. https://doi.org/10.1007/978-0-387-09506-6

Cahyadi, R. A. H. (2019). Pengembangan Bahan Ajar Berbasis Addie Model. *Halaqa: Islamic Education Journal*, *3*(1), 35–42. https://doi.org/10.21070/halaqa.v3i1.2124

Callistasia, W. (2019). *Bencana longsor: "Tidak ada alasan pemda dan masyarakat tidak tahu daerah rawan longsor."* BBC Indonesia.

Chikalamo, E. E., Mavrouli, O. C., Ettema, J., van Westen, C. J., Muntohar, A. S., & Mustofa, A. (2020). Satellite-derived rainfall thresholds for landslide early warning in Bogowonto Catchment, Central Java, Indonesia. *International Journal of Applied Earth Observation and Geoinformation*, *89*. https://doi.org/10.1016/j.jag.2020.102093

Departemen Pekerjaan Umum, D. J. P. R. (2007). *Peraturan Menteri Pekerjaan Umum No.22/PRT/M/2007* (Issue 22).

DOI: 10.15408/ tjems.v9i1.30159

Desfa, Y. (2020). *Pengembangan Modul Al Islam dengan Model Imajinasi Kreatif Berbasis Neurosains (IKBN)*. Universitas Ahmad Dahlan.

Dewald, van N. (2011). Introduction To Disaster Risk Reduction. In *USAID Disaster Risk Reduction Training Course for Southern Africa* (Issue August, p. 59). USAID Disaster Risk Reduction Training Course for Southern Africa.

Fahm, A. G. O. (2019). Islam and disaster management in contemporary times: a psycho-socio-spiritual response. *Journal of Religion and Spirituality in Social Work*, *38*(3), 259–280. https://doi.org/10.1080/15426432.2019.1632246

Faizana, F., Nugraha, A. L., & Yuwono, B. D. (2015). Pemetaan Risiko Bencana Tanah Longsor Kota Semarang. *Jurnal Geodesi Undip*, *4*(1).

Fauzi, N. A. F. (2019). Muhammadiyah's New Fiqh Reasoning : Constructing a Holistic Islamic Law Paradigm. *Afkaruna*, *15*(1). https://doi.org/10.18196/aiijis.2019.0094.32-54

Fauzi, N. A. F., & Ayub. (2019). Fikih Informasi: Muhammadiyah's Perspective on Guidance in Using Social Media. *Indonesian Journal of Islam and Muslim Societies*, *9*(2), 267–293. https://doi.org/10.18326/ijims.v9i2.267-293

Fitri, A. Z., Indarti, L., & Nafis, M. M. (2020). *Model Pendekatan Multi-Inter-Disipliner dalam Pembelajaran Berbasis Kurikulum KKNI*. Akademia Pustaka.

Fitri, A. Z., Nafis, M., & Indarti, L. (2020). Multidisciplinary, Interdisciplinary, And Transdisciplinary (MIT) Learning Approach And Strategy Based On Indonesian National Qualification Framework (Kkni) Curriculum. *Ulumuna*, *24*(1), 183–204.

Garnica-Peña, R. J., & Alcántara-Ayala, I. (2021). The use of UAVs for landslide disaster risk research and disaster risk management: a literature review. In *Journal of Mountain Science* (Vol. 18, Issue 2, pp. 482–498). Science Press. https://doi.org/10.1007/s11629-020-6467-7

Gitnita, S., Kamus, Z., & Gusnedi. (2018). Analisis Validitas, Praktikalitas, dan Efektifitas Pengembangan Bahan Ajar Terintegrasi Konten Kecerdasan Spiritual Pada Materi Fisika Tentang Vektor dan Gerak Lurus. *Pillar of Physics Education*, *11*(2), 153–160.

Göksu, I., Özcan, K. V., Cakir, R., & Göktas, Y. (2017). Content Analysis of Research Trends in Instructional Design Models: 1999-2014. *Journal of Learning Design*, *10*(2), 85. https://doi.org/10.5204/jld.v10i2.288

Hackett, C., Grim, B. J., Stonawski, M., Skirbekk, V., Potančoková, M., & Abel, G. J. (2012). The Global Religious Landscape A Report on the Size and Distribution of the World's Major Religious Groups as of 2010. In *Pew Research Center*. https://doi.org/10.13140/2.1.4573.8884

Harahap, M., & Siregar, L. M. (2017). Konsep Pendidikan Islam Dalam Membentuk Manusia Paripurna. *Jurnal Pendidikan Agama Islam Al-Thariqah*, *2*(2), 148–163. https://doi.org/10.25299/althariqah.2017.vol2(2).1040

Harifuddin, H. (2017). Flood Disaster, Local Belief And Islam-Sufism. *El-Harakah*, *19*(1), 41. https://doi.org/10.18860/el.v19i1.3916

DOI: 10.15408/ tjems.v9i1.30159

Hidayah, K., Azizah, N. N., Hamid, F. R., Aqimuddin, A., Ahmad, R. D., & Wibowo, Y. A. (2021). Landslide Vulnerability-Based Disaster Mitigation Planning In The Elementary School Environment Of Boyolali Regency. *Jurnal Geografi Gea*, *21*(1). https://ejournal.upi.edu/index.php/gea

Hidayat, N. (2019). *Urgensi Pendidikan Islam di Era 4.0*. *May*, 0–15.

IIng Rika Yanti, L. M. (2014). Validasi Pengembangan Modul Fisika Dasar Berbasis Problem Based Instruction Untuk Mahasiswa STKIP PGRI Sumatera Barat. *Jurnal Riset Fisika Edukasi Dan Sains*, *1*(1).

Intarti, Y. R., Fitrinitia, I. S., & Widyanto, M. R. (2013). Towards Disaster Management in Indonesia Case Studies: Jakarta and Yogyakarta Provinces. *International Journal of Disaster Recovery and Business Continuity*, *4*, 11–22. https://doi.org/10.14257/ijdrbc.2013.4.02

International Institute of Islamic Thought. (2016). *Reform of Education In Muslim Societies*.

Iqbal, M. M. (2017). Merumuskan Konsep Fiqh Islam Perspektif Indonesia. *Al-Ahkam: Jurnal Ilmu Syariah Dan Hukum*, *2*(1), 1–20.

Islam, R., & Siwar, C. (2012). Characterization of Hazards, Vulnerability and Risk of Disaster Management. *Advances in Environmental Biology*, *6*(3), 955–966.

Jeong, S., & Yoon, D. K. (2018). Examining Vulnerability Factors to Natural Disasters with a Spatial Autoregressive Model: The Case of South Korea. *Sustainability (Switzerland)*, *10*(1651), 1–13. https://doi.org/10.3390/su10051651

Kurnia, T. D., Lati, C., Fauziah, H., & Trihanton, A. (2019). Model ADDIE Untuk Pengembangan Bahan Ajar Berbasis Kemampuan Pemecahan Masalah Berbantuan 3D. *Prosiding Seminar Nasional Pendidikan Matematika (SNPM)*, *1*(1), 516–525.

Lindsey, A. B., Donovan, M., Smith, S., Radunovich, H., & Gutter, M. (2014). Impacts of Technological Disasters. *IFAS Extension*, 2–4.

Menteri Pendidikan dan Kebudayaan Republik Indonesia. (2020). *Permendikbud Nomor 3 Tahun 2020*.

Muktaf, Z. M. (2017). Disaster Literacy in Communication Perspective. *International Conference and Call for Paper SILAT APIK PTM*, 1–11.

Muqtedar K. (2020). *Symposium on Islam and Good Governance*.

Mutlu, G. (2016). A qualitative analysis and comparison of the two contemporary models of instructional design. *Journal of Human Sciences*, *13*(3), 6154. https://doi.org/10.14687/jhs.v13i3.4350

Nasiah, & Invanni, I. (2014). Identifikasi Daerah Rawan Longsor Sebagai Upaya Penanggulangan Bencana di Kabupaten Sinjai. *Jurnal Sainsmat*, *3*(2), 121.

Parwanto, W. (2019). Teologi Bencana Perspektif Hadis. *Al-Bukhari : Jurnal Ilmu Hadis*, *2*(1), 69–90. https://doi.org/10.32505/al-bukhari.v2i1.1132

Pazil, A. H. M., & Razak, R. C. (2019). The Applications of Importance-Performance Analysis in Higher Education Institutions: A Text Mining of Literature. *International Journal of Innovation, Creativity and Change*, *10*(9), 70–88.

DOI: 10.15408/ tjems.v9i1.30159

Prihatin, R. B. (2018). Peran Pemerintah Daerah dalam Penyelenggaraan Kesehatan Reproduksi (Studi di Provinsi Jawa Tengah dan Provinsi Kalimantan Barat). *Jurnal Aspirasi*, *7*(1), 1–16. https://doi.org/10.22212/aspirasi.v7i1.1084

Rahayu, P., Sriyono, & Ngazizah, N. (2012). Pengembangan Worksheet dengan Pendekatan Guided Inquiry pada Pokok Bahasan Suhu dan Kalor untuk Mengoptimalkan Domain Proses Sains Siswa Kelas X SMAN 11 Purworejo Tahun Pelajaran 2012/2013. *Jurnal Radiasi*, *3*(1), 78–82. download.portalgaruda.org.article

RJ, M. (2018). Theory Building in Disaster Management: Intricacies and Barriers. *Journal of Geography & Natural Disasters*, *08*(02). https://doi.org/10.4172/2167-0587.1000225

Sari, W., Jufrida, & Pathoni, H. (2017). Pengembangan Modul Elektronik Berbasis 3D Pageflip Professional pada Materi Konsep Dasar Fisika Inti dan Struktur Inti Mata Kuliah Fisika Atom dan Inti. *Jurnal EduFisika*, *02*(01), 38–50. https://doi.org/https://doi.org/10.22437/edufisika.v2i01.4041

Serageldin, I. (2008). Science in Muslim countries. In *Science* (Vol. 321, Issue 5890). https://doi.org/10.1126/science.1162825

Shalihin, R. R. (2020). *Pengembangan Materi Fikih Kebencanaan sebagai Mitigasi Tanah Longsor Berbasis Pendekatan islam Transdisipliner* (Issue December 2020). Universitas Ahmad Dahlan.

Shalihin, R. R., Bustam, B. M. R., Suyadi, & Pramudya, Y. (2021). *Fikih Kebencanaan : Modul Mitigasi Bencana Tanah Longsor Berbasis Pendekatan Islam Transdisipliner* (Fadhlurrahman, Ed.; I). UAD Press.

Statista. (2022). *Monthly number of landslides that have occurred in Indonesia from January 2019 to March 2022*.

Suwaryo, P. A. W., Sarwono, & Yuwono, P. (2020). Role of Muhammadiyah Disaster Management Center in Disaster Mitigation. *Jurnal Ilmiah Permas: Jurnal Ilmiah STIKES Kendal*, *10*(1), 33–40.

Suyadi, Nuryana, Z., & Fauzi, N. A. F. (2020). The fiqh of disaster: The mitigation of Covid-19 in the perspective of Islamic education-neuroscience. *International Journal of Disaster Risk Reduction*, *51*.

Tegeh, I. M., Jampel, I. N., & Pudjawan, K. (2015). Pengembangan Buku Ajar Model Penelitian Pengembangan dengan Model ADDIE. In *Seminar Nasional Riset Inovatif IV*.

Thaib, D., Wahyudin, D., Rahmawati, Y., & Riyana, C. (2016). Studi Analisis Kebutuhan Terhadap Pengembangan Model Blended Learning pada Sistem Pendidikan Jarak Jauh untuk Meningkatkan Kompetensi Lulusan. *Jurnal Pendidikan Dasar*, *8*(2), 107–125.

The Fatwa and Islamic Research Council and Muhammadiyah Disaster Management Center. (2016). *Coping with Disaster: Principle Guidance from an Islamic Perspective*. Majelis Tarjih and Tajdid Pimpinan Pusat Muhammadiyah (MTT)/ The Fatwā and Islamic Research Council, the Central Board of Muhammadiyah.

DOI: 10.15408/ tjems.v9i1.30159

Triana, D., Hadi, T. S., & Husain, M. K. (2017). Mitigasi Bencana Melalui Pendekatan Kultural dan Struktural. *Seminar Nasional XII "Rekayasa Teknologi Industri Dan Informasi 2017"*, 379–384.

UNISDR. (2004). Disaster Risk Reduction Tools and Methods for CLimate Change Adaptation. In *Tools and Methods IATF Working Group on Climate Change and Disaster Risk Reduction*.

USAID. (2017). *Climate Risk Profile Indonesia*.

Usup, F. M. H., Franklin, P. J. C., & Karongkong, H. H. (2019). Analisis Aspek Kebencanaan di Kecamatan Bolangitang Barat Kabupaten Bolaang Mongondow Utara. *Jurnal Spasial*, *6*(2), 511–520.

Utia, R., & Fauzi, A. (2021). The Validity Of The Integrated Physics Ebook On Landslide Disaster Mitigation Materials Based On A Problem Based Learning Model. *International Journal of Progressive Sciences and Technologies (IJPSAT*, *25*(1), 630–638. http://ijpsat.ijsht-journals.org

Walter Dick, Lou Carey, J. O. C. (2004). *The Systematic Design of Instruction*.

Winarti. (2015). Pengembangan Perangkat Pembelajaran Fisika Bermuatan Integrasi Islam-Sains untuk Menanamkan Nilai-nilai Spiritual Siswa Madrasah Aliyah. *Jurnal Pendidikan Fisika Dan Keilmuan*, *1*(2).

Yusuf, A. A., Shidiq, A. R., & Hariyadi, H. (2020). On socio-economic predictors of religious intolerance: evidence from a large-scale longitudinal survey in the largest muslim democracy. *Religions*, *11*(1). https://doi.org/10.3390/rel11010021.

.

DOI: 10.15408/ tjems.v9i1.30159