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The Effectiveness of Peaceful Education Learning Strategies for Students at Emergency Madrasas Following Natural Disasters in Sidoarjo

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ABSTRACT

Purpose – This research aims to develop and evaluate learning strategies and curricula focused on risk management education for emergency schools in post-disaster areas. The goal is to support a peaceful learning process that helps students recover from trauma while improving motivation, academic performance, and disaster preparedness.

Methods – This research uses the Borg & Gall Research and Development Model to find an appropriate instructional strategy for peace education in post-natural disaster school areas. Data collection was found through documentation, interviews, and observation. Field tests I, II, and III were conducted at *Madrasa Ibtidaiyah* (Islamic Elementary School) in Sidoarjo, which is close to the mud-flood areas of Lapindo Enterprise.

Findings – The results show an improvement in test scores conducted over three cycles in class 3 ICP 1 and ICP 2. Additionally, students were enthusiastic about participating in the learning series. The research was concluded after cycle III as it was deemed effective. The strategy using disaster mitigation questions was effectively implemented in the science class (IPA) of ICP 1, contributing 56.9%, and in the religious class (*akidah akhlak*) of ICP 2, contributing 75.4%, enhancing student achievement, motivation, awareness, and readiness in disaster mitigation. The peaceful education strategy for disaster mitigation was more effectively applied in *akidah akhlak* classes. The validation criteria were sufficiently valid and proven effective for emergency *madrasa* students.

Research implications/limitations – This studys implications have proven to be practically useful in handling post-disaster emergency education in *madrasa* environments in Sidoarjo through the instillation of peaceful education in the learning process of science and Islamic Religious Education. However, this study has limitations regarding the level and number of *madrasas* studied.

Originality/value – The originality of this research is shown from the results of field findings in *madrasa* in Sidoarjo, with the validity value of the R&D Model Borg and Gall research method. Further research development can be done by expanding the types and levels of *madrasas* or schools in East Java.

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Introduction

Indonesia is not only located in a very strategic position, but also in a the ring of fire, which makes Indonesia quite prone to disasters (Akhirianto et al., 2025). Indonesia is known as a country with a high risk of disasters. The most common natural disasters are floods, cyclones, landslides, forest fires, earthquakes, and volcanic eruptions (Pelupessy & Silverman, 2024). From 2019 to 2023, the largest disaster according to the Central Statistics Agency Indonesia was flooding. In 2020, there were 1,518 cases, increasing to 1,794 in 2021, with 337 fatalities, 2,034 injuries, and over 7,900,813 people affected by floods, some of whom became displaced. East Java Province is among the top five provinces with the highest number of flood cases (Rustinsyah et al., 2021). This indicates that the region has a relatively high level of vulnerability to hydrometeorological disasters, particularly floods (Permana, 2025). The number of disasters that occurred from 2014 to 2023 can be seen in Figure 1.

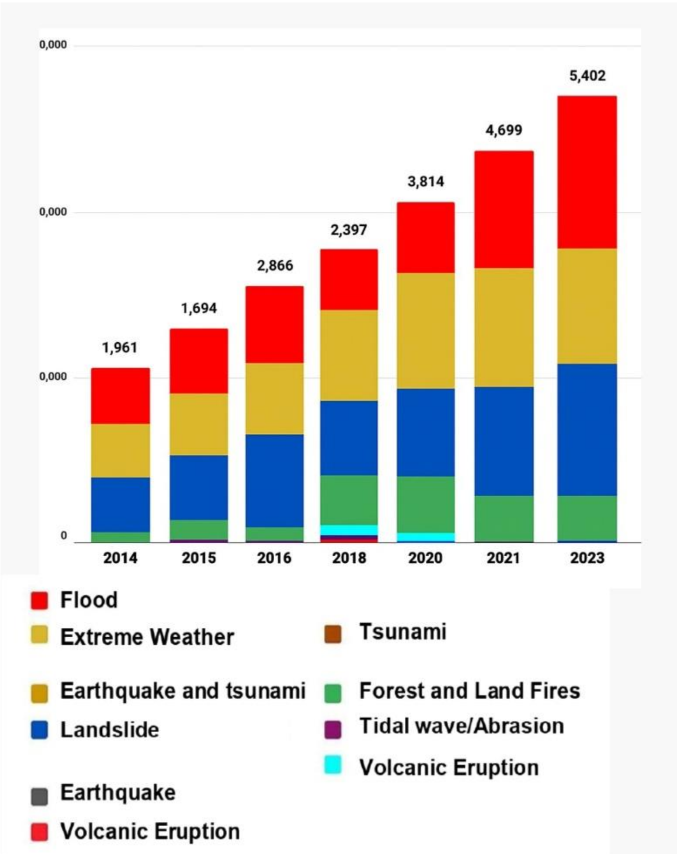

Figure 1. Number of Disasters in 2014–2023

Figure 1 illustrates the trend of disasters in Indonesia, which increased from 2014 to 2023, reaching 5,402 cases, then decreased in 2022 to 3,544 cases, but rose again in 2023 to 5,400 cases. The most frequent disasters were floods, as indicated by the longer red bars. The number of flood incidents decreased from 2021 to 2023. The number of affected victims and displaced persons in 2023 increased by 30.48%.

In 2019, National Disaster Management Agency Indonesia reported that 54,080 schools, or around 24.59% of the total number of schools in Indonesia, were located in flood-prone areas, with 56% of the population affected. This figure continued to increase until in 2022, 75% of schools in Indonesia were classified as disaster-prone. In 2023, this percentage rose again to 78%, with around 202,000 schools in Indonesia at high risk of flooding (Zulfa et al., 2024).

Flooding is not entirely due to natural conditions such as the rainy season but can also occur during the dry season due to small and clogged rivers, which are caused by human activities. Ironically, most floods occur in metropolitan areas or large cities, despite these regions having relatively good disaster management systems and infrastructure (Nasliati et al., 2025). Most schools are built in strategic locations to facilitate transportation access, often in densely populated areas within districts, cities, or municipalities. This causes traffic congestion, especially during school entry and dismissal times. When schools are affected by disasters, such as floods, traffic density and the learning process are disrupted. Many students struggle to learn in classrooms flooded with water. In such situations, the learning process should adopt an emergency curriculum (Gokmenoglu et al., 2023).

Floods often cause schools to be submerged and result in extended school closures. East Java, particularly Greater Surabaya, has a higher number of schools affected by flooding (1,890 schools) compared to Jakarta (214 schools) (East Java Provincial Central Statistics Agency, 2023). The Tanggulangin subdistrict faces the potential for flooding due to overflowing water or the collapse of retaining walls. In 2021, this area experienced prolonged flooding, forcing several schools to suspend in-person activities. Many learning tools were damaged, and a number of teachers and students had health problems. The government and humanitarian organizations opened emergency schools to continue education, protect children from trauma, psychosocial stress, and the risk of dropping out of school. Disaster mitigation efforts such as early warning systems, mapping, and conservation were carried out to prevent future flood impacts (Rustinsyah et al., 2021). This study was conducted at *Madrasa Ibtidaiyah Maarif* Ketengan, Tanggulangin, Sidoarjo, which was affected by the Lapindo mudflow disaster in 2006. This school is categorized as an area with a high level of threat due to mud eruptions. The school is also located in a flood-prone area. These conditions affect students physical, psychological, and emotional well-being (Hadianti & Dewanto, 2023).

Several learning strategies, such as Design for Change (DFC) in problem-based learning processes with a four-step formulation (FIDS: Feel, Imagine, Do, and Share), are considered effective in enhancing students soft skills in Islamic education. Furthermore, curriculum innovation in Islamic education from the perspective of Fethullah Gülen, utilizing learning media such as videos and multimedia, can shape students character, creativity, and environmental awareness. Additionally, the implementation of IT-based online learning methods by schools has resulted in more effective teaching and learning processes during educational disasters. Digital technologies such as youtube social media foster collaboration between teachers and students in facilitating and enriching learning understanding. The implementation of an integrated Islamic education curriculum can shape tolerant attitudes and behaviors, thereby reducing social conflicts. Generative learning strategies include learning through drawing, learning through mapping, learning through summarizing, learning through imagination, and learning through teaching, which can engage students cognitive aspects to improve learning achievement.

However, research specifically developing peaceful education learning strategies for post-disaster situations has yet to be found. This approach is important because it not only supports students cognitive aspects but also helps them overcome psychological trauma, build positive attitudes, and create a conducive learning environment. This strategy is particularly relevant for emergency *madrasas* that play a role in supporting student recovery after a disaster.

R&D (Research and Development) research is a process of developing or improving products, methods, or services by applying science and technology. R&D in education aims to create more effective teaching materials, teaching strategies, or evaluation tools through the stages of design, development, testing, and evaluation to ensure effective and applicable results (Siregar, 2023). One of the most commonly used R&D models is the 4D model (Define, Design, Develop, Disseminate), which is applied to digital-based Islamic Education teaching through the eXe-Learning application. Research findings indicate that this approach successfully improves learning quality in schools, with an effectiveness rate of 89.2% in enhancing students spirituality. In addition to the 4D model, the R&D approach according to Borg and Gall (1989) offers more detailed and comprehensive steps. This model consists of ten main stages, ensuring user involvement through repeated testing to achieve optimal results (Divayana et al., 2021).

This R&D-based research identifies how peace education learning strategies influence students in *Madrasas* in Sidoarjo after natural disasters in the science and religion classes. This strategy was designed through a learning scheme that includes understanding the environment, strengthening spiritual values, and the importance of collaboration in preserving nature. Each component of the strategy was implemented in stages, with environmental understanding integrated into cycles I and II, spiritual values into cycles I and III, and cooperation in nature conservation into cycle II.

This study aims to design and evaluate the effectiveness of the peace education strategy and risk management curriculum for post-disaster emergency *madrasas* at *Madrasa Ibtidaiyah Maarif* Ketegan Tanggulangin Sidoarjo in improving students performance, motivation, awareness, and preparedness through three learning cycles. The research results are expected to show the significant positive impact of this strategy on student learning and recovery, while also supporting broader disaster mitigation efforts.

Methods

The research data was collected primarily through interviews, direct observation, field visits, questionnaires, and document studies. Secondary data consisted of other sources described in printed and non-printed materials, as well as findings from the selected disaster areas. The data was collected over a two-month period from January 2023 to February 2023. The research location was *Madrasa Ibtidaiyah Maarif* in Tanggulangin, Sidoarjo, East Java. The research method used here was the Research and Development

(R&D) Model by Borg and Gall (1989). The research subjects were 74 third-grade students from Group 3 ICP 1 (IPA) from three IPA classes (IPA 1, IPA 2, and IPA 3), and the second group consisted of 80 third-grade students from Group 2 ICP 2 (*akidah akhlak*) for the 2022-2023 academic year. The sample was selected using purposive sampling.

This research design uses the Research and Development (R&D) method based on the Borg and Gall model. Educational R&D is a process for developing and validating educational products. This study aims to design and evaluate the effectiveness of peaceful education strategies and risk management curricula for emergency *madrasas* post-disaster at *Madrasa Ibtidaiyah Maarif* Ketegan Tanggulangin Sidoarjo in improving students achievements, motivation, awareness, and preparedness through three learning cycles. R&D connects basic research, which focuses on new theories and concepts, with applied research to achieve practical goals, as well as integrating creativity to increase knowledge and design new applications (Judijanto et al., 2024). R&D is part of the field study required to describe the existing natural conditions of emergency schools, identify various standards for the conditions encountered that can be analyzed, or establish relationships between specific events (Cohen et al., 2017). The stages of the R&D method are based on the Borg and Gall model as shown in Figure 1 (Borg & Gall, 1989).

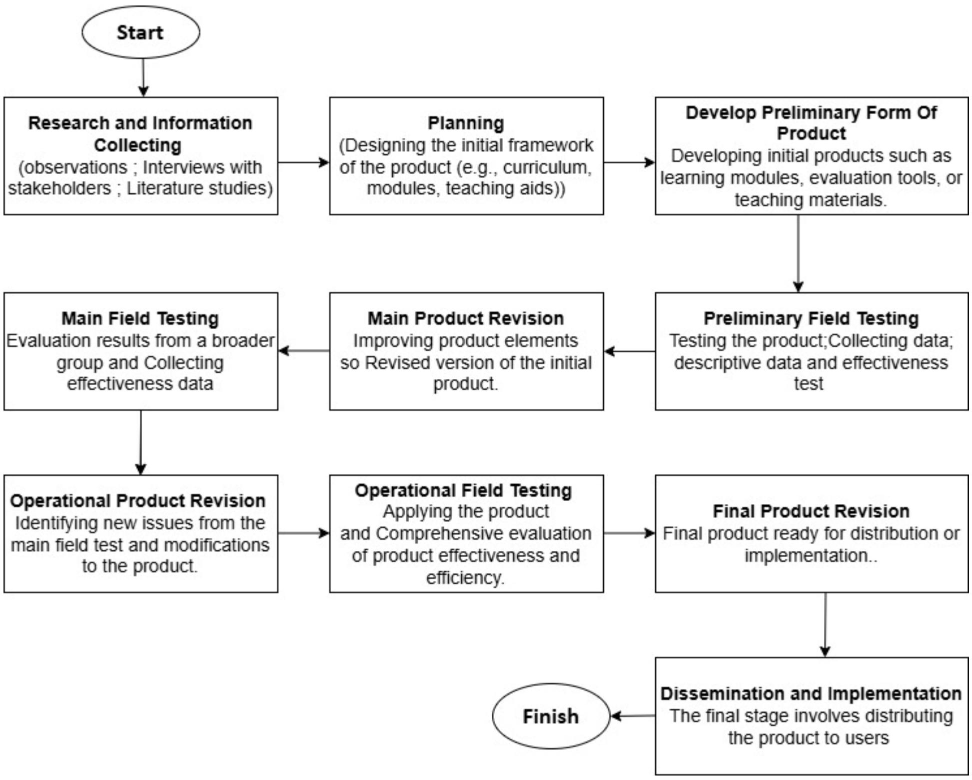

Figure 1. Borg and Gall's Research and Development (R&D) Model Design

This study applies the Borg & Gall R&D Model, which has been simplified into three main stages by Sugiyono, namely: the first stage consists of preliminary studies covering steps 1-3, namely initial research, planning, and initial product development. The objective is to identify needs and produce an initial prototype. Second, the development and testing stage, which includes steps 4-7 from Borg and Gall, namely initial testing, product revision, field testing, and revision based on field

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test results. At this stage, the product is tested gradually and refined. Third is the implementation stage. This stage includes steps 8-10 from Borg and Gall, namely operational testing, final product revision, and dissemination. The mature product is implemented and disseminated widely.

The instruments used include expert material validation sheets, media expert validation sheets, and student response questionnaires. After the data is collected, the researcher calculates the total score of all validated questionnaires using Suharsimi Arikuntos formula (Natasia et al., 2022):

$$\boldsymbol{p}(\%) = \frac{\sum \boldsymbol{x}}{\sum \boldsymbol{T}}\, \boldsymbol{x}\ \mathbf{100}\%$$

Description:

$\boldsymbol{p}(\%)$ = percentage that describes how valid an instrument or item is

$\sum \boldsymbol{x}$ = total value of instruments assessed by validators

$\sum \boldsymbol{T}$ = the maximum score expected from the instrument being evaluated.

The validation criteria are shown in the table below:

Table 1. Research Variables

Percentage (%)	Validation Criteria	Follow-up
76 – 100	Valid	Applied
56 – 75	Valid Enough	Applied
40 – 55	Less Valid	Revision
0 – 39	Invalid	Revision

Source: (Arikunto, 2021)

Table 2. Research Variables

Symbol	Research Variables	Data type
$\boldsymbol{\tau}$	Cycle (1) Cycle 1 (2) Cycle 2 (3) Cycle 3	Nominal
$\boldsymbol{x}$	Scores from disaster mitigation questions before the learning process began (pre-test)	Ratio
$\boldsymbol{y}$	Scores on disaster mitigation questions after the classroom learning process (post-test)	Ratio

The effectiveness test used the ANCOVA (Analysis of Covariance) method, which is helpful and appropriate for controlling between existing groups and variables that differ from a group, as well as influencing the dependent variable (PCV or Potentially Confounding Variables) (Keller & Marchev, 2023).

The ANCOVA formula is as follows (Yang et al., 2024):

$$y_{ij} = \mu + \tau_i + \beta x_{ij} + \varepsilon_{ij}\ , i = 1, 2, \dots a; j = 1, 2, \dots n_i$$

y_{ij} = The response value or result measured for observation-j in treatment-i. This is the post-test value or final result measured after treatment.

μ = Average

x_{ij} = Covariate value in observation-j in treatment-i related to y_ij, representing the independent variable or pre-test (before treatment)

τ_i = Effect of treatment i, in terms of the number of cycles performed

β = Linear regression coefficient

ε_{ij} = Random error of observation j in treatment-i

a = Number of categories in treatment

ni = Number of observations in the category

Assumptions and hypotheses in ANCOVA are defined as follows (Kutner, 2005).

1. X is constant, measured without error, and independent of treatment (not influenced by treatment).
2. $\boldsymbol{\varepsilon_{ij}}$ following the distribution of NIDN (0, σ^2).
3. β ≠ 0 which shows that there is a linear relationship between x and y.

ANCOVA hypothesis for testing the effectiveness of learning strategies:

Simultaneous test

Ho = $\beta_{1j} = \beta_{2j} = \cdots = \beta_{aj}$

H1 = at least one $\beta_{ij} \neq 0$, i = 1, 2, … a

Partial test

Ho = $\beta_{aj} = 0$

H1 = at least one $\beta_{ij} \neq 0$, i = 1, 2, … a

ANCOVA hypothesis for treatment differences (cycles)

Ho = T1 = T2 = …. Ta = 0.

H1 = at least one τi ≠ 0, i = 1, 2, … a

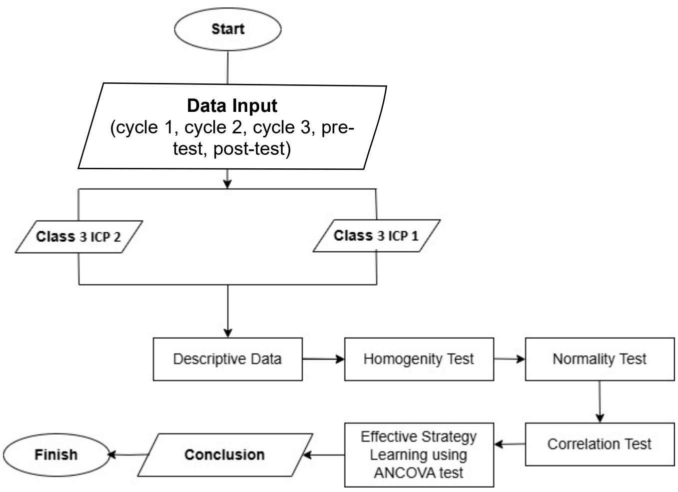


Figure 2. Stages of Testing the Effectiveness of Peace Education Strategies Using ANCOVA

Result and Discussion

Peaceful education is one of the appropriate strategies that can be applied in the classroom. The peace education learning model involves imparting knowledge, developing values, skills, and behaviors to groups of students or individuals in such a way that they develop empathy, help each other, and foster a culture of peace. Therefore, peace education is considered suitable for implementation in conflict areas, including post-disaster areas.

1. R&D Strategy for Peaceful Education Learning

The stages of the R&D method based on the Borg and Gall model applied in the research "Peace Education Learning Strategies for Students of Emergency *Madrasas* after Natural Disasters in Sidoarjo." First, identifying the needs of emergency Madrasa students post-disaster through interviews, observations, and literature reviews related to post-disaster education. Second, designing a peace education learning strategy tailored to the needs of students in emergency *Madrasas*. Third, developing peace education-based learning modules or tools, including materials, evaluation tools, and implementation methods. The fourth to sixth stages involve cycle testing.

Field tests (field test I, II, and III) were conducted separately in two different classes at the *Madrasa* in Sidoarjo through classroom action research, with the subjects being students from class 3 of the International Class Program (ICP) 1 and ICP 2 for the 2022-2023 academic year. The field tests were conducted in three cycles, with one meeting per cycle each week in January 2023.

1.1 Initial Trial Field Test I (Cycle 1)

Implementing emergency *Madrasa* learning strategies to identify initial deficiencies.

1.1.1 Action Plan

Before implementing learning in the first cycle, the first thing that needs to be done is to develop a learning plan that applies peaceful education strategies in one of the schools located in the post-disaster area of Lapindo Sidoarjo. The learning plan that is developed becomes the basis for the steps or procedures carried out by teachers in the learning process. The procedures for the peaceful education learning strategy that are applied are as follows:

(1) Greetings and prayers
(2) Introduction and perception
(3) Delivery of lesson material in accordance with the lesson plan using teaching aids (pictures, etc.) while instilling values of caring for others, mutual assistance, and peace
(4) Divide the class into 5 groups named: Peace, Care, Patience, Empathy, and Love (interspersed with quizzes)
(5) Distribute questions to each group (attached) to be answered together
(6) Educational games (singing, clapping, cheers, or others)

(7) Summarize the core lesson (by the teacher) and provide motivation
(8) Post-test (oral or written)
(9) Closing

1.1.2 Observation

The observation was conducted during the learning process until its completion by implementing a peaceful education strategy with the main topics of *kalimah thayyibah* in class 3 ICP 2 and earth and the Universe in class 3 ICP 1. The results of the study showed that the average score obtained by students in class 3 ICP 1 in answering disaster mitigation questions was 60, and the average post-test score was 61.6. Meanwhile, the average score obtained by students in class 3 ICP 2 in answering disaster mitigation questions was 62.2, and the average post-test score was 69.2.

1.1.3 Reflection

Based on the description of the research results in cycle I, the average scores obtained by students in both classes were still below 70, so that in cycle II there should be an improvement, as well as in cycle III. After reflection, there were several aspects that needed to be improved in the learning process in cycle I, both in teacher activities and student activities. The teacher activities that need to be improved are conducting learning activities in accordance with the designed procedures and guiding students to discuss well, while the student activities are discussing well, following the learning sequence well, and completing the post-test questions.

To overcome this, in the implementation of cycle II, these shortcomings must be corrected. This includes conducting learning activities in accordance with the designed procedures and providing guidance to encourage students to actively participate in discussions. Additionally, to ensure students can follow the learning process effectively, engaging activities such as games and selecting appealing media such as showing animated videos about disaster mitigation via the smart TV in the classroom should be incorporated. Clear instructions should also be provided when completing the post-test questions.

1.2 Revision of Initial Product Field Test II (Cycle 2)

There is improvement on learning modules or devices based on initial test results and feedback from experts and users.

1.2.1 Action Plan

In cycle II, the steps or procedures carried out by teachers in the learning process are the same as those applied in cycle I. The schedule for implementing cycle I actions is on Wednesday, January 18, 2023, from 7-8 a.m. for class 3 ICP 1 and on Tuesday, January 17, 2023, from 9-10 a.m. for class 3 ICP 2. The main topics are Natural Resources and *Thayyibah* Sentences.

1.2.2 Observation

After conducting cycle I testing, cycle II learning improvements were implemented. Observations were conducted during the learning process until its completion, applying peaceful education strategies with the main topics of *kalimah thayyibah* in class 3 ICP 2 and Natural Resources in class 3 ICP 1.

The research results showed that the average score obtained by students in class 3 ICP 1 in answering disaster mitigation questions was 74, and the average post-test score was 73.8. Meanwhile, the average score obtained by students in class 3 ICP 2 in answering disaster mitigation questions was 77.2, and the average post-test score was 80.9.

1.2.3 Reflection

After completing cycle II of the learning process, the researcher compared the average results obtained in the cycle I test with those in the cycle II test. In addition, several shortcomings that occurred in cycle I were improved, such as the teachers activities in conducting learning activities being in accordance with the designed procedures, as well as guiding students to discuss well. Meanwhile, in terms of student activities, through the guidance of the teacher, students were able to discuss well and in a conducive manner.

In cycle II, an animated video on natural disasters was shown before the disaster mitigation questions were distributed. This gave students new insights into natural disasters, which led to an improvement in their scores compared to cycle I. However, in cycle II, some students felt bored with the disaster mitigation questions, so in cycle III, new activities will be provided as a break to make them more enthusiastic and excited.

1.3 Field test III (Cycle 3)

1.3.1 Action Plan

In cycle II, the steps or procedures carried out by teachers in the learning process are the same as those applied in cycle I. The schedule for implementing cycle I actions is as follows: Wednesday, January 25, 2023, from 7:00 AM to 8:00 AM for class 3 ICP 1, and Tuesday, January 24, 2023, from 9:00 AM to 10:00 AM for class 3 ICP 2. The main topics are Seasons and Weather, as well as *asmaul husna*.

1.3.2 Observation

After conducting cycles I and II tests, cycle III learning improvements were carried out. Observations were conducted during the learning process until its completion by implementing peaceful education strategies with the main topics of *asmaul husna* in class 3 ICP 2 and Seasons and Weather in class 3 ICP 1.

The research results showed that the average score obtained by students in class 3 ICP 1 in answering disaster mitigation questions was 87, and the average post-test score was 85.8. Meanwhile, the average score obtained by students in class 3 ICP 2 in answering disaster mitigation questions was 88.8, and the average post-test score was 91.4. Based on the statistical data above, it can be concluded that the peaceful education learning strategy has improved and increased from field test I, field test II, and field test III.

1.3.3 Reflection

After completing cycles I and II of the learning process, the researcher compared the average results obtained during the cycle II test with those from the cycle III test. Based on the results, there was a significant improvement. Additionally, the shortcomings observed in cycle II were addressed, such as students becoming more enthusiastic and engaged in the learning process. This was because, in cycle III, they participated in new activities as a break, which made them more enthusiastic and engaged. These activities included creating posters about the importance of protecting the environment to prevent disasters caused by human actions. Examples include posters about not littering to prevent flooding, posters about conserving energy, posters about not cutting down trees indiscriminately, and posters about reforestation.

Through these activities, the students became more enthusiastic, which had a positive impact on their test results. As a result, the research was not continued to the next cycle. Seventh stage: revising the product after the third cycle of testing. Eighth stage: implementing the learning strategy widely in various emergency *Madrasas* post-disaster in Sidoarjo. Ninth stage: Combining all inputs from previous stages to produce the final peaceful education learning strategy. Final stage: Publishing the research results and implementing the strategy sustainably in other emergency *Madrasas*.

The results of the implementation of field tests I, II, and III show that the field tests conducted over three cycles spanning three weeks starting in January 2023 were carried out on two different classes, namely ICP 1 and ICP 2, at a *Madrasa* in Sidoarjo. The stages of the learning process in each cycle include planning, implementation of actions, observation, and reflection. Through the peace education strategy applied in these learning activities, the aim is to foster empathy, care, and mutual assistance among students, as well as to cultivate a sense of peace, realism, and risk reduction post-disaster.

2. Description of Cycle Implementation Data

Field tests II and III were implemented using the same methods and procedures as field test I. After the action plan was implemented, teachers applied peaceful learning strategies for three cycles, with the average results shown in tables 4 and 5 below.

Table 4. Field Test I, II, and III Scores for ICP 1 (*IPA*) Class

CYCLE 1		CYCLE 2		CYCLE 3	
Disaster Mitigation Issues	Post-Test	Disaster Mitigation Issues	Post-Test	Disaster Mitigation Issues	Post-Test
60	61.6	74	73.8	87	85.8
Average		Average		Average	
61		74		86	

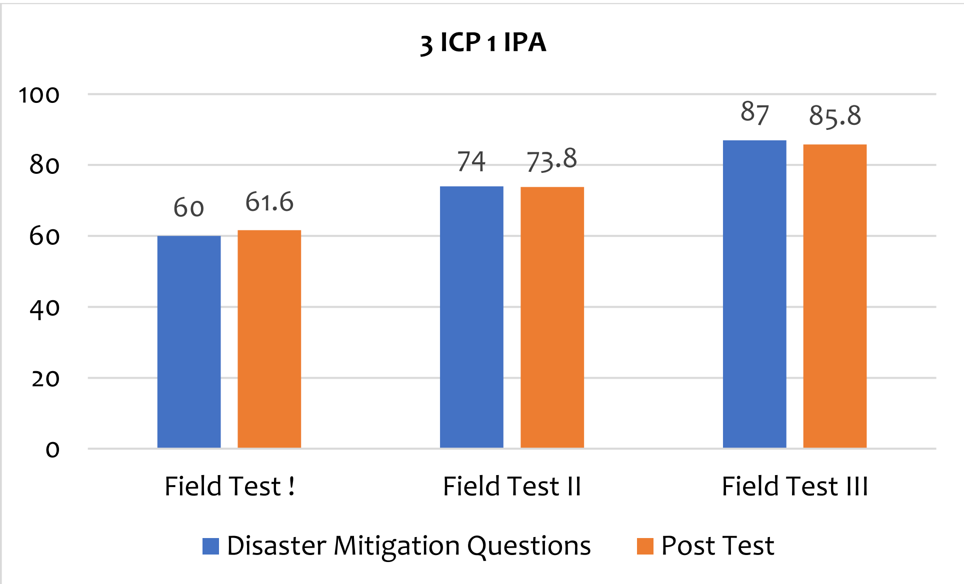
Meanwhile, the average results obtained in class 3 ICP 2, which was taught the subject of *akidah akhlak*, are as follows:

Table 5. Field Test I, II, and III Scores for ICP 2 Class (*akidah akhlak*)

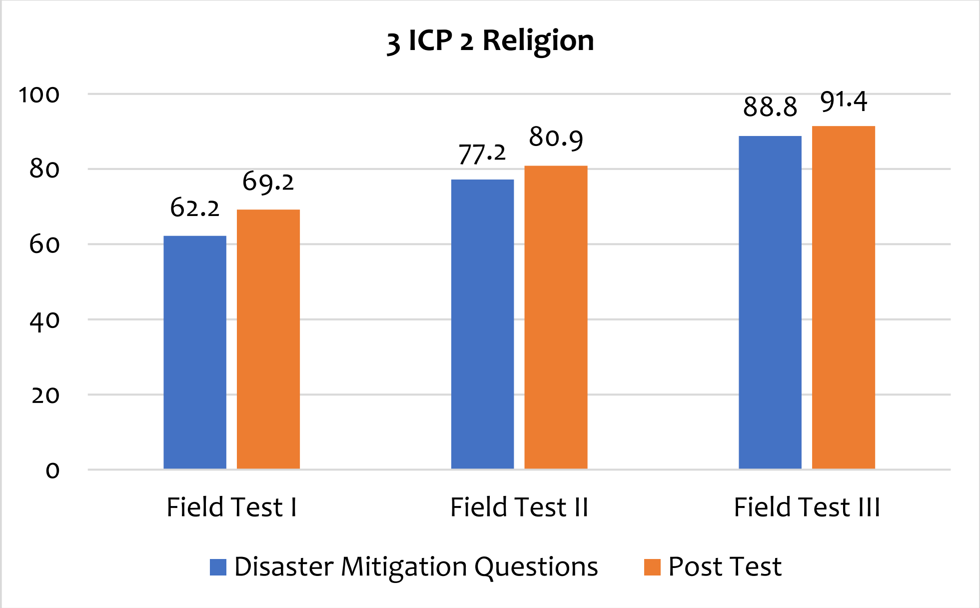
CYCLE 1		CYCLE 2		CYCLE 3	
Disaster Mitigation Issues	Post-Test	Disaster Mitigation Issues	Post-Test	Disaster Mitigation Issues	Post-Test
62.2	69.2	77.2	80.9	88.8	91.4
Average		Average		Average	
65		79		90	

Based on tables 4 and 5 above, the average scores of the two classes, ICP 1 and ICP, in each field test showed significant improvement. The results in cycle 1 yielded an average of 61 for class 3 ICP 1 and 65 for class 3 ICP 2. In cycle 2, the average was 74 for class 3 ICP 1 and 79 for class 3 ICP 2. In cycle 3, the average was 86 for class 3 ICP 1 and 90 for class 3 ICP 2. It can be seen that class III ICP 2 with the subject of religion (*akidah akhlak*) had a higher average score in each cycle than that achieved by class ICP 2 with the subject of science.

Graphs 1 and 2 of the reults of field tests I, II, and III for both classes illustrate an increase in learning outcomes from cycle 1 to cycle 3. The learning outcomes of students from the *akidah akhlak* class (3 ICP 2) appear to be superior and show a significant increase compared to class ICP 1 (*IPA*). Disaster mitigation material appears to be better understood and internalized by class ICP 2 (*akidah akhlak*).



Graph 1. Average Scores for Field Tests I, II, and III for Class III ICP 1



Graph 2. Average Scores for Field Tests I, II, and III for Class III ICP 2

3. Testing the Effectiveness of Peace Education Learning Strategies

The data above was analyzed using covariance (One-Way ANOVA) to measure the effectiveness of the peaceful education strategy at *Madrasa Ibtidaiyah Maarif* Tanggulangin Sidoarjo. The research unit consisted of third-grade students in ICP 1 (IPA) and ICP 2 (*akidah akhlak*) during the second semester of the 2022-2023 academic year. The peaceful education strategy used three cycles of treatment/intervention. (τ) and working on disaster mitigation issues before the learning process begins (X), then after being given classroom activities, students are assessed again to obtain post-test scores (Y).

4. Testing Assumptions of Analysis of Covariance (ANCOVA)

The steps in performing covariance analysis are to diagnose the assumptions that must be met, namely data homogeneity, data normality, data linearity, and the existence of a correlation between the post-test score variable (Y) and the pre-test score variable for disaster mitigation (X). The following are the assumption tests in covariance analysis (ANCOVA).

Table 6. Data Homogeneity Test (Lavene Test)

Class	F	df1	df2	P-Value
3 ICP 1 (*IPA*)	1,441	2	72	0,243**
3 ICP 2 (*akidah akhlak*)	0,440	2	78	0,646**

note: **) not significant at the level of α=5%

Hypothesis =

H0 : Data cycle 1, cycle 2, cycle 3 in the IPA and Homogeneous *akidah akhlak* classes

H1 : Data from cycle 1, cycle 2, and cycle 3 in the IPA and *akidah akhlak* classes were not homogeneous.

Based on table 6, in the IPA class, the F-test statistic value was 1.441 and the P-value was 0.243 with degrees of freedom of 2 and 72, where the F-test statistic value was <F_(2,72;5%), namely 1.441<3.10, and the P-value was $>\alpha$, namely 0.243>0.05, so the assumption of data homogeneity of the data in the IPA class is satisfied. Similarly, for the *akidah akhlak* class, the F-test statistic value was 0.440 and the P-value was 0.646 with degrees of freedom of 2 and 78, where the F-test statistic value F_(calculated) < F_(2,78;5%) (i.e., 0.441 < 3.01) and the P-value > α (i.e., 0.646 > 0.05), so the assumption of data homogeneity assumption of data homogeneity in the *akidah akhlak* group is met. Since the assumption of data homogeneity is met, the ANCOVA method can be used. Then, proceed to the data normality assumption test as shown in Table 7.

Table 7. Data Normality Test

Statistical Test	3 ICP 1 (Science, *IPA*)		3 ICP 2 (Religion, *Akidah Akhlak*)	
	Mitigation questions (Pre-test)	Post-Test	Mitigation questions (Pre-test)	Post-Test
Kolmogorov-Smirnov (D)	0150	0,168	0,174	0,156
P-Value	0,000*	0,000*	0,000*	0,000*

Note: *) abnormal at this level α =5%

Hypothesis=

H0 : Data from cycle 1, cycle 2, and cycle 3 in the IPA and *akidah akhlak* classes were normally distributed.

H1 : Data from cycle 1, cycle 2, and cycle 3 in the IPA and *akidah akhlaq* classes were not normally distributed.

Based on Table 7 above, in class 3 ICP 1 (IPA) or 3 ICP 2 (*akidah akhlak*), the statistical test P-value for the pre-test and post-test was 0.00, where the P-value < α , i.e., 0.00 < 0.05, so the assumption of data normality in class 3 ICP 1 (IPA) or 3 ICP 2 (*akidah Akhlaq*) was not met. Therefore, it is recommended to increase the sample size in this study.

Table 8. Data Linearity Test

Class		Sum of Squares	df	Mean Square	F	P-Value
3 ICP 1 (*IPA*)	Pre-test(X)	141,323	6;80	23,554	0,255	0,956**
	Cycle	0,167	1;80	0,167	0,002	0,966**
3 ICP 2 (*Akidah Akhlak*)	Pre-test(X)	425,987	7;80	60,855	1,758	0109**
	Cycle	5,556	1;80	5,556	0,186	0667**

Note:**) not significant at the level of α=5%

Hypothesis=

H0 : Cycle data and pre-test in the IPA and *akidah akhlak* classes linear

H1 : Cycle data and pre-test results for IPA and *akidah akhlak* classes were not linear

Based on table 8, the IPA class obtained a pre-test F-test statistic value of 0.255 and a P-value of 0.956 with degrees of freedom of 6 and 80, then a cycle F-value of 0.002 and a P-value of 0.966 with degrees of freedom of 1 and 80, where the test statistic value $F_{pre-test} < F_{6,80;5\%}$ $that\ is$ $0{,}255 < 2{,}80$ dan P-Value >α that is 0,956>0,05 while $F_{cycle} < F_{1,80;5\%}$ $that\ is$ $0{,}002 < 3{,}00$ and P-Value >α that is 0,966>0,05. Therefore, the assumption of linearity in the IPA group is fulfilled. In *akidah akhlak*, the pre-test F-value was 1.758 and the P-value was 0.109 with degrees of freedom of 7 and 80, while the cycle F-value was 0.002 and the P-value was 0.966 with degrees of freedom of 1 and 80, where the test statistic value was $F_{pretest} < F_{6,80;5\%}$ $that\ is$ $0{,}255 < 2{,}80$ and P-Value>α that 0,956>0,05 sedangkan $F_{siklus} < F_{1,80;5\%}$ $that\ is$ $0{,}186 < 3{,}00$ and P-Value>α that 0,667>0,05 Therefore, the linearity assumption in the *akidah akhlak* group is fulfilled, because the linearity assumption of the data has been fulfilled so that the ANCOVA method can be used. Next, a correlation test was conducted between the pre-test (X) and post-test (Y), as shown in table 9.

Table 9. Correlation test between pre-test (X) and post-test (Y)

Statistical Test	3 ICP 1 (*IPA*)	3 ICP 2 (*akidah akhlak*)
Pearson Correlation	0,737	0,822
P-Value	0,000*	0,000*

Note: *) not significant at the level of α =5%

Hypothesis :
H0 : $\rho_{ij} = 0$ (there is no relationship between the pre-test (X) and post-test (Y))
H1 : $\rho_{ij} = 0$ (there is a relationship between the pre-test (X) and post-test (Y))

Based on table 9, the IPA class obtained a P-Value test statistic of 0.000 and *akidah akhlak* class obtained a P-Value of 0.000, where P-Value <α that 0,000<0,05 It can therefore be concluded that there is a relationship between mitigation issues and pre-tests (X) and post-test (Y). There is a correlation between the pre-test (X) and post-test (Y). Therefore, the ANCOVA method is appropriate because it combines ANOVA with linear regression. The assumption in linear regression is that there is a relationship between the predictor variable (X) and response variables (Y). In addition, the correlation coefficient value produced by the IPA class was 0.737, which means that there is a strong relationship between the pre-test questions on mitigation and the final post-test results. If the pre-test scores increase, the post-test scores will also increase. The correlation coefficient value produced by the *akidah akhlak* class was 0.822, indicating a strong correlation between the administration of the mitigation pre-test and the final post-test results. If the pre-test scores increase, the post-test scores will also increase. A positive and high correlation coefficient value close to 1 proves that implementing peaceful learning strategies accompanied by mitigation questions (pre-test) will improve student learning outcomes (post-test). This proves that peaceful learning strategies accompanied by mitigation questions (pre-test) contribute to improving student learning outcomes. This finding is in line with research by Suryana et al (2020), which shows that the psychological trauma of earthquake survivors is correlated with symptoms, occupation, and age, but not with faith. Nevertheless, *akidah akhlak* approaches remain important in post-disaster recovery. Integrating *akidah akhlak* based peace education can strengthen understanding of disaster mitigation while fostering psychological and spiritual resilience, as well as the values of monotheism, patience, and empathy in facing disasters.

5. Significance of Parameters (ANCOVA)

After testing the assumptions in the analysis of covariance, the next step is to test the significance of the effectiveness of the Peace Education strategy on students in grades 3 ICP 1 (IPA) and 3 ICP 2 (*akidah akhlak*) in the even semester of the 2022-2023 academic year. The results of the effectiveness test using Analysis of Covariance (ANCOVA) can be seen in the table below.

Hypothesis:
H0 : β_ij=0 (Peace Education Strategy Not Effective in Grade 3 ICP 1 (IPA))
H1 : β_ij≠0 (Effective Peace Education Strategy in Grade 3 ICP 1 (IPA))

Table 10. ANCOVA Test for Grade III ICP 2 (IPA)

Source	Type III Sum of Squares	df	Mean Square	F	P-Value	Partial Eta Squared
Corrected Model	7877,627	3	2625,876	31.192	0,000*	0,569
Error	5977,040	71	84,184			
Corrected Total	13854,667	74				

Note: *) significant at the level α=5%

Based on Table 10, the ANCOVA test for science classes obtained a corrected model test statistic P-value of 0.000, where P-value < α , i.e., 0.000<0.05, so it can be concluded that the peaceful education strategy model using three cycles and the provision of disaster mitigation questions has been effectively implemented at *Madrasa Ibtidaiyah Maarif* Tanggulangin Sidoarjo, contributing 56.9% to the improvement in students performance, motivation, awareness, and preparedness in disaster mitigation.

Furthermore, the effect of the peaceful education strategy in improving students learning motivation can be seen in Table 11 below.

Table 11. Test of the Effect of Pre-test on Post-test in IPA Class

Parameter	B	Std. Error	t	P-Value
Intercept	44,736	16,070	2,784	0,007
X_*IPA*	0,472	0,184	2,572	0,012*
[Factor_cycle *IPA*=1]	-11,456	5,593	-2,048	0,044*
[Factor_cycle *IPA*=2]	-5,864	3,525	-1,664	0,101

Note: *) significant at the level α=5%

Hypothesis:
$H_0 : \beta_1 = 0$ (the disaster mitigation questions given did not affect the post-test results)
$H_1 : \beta_1 \neq 0$ (questions on disaster mitigation had an effect on post-test results)

Based on Table 11, the test of the effect of peaceful education strategies in increasing student learning motivation on the factor of mitigation/pre-test questions (X) in IPA classes obtained a T-test statistic value of 2.572 and a P-value of 0.012, where the test statistic value $T_{Count} > t_{74;5\%}$ $that\ is$ $2{,}572 > 1{,}67$ and P-Value <α that 0,012<0,05 It can be concluded that the disaster mitigation questions included in the peaceful education strategy influenced and improved students post-test learning outcomes. If the disaster mitigation question score increased by 1 point, the post-test score would increase by 0.472, and the P-value test statistic in cycle I was 0.044. This indicates that cycle I had an effect on improving students post-test learning outcomes. Therefore, it can be concluded that the use of the peace education strategy can increase students learning motivation by 56.9%. The ANCOVA equation model formed is:

$$Y_{ij} = 44{,}736 - 11{,}456_{(1)} - 5{,}864_{(2)} + 0{,}472\mathrm{X}_1$$

Then, to find out which cycle/treatment had a different effect on students reactions in understanding disaster mitigation, see Table 12 below.

Table 12. Treatment Difference Test (Cycle) in IPA Class

(I) Instructional Strategy	(J) Instructional Strategy	Estimation Mean	Mean Difference	Std. Error	P-Value
Field test/cycle 1	Cycle 2	68,051	-5,592	3,652	0,130
	Cycle 3		-11,456*	5,593	0,044*
Field test/cycle 1	Cycle 1	73,643	5,592	3,652	0,130
	Cycle 3		-5,864	3,525	0,101
Field test/cycle 1	Cycle 1	79,507***	11,456*	5,593	0,044*
	Cycle 2		5,864	3,525	0,101

Note: *) Different cycles at the α =5% level; ***) Highest Mean

Hypothesis:
H_0: $\tau_1 = \tau_2 = \tau_3$ (no cycle difference)
H_1: $at\ least\ one\ \tau_i \neq 0$ (at least one cycle must be different)

Based on Table 12 above, it shows that the cycles/treatments that had different effects on students reactions in understanding disaster mitigation were cycle 1 and cycle 3. The implementation indicator for cycle I is understanding the earths surface and shape, with the main topic being "the earth and the universe," while the indicator for cycle III is understanding the various seasons and weather in Indonesia, as well as the impact of seasons and weather on human activities, with the main topic being "seasons and weather". Cycle III achieved the highest average score of 79.507 due to the activity of creating posters encouraging environmental conservation, which boosted students motivation and test results. This learning motivation reflects students ability to understand the connection between natural phenomena and human actions, aligning with modern scientific thought that has evolved from mythology to scientific experiments. Similar to the history of thought on the origin of life through evolutionary theory, cell theory, and the oparin and miller-urey experiments (Prosdocimi & de Farias, 2025). Students learning processes also develop through contextual and creative approaches. Even the latest scientific understanding of light and earths position in the universe by Sauerheber (2024) demonstrates the values instilled through thematic learning that fosters ecological awareness and social responsibility.

The ICP 2 (*akidah akhlak*) class 3 group also underwent ANCOVA testing, as shown in Table 13 below.

Hypothesis:
H0 : $\beta_{ij} = 0$ (Peace education strategy not effective in grade 3 ICP 2 (*akidah akhlak*))
H1 : $\beta_{ij} \neq 0$ (Effective peace education strategy in 3 ICP 2 (*akidah akhlak*))

Table 13. ANCOVA Test for Grade 3 ICP 2 (*akidah akhlak*)

Source	Type III Sum of Squares	df	Mean Square	F	P-Value	Partial Eta Squared
Corrected model	6784,571	3	2261,524	78,602	0,000*	0,754
Error	2215,429	77	28,772			
Corrected total	9000,000	80				

Note: *) Significant model at the α =5% level

Based on table 13, the ANCOVA test for the *akidah akhlak* class obtained a value in the corrected model test statistics P-Value of 0.000, where P-Value < α , namely 0.000<0.05, so it can be concluded that the peaceful education strategy model using three cycles and the provision of disaster mitigation questions has been effectively implemented in the *akidah akhlak* class at *Madrasa Ibtidaiyah Maarif* Ketegan Tanggulangin Sidoarjo, contributing 75.4% to improvements in students performance, motivation, awareness, and preparedness in disaster mitigation.

Then, in testing whether the disaster mitigation questions given in the peacefull education strategy influenced and improved students post-test learning outcomes, as shown in table 14.

Hypothesis:
H_0 : $\beta_1 = 0$ (The disaster mitigation questions given did not affect the post-test results)
H_1 : $\beta_1 \neq 0$ (Questions on disaster mitigation had an effect on post-test results)

Table 14. Test of the Effect of Pre-test on Post-test in *Akidah Akhlak* Class

Parameters	B	Std. Error	T	P-Value
Intercept	71,836	9,995	7,187	0,000
X_*Akidah Akhlak*	0,221	0,112	1,976	0,050*
[Factor_cycle *Akidah Akhlak* =1]	-16,329	3,321	-4,917	0,000*
[Factor_cycle *Akidah Akhlak* =2]	-7,977	1,958	-4,074	0,000*

Note: *) Significant model at the α =5% level

Based on table 14, the test of the effect of the peaceful education strategy in increasing student learning motivation on the factor of giving mitigation/pre-test questions (X) in the *akidah akhlak* class obtained a T-count test statistic value of 1,976 and a P-value of 0.050, where the test statistic value $T_{count} > t_{76;5\%}\ that\ is\ 1{,}976 > 1{,}68$ and P-Value≤α that 0,050≤0,05 It can be concluded that the disaster mitigation questions included in the peacefull education strategy influenced and improved students post-test learning outcomes. If the disaster mitigation question score increased by 1 point, the post-test score would increase by 0.221. The P-value test statistics for cycle I and cycle II were 0.00, indicating that cycle I and cycle II had a significant impact on improving students post-test learning outcomes. This study aligns with the findings of Kadir (Kadir et al. 2024) who developed IPA teaching materials that integrate verses from the quran to enhance students religious attitudes at *Madrasa Tsanawiyah*.

Using the Research and Development (R&D) method based on the Borg & Gall model and the ADDIE stages (Analysis, Design, Development, Implementation, Evaluation), the research successfully produced valid, practical, and effective teaching materials. The implementation of these teaching materials was proven to significantly improve students spiritual attitudes at *Madrasa Tsanawiyah Negeri* Konawe, indicating that integrating quranic values into IPA education materials can have a positive impact on students religious and cognitive aspects. Thus, both studies emphasize the importance of an educational approach that combines academic aspects and spiritual values to enhance the quality of education in *Madrasas*. This approach not only improves academic performance but also fosters religious attitudes and awareness of disaster mitigation, which is highly relevant for students in a post-disaster *Madrasa* environment. The integration of these strategies is expected to serve as an effective and sustainable learning model in addressing educational challenges in the modern era.

Therefore, it can be concluded that the use of peaceful education strategies can increase student motivation by 75.4%, as shown in table 14. The equation model formed is:

$$Y_{ij} = 71{,}836 - 16{,}329_{(1)} - 7{,}977_{(2)} + 0{,}221\mathrm{X}_1$$

Then, to test which cycle/treatment had a different effect on students reactions in understanding disaster mitigation, see table 15 below.

Table 15. Treatment Difference Test (Cycle) in The Akidah Akhlaq Class

(I) Instructional Strategy	(J) Instructional Strategy	Estimation Mean	Mean Difference	Std. Error	P-Value
Field test/cycle 1	Cycle 2	72,329	-8,351*	2,224	0,000*
	Cycle 3		-16,329*	3,321	0,000*
Field test/cycle 2	Cycle 1	80,680	8,351*	2,224	0,000*
	Cycle 3		-7,977*	1,958	0,000*
Field test/cycle 3	Cycle 1	88,657***	16,329*	3,321	0,000*
	Cycle 2		7,977*	1,958	0,000*

Note: *) different cycles at the α =5% level; ***) highest Mean

Hypothesis:
H0: $\tau_1 = \tau_2 = \tau_3$ (There is no difference in the cycle in the *Akidah akhlak* class)
H1: $at\ least\ one\ \tau_i \neq 0$ (At least one cycle must be different)

Based on table 15, it shows that all cycles/treatments (cycles I, II, and III) tested had different effects on students reactions in understanding disaster mitigation. The indicator for cycle I is reciting the *kalimah thayyibah* sentence, understanding its meaning and the wisdom of reading the *kalimah thayyibah* sentence with the main topic of "earth and the universe". The indicator for cycle II is understanding the timing of reciting the *kalimah thayyibah* sentence and its application in daily life. The indicator for cycle III is understanding the meaning of *asmaul husna* and examples of actions that emulate the practice of *asmaul husna* in daily life. Cycle III yielded the highest average score estimate of 88.657. This is because in cycle III, new activities were introduced as a break, which made the students more enthusiastic and motivated. These activities included creating posters encouraging environmental conservation to prevent disasters caused by human actions, such as posters about not littering to prevent floods, posters about conserving energy, posters about not massively cutting down trees, or posters encouraging reforestation. Through these activities, students became more enthusiastic, and this positively impacted the results of the tests they completed.

These findings are in line with previous studies that emphasize the importance of disaster mitigation education through creative approaches. For example, science, technology, engineering, and mathematics (STEM) based natural disaster mitigation module learning by Ulfa et al (2020), problem-based learning models for integrated flood mitigation fluid material learning by Fitri et al (2021), Ningsih et al (2022), the development of an android-based landslide disaster mitigation e-book, and a post-eruption mitigation textbook by Safitri et al (2023). Development of an e-model assisted by flipbuilder in empathy project-based learning on the theme of environmental awareness and care based on religious values by Khusna et al (2024), and development of an e-jasbio canva electronic module by Haka et al (2024) using Borg & Gall's R&D research method, which is effective in enhancing students cognitive abilities, responsiveness, and performance in disaster mitigation.

Based on the data description, students from the *akidah akhlak* class group (3 ICP 2) achieved better learning outcomes compared to students from the IPA class (ICP 1). Specifically, disaster mitigation material, which is thematically more relevant to the IPA class, was actually better understood and internalized by students in the *akidah akhlak* class. Based on the statistical analysis of covariance (ANCOVA) on the effectiveness of the peaceful learning strategy, it was revealed that the spiritual values-based approach applied in the *akidah akhlak* class had a significant influence on students understanding of disaster mitigation. The impact of this strategy on the learning outcomes of *akidah akhlak* class students reached 75.4%, indicating the effectiveness of the approach that integrates spiritual values into disaster mitigation learning. The findings of Fahmi et al (2025) confirm that value-based approaches, both spiritual and multicultural, play a crucial role in shaping students social and spiritual resilience. Spiritual approaches have proven effective in the context of disaster mitigation, while multicultural Islamic education strengthens social cohesion through the integration of local culture and values of tolerance. The post-disaster peace education approach that integrates spiritual and multicultural values aligns with the SpaSE model by Asrohah et al (2025), which emphasizes the importance of social, physical, and spiritual environments in fostering tolerant and adaptive attitudes that support the development of resilient and moderate students in facing various social and global challenges.

Post-disaster peace education is crucial for students psychosocial recovery while fostering empathy, solidarity, and the ability to handle differences. The integration of spiritual and multicultural values helps students develop emotional resilience, social skills, and strengthen social integration in line with social identity theory. In this context, educational transformation that prioritizes the preservation of traditional values and new innovations, supported by the AGIL approach and the three in one curriculum, enhances adaptability in the Society 5.0 era while contributing to peace education in post-disaster recovery (Mutammam et al., 2024).

Conclusion

The implementation of peaceful education strategy at *Madrasa Ibtidaiyah Maarif* Tanggulangin has been running well. Various activities have been carried out involving various parties in their implementation, including the principal, teachers, and students. The aim is to foster empathy, care, and mutual assistance among students, as well as to foster a sense of peace, realism, and risk reduction after a disaster. The implementation of the peaceful education strategy at *Madrasa Ibtidaiyah Maarif* Tanggulangin Sidoarjo can be considered effective, as it has successfully increased students motivation to learn. This can be proven by the test results they achieved over three cycles, showing an increase of 25 in class 3 ICP 1 and 24 in class 3 ICP 2. Additionally, students also feel enthusiastic and motivated in participating in the learning process. Therefore, this research has been sufficiently conducted up to cycle III and will not be continued to the next cycle.

The peaceful education strategy using three cycles and disaster mitigation questions has been effectively implemented in the IPA class at *Madrasa Ibtidaiyah Maarif* Tanggulangin Sidoarjo, contributing 56.9% to the impact, while the peaceful education strategy model using three cycles and disaster mitigation questions has been effectively implemented in the *akidah akhlak* class at *Madrasa Ibtidaiyah Maarif* Tanggulangin Sidoarjo, contributing 75.4% to improvements in student achievement, motivation, awareness, and preparedness in disaster mitigation. Peaceful education strategy for disaster mitigation is more effective when applied to the *akidah akhlak* class than the IPA class. Thus, the criteria validation is sufficiently valid for ICP 1 and ICP 2 classes to apply the peaceful education learning strategy for students in emergency *Madrasas*.

The factors of disaster mitigation questions/pre-tests and cycles influence student learning outcomes/post-tests. The use of peace education strategies can increase learning motivation with the factor of disaster mitigation questions/pre-tests for students. Cycle III provides the highest average score estimate for both the IPA and *akidah akhlak* classes, so that cycle III has an impact on improving student test results.

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