



Meta-Analysis: An integrative approach to islamic values in biology learning





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ARTICLE INFO	ABSTRACT
<p>Article history Received May 22, 2021 Revised June 10, 2021 Accepted June 18, 2021</p> <p>Keyword: Meta-Analysis Integrative approach Application of Islamic values science/biology learning</p>	<p>One example of an integrative approach in learning is the integration of Islamic values in Biology learning. This article describes and analyzes the influence of Islamic values in Biology learning. The results of the study are a summary of the available empirical evidence about the effect of integrating Islamic values in Biology learning. This study uses a meta-analysis method, the articles analyzed are 15 articles that meet the requirements of 57 articles that have an integrative approach to Islamic values. The results showed that the integration of Islamic values in Biology learning had a large effect with an effect size of 3.50. For education level, the largest effect size is at the high school education level (3.74), for the provision of action the largest effect size is for the Hypno-teaching method (5.13), for the use of the dependent variable the largest effect size is on the dependent variable mastery of concepts (4.70), while for Biology material, the largest effect size is on the material of the reproductive system (5,08). The results of the research as a whole conclude that the integrative approach of Islamic values in biology learning is effective for use, especially at the high school level, in the Hypno-teaching method, in mastering concepts, and reproductive system materials.</p>
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Introduction

Graduate competency standards set by the Ministry of Education and Culture Indonesian government based on the 2013 curriculum are student learning that aims to master 21st-century life skills (Kementerian Pendidikan dan Kebudayaan, 2016). The 2013 curriculum requires students to be able to achieve the four bits of intelligence listed in the core competencies, namely spiritual, social, and emotional intelligence, intellectual, and skills (Nurdyansyah & Fahyuni, 2016).

One of the strategies to achieve learning objectives based on the 2013 curriculum is an integrative approach, namely, a teacher can link Islamic values through models and learning methods (Nasution, 2012). In Indonesia, the integrated curriculum is widely applied to the Madrasah environment, namely 70% general subjects and 30% religious subjects (Tan, 2014). This is still far from expectations, considering that one of the benefits of learning that is integrated with Islamic values is that it provides more

opportunities for integrated learning that links science concepts with students' real experiences as Muslims which will ultimately lead to meaningful learning (Purwati et al., 2018).

Linking Islamic values in learning is important because the role of value education taught to students will make students not only intellectually intelligent but also can improve the quality (value) of moral and moral responsibility (Khadavi, 2016). This is confirmed by Ikhwan (2014) that integrative learning by instilling Islamic values in learning can develop spiritual insight, equip students with various abilities, and develop students' self-ability to respect each other.

The understanding between the concept of Biology and the verses of the Qur'an can be combined because the natural science material (IPA) is material related to religious values, especially in everyday life (Muspiroh, 2013). For example, through integrative learning, students are more grateful by using the understanding they have gained to seek the truth and belief in the values contained in the Qur'an (Ramadanti, 2020).

In the science learning process, students are taught to be grateful for having senses, so they can see the truth of the verses of the Qur'an, so that mastery of concepts between science and technology and IMTAQ can run in harmony in learning (Muspiroh, 2013). This supports the achievement of learning objectives based on the 2013 curriculum.

Based on the number of research studies in the form of the application of Islamic values in Biology learning. However, different studies on the same topic sometimes provide varying research results and result in conclusions about research being subjective (Tamur & Juandi, 2020).

Thus, it is necessary to integrate several quantitative findings so that they can provide accurate and useful conclusions for policymaking (Paloloang et al., 2020). The existence of a meta-analysis is a good solution to find out cumulatively how much influence or effect size is from all previous studies (Mandailina et al., 2021).

Retnawati et al. (2018) suggest that there are previous studies, it is necessary to re-analyze them to see how much influence and effectiveness they have. In particular, the effect of implementing the

integration of Islamic values in Biology learning. This is supported by Schmidt (1992) who states that meta-analysis can integrate the findings of several studies to reveal the pattern of relationships that underlie the research literature, thus providing a basis for theory development.

The calculation of the effect size in the meta-analysis study is an important part because this research combines combining studies. The magnitude of the influence commonly used in research is the average (standardized mean difference), binary data (odds ratio), and correlation (Pearson correlation) (Fritz et al., 2012). In this study, the standardized mean difference according to Cohen's is used to find out how much influence (effect size) a study has (Retnawati et al., 2018), especially the application of the integration of Islamic values in Biology learning.

Several meta-analytical studies on science learning in Indonesia and other countries have been carried out. Every year, many research results in the field of education take the theme of integrative learning of Islamic values which are published as media in the form of journals. The research was experimental, descriptive, and R&D.

However, data regarding the results of learning research related to the integration of Islamic values is only limited to testing its effectiveness. While there is a need that educators need accurate information to decide how effectively to use the application of the integration of Islamic values in Biology learning. In this case, further research is needed on the effect size calculation data so that it can be mapped and analyzed the effect of a treatment in integrated learning of Islamic values.

With the determination of the effect size of each study, overall it can be found and determined how much influence a treatment has. Therefore, this meta-analysis study aims to provide information about the effect of an integrative approach in the form of inculcating Islamic values in Biology learning in terms of education level, giving actions, dependent variables, and science/biology material. The findings of this study provide accurate information to educators in implementing the integration of Islamic values in the present and the future.

Method

The method used in this study is a meta-analysis method by reviewing fifteen of fifty-seven scientific articles. According to Nindrea (2016) meta-analysis is a statistical technique to combine the results of or more similar studies to obtain a quantitative blend of data.

The instrument used in the meta-analysis research is the coding data sheet (Nafsih et al., 2020). The variables in the coding are used to generate the information needed to calculate the effect size, including the article code, name of the researcher, year of publication, level of education, giving action, dependent variable, and Biology material.

This research consists of determining research questions, determining relevant research, coding, calculating effect sizes and standard errors, conducting data analysis assisted by JASP software, interpreting the results of data analysis or output from JASP software, and finally drawing conclusions from the research results (Retnawati et al., 2018). The flow chart of the research procedure is shown in Figure 1.

To determine research questions, it is necessary to collect study results and estimate the mean of the many studies by looking at pre-post comparisons and comparisons of two groups.

In the step of determining relevant research, identification needs to be carried out, article searches are carried out by writing the keywords "integrative approach", "Biology learning" on the website <http://sinta.ristekbrin.go.id/> and Google Scholar.

The coding step is carried out by screening the feasibility of the articles obtained, all articles collected are coded data (coding data). Code A includes the article code from the journal and code B from the thesis. Furthermore, all articles were examined and assessed for inclusion in the meta-analysis using the criteria, namely articles published nationally in Sinta Indonesia and Google Scholar in 2009-2020, the theme of the article on the application of Islamic values integration in Biology learning, the method of the article in the form of experimental research and fulfilling the completeness statistical data such as pretest, posttest and standard deviation scores. Meanwhile, articles from qualitative and R&D types are not included

in the criteria to be analyzed. The screening results obtained fifteen articles on the application of the integration of Islamic values in Biology learning which were used as research samples as can be seen in Table 2.

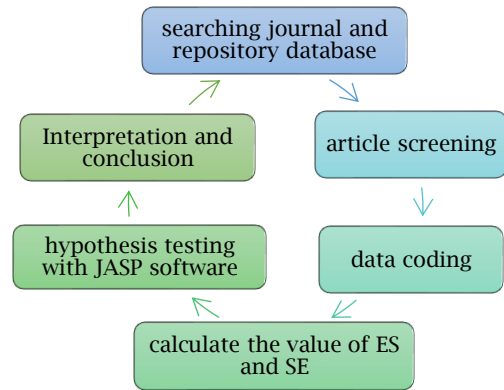


Figure 1. Meta analysis procedure

In the next step, all articles that meet the criteria are analyzed with a meta-analysis study, namely by calculating the value of effect size, standard error. The calculation of effect size is the most important part of this study. The reason is that the meta-analytic approach is carried out by combining the results of the study by involving the calculation of the effect size. Retnawati et al. (2018) suggest that the combination study involves the effect size of the primary combining studies to estimate the effect size of the same type or range of the effect size. Combining studies aim to identify the mean of effect sizes. Calculation of effect size (ES) is used Cohen's formula, namely:

$$d = \frac{x_2 - x_1}{S_{pooled}} \text{ with}$$

$$S_{pooled} = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}}$$

(Retnawati et al., 2018)

Where "n" is the number of students, S is the standard deviation, namely the mean of pretest and posttest. After obtaining the effect size (ES) value, Fritz et al. (2012) interpret Cohen's effect size in the category as Table 1.

Table 1. Classification of effect size

Effect Size (ES)	Category
d ≤ 0.5	Small
d ≥ 0.5	Medium
d ≥ 0.80	Big

The results of the meta-analysis study stage are obtained, then the analysis procedure is continued by calculating the summary effect (combined ES) with the help of JASP software. Then interpret the results of the analysis or the output of the JASP software such as heterogeneity test, confidence interval, hypothesis testing by calculating the Z value and p-value and forest plot. The last stage is concluding (Retnawati et al., 2018).

Results and Discussion

Based on the research results of fifteen verified articles used as samples. The data from the research articles are categorized into five variables, namely the overall influence, education level, giving action, dependent variable, and science/biology material. The list of fifteen articles can be seen in Table 2.

The first objective of this study was to determine the overall effect of the combination of several studies with the theme of applying the integration of Islamic values in learning biology. The first stage of the analysis is to calculate the primary study. Based on the overall calculation, the effect size of each study can be seen in Figure 2.

Referring to the effect size classification, the results of the effect size (ES) calculation show that twelve articles have a positive effect, namely ES in the large category. Meanwhile, three articles have effect sizes in the medium category. The next step is calculating the summary effect, heterogeneity test, hypothesis testing, and confidence interval. The results of statistical data can be seen in Table 3.

Based on Table 3 It shows that the overall range of effects is 2.76 to 4.24, with

a 95% confidence level and a standard error of 0.37. The study's overall effect yield was 3.50. this effect size is accepted as a large effect. it means that the average application of the integration of Islamic values has a largely positive influence on learning biology.

The heterogeneity test was performed using JASP software. The results of the heterogeneity test based on Table 3 the Q value is 20.225 and the p-value is 0.123. thus, the effect size distribution is homogeneous because $p > 0.05$. This means that the model is used to calculate the summary effect with the fixed effect model.

Based on Table 3 the 95% confidence interval ranges from 2.76 to 4.24 which indicates that the difference in the mean of each study can fall anywhere within this range with large effect sizes. as a result of calculating the Z test to determine significance, the Z score was obtained at 9.282. This result can be said to be statistically significant at the level of $p < 0.001$. Thus, the application of the integration of Islamic values has a significant relationship with Biology learning.

The summary effect calculation indicates that the application of the integration of Islamic values in Biology learning has a large effect size. The magnitude of this effect is in line with the research of Baba et al. (2015) that the application of integrated learning of Islamic values directly or indirectly makes the learning process more meaningful. It is proven that integrated science learning, can add scientific insight and instill "values" namely students not only learn general knowledge but the values contained therein (Ramadanti, 2020).

Table 2. List of meta-analysis article

Study	Article code	Researcher	Year
1	B1	Sri Sutani	2010
2	B4	Dini Afriansyah 1	2015
3	B4	Dini Afriansya 2	2015
4	B16	Feri Wahyuni	2009
5	B17	Muhammad Irwansyah	2012
6	B18	Aprita Sari	2009
7	B19	Desi Eka Setiawati	2009
8	B20	Salfiani	2017
9	B21	Tahmidah Rahmi	2010
10	B22	Liyla Alviana	2013
11	B23	Rafika Nurhutami 1	2019
12	B23	Rafika Nurhutami 2	2019
13	B24	Sahroni	2018
14	A1	Kasiful Gito	2013
15	A24	Susanti	2018

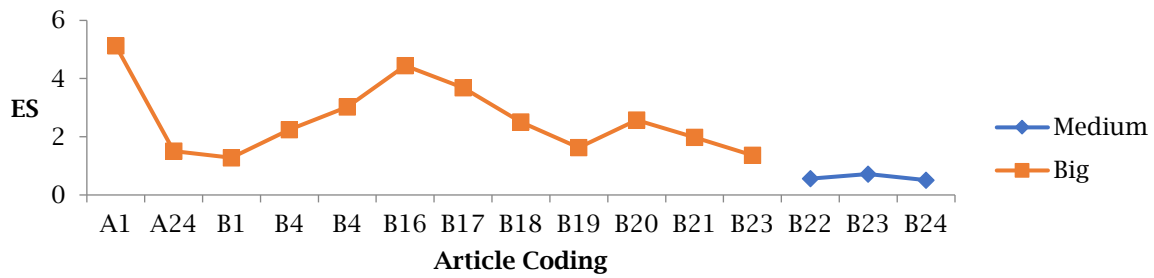


Figure 2. Effect size chart by category

The results of the meta-analysis in the form of estimates using the fixed-effect model (FE) can be seen in the forest plot as shown in Figure 3. The diamond box (diamond shape) on the forest plot graph shows that the estimate (overall effect) shows a value of 3.50 with a fixed-effect model. The results of the calculation can be seen that the magnitude of the influence of the application of Islamic values in Biology learning for each study article can be shown by a rectangular box.

The horizontal line that accompanies each box on the forest plot diagram represents the confidence interval for each study. The longer the line, the wider the confidence interval and vice versa (Dahlan, 2012).

The effect size value in the rectangular box is located to the right of the zero vertical lines. Proving that there is a significant influence between the integration of Islamic values with Biology learning. According to Retnawati et al. (2018) that if the effect size value is to the right of the zero value, then the posttest score is higher than the pretest value. This means that in each study article on the application of the integration of Islamic values, there is an increase in Biology learning.

In line with the research of Purwati et al. (2018) that in integrated science learning, Islamic values are higher than in non-integrated science learning. The average score of student learning outcomes with Islamic integration learning is 15.196% higher than students who are taught using conventional learning. This is also confirmed by Hanif et al. (2016) that the integration of Islamic values is proven to significantly increase students' mastery

of concepts. With the proof that the posttest average value is higher, namely 74 compared to the 36 pretest results.

Thus, the application of the integration of Islamic values gives a positive influence in learning Biology. The strategy of integrating Islamic values in the learning process provides opportunities for students to connect scientific knowledge with students' concepts and experiences in real life as Muslims (Ikhwan, 2014). As a result, it makes students more motivated in the learning process. The process of learning will affect the learning outcomes.

The large influence of the application of the integration of Islamic values based on the level is shown in Table 4. The application of the integration of Islamic values in Biology learning has a major influence on the high school education level compared to the junior high school level. This is evidenced by the effect size value in high school, which is 3.74.

The high value of effect size at these two levels of education has implications for children's cognitive abilities. Psychologically, students at the junior and senior high school levels are in the formal operational stage, namely the stage that they can abstract and think hypotheses (Mu'min, 2013).

However, the magnitude of the influence at the high school level is higher because the emotional ability is higher than junior high school (Aniyatin & Mahrudin, 2017). High school students have more experience than junior high school students. In line with Fajarini and Khaerani (2014) that the level of emotional maturity of a person is directly proportional to the high level of education.

Table 3. Statistical result of the meta-analysis test

Combined ES	Standard error	Heterogeneity		Hypothesis		Trust interval 95%	
		Q	P	Z test	p-value	Lower	Upper
3.50	0.37	20.225	0.123	9.282	<0.001	2.76	4.24

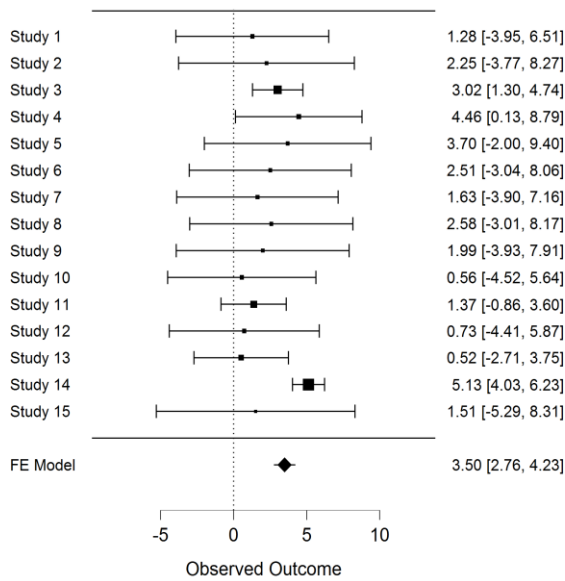


Figure 3. Forest plot

The magnitude of the influence can also be seen based on the application of the act of implementing the integration of Islamic values in Biology learning. The provision of action in question is treated in the experimental class with the application of the integration of Islamic values, both carried out by approaches, models, and methods. The results based on the provision of action can be shown in Table 5.

The magnitude of the influence based on the level of education on the application of the integration of Islamic values can provide the greatest influence through the Hypno-teaching method. Meanwhile, the influence in the medium category is through the inquiry and talking stick models. Although the Hypno-teaching method has the most influence, it does not make other types of integrated learning ineffective. It can be seen in Table 5 that the average effect size on the CTL approach, integration, SETS, 5E learning cycle, PBL, STM, Reciprocal teaching, and concept maps are included in the large category.

The Hypno-teaching learning method is the most influential because learning in the hypno-teaching method emphasizes good interactions between teachers and students (Ismuzaroh, 2013). It is also influenced by the learning stages, including setting dreams and targets, visualizing student dreams and learning targets, students entering a super genius condition, affirming material, learning

activities, and repeating material to improve students' memory and gratitude (Gito et al., 2013). So that this method is effectively used in learning Biology integrated with Islamic values.

The results of this study, can provide solutions for educators to implement integrated models, methods, and approaches. So that learning can improve the progress of science and technology and IMTAQ. According to Rustam et al. (2012) that the use of effective learning methods can help to achieve learning objectives. integrated learning with Islamic values, approaches, strategies, and methods of integrating Islamic values into indispensable learning materials. This is because it can encourage students to learn better and get better results.

The influence of the dependent variable on the fifteen articles contained five groups of dependent variables. The results of the calculation of the effect size can be seen in Table 6. That the value of the greatest effect size is an increase in the strengthening of the concept. While the lowest is the ability to analyze.

The magnitude of the effect of increasing mastery of concepts compared to others is in line with the research of Ihsani et al. (2020) that the application of the integration of Islamic values can increase the understanding of students' concepts. Understanding this concept can be seen from how the results of student activities in discussing assignments that are combined with verses from the Qur'an are inserted into the biology material.

The application of the integration of Islamic values plays a role in developing mastery of concepts because students have skills that encourage the acquisition of knowledge and understanding of concepts about natural phenomena around them (Hanif et al., 2016). This is because the religious subject matter studied is related to science (Harahap, 2018). To be able to train students' abilities in higher-order thinking in analyzing the relationship between science and religion.

Table 4. Effect size based on the education level

Education Level	Number of Articles	ES Average
Junior High School	5	1.60
Senior High School	10	3.74

Table 5. Effect size based on the provision of action

Type of learning	Integrated action giving	Total	Effect size average
Approach	CTL	4	1.31
	Integration	1	3.69
	SETS	1	2.57
Model	5E learning cycle	2	2.96
	PBL	1	1.51
	STM	1	4.45
	Reciprocal teaching	1	2.51
	Inquiry	1	0.51
	Talking stick	1	0.56
Method	Hypno-teaching	1	5.13
	Mind-map	1	1.98

However, the ability to think analytically has a small effect compared to others. This is because in article code B24 the application of integrated biology learning with Islamic values is applied at the junior high school level whose abilities are still in the development stage. Judging from Bloom's taxonomy, analytical thinking skills are included in the high-level cognitive domain (Gunawan & Palupi, 2016).

The application of the integration of Islamic values in Biology learning can be done by inserting verses of the Qur'an which can be done on all IP/Biology materials. Agustina et al. (2020) mapped the verses of the Qur'an that were adapted to the materials contained in each science/biology material.

The magnitude of the influence based on the science/biology material which was analyzed from fifteen articles contained six materials. As can be seen in Table 7. The application of the integration of Islamic values has a great influence in learning Biology on the material of the reproductive system. However, judging from the average value of the effect size, all of them have a large influence which is included in the large category.

Table 6. Effect size based on the dependent variable

Dependent variable	Total	ES Average
Concept Mastery	5	4.72
Learning outcomes	6	2.37
Attitude	2	2.41
Analysis Ability	1	0.52
Science Literacy Ability	1	0.85

The magnitude of the effect size on the material of the reproductive system is in line with Yusuf et al. (2018) that the integration of the concept of biology in the reproductive system chapter is in line with the concept of science with the Qur'an. As explained by Agustina et al. (2020) that the

concept of Biology in the material of the reproductive system is in line with the many verses of the Qur'an. For example, the concept of reproduction describes the menstrual cycle, pregnancy, until finally becoming a complete human being.

The understanding of the integration of Islamic values in Biology learning is contained in Q.S. Al-Anbiya verse 30 that many of His verses are emphasized so that humans always think about events in nature to strengthen religious beliefs (Muspiroh, 2013). Therefore, it is important to instill Islamic values in every lesson.

The understanding of the integration of Islamic values in science/biology learning is implied in the Qur'an. The Qur'an does not contradict science and religion. Even science is an integral part of religion and the two complement each other.

Table 7. Effect size based on science/biology material

Science/Biology Materials	Total	ES Average
Ecosystem	5	1.93
Plantae Kingdom	4	2.29
Reproduction system	2	5.08
Plant Tissue Structure	2	1.45
Biodiversity	1	0.85
Environmental Change	1	1.51

Conclusion

Based on the results of the study, it can be concluded that the application of the integration of Islamic values has a large positive impact on learning Biology with an effect size value of 3.50. The implementation of the most effective integration of Islamic values at the high school level education level with an effect size value of 3.74 is in a large category. Based on the provision of the most effective action on the hypno-teaching

method with an effect size value of 5.13. Based on the dependent variable the most effective in increasing mastery of concepts with an effect size value of 4.70, while based on Biology the most effective material on the reproductive system with an effect size value of 5.08.

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