



Development of OEFPADU Syntax Biology LKPD to Improve Critical Thinking of Islamic Values and Scientific Attitude

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Received: July 19, 2023

Revised: September 15, 2023

Accepted: October 25, 2023

Published: October 31, 2023

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DOI: [10.29303/jppipa.v9i10.4733](https://doi.org/10.29303/jppipa.v9i10.4733)

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Abstract: This study aims to produce Biology LKPD, determine the feasibility and effectiveness of the LKPD developed to increase critical thinking of Islamic value and Scientific attitude. The method used in this research is Research and Development (R & D) with the ADDIE model (Analysis, Design, Development, and Implementation, Evaluation) developed by Dick & Carry. Data analysis techniques used gain scores (Statistic analysis). Evaluation of biological LKPD products according to product feasibility experts is in the good category. According to the biology teacher, it was in the outstanding category and the students' responses were in the outstanding category. Learning using the OEFPADU LKPD syntax shows that critical thinking of Islamic values increases (the average gain score is 0.72), independent test simple t test sign. 0.000 and paired sample t-test 0.001 and observations of 7.60%. The scientific attitude of students increased by 14.30%, from the good to outstanding category with the Wilcoxon test analysis, the scientific attitude before and after using the OEFPADU syntax LKPD there was a significant difference with the Asymp results. Sig. 0.000 (<0.05). This shows that the use of OEFPADU LKPD syntax is effective in improving critical thinking skills of Islamic values and scientific attitudes.

Keywords: Biology LKPD; Critical thinking skills of Islamic values; OEFPADU Syntax; Scientific attitude

Introduction

Education is the need of every human being, anytime and anywhere. The National Education System Law No. 20 of 2003 concerning the National Education System states that education is a learning process so that students can develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills needed for quality live better than before. Based on the Law on the National Education System, national education is expected not only to develop intellectual intelligence and students' skills in facing the challenges of an increasingly developing era, but also to develop students who have a spiritual attitude in accordance with their religion. Meanwhile, education from an Islamic perspective is a process that aims to make students the next generation who have Islamic character (Murohab, 2021).

The results of the international Trends in Mathematics and Science Study (TIMSS) assessment based on data from the Ministry of Education and Culture Research and Development 2016, also show that the achievements of Indonesian students in the fields of mathematics and science are still far from satisfactory, from the last data ranking 46 of the participants (51 TIMSS 2015 countries). The scores of Indonesian students obtained from the assessment were included in the low category, which means that students were less capable of organizing information, making formulations, solving problems, and taking and submitting concluding justification arguments (McComas, 2014). The TIMSS data illustrates that Indonesian students really need mastery of thinking skills, especially mastery of critical thinking and problem solving which is one of the abilities needed in the 21st century.

How to Cite:

Sanudin, S., & Aminatun, T. (2023). Development of OEFPADU Syntax Biology LKPD to Improve Critical Thinking of Islamic Values and Scientific Attitude. *Jurnal Penelitian Pendidikan IPA*, 9(10), 8997–9005. <https://doi.org/10.29303/jppipa.v9i10.4733>

Mastery of critical thinking is needed by students to face future challenges. This skill as reasonable and purposeful thinking which includes analyzing, synthesizing and evaluating information to make further conclusions and decisions (Shcheglova, et al., 2019). Facing the challenges of the 21st century world, knowledge and information alone are not enough so that the ability to solve problems effectively is needed. In the information age, critical thinking is the main ability one needs to become a resilient global society. With this ability a person will be careful in making decisions and solving problems (Zetriuslita et al., 2018).

According to Allison G. Snyder (2006), students' mastery of critical thinking can be developed or strengthened through the use of certain methods or models in the learning process. However, not all learning models can automatically improve mastery of critical thinking. Learning methods and models that emphasize more active students, learning models that encourage discussion and provide lots of opportunities to express opinions, use ideas, give students lots of opportunities to express ideas in writing, encourage collaboration in studying and discovering developing knowledge responsibility, self-reflection and social awareness which will develop students' mastery of critical thinking.

Core competencies as stated in Permendikbud Number 24 of 2016 concerning Core Competencies and Basic Competencies in the 2013 Curriculum, are the level of ability that students must have to achieve graduate competency standards at each grade level. This core competency consists of four parts, namely spiritual attitudes, social attitudes, knowledge, and skills. These four competencies should be applied in learning at school. However, when referring to the revised 2013 Curriculum RPP, only the subjects of Religious and Moral Education and Citizenship Education apply the four core competencies in learning. Other subjects, including biology, only apply 2 core competencies, namely knowledge core competencies and skills core competencies. This is not in line with the contents of Permendikbud Number 24 of 2016 concerning Core Competencies and Basic Competencies in the 2013 Curriculum, where there are four core competencies, while only two are applied in learning. As a result, biology learning in schools tends to only pursue cognitive and psychomotor values, without including spiritual attitudes and social attitudes. Even if there is, the spiritual attitude that is highlighted is only limited to praying before starting and ending learning. One of the efforts that can be made to include a spiritual attitude is to include Islamic values in Biology learning through teaching materials.

The results of observations in Islamic schools in Sleman Regency show that only 25% of biology teachers

apply learning accompanied by verses from the Quran and Sunnah related to the subject of biology both in planning and implementing learning. The application that was carried out was only limited to conveying information from the teacher to students that there were verses of the Quran and Sunnah related to the subject of biology, not until they were presented in the learning media to find and link Qur'an verses and Sunnah related to the subject matter.

SMA IT Baitussalam Prambanan is one of the Islamic schools that are in the TERPADU Islamic School Network or JSIT. The TERPADU Islamic School (SIT) is essentially a school designed to implement the concept of education based on the Quran and Sunnah. SIT is intended so that the education that is held is still guided by religious laws so that there is no separation of religious education from general education. The SIT concept is a school concept that combines education based on religious values with education organized by the government in one curriculum that has certain characteristics. With an approach like this, every process of delivering learning cannot be separated from Islamic values. There is no secularization, no dichotomy between religious studies and general subjects such as Biology, Physics, History, Mathematics, Languages, Crafts, etc., all of which are inseparable from Islamic values. The character of SIT which combines general learning with Islamic values where the syntax in the learning process uses OEFPADU (Observation, Exploration, Formulate, Presentation, Application, Worldly, and Ukhrawi).

The results of interviews with biology teachers in high schools (SMA) show that teachers have never implemented media-based learning that is OEFPADU with Islamic values, especially in biology subjects. In fact, the school has the potential to implement media accompanied by verses from the Quran and Hadith considering that all students at the school are Muslims. Islamic schools should be able to more optimally integrate Islamic values through verses from the Quran and hadith related to certain subjects to improve students' spiritual attitudes.

The results of observations when learning in the classroom, at the beginning of learning the teacher often reminds the concepts that have been studied before. When the teacher gives the inducement to a question, the students immediately open the source book they have and read the answers to the questions from the teacher according to what is written in the book. During practicum learning the teacher asks problems that occur related to the experiments to be carried out, students choose to be silent and do not answer questions. This condition indicates that students are less sensitive in recognizing surrounding problems. In addition, at the end of the experiment there were still many students

who had not been able to write down the results of conclusions that were in accordance with the objectives with the existing problems and the results of the mean score related to critical thinking questions that had been given was 50.50. This shows that students' critical thinking skills are still relatively low.

The presence of learning media is expected to make it easier for students to understand the knowledge being studied. Based on the description above, students still need help in the form of learning media that can be used as a guide when carrying out practicum activities. Moreover, learning media in the form of student worksheets can combine three competency targets in the form of knowledge, skills and attitudes. Learning will be more meaningful if students are actively involved in learning. Learning outcomes will also last longer if these results are obtained from the students' own efforts. Whereas, to support success in learning, tools other than K-13 books are needed which are equipped with competency skills and attitudes in the form of practicum guidelines.

Based on the problems above, the researcher intends to develop a product that can be used by students as a learning medium that can increase the ability to think critically about Islamic values and scientific attitudes in learning. The hope to be achieved is that learning becomes more meaningful because the process takes place scientifically in the form of student work activities and contains Islamic values. Integrating biology with religious values is a step in producing a complete science because biology as a science and religious values as a moral and moral foundation will make students not only knowledgeable but also have good morals. This is in line with the opinion of Rosada et al, (2019) that after participating in learning to use the OEFPADU science worksheet on religious values, students gave a positive response to the implementation of the OEFPADU worksheet. In addition, in research conducted by Zahwa et al, (2020) and Susanto et al, (2022) it was found that the biology worksheets that were made were feasible to use to train critical thinking skills.

The contextual material developed in this learning media is environmental material because the subject matter requires a critical thinking process in terms of analysis, evaluation, and finding solutions to solving environmental problems. The conclusions from observations and interviews in the field, the implementation of biology learning that facilitates the growth of students' critical thinking skills and scientific attitudes can be achieved better if it is supported by tools in the form of lesson plans and worksheets (Manalu et al., 2022). The development of student worksheets can be used to improve the critical thinking skills of Islamic values and scientific attitudes of students, so research

will be carried out with the title "Development of Biology Worksheets Using OEFPADU Syntax on Environmental Change Material to Improve Critical Thinking Ability Islamic Values and Scientific Attitude".

Method

Development of OEFPADU syntax biology student activity sheets (LKPD) using the ADDIE development model Dick and Carry (Bhushan, 2006). Assessment instrument trials include empirical trials, limited trials and field trials. LKPD is validated by LKPD feasibility experts, and teachers. The assessment instrument is validated by expert lecturers. The test subjects were students of SMA IT Baitussalam Prambanan. The type of data obtained is quantitative and qualitative. Data collection techniques use non-test techniques and tests. Validation of test instruments by expert lecturer's dan the implementation stage shown in Figure 1.

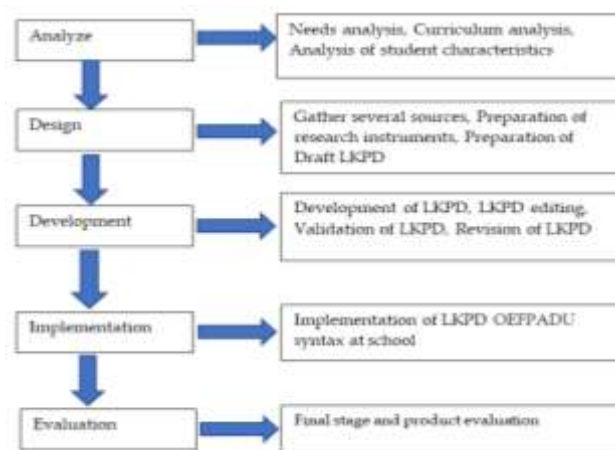


Figure.1. ADDIE Development Model Flow to Evaluation Stage

The data analysis technique uses a validation sheet, observation learning, student responses, gain score Hake (Dewara & Azhar, 2019), paired sample t-test, independent t-test with the SPSS 17 for Windows program. The research instrument used a Likert scale from a score of 1-5. The development results are suitable for use in learning if they get a good category, while observation data, both critical thinking of Islamic values and scientific attitudes using the percentage formula.

Tabel 1. Convert Actual Scores to Five Scale Scores (Widoyoko, 2009)

Average Score	Category
ASA > 4.2	Outstanding
3.4 < ASA ≤ 4.2	Good
2.6 < ASA ≤ 3.4	Enough
1.8 < ASA ≤ 2.6	Less
ASA ≤ 1.8	Very less

Note: ASA = Average Score Actual

Tabel 2. Convert Quantitative Scores to Qualitative (Widoyoko, 2009)

Percentage	Category
80 < PV ≤ 100	Outstanding
60 < PV ≤ 80	Good
40 < PV ≤ 60	Enough
20 < PV ≤ 40	Less
0 ≤ PV ≤ 20	Very less

Note: PV = Percentage Value

Result and Discussion

The initial stages of product development, namely: This LKPD has gone through five stages of development, namely analysis, design, development, implementation and evaluation. The details of the results of each development stage are as follows: the analysis stage includes needs analysis, curriculum analysis, and student characteristic analysis. The development stage is carried out by analyzing the selection of media sources, preparation of teaching material drafts (LKPD), preparation of research instruments. The Development Stage includes the development of LKPD with preface cover components, table of contents, sections of LKPD consisting of competency maps, concept maps, integration models, activity topics, learning objectives, biology info and Islamic values, OEFPADU components, competency maps and concepts, learning activities, objectives, OEFPADU Components (Observation, Exploration, Formulate, Present, Application, Worldly and Ukhrawi) Reflection and bibliography. Editing carried out activities from the LKPD that had been developed in consultation with the supervising lecturer, then the results from the preparation of the LKPD draft and research instruments were then consulted with the lecturer to get input and suggestions. Furthermore, it was validated by experts and biology teachers then implemented in the field and evaluated.

Tabel 3. Results of the TERAPDU Syntax LKPD Validation

Validators	Average score	Category
LKPD Feasibility	4.18	Good
Expert Lecturer		
Biology Teacher	4.79	Outstanding

The OEFPADU Syntax LKPD product was validated by two expert lecturers, two Biology teachers from the components of OEFPADU syntax suitability (4.60), suitability of content (4.90), language (4.20), graphics (4.90), presentation (4.60) of validation results are in Table 3 and the results are feasible for use in accordance with the criteria. The student questionnaire responses were in the Outstanding category with an

average score of 4.30 for the language (4.30), graphic (4.60) and presentation (4.0) components.

Instrument validation by expert lecturers assembling critical thinking assessments of Islamic values, and observation sheets of critical thinking on Islamic values and scientific attitudes are in the proper category to use. The results of field trial used two classes, namely experimental and control. The experimental class uses the OEFPADU syntax LKPD while the control class does not use it. Prior to testing, it is necessary to carry out parametric tests, namely homogeneity tests and homogeneity tests aimed at showing that the experimental class and control class come from populations that have the same cognitive ability and variance (homogeneous) at a significance level of 5% (0.05). The normality test using the Shapiro-Wilk test shows 0.196 and 0.135 meaning the data is normally distributed and the homogeneity test uses the Levene's test and shows a value of 0.144 meaning the data is homogeneous.

The result of student implementation is 100. This shows that biology learning with OEFPADU syntax runs optimally. The field test is presented in Table 3. Pretest and post test data from the control and experimental classes were analyzed using the t-test to determine the effectiveness of the OEFPADU Syntax LKPD. The t-test analysis is preceded by a parametric statistical prerequisite test, namely the normality and homogeneity tests as shown in Table.4.

Table 4. Normality and Homogeneity Test Results

Prerequisite test	Test Type	Sig.
Normality Test		
Control Class	Shapiro-wilk	Pretest: 0.240
		Posttest: 0.079
Experiment class	Shapiro-wilk	Pretest: 0.381
		Posttest: 0.162
Homogeneity Test	Leven's test	Average Pretest dan Posttest: 0.097

Table 4 shows that pretest and post test data for both classes are normally distributed and homogeneous because sig. > 0.05 so that H_0 is accepted. The next analysis is the t-test which aims to determine the effectiveness of using LKPD. The following are the results of the t-test presented in Table 5.

Table 5. Independent Sample t-test Results

Variabel	F	Sig.
Class (control and experiment)	0.658	0,000 (<0.05) HO rejected

Table 5 Shows that there is a significant difference in post test results between the control class and the experimental class because of the sig. 0.000 (<0.05). The results of the t-test show that the use of the OEFPADU

syntax LKPD is proven to be effective in increasing the ability to think critically of Islamic value. A diagrams of the avarge pretest and post test scores on aspects of

critical thinking skills of students' Islamic values can be seen in Figure 2.

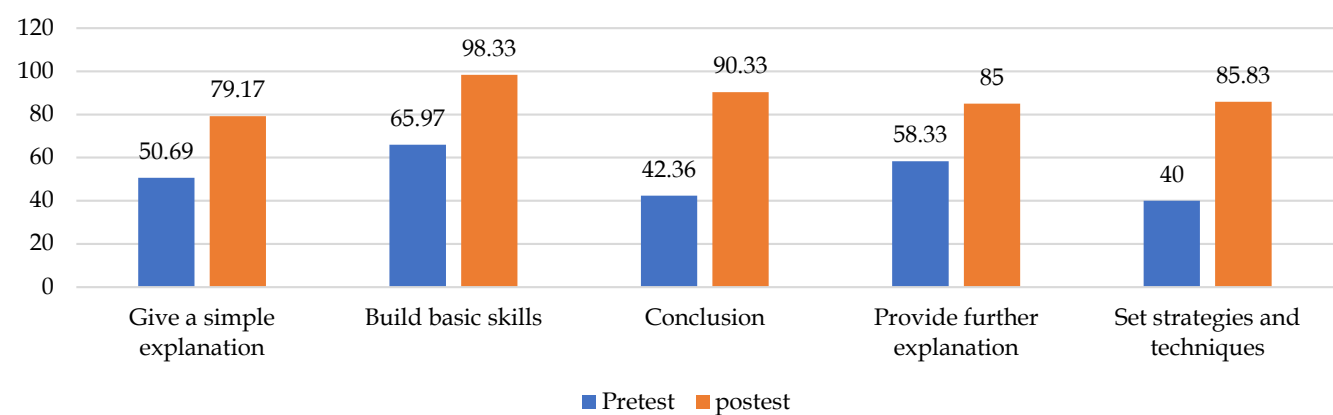


Figure 2. Pretest and Posttest Score Average Diagram

Diagram of the mean scores of pretests and posttest control classes and experiments can be seen in Figure 3.

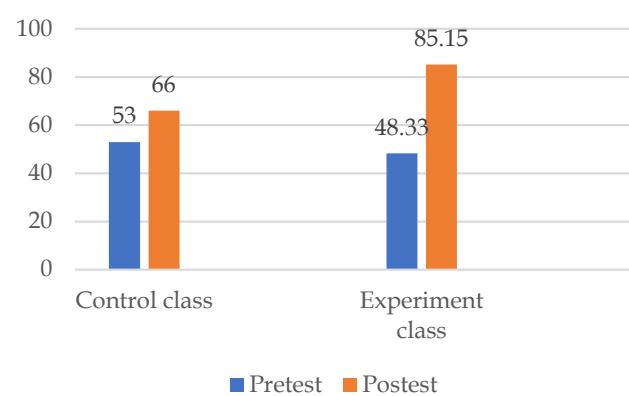


Figure 3. Diagram of the average pretest and posttest scores for the control and experimental classes.

Thus, as a whole the developed OEFPADU syntax Biology LKPD can increase students' pretest-posttest scores with a gain score of 0.72 which is included in the high improvement category. Based on diagrams 2 and 3 it can be seen that every aspect of critical thinking skills of Islamic values has increased scores from pretest to post test. Aspects of simple explanations, building basic skills, concluding, providing further explanations, set strategies and techniques have increased in the high category with a gain score greater than 0.70.

Then the results of the paired sample t-test of critical thinking on Islamic values before and after using the TERPDU syntax LKPD concluded that there was a significant difference with sig. 0.001 (<0.05). The results of the paired sample t-test showed that there were differences in the ability of critical thinking of Islamic

value skills before and after using the OEFPADU syntax LKPD.

Furthermore, the mean post test results for the control and experimental classes were 66 and 85.15 indicating that there was a significant difference in the post test results between the control class and the experimental class with sig. 0.000 (<0.05). The results of the t-test (Independent sample t-test) show that the use of the OEFPADU LKPD syntax has proven effective in increasing the ability to think critically about Islamic values meeting. The results of students' Islamic value critical thinking skills can be seen in Figure 4. Based on the diagram in Figure 4. It can be seen that based on the results of observations; all aspects of critical thinking skills of students' Islamic values have increased in percentage at each meeting.

The increase in critical thinking skills from meeting 1 to meeting 2 was 2.80%, the improvement in critical thinking skills in Islamic values of students from meeting 2 to meeting 3 was 4.80%, so that the increase in critical thinking skills in Islamic values of students as a whole increased by 7.60% after using the developed LKPD, namely from good to Outstanding category. Based on the n-gain score of the pretest-post test and the percentage increase in the critical thinking skills of Islamic values that have been mentioned previously, it is evident that the developed OEFPADU syntax biology worksheets can improve students' critical thinking skills of Islamic values as are media facilities with supporting characteristics (Parenta et al., 2022; Billa et al., 2022). This is in line with the opinion of Hanuri Sakuriti (2020) which states that the Quran-based LKPD is seen as making a significant contribution in developing students' critical thinking skills through problem solving.

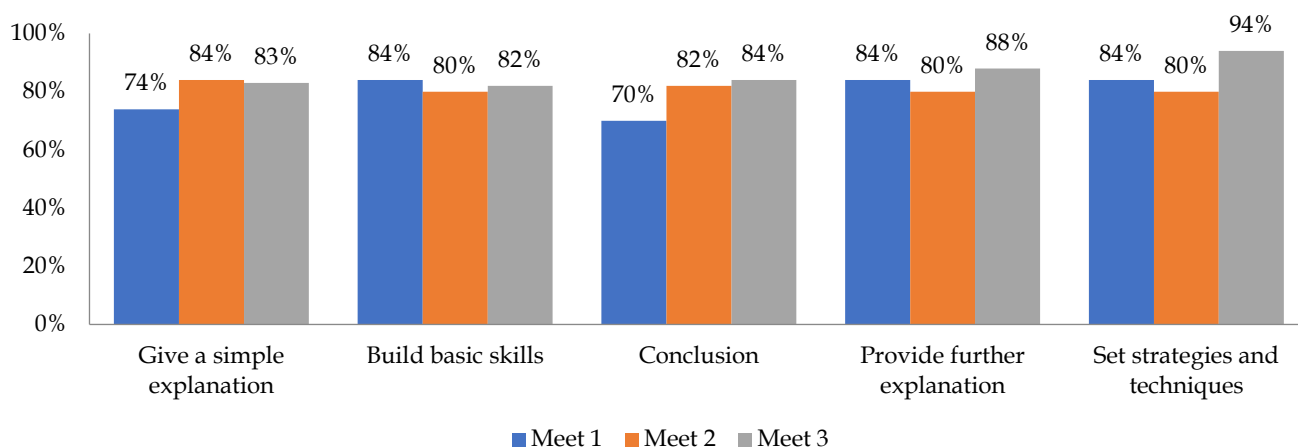


Figure 4. Percentage Score Diagram for Increasing Critical Thinking Skills in Islamic Values of Students

Furthermore, it is strengthened according to the Islamic perspective in Mohammad Manzoor Malik (2019) that rooted in original Islamic sources and in its historical scientific tradition, knowledge in Islam can be divided into transmitted science (al-ulum al-naqliyah) and rational science (al-ulum al-aqliyah) with the concept of Islamic critical thinking as well as (Malik, 2021), namely through knowledge (العلم; al-'ilm) becomes the core of Islamic critical thinking, and the means of this knowledge is revelation (الوحي; al-wahy), the use of the senses (الحواس; al-hawas), reason (mind and heart; العقل والقلب; al-aql wa al-qalb), experience or historical testimony (أول شهادة السد ياح; al-siyahah aw al-shidah), and meditation on nature and the world physical (كونال; al-kaun). As according to the curriculum suggested by Al-Ghazali, it can be seen from two aspects: the content point of view, and the methodological point of view. Teaching should be a slow but dynamic procedure, including thinking logically (critical thinking) and inspiration (intuition). Al-Ghazali highlighted that educating students must be linked to real life situations (Sheikh & Ali, 2019).

This is further strengthened by Kolb (2021) who says that religious pedagogic considerations which need to be underlined as a Muslim are the need for empirical analysis instructed by theoretical practices in relation to everyday life. According to Davids and Waghid quoted from Najwan Saada and Haneen Magadlah (2021) that critical reasoning is mentioned several times in the Quran. Indeed, Allah in the Quran encourages everyone to explore and seek God's wisdom by highlighting the concepts of tafaqqur (contemplation), tadabbur (contemplation), tafaqquh (understanding) and taaqqul (reasoning). Moreover, critical reasoning was part of the practice of Muslim theologians and philosophers between the eighth to eleventh centuries, 'a period when Islamic thought was at a high level, alongside strong

cultural intellectual, and scientific developments' (Saada & Magadlah, 2021).

Reinforced by Usman, Shaharuddin, and Abidin (2017) stated that part of the flow of critical thinking originating from movements that uphold humanism spreads to all aspects of society, one of which is in the form of spiritualism. The ukhrawi aspect in LKPD, develop aspects of the skills and knowledge of students to be able to link hadith and the Quran in learning and be committed to practicing it.

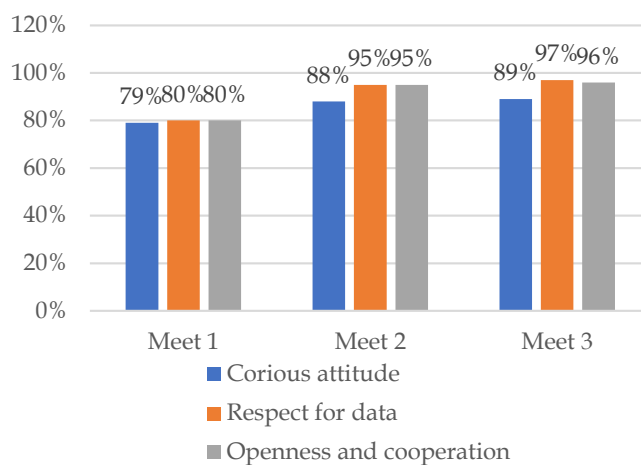


Figure 5. Percentage Score Diagram for Increasing Students' Scientific Attitudes

In line with Mualimin (2020), that not only Islamic sciences are extracted directly from the Qur'an, such as interpretation, jurisprudence and monotheism, but the Qur'an is also a source of science and technology, because there are many signs of Al-Quran. The Quran which talks about issues of science and technology and other fields. The integration in question is not just an ordinary mixing process (Islamization), but as a process of dissolution. The integration of the Quran and Hadith

in learning biology is an alternative educational model that is considered important for achieving national education goals that can increase the spiritual and intellectual values of students as mandated by Law Number 20 of 2003 concerning the National Education System (Mualimin & Subali, 2018; Susilowati, 2017). Thus, the LKPD resulting from the development is appropriate for used to improve the critical thinking skills of students' Islamic values.

The percentage of assessment of the increase in scientific attitude can be known through the observation sheet of students' scientific attitudes. The results of the percentage of students' scientific attitudes can be seen in Figure 5. Based on the diagram in Figure 5. It can be understood that all aspects of students' attitudes have increased at each meeting, based on the results of observations.

The increase in scientific attitude from observation of meeting 1 to meeting 2 was 13%. The improvement in students' attitudes from meeting 2 to meeting 3 was 1.3%, and from meeting 1 to meeting 3 was 14.3%. After using the development results of the LKPD, namely from the good category to very good. Based on Figure 6. it can be understood that for every aspect of the scientific attitude there is an increase in the score from the data before and after the use of the developed LKPD.

Aspects of curiosity, attitude towards data and an attitude of openness and cooperation get an increase in the high category with a gain score of 0.70. The results of data analysis with the Wilcoxon test showed scientific attitudes before and after using the OEFPADU syntax LKPD which concluded that there was a significant difference with Asymp. sig. 0.000 (<0.005). Compared to the first meeting, the assessment of scientific attitudes at the second meeting was higher because at the second meeting the learning activities were in the form of practicum which took quite a lot of time to observe the scientific attitudes that emerged in students (Chao, 2017).

Through LKPD or media it is very effective for improving students' science process skills, scientific creativity and scientific attitudes (Dwianto et al., 2017; Susilawati et al., 2022). Students will also better understand the nature of science with this science domain through learning tools. Furthermore, according to Olasehinde & John Kayode (2014), there is a significant positive relationship between scientific attitudes and attitudes towards science. This shows that the higher the scientific attitude of students, the higher the attitude towards science. This is because some scientific attitudes are based on own experience, knowledge and skills acquired (Sakariyau et al., 2016; Afifah et al., 2022).

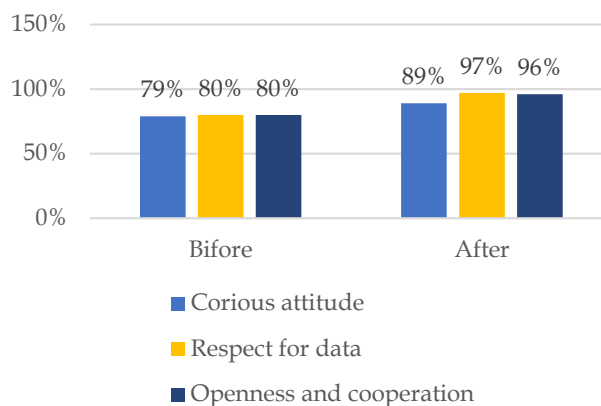


Figure 6. Data Score Diagram for Increasing Students' Scientific Attitudes before and after using LKPD

The observed scientific attitude is an attitude that must exist when the scientific process is carried out. Furthermore, to facilitate the observation of scientific attitudes in worksheets, there are scientific attitude entries in the scientific process, including discovery attitudes (formulating hypotheses, identifying and defining operational variables, presenting data), and critical thinking (data analysis, concluding, and abstracting). An attitude of curiosity and strong determination is seen during the learning process and the use of LKPD takes place (Misbah et al., 2018; . Tahya et al., 2022; Chaeruddin B, 2016).

Conclusion

Based on the research, it can be concluded that the development of OEFPADU LKPD syntax with environmental change material is feasible (according to the results of expert validity and student responses) and can improve critical thinking of Islamic values and scientific attitudes in the learning process with critical thinking of Islamic values, an average gain score of 0.72, Test Independent Sample t-test. 0.000 and paired sample t test 0.001 and an increase in the results of critical thinking of Islamic values observations by 7.60%. Students' scientific attitudes increased by 14.30% from good to outstanding category with the Wilcoxon analysis test. There is a significant difference in scientific attitudes before and after using the OEFPADU LKPD syntax with the Asymp results signature 0.000 (<0.05).

Acknowledgments

Thank you to Mr. Ferry Subakti and Mr. Qomarrudin as teachers' biology and headmaster of SMA IT Baitussalam who have helped with the research and have been given permission to conduct research trials.

Author Contributions

The author in this research are divided into executor and advisor.

Funding

This research received no external funding.

Conflicts of Interest

The author declares no conflict of interest in this research.

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