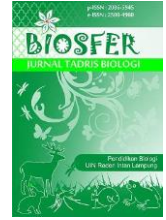




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# Developing Student Worksheet Based on Islamic, Science, Environment, Technology, and Society on Junior High School Students' Critical Thinking Skills

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### ABSTRACT

This research aims to develop I-SETS-based LKPD to train critical thinking skills of SMP/MTs students to train critical thinking skills of SMP/MTs students in biology learning. The type of research used is Research and Development (R&D) according to the ADDIE development steps (Analysis, Design, Development, Implementation, and Evaluation). The results of validation tests by language, religion, and media experts stated that the learning media was suitable for use, while material experts stated that the learning media was very suitable for use. The results of the students' attractiveness response test based on small group and large group trials obtained the criteria for interpreting students' responses, namely very interesting. Meanwhile, the results of the effectiveness test of I-SETS-based LKPD to train critical thinking skills of SMP/MTs students on animal and plant breeding material in the learning process could not be implemented due to COVID-19 which occurred globally throughout the world, including the learning process of students in school. So, this research and development is only carried out to the attractiveness response testing stage.

#### *Pengembangan Lembar Kerja Siswa Berbasis Islam, Sains, Lingkungan Hidup, Teknologi, dan Masyarakat Terhadap Keterampilan Berpikir Kritis Siswa SMP*

**ABSTRAK:** Penelitian ini bertujuan untuk mengembangkan LKPD berbasis I-SETS untuk melatih keterampilan berpikir kritis siswa SMP/MTs untuk melatih keterampilan berpikir kritis siswa SMP/MTs pada pembelajaran biologi. Jenis penelitian yang digunakan yaitu Research and Development (R&D) menurut langkah pengembangan ADDIE (Analysis, Design, Development, Implementation, dan Evaluation). Hasil uji validasi oleh ahli bahasa, agama, dan ahli media menyatakan bahwa media pembelajaran layak digunakan, sedangkan untuk ahli materi menyatakan bahwa media pembelajaran sangat layak digunakan. Hasil uji respon kemenarikan siswa berdasarkan uji coba kelompok kecil dan kelompok besar memperoleh kriteria interpretasi respon siswa yaitu sangat menarik. Sedangkan hasil uji efektivitas LKPD berbasis I-SETS untuk melatih keterampilan berpikir kritis siswa SMP/MTs pada materi perkembangbiakan hewan dan tumbuhan dalam proses pembelajaran tidak dapat terlaksana dikarenakan adanya COVID-19 yang terjadi secara global diseluruh penjuru dunia, termasuk proses pembelajaran siswa di sekolah. Sehingga penelitian dan pengembangan ini hanya dilaksanakan sampai tahap uji respon kemenarikan saja.

## INTRODUCTION

The world of work in the 21st century is very competitive, so educational institutions must produce graduates who can compete, which means they must have 4C skills (critical thinking, collaboration, communication, and creativity) (Haka et al., 2021). The 4C skills are essential in the 21st century because they are life skills that education graduates must have to exist and overcome future challenges. Therefore, improving the quality of education must be addressed (Fadhilawati, Malahayati, & Suyitno, 2023).

Learning procedures cannot be disconnected from learning media (Anggoro et al., 2019; Firdawati, Maison, & Nazarudin, 2021; Saputri & Hasratuddin, 2020) because learning media is a tool in learning that contains specific learning materials as a learning resource (Pratama, Handoko, & Anwar, 2020). Using learning media is expected to help students achieve their learning goals more effectively (Mukhoyyaroh, Miharja, Baldah, & Yuniarti, 2022). Worksheets are recommended for learning media during the process (Andhani, N. D., Ningsih, K., & Tenriawaru, 2021).

Using worksheets allows students to participate actively in the learning process and express their abilities in developing their thinking process (Khalifah, Riyanto, Nazip, & Meilinda, 2021). One of the models that can encourage students to develop their thinking process is the Islamic Science, Environment, Technology, and Society (I-SETS) learning model. The I-SETS learning model evolved from the SETS learning model and is based on Islamic ideals found in the Al-Qur'an and Hadith (Fazrina, Hidayat, & Hasanah, 2020). Applying the I-SETS model allows students to better grasp the subject matter, make decisions on difficulties that arise, and relate them to Islamic principles. Student learning can appear more engaged with the I-SETS model (Conilie, Sandika, & Al Haq, 2023).

The national education objectives require students to develop thinking skills,

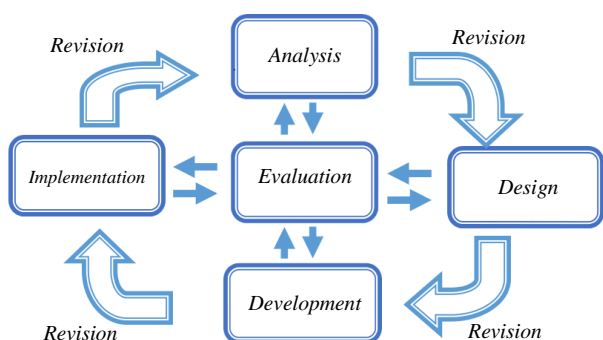
one of which is critical thinking skills. According to (Handayani, Rahayu, & Agustini, 2021), critical thinking is an intelligent, disciplined process of active and skilled conceptualization, application, analysis, synthesis, and evaluation derived from or generated by observation, experience, reflection, reasoning, or communication as a guide to belief and action. Critical thinking can help students analyze more deeply and make their points of view more flexible; however, if critical thinking is not practiced, students will experience fixation in their points of view (Puspita, Firdaos, & Istiqomah, 2019).

(Nizar, 2023), who developed Islamic-based worksheets on temperature and heat material, argues that worksheets can orient students between the material taught and the real-world situation using Islamic values. (Sulaiman, 2023) also claims that I-SETS-based worksheets will help students discover concepts independently or in groups, resulting in more meaningful learning regarding material and Islamic values. Islamic values have three types: aqidah, worship, and morality (Tiana, Mustika, & Rohani, 2023). Given that the school setting is a madrasa or Islamic school, learning media associated with Islamic values or motivational sentences sourced from the Qur'an and Hadith will be more appealing (Ihsani, Idrus, & Jamaludin, 2020). Media integrated with Islamic values or religious theory will form a strong theory. Learning combined with Islamic or religious values can provide values about divinity consistent with the scientific concept to instill strong faith and critical thinking in students (Munazilah & Yulianto, 2021);(Imaduddin, 2020).

Based on previous research, the authors are interested in developing I-SETS-based worksheets to assist Islamic junior high school students improve their critical thinking skills. The researchers use biology material, specifically animal and plant development, which sets it apart from previous research.

**METHOD**

This study employed the Research and Development (R&D) method. The model used in this development research was a procedural, descriptive model that outlines the development steps. To create a product, the following steps must be taken: 1) Analysis, 2) Design, 3) Development, 4) Implementation, and 5) Evaluation (Alcid dkk. 2017). The research model can be seen in Figure 1.



**Figure 1.** The Stages of ADDIE Development Model (Branch, 2009; Komarudin, Pahrudin, & Nurmalia, 2021; Sari, Amin, & Lukiati, 2017)

**A. Data Collecting Technique**

The data was gathered through interviews, questionnaires, and tests. The research instruments consisted of validation questionnaires, student response questionnaires, and test questions.

**B. Data Analysis Technique**

The data analysis technique used in this study is a qualitative descriptive analysis technique, which describes product development results in the form of I-SETS-based worksheets to train the critical thinking skills of junior high school students. The purpose of this analysis is to describe the characteristics of the data for each variable. The assessment sheets filled out by experts are then analyzed to determine the quality of the learning media created by researchers. The data analysis technique begins with the steps listed below:

1. Experts' Validation Data and Students' Responses

The following are the steps in analyzing data from expert validation instruments, practitioners, and student responses:

- a. The first step is to assign a score to each criterion, with Very Good (SB) criteria receiving a score of 4, Good (B) receiving a score of 3, Less (K) receiving a score of 2, and poor (SK) receiving a score of 1.
- b. Furthermore, the following is how each item of the formula statement is calculated:

$$P = \frac{\text{total score}}{\text{total criteria score}} \times 100\%$$

P: Feasibility percentage.

- c. The final step is to examine Table 1 to conclude the calculation results based on aspects.

**Table 1.** Experts' Validation Criteria and Students' Responses

Percentage (P)	Criteria
$P > 80\%$	Excellent
$60\% < P \leq 80\%$	High
$40\% < P \leq 60\%$	Low
$P \leq 40\%$	Poor

The developed media is valid if the percentage score exceeds 60% and the minimum qualitative criteria are high. If the percentage score is less than 60%, improvements will be made based on the validator's recommendations.

2. Effectiveness Test

The product's effectiveness level is determined by the pre-test and post-test results on student learning outcomes in the form of a gain score, which has previously been parametrically tested through normality and homogeneity tests. The gain score is calculated using the following formula (Hasan, Darmawan, & Sukmawati, 2023; Komarudin, Rosmawati, & Suherman, 2020):

$$N - \text{gain} = \frac{\text{posttest score} - \text{pretest score}}{\text{maximum score} - \text{pretest score}}$$

The criteria for the effectiveness level are presented in Table 2.

**Table 2.** The Criteria of the Product's Effectiveness

Criteria	Effectiveness level
$n - gain \geq 0,7$	High
$0,3 < n - gain < 0,7$	Moderate
$n - gain \leq 0,3$	Low

## RESULTS AND DISCUSSION

This research and development aims to produce a valid and feasible I-SETS-based worksheet to train the critical thinking skills of Islamic junior high school (SMP/MTs) students in biology.

### 1. The Analysis Stage

Tah The analysis stage is the first stage in this research. As a consideration for conducting research and developing biology learning media, the analysis stage carried out was a needs analysis, curriculum analysis, and analysis of student characteristics (AlAfnan, Samira Dishari, Marina Jovic, & Koba Lomidze, 2023).

#### a. Need Analysis

According to the needs analysis findings, there was a lack of student interest in learning biology, and teachers continued to use traditional learning media such as printed books and LCDs (Paramita, Rati, & Sudatha, 2020). Therefore, the researchers researched the development of an attractive biology learning media to increase student interest in learning.

#### b. Curriculum Analysis

The curriculum employed at MTs Negeri 2 Bandar Lampung is the 2013 curriculum. Researchers identified the core competencies and basic competencies required in the development of I-SETS-based worksheets to train junior high school students in critical thinking skills in Biology. According to (Khoiron, Wahyuningtyas, & Miftakhuddin, 2020), the core competencies and basic competencies of the 2013 curriculum lessons in primary and secondary education are presented in Table 3.

**Table 3.** Core and Basic Competencies

Core Competencies		Basic Competencies	
KI. 1	Appreciate the teachings of the religion he adheres to.	3.2	Analyze the reproductive system in plants and animals and the application of technology in the reproductive system of plants and animals;
KI.2	Appreciate honest behaviors, discipline, responsibility, caring (tolerance and cooperation), politeness, and confidence in interacting effectively with the social and natural environment within the range of association and existence.	4.2	Present the work of plant reproduction.
KI.3	Understand knowledge (factual, conceptual, and procedural) based on his curiosity about science, technology, arts, and culture related to visible phenomena and events.		
KI. 4	Trying, processing, and presenting in the concrete realm (using, parsing, assembling, modifying, and making) and the abstract realm (writing, reading, calculating, drawing, and composing) following what is learned at school and other similar sources in the point of view/theory.		

#### c. Student Analysis

The results of the student needs analysis questionnaire and interviews with biology teachers at MTs Negeri 2 Bandar Lampung showed that the biology learning process was less attractive for students. Besides, students also tended to be passive. Therefore, researchers developed learning

media as worksheets to support the biology learning process.

### 2. The Design Stage

Following an evaluation at the analysis stage, the researcher moved on to the planning stage, yielding the following results:

a) Framework Development

The worksheet was organized in the following order: front page/cover such as (1) Core Competency (KI) page, Basic Competencies (KD) and Indicators, preface, table of contents, and concept map; (2) core/material page, and (3) back page.

b) Designing Material Presentation

The material is presented based on the development of core competencies and basic competencies identified as indicators of competency achievement. Animal and plant reproduction materials are adapted from trusted printed books. The worksheet's content is based on Islamic Science, Environment, Technology, and Society (I-SETS).

3. The Development Stage

The framework created during the design stage was validated during the development stage. The following are the stages of development:

a. The Development of an I-SETS-based Worksheet

The framework developed during the planning stage was then transformed into a learning media to assist and facilitate students in the biology learning process independently (Suryanda, Azrai, & Julita, 2020) on animal and plant reproduction material. The worksheet was presented in hard copy. The components contained in the worksheet are as follows:

- 1) The front section includes the front cover, table of contents, preface, curriculum sheet, and worksheet instructions.

The front page was designed in a book format, with additional images representing the material's content about animal and plant reproduction. It is hoped that the combination of colors, typeface, and font size will pique users' interest.



Figure 2. Front Cover

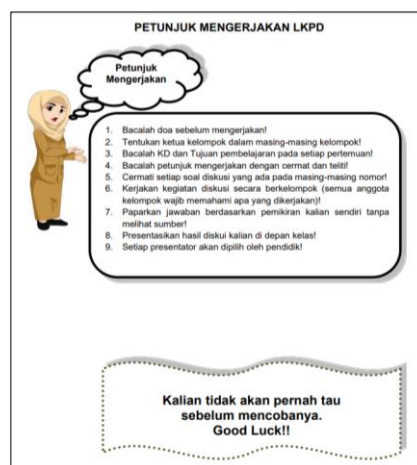


Figure 3. Usage Instruction

- 2) The content/material section includes additional hadiths and Qur'anic verses. Worksheet activities based on I-SETS include observing animals and plants by adding hadiths or Qur'anic verses about animals and plants and a bibliography.

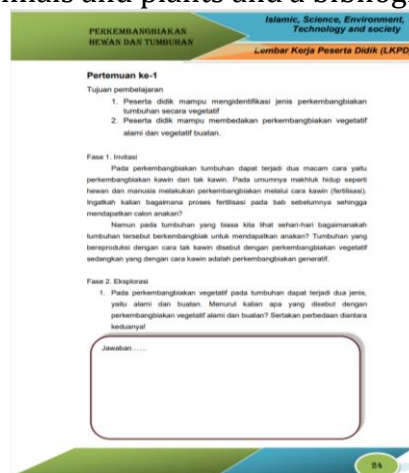


Figure 4. Worksheet's Activities for the First Meeting



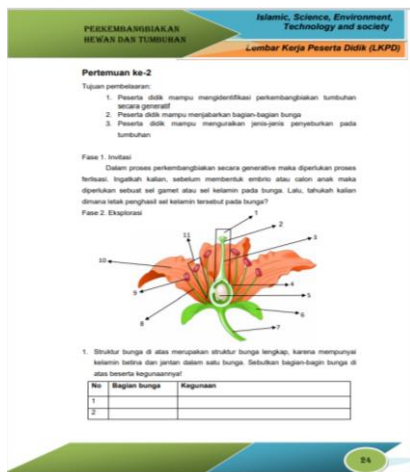


Figure 5. Worksheet's Activities for the Second Meeting

3) The back section covers the author's profile and a back cover.



Figure 6. Author's Profile



Figure 6. Back Cover

## b. Product Validation

The product feasibility assessment was carried out by several experts in their fields, namely UIN Raden Intan Lampung lecturers, to validate the feasibility of language, religion, media, and material.

### 1) Language Experts' Validation

Untung Nopriansyah, M.Pd as Validator I, and Mardiyah, M.Pd as Validator II, conducted the language feasibility assessment at UIN Raden Intan Lampung. Based on Phase I results, the percentage of language feasibility on the worksheet developed by validator I was 75%, and the percentage of feasibility obtained from validator II was 85%, with an average of 80%.

Based on the percentage results from validator I, which obtained the criteria "Feasible," and validator II, which obtained the criteria "Very Feasible," it can be concluded that the worksheet developed is "Feasible" to be tested.

### 2) Religious Expert's Validation

Dr. Sunarto, M.Pd, a lecturer at UIN Raden Intan Lampung, assessed the feasibility of applying religious knowledge to the developed worksheet and obtained a percentage of 77% with the criteria "Feasible."

### 3) Media Experts' Validation

The media used in the worksheet were assessed for feasibility by lecturers from UIN Raden Intan Lampung, namely Komarudin, M.Pd as validator I and Ardian Azhari as validator II. Based on the validation results from stage I, the percentage of validator I results was 77%, and validator II results were 78%, for an average of 78%, both in the "feasible" category. Therefore, it is possible to conclude that the worksheet developed was "feasible" to test.

### 4) Material Expert's Validation

Nukhbatul Bidayati Haka, M.Pd, a biology lecturer at UIN Raden Intan Lampung, conducted the feasibility assessment of the worksheet content

developed. The feasibility of the material on the worksheet received an 86% with the criteria "Very Feasible" based on the validator results. Table 4 shows the results of the stage 1 validation test.

**Table 4.** The Results of Validation

No	Aspect	Item	Validator	
			1	2
1	Language	Percentage	75%	85%
		Criteria	Feasible	Very Feasible
		Average Combined criteria	80 Feasible	
2	Religion	Percentage	77	-
		Criteria	Feasible	-
3	Media	Percentage	77%	78%
		Criteria	Feasible	Feasible
		Average Combined criteria	78 Feasible	
4	Material	Percentage	86	-
		Criteria	Very Feasible	-
		Average Combined criteria	86 Very Feasible	

Source: Expert Validation Questionnaire

### c. Attractiveness Test

The product declared suitable for use by validators was then tested on students at MTs Negeri 2 Bandar Lampung to determine the attractiveness of learning media for students. The attractiveness response test was divided into two stages: small-scale and large-scale trials. The description is as follows:

#### 1) Small-scale Trial

Researchers conducted a small-group trial on ten students who had studied animal and plant reproduction material. Ten students with varying ability levels were given an attractiveness response questionnaire to assess the attractiveness of learning media. Table 5 shows the results of the small class trial calculation analysis.

**Table 5.** The Result of the Small-scale Trial

No.	Name of Respondent	Total Score	Maximum Score	Final Score
1	PD - 1	40	40	4,0
2	PD - 2	33	40	3,3
3	PD - 3	36	40	3,6
4	PD - 4	40	40	4,0
5	PD - 5	33	40	3,3
6	PD - 6	33	40	3,3

No.	Name of Respondent	Total Score	Maximum Score	Final Score
7	PD - 7	35	40	3,5
8	PD - 8	32	40	3,2
9	PD - 9	40	40	4,0
10	PD - 10	30	40	3,0
Average				3,52

Based on the results of the analysis in Table 5, the small-scale trial obtained an average value of 3.52 with very interesting interpretation criteria. The suggestions made in the small-scale trial were then used to revise the worksheet.

#### 2) Large-scale Trial

The large-scale trial was conducted in a large class on August 26, 2020, with 21 students who had studied animal and plant reproduction material with diverse abilities. The students were given an attractiveness response test questionnaire to assess the attractiveness of the developed worksheet. Table 6 shows the results of the large-scale trial.

**Table 6.** The Result of the Large-scale Trial

No.	Name of Respondent	Total Score	Maximum Score	Final Score
1	PD - 1	40	40	4,0
2	PD - 2	39	40	3,9
3	PD - 3	40	40	4,0
4	PD - 4	40	40	4,0
5	PD - 5	40	40	4,0
6	PD - 6	36	40	3,6
7	PD - 7	40	40	4,0
8	PD - 8	40	40	4,0
9	PD - 9	40	40	4,0
10	PD - 10	35	40	3,5
11	PD - 11	32	40	3,2
12	PD - 12	30	40	3,0
13	PD - 13	39	40	3,9
14	PD - 14	36	40	3,6
15	PD - 15	38	40	3,8
16	PD - 16	40	40	4,0
17	PD - 17	33	40	3,3
18	PD - 18	40	40	4,0
19	PD - 19	40	40	4,0
20	PD - 20	36	40	3,6
Average				3,77

According to Table 6, the large-scale trial results obtained an average score of 3.77 with very interesting interpretation criteria. This finding demonstrates that the product met the attractive criteria to be used

in the learning process.

Students responded positively to learning activities that integrated science and religion. The religious subjects studied, particularly in madrasas, had a lot to do with science and can train their ability to think at a high level, particularly analyzing the relationship between science and religion and providing a strong conceptual understanding of science and religion that is always in line and does not conflict (Herlanti, Noor, & Zein, 2022; Muzazzinah, Ramli, & Wulandari, 2023; Ramadhani & Indahsari, 2023). (Yusuf, Sari, & Setiawan, 2022) and (Wahyuni, 2022) demonstrated that learning tools infused with Islamic values can improve students' understanding of concepts.

#### 4. The Implementation Stage

The implementation stage is the next step in the ADDIE model. The implementation stage was used to assess the effectiveness of the developed product. Activities on problem-based worksheets incorporating Islamic values can teach students to think critically, analyze a problem, and find a solution. The incorporation of Islamic values into learning can be accomplished in the following ways: 1) always mentioning Allah's name; 2) use of Islamic terms; 3) visual illustrations; 4) applications or examples; 5) inserting relevant Qur'an or hadith verses; 6) tracing the Prophet and Messenger's history related to the material; 7) symbol of *kauniah* verses (Puspita, Masykur, Eko Saputro, & Komarudin, 2022). Learning biology associated with Islamic theory can increase students' knowledge of Islam (Herlanti et al., 2022; Muzazzinah et al., 2023). (Satiti, Wisnu Siwi, 2021) and (Fazira & Jayanti, 2023) on the development of biology learning tools support this by inserting Qur'anic verses or hadith relevant to the material and using Islamic terms such as Islamic names in concept mastery instruments.

Student comments are used to determine usability. Worksheets are said to be practical if they are easy for users to use and can entice students to use them (Cahya,

Suprpto, & Lusiana, 2020). This stage was scheduled to occur in the early months of the odd semester 2020 at MTs 2 Negeri Bandar Lampung. However, this stage could not be completed due to limitations imposed by the coronavirus disease (COVID-19). COVID-19, which is spreading globally, causes almost all human activities to be temporarily restricted and carried out online until COVID-19 is eradicated and it is safe to resume activities, including student learning at school. This is based on Circular Letter Number 4 of 2020 from the COVID-19 Control Task Force concerning Criteria for Restricting People's Travel in the Context of Accelerating the Handling of Corona Virus Disease 2019 (COVID-19) in Bandar Lampung City, which Circular Letter Number reinforces: 420/1011/III.01/2020 concerning Extension of Learning Activities from Home During the Corona Virus Period (COVID-19) in Bandar Lampung City. Therefore, the researchers could not test the product's effectiveness because the students learn online or from home. Carrying out the implementation stage online would be less effective. According to the Biology Education department's policy, researchers only developed this until the student interest response test stage.

#### 5. THE Evaluation Stage

The evaluation stage was the last in this development. The evaluation stage was applied at each stage of the ADDIE development model. The last evaluation carried out by researchers was to analyze the research data obtained, namely the analysis of student needs, design preparation, validity of learning media by experts, and the results of student interest response questionnaires (Dwijayani, 2019; Siregar, Adisaputera, & Yus, 2020). Based on the analysis, the product developed was feasible and attractive.

#### CONCLUSIONS AND SUGGESTIONS

The following conclusions are reached based on the discussion and development results:



1. This research and development produces learning media in the form of I-SETS-based worksheets to train junior high school / MTs students' critical thinking skills on animal and plant reproduction material. The ADDIE development model was used to create this product. The validation test results from language, religion, and media experts indicated that the learning media was feasible. The material experts indicated that the learning media was extremely feasible to use.
2. The response to the attractiveness test through small and large-group trials obtained a very attractive criterion.
3. The effectiveness test of the worksheets could not be carried out due to COVID-19, which occurred globally, including in the learning process at school. Therefore, this research and development was only carried out until the attractiveness response test stage.

The suggestion for this research and development is to add more religious learning activities and evaluation questions. The implementation should be done offline to make the learning activities more conducive. It is hoped that the findings of this research can inspire readers to conduct even more thorough research.

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