

DEVELOPMENT OF AN INTEGRATED E-BOOKLET I-SETS (ISLAMIC, SCIENCE, ENVIRONMENT, TECHNOLOGY, AND SOCIETY) ENVIRONMENTAL CHANGE MATERIAL FOR CLASS X SMA/MA STUDENTS

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Abstract. The use of integrated I-SETS (Islamic, Science, Environment, Technology, and Society) learning media on environmental change aims to train students' creativity. This research aims to analyze the feasibility, student responses and teacher responses to the product being developed, namely the I-SETS integrated e-booklet on environmental change. The research carried out is research and development (R&D), using the ADDIE development model. Data collection techniques used were interviews and questionnaires (validation, teacher and student responses). The test subjects were carried out on one teacher and 11 class XI students of SMA Negeri 1 Kotagajah. Data analysis in this research used qualitative and quantitative data. The research results indicate that the media developed has met the following criteria: (1) material expert validation of 74% with "feasible" criteria; (2) media expert validation of 86% with the criteria "very feasible"; (3) the results of the biology teacher response trial with a percentage of 96% showed that the media developed was "very suitable" for use; and (4) assessment of 11 students' response test to the product developed with a percentage of 88% with the criteria being very suitable for use as a learning resource for class environmental changes to train students' creativity.

Keywords: E-Booklet, I-SETS, environmental changes

INTRODUCTION

Technological advancements bring significant changes to various fields, including education. The current era sees the integration of technology into school learning (Saparina et al., 2020). Technological progress should support educational advancement, fostering students' skills in the 21st century (Sary et al., 2023). Educational demands and curricular requirements emphasize integrated technology and learning assignments. Consistent with research findings (Wahyuni et al., 2022), 21st-century learning skills are crucial for human resource development, focusing on collaborative, creative, and critical thinking principles. Learning media serves as a student reference in the school learning process.

Learning media refers to anything that can be used to convey messages from the sender to the receiver by stimulating students' minds, attention, and interest in learning. Engaging learning media can enhance students' learning motivation (Muslim, 2021). Teachers and students are two inseparable elements in the learning process, where the teacher plays a pivotal role as an educator in helping students achieve maximum learning outcomes. Media's role in the teaching and learning process is integral to the education system. The chosen learning media must be effective and efficient, making it easy for students to understand. Learning media is created based on students' needs, making the presented material more relevant and

providing greater opportunities to improve students' learning outcomes (Lativa et al., 2021).

In science education, particularly in Biology, students are required not only to understand the material but also to integrate it into daily life. However, integrated learning with the environment and daily life is still minimal in schools, as indicated by interviews with teachers and students at SMA Negeri 1 Kotagajah. Biology teachers lack comprehensive teaching media, especially integrated teaching media to broaden students' insights into the environment and daily life. Pre-survey results at SMA Negeri 1 Kotagajah revealed that the learning process already incorporates teaching modules, PowerPoint (PPT), and Student Worksheets (LKPD). Still, students need additional teaching media that can be integrated into daily life. The proposed learning media is an I-SETS integrated E-booklet on environmental change. When students understand the importance of integrated learning, they can connect their studies to the environment and daily life (Andriani & Rasto, 2019).

An E-booklet is a learning medium similar to an e-book, but with a different size. E-booklets are more concise than e-books, even though they serve the same purpose (Sari et al., 2021). E-booklets have advantages, such as being practical to access anytime and anywhere, featuring attractive colors and clear illustrative images (Ramadhani et al., 2021). The benefits of using I-SETS integrated E-booklets include practicality, effectiveness, and ease of use in various settings (Yuliani, 2021). Additionally, compared to printed booklets, E-booklet teaching materials are less prone to damage, practical, and can be accessed anywhere without carrying physical booklets (Sari et al., 2021). Therefore, E-booklets are suitable for 21st-century students as an integrated I-SETS learning medium, containing concise materials accessible anywhere.

The I-SETS (Islamic, Science, Environment, Technology, Society) approach is a development from the STS (Science, Technology, Society) approach, known as SETS (Science, Environment, Technology, Society) (Sari et al., 2022). Based on NGSS (Next Generation Science Standards: For States, By States), Science, Technology, Society, and Environment (STSE) are designed to help students understand the interconnections between Science, Technology, and Society (STS), focusing on environmental issues. This approach emerged in the 1980s in the UK and the USA (Shinta et al., 2021). The main aspect of I-SETS learning is not just providing information on scientific concepts but also helping students understand Islamic values involved in scientific development and local societal, environmental, and technological aspects (Azizah & Astuti, 2020). Islamic values are human guidelines for living in this world, ensuring a safe life (Syi'aruddin, 2018). Islamic values related to environmental change are outlined in the Quran, such as (1) environmental damage due to human actions (Q.S Ar-Rum 41); (2) warnings to humans to protect the environment (Q.S Asy-Syu'ara 151-152); (3) prohibition of causing environmental damage (Q.S Al-Qasas 77).

One suitable Biology topic for the second semester of high school (SMA/MA) that can be used in the I-SETS integrated E-booklet is the environmental change topic. Environmental issues concern everyone because environmental problems always have global and transnational effects. At the end of 2023, an earthquake disaster shook Indonesia in the Sukabumi region, West Java. Therefore, the integration of E-booklets into the environmental change topic is appropriate, as environmental issues can provide students with comprehensive insights. Students can connect environmental changes with Islamic, scientific, technological, and societal contexts. Environmental change explains alterations in the environment, resulting in imbalances caused by both

human and natural factors (Hasanah & Fitrihidajati, 2020). Human-induced environmental changes include forest fires, deforestation, industrial waste, and pesticides. Natural factors include volcanic eruptions, tsunamis, and earthquakes (Arimbi & Pramesti, 2020).

To foster students' interest and motivation to learn at SMA Negeri 1 Kotagajah, a learning medium like the E-booklet can be developed. It should contain summaries and attractive images to facilitate students' understanding of the material. The chosen material is environmental change integrated with I-SETS (Islamic, Science, Environment, Technology, and Society), aiming to broaden students' insights comprehensively (Wahyuni et al., 2020). The main aspects of I-SETS learning are not just providing information on scientific concepts but also helping students understand Islamic values associated with the Qur'an in the studied material. It also involves linking technological and societal values in daily life (Bloom & Reenen, 2019).

METHOD

This study is a type of development research or Research and Development (R&D), aiming to develop a new product or improve existing products. The development model used is ADDIE (Analysis, Design, Development, Implementation, Evaluation) (Ramadhani et al., 2021). The research development process is as follows:

Analysis Stage

In this initial stage, an analysis of the Biology learning issues in grade X at SMA Negeri 1 Kotagajah was conducted. Data obtained from pre-surveys analyzed needs, curriculum analysis, and material analysis. Based on interviews with 20 grade X students at SMA, through a student needs questionnaire, it was found that some students had difficulty understanding the material on environmental changes. This issue became the background for developing an I-SETS integrated E-booklet on environmental change. The developed product is expected to be a solution to students' needs in understanding the interesting material on environmental changes.

Design Stage

In the second stage, the design of the I-SETS integrated E-booklet product on environmental change was created, including the following steps: (1) determining learning objectives, learning goals, and the flow of learning goals; (2) creating the concept of environmental change material, arranged in the following sequence: environmental balance, understanding environmental change, environmental change due to nature, environmental change due to human activities, understanding environmental pollution, types of environmental pollution, understanding waste, types of waste, environmental conservation; (3) determining the software to be used in the e-booklet, namely Canva and Flipping Book; (4) designing integrated I-SETS learning media; (5) selecting the writing format in Canva, using A4 paper size, Bree Serif font, Bugaki, spacing: 1.0; (6) the I-SETS integrated E-booklet product consists of: front cover, editorial name, introduction, user guide for the e-booklet, table of contents, list of images, learning objectives, introduction, environmental change material integrated with Islamic, scientific, environmental, technological, and societal values, bibliography, image bibliography, author biography, back cover.

Development Stage

In the third development stage, the product underwent validation by material and media experts. This validation aimed to assess the feasibility of the developed E-booklet product. The validation process involved assessment sheets containing

comments and suggestions from validators. Material and media expert validation was carried out by lecturers from IAIN Metro Lampung. If the product was deemed unfit for testing, revisions were made according to the suggestions of material and media experts. Once the product was revised and deemed fit, it could be tested by students and teachers at SMA Negeri 1 Kotagajah.

Implementation Stage

In this stage, the validated product was implemented for biology subject teachers and students. Implementation was done to measure the feasibility of the I-SETS integrated E-booklet on environmental change that had been developed (Safitri et al., 2023). The response trial was conducted with one biology subject teacher and eleven grade XI students. The response trial involved providing questionnaires to both teachers and students, including assessment columns, comments, and suggestions regarding the developed product.

Evaluation Stage

This evaluation was conducted on the product, considering its shortcomings. Therefore, the I-SETS integrated E-booklet on environmental change needed improvement and refinement. After the product evaluation, it would be ready for use.

Data Analysis Techniques

The data analysis techniques used in this research include quantitative and qualitative data analysis:

Quantitative Data Analysis

This analysis is used to analyze the results of material and media expert validation and teacher and student responses. The analysis involves scoring data, which is then analyzed using the Likert Scale. The Likert Scale is used to measure respondent results, containing assessment criteria ranging from excellent to poor (Nasution et al., 2023). The research criteria are as follows, as shown in Table 1:

Table. 1 Assessment for each alternative response

Alternative Response	Weighting Assessment (score)
Excellent	5
Good	4
Fair	3
Poor	2
Very Poor	1

(Sugiyono, 2017)

Validation Questionnaire Analysis

The validation questionnaire analysis involves comparing the obtained score sum ($\sum x$) and the maximum score sum (n). The data from the questionnaire are analyzed using the following calculation (Soleha et al., 2022):

$$P = \frac{\sum x}{n} \times 100\%$$

Information:

P = Validity Percentage

$\sum x$ = Sum of Scores obtained for each criterion

n = Total Maximum Score

Analysis of Teacher and Student Response Questionnaires

The analysis of teacher and student response questionnaires at SMA Negeri 1 Kotagajah aims to determine the assessment results of the developed e-booklet. The data from the questionnaire are calculated using the following formula (Alatas & Solehat, 2022):

$$P = \frac{\sum x}{n} \times 100\%$$

Information:

Information:

P = Validity Percentage

$\sum x$ = Sum of Scores obtained for each criterion

n = Total Maximum Score

Criteria used in the expert validation, teacher response, and student response assessment questionnaires

The scores obtained from the expert validation, teacher response, and student response formulas are adjusted to the qualifications in the Table 2 (Plutzer, 2021).

Table 2. Validity criteria

Score Interval	Qualification	Criteria
$84 \leq S \leq 100$	Excellent	Very Feasible
$68 \leq S < 84$	Good	Feasible
$52 \leq S < 68$	Fair	Fairly Feasible
$36 \leq S < 52$	Poor	Unfeasible
$20 \leq S < 36$	Very Poor	Very unfeasible

(Karina et al., 2019)

Qualitative Data Analysis

In qualitative data analysis, the results of evaluations from material experts, media experts, teacher responses, and student responses are not in the form of numerical scores but in the form of suggestions and comments from material experts, media experts, teachers, and students to improve the developed product. The obtained data is then elaborated, providing conclusions in a descriptive manner (Karina et al., 2019).

RESULTS AND DISCUSSION

The result of the product development is an I-SETS integrated E-booklet on environmental change as a learning source for grade X high school students. The novelty of the developed product in this research lies in the inclusion of I-SETS values in the environmental change material. The developed e-booklet learning media contains a summary of environmental change material with interesting and easily understandable illustrations. The integration within the developed e-booklet includes Islamic, scientific, environmental, technological, and societal values. The appearance of the I-SETS integrated E-booklet can be seen in Table 3.

Table 3. I-SETS Integrated E-booklet Display



Figure 1. Front and back cover parts



Figure 2. Integrated Islamic values (Islamic)



Figure 3. Integrated environmental (Environment), Islamic (Islamic), and scientific (Science) values



Figure 4. Integrated environmental (Environment) and technological (Technology) values

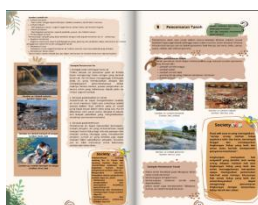


Figure 5. Integrated societal values (Society)

The product that has been completed was then validated by two experts, namely a subject matter expert and a media expert. Based on the validation, it was found that the I-SETS integrated E-booklet on environmental change, which was developed, is suitable in terms of content and presentation. Thus, it can proceed to the implementation stage to assess the feasibility and responses given by a small group trial.

Product Validation

Subject Matter Expert

The first validation by the subject matter expert resulted in a percentage of 64% with the criteria "fairly feasible". However, it was still not eligible for field trials and needed revision based on the suggestions and inputs from the subject matter expert validator. After the revision was completed, the product was revalidated by the subject matter expert, resulting in a second validation percentage of 74% with the criteria "eligible for use". This showed an improvement in the product's eligibility from 64% to 74%. There were no improvement suggestions from the subject matter expert in the second validation. Therefore, the I-SETS integrated E-booklet on environmental change is considered suitable for trial. The data from the subject matter expert validation can be seen in Table 4.

Table 4. Data from subject expert validation

No.	Aspect	Score	Maximum Score	Percentage	Criteria
1	Material	38	50	76%	Feasible
2	Language	17	25	68%	Feasible
3	Instructional learning	19	25	76%	Feasible
Total Score		74	100	74%	Feasible

The first validation by the media expert resulted in a percentage of 60% with the criteria "fairly feasible". However, it was still not eligible for field trials, and revision was necessary based on the suggestions and inputs from the media expert validator. After the revision, the product was revalidated by the media expert,

resulting in a second validation percentage of 86% with the criteria "very feasible". This indicated an improvement in the product's eligibility from 60% to 86% (Alatas & Solehat, 2022). There were no improvement suggestions from the media expert in the second validation. Thus, the I-SETS integrated E-booklet on environmental change is considered suitable for trial.

Table 5. Data from media expert validation

No.	Aspect	Score	Maximum Score	Percentage	Criteria
1	Physical Appeal	13	15	86%	Very Feasible
2	Physical Appeal	61	70	87%	Very Feasible
3	Instructional learning	12	15	80%	Feasible
Total Score		86	100	86%	Very Feasible

(Karina et al., 2019)

The implementation stage involved testing the product with a biology teacher and X-grade students at SMA Negeri 1 Kotagajah. The e-booklet media, already validated by the validator team, was then tested. The trial involved feedback from one biology teacher and responses from 11 students in grade XI. The purpose of this trial was to assess the teacher's and students' responses to the feasibility of the developed e-booklet product through the completion of assessment questionnaires.

Teacher and Student Responses

Based on the response from the biology teacher at SMA Negeri 1 Kotagajah, the result was a percentage of 96% with the criteria "very suitable." The I-SETS integrated E-Booklet is highly suitable for X-grade high school students (Septia et al., 2021). The assessment from 11 students resulted in a percentage of 88% with the criteria "very suitable." The data from teacher and student responses can be seen in Tables 6 & 7.

Table 6. Data from teacher response

No.	Aspect	Score	Maximum Score	Percentage	Criteria
1	Material Relevance	23	25	92%	Very Suitable
2	Appearance	40	40	100%	Very Suitable
Total Score		63	65	96%	Very Suitable

(Karina et al., 2019)

Table 7. Data from students response

No.	Aspect	Score	Maximum Score	Percentage	Criteria
1	Instructional learning	13	15	86%	Very Suitable
2	Appearance	61	70	87%	Very Suitable
3	Attractiveness	14	15	82%	Suitable
Total Score		88	100	88%	Very Suitable

(Karina et al., 2019)

In the final stage of evaluating the developed e-booklet, revisions were made based on feedback from the subject matter expert and media expert. In this stage, the product's eligibility was evaluated, and revisions were made based on suggestions and inputs from the validator team through the validation sheet. The subsequent evaluation was conducted after the product was tested by biology teachers and

students through assessment questionnaires, resulting in the final product ready for use. The criticisms and suggestions from the subject expert and media expert validators can be seen in Tables 8 and 9.

Table 8. Input and suggestions from the subject expert validation


Validator	Expert		Input and Suggestions	Revision
Subject Validator	Expert	1	Pay attention to the arrangement of the e-booklet by adding Learning Outcomes and Learning Objectives at the beginning.	Improvements have been made as suggested.
		2	Display I-SETS explanations at the beginning and provide instructions on how to use the e-booklet.	
		3	Each sub-chapter should be presented in the content section.	




Table 9. Input and suggestions from the media expert validation

Validator	Expert		Input and Suggestions	Revision
Media Validator	Expert	1	Reduce the size of the images on the cover, prioritize images depicting environmental damage.	Improvements have been made as suggested.
		2	Use margins to prevent e-booklet content from being cut off when read.	
		3	Bolden the text in the I-SETS box.	

The revised appearance of the e-booklet based on the suggestions from the subject matter expert and media expert can be seen in Tables 10 & 11.

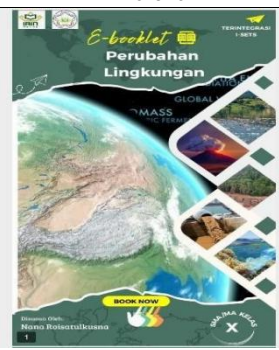
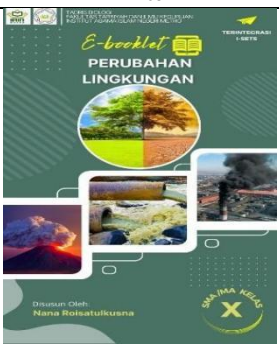
Table 10. E-booklet before and after subject expert revisions

No.	Revision	Before	After
1	Pay attention to the arrangement of the e-booklet by adding Learning Outcomes and Learning Objectives at the beginning.	None	

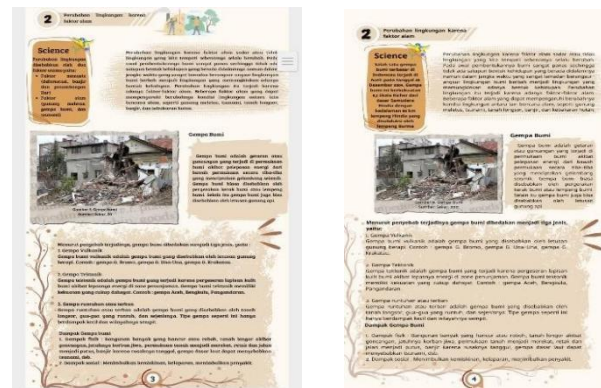
2	Display I-SETS explanations at the beginning and provide instructions on how to use the e-booklet.	None	
3	Each sub-chapter should be presented in the content section.		

(Taskiyah & Malasari, 2022)

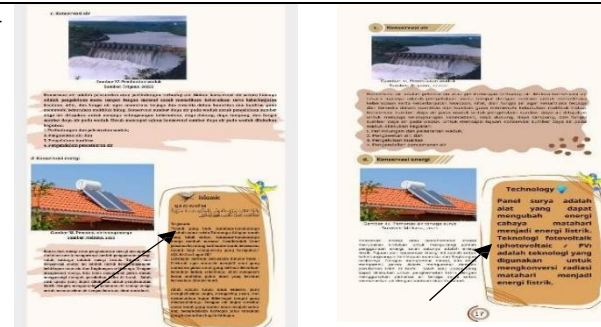
Table 11. E-booklet before and after media expert revisions

No.	Revision	Before	After
1	Reduce the size of the images on the cover, prioritize images depicting environmental damage.		

- 2 Use margins to prevent e-booklet content from being cut off when read.



- 3 Bold the text in the I-SETS box.



Overall Percentage Results

The research results indicate that the developed media has met the following criteria: (1) subject matter expert validation at 74% with the criteria "feasible"; (2) media expert validation at 86% with the criteria "very feasible"; (3) the trial results of biology teacher responses with a percentage of 96% show that the developed media is "very suitable" to use; and (4) the assessment of responses from 11 students to the developed product with a percentage of 88% with the criteria "very suitable" for use as a learning source for class X students (Candrawaty et al., 2022). It is concluded that the E-booklet is very suitable for use as integrated I-SETS learning media on the topic of environmental changes for class X. The overall percentage results can be seen in Figure 6.

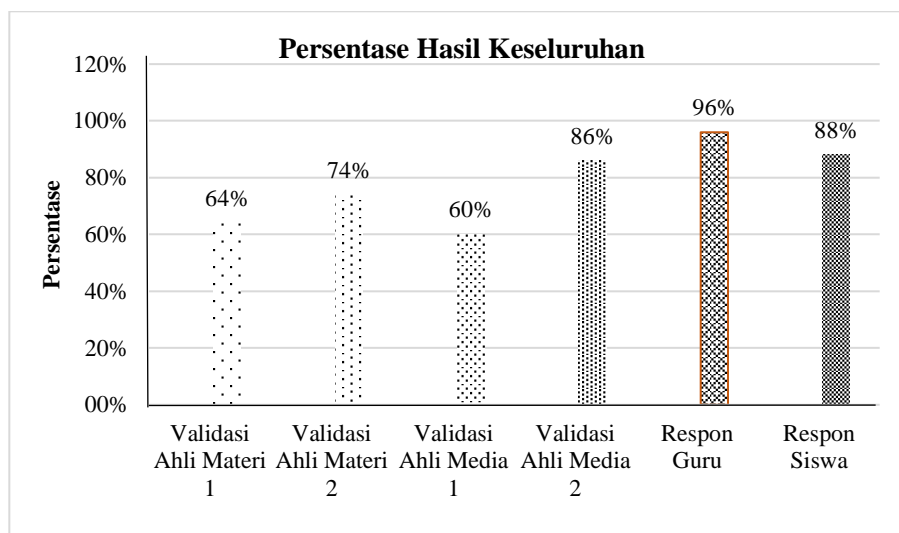


Figure 6. Overall graph of the product trial diagram

Based on Figure 6, it is known that the feasibility assessment, teacher response results, and student responses obtained a very suitable criterion for using Biology class X learning media. The integrated I-SETS E-booklet on environmental changes is highly suitable for use as a learning medium in schools. This is evidenced by the teacher response with a percentage of 96%, criteria "very suitable." And participant responses of 88% with the criteria "very suitable" (Hazariyah, 2021).

The E-booklet developed in this research is different from previous studies and has its own advantages. For instance, the integrated I-SETS E-booklet presents a summary of the material containing elements of Islamic values, the surrounding environment, technology, and society (Azizah & Astuti, 2020). This media is highly suitable for use so that science learning can be related to everyday life, thereby fostering students' creativity. The material on environmental changes is highly relevant to integrate with I-SETS due to its connection to global issues, allowing students to use environmental change material to enhance.

CONCLUSION

Based on the results of the development of integrated I-SETS E-booklet learning media on the topic of environmental changes as a learning medium for class X high school students, the following conclusions can be drawn: The integrated I-SETS E-booklet on environmental changes is developed based on the ADDIE steps, including analyzing material, analyzing the needs of learning media, and designing products using Canva software. Next, product validation was carried out by subject matter experts and media experts. After the product was declared suitable by the validators, it was then tested on biology teachers and class XI high school students. The components of the product include the front cover, preface, table of contents, list of images, user instructions, learning outcomes, material, bibliography, image bibliography, biography, and back cover. The developed product was validated by subject matter experts and media experts twice, resulting in material validation with the criteria "Very Suitable."

From the validation results, the integrated I-SETS E-booklet learning media on environmental changes is declared "Suitable for field testing without revision." The assessment results of the trial responses from biology teachers and students to the

developed product obtained the criteria "Very Suitable" for use as a learning medium. This proves that the learning media in the form of the integrated I-SETS E-booklet on environmental changes is suitable for use in the biology learning process for class X high school students. The development of the integrated I-SETS E-booklet on environmental changes in further research is expected to be expanded to other biology topics, and more comprehensive E-booklet media can be developed as learning media for students.

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