BUKTI KORESPONDENSI ARTIKEL SYARAT KHUSUS

Septina Severina Lumbantobing

Judul Artikel **:** Improving Students' Digital Literacy and Higher-Order Thinking Skills Through the Development of Flipbook Media for Physics Learning

Jurnal **:** Journal of natural Science and Integration (Sinta 2)

Nama Penulis : Septina Severina Lumbantobing, Andreas Rian Nugroho

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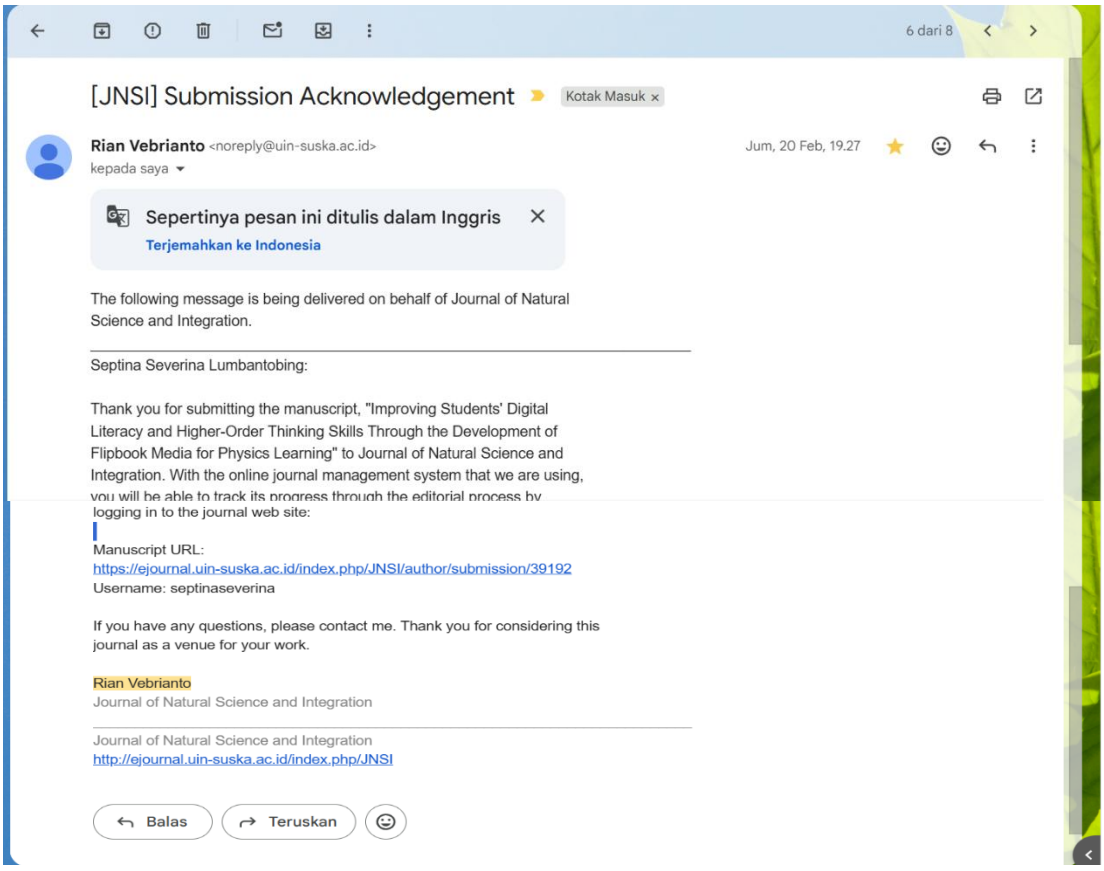

6 dari 8

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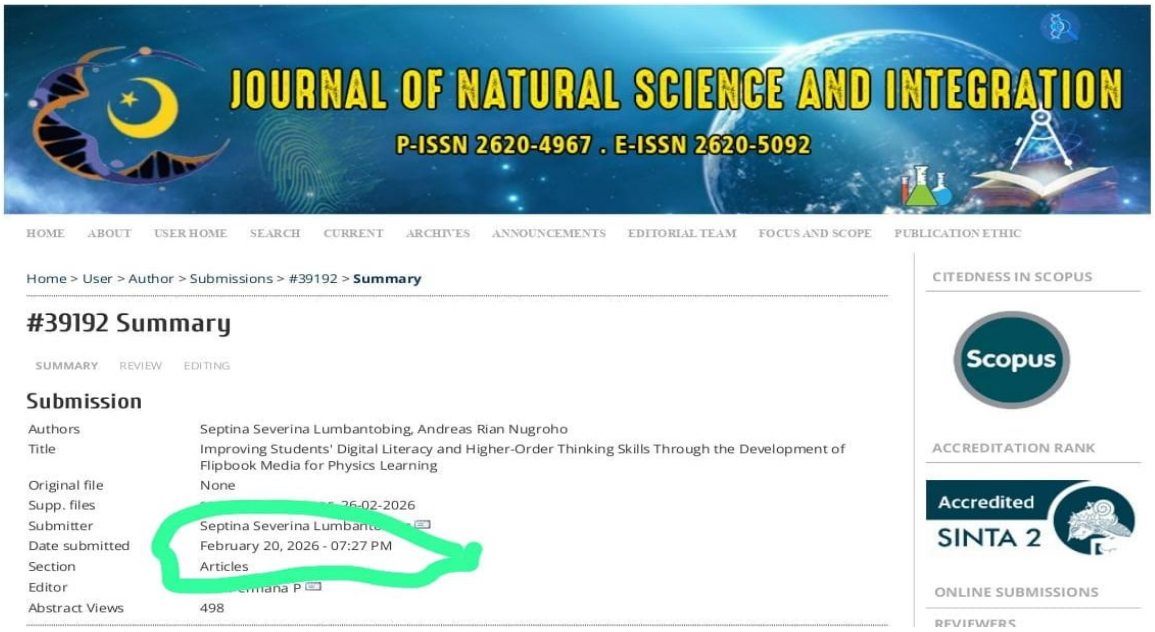

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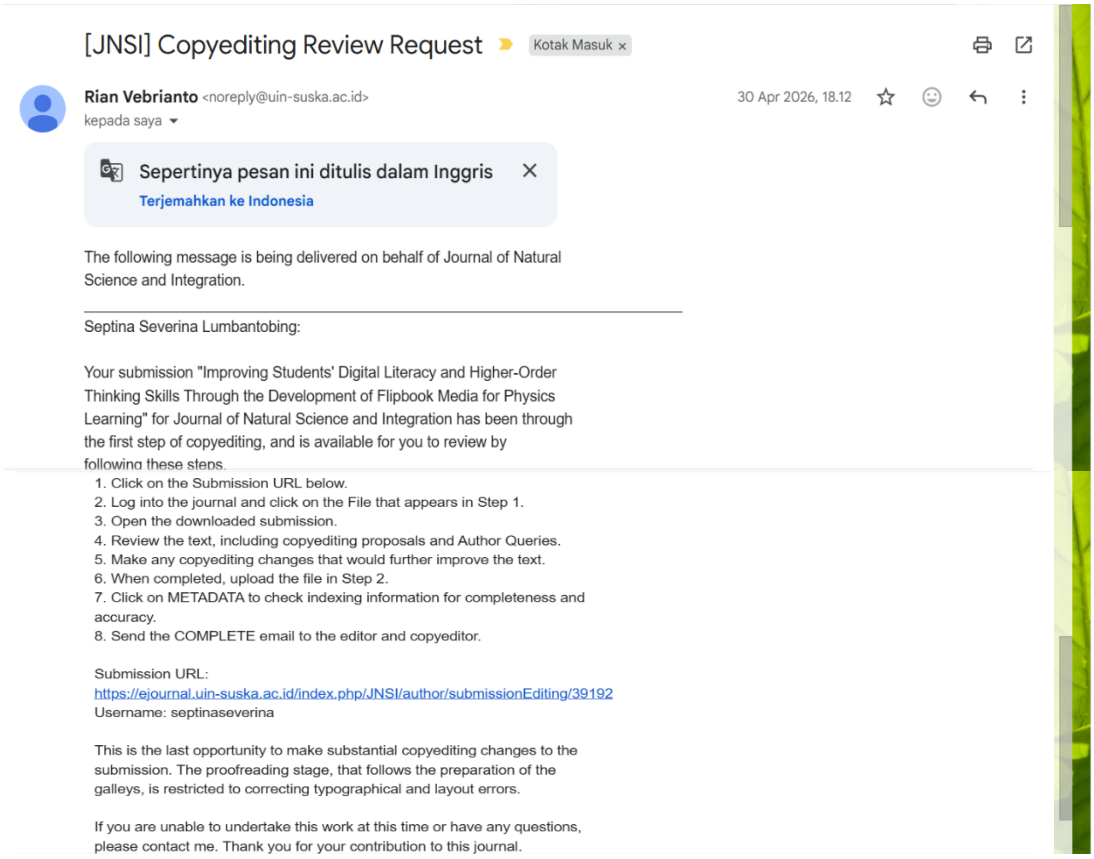

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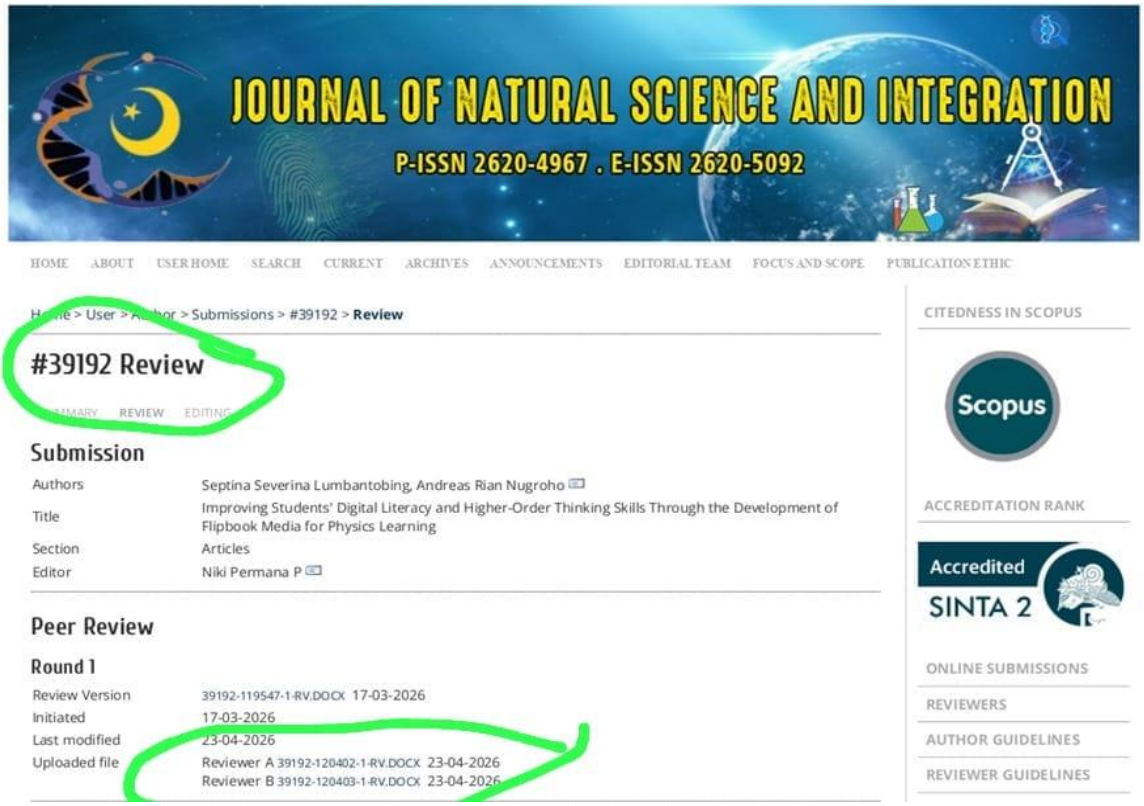
This is the last opportunity to make substantial copyediting changes to the submission. The proofreading stage, that follows the preparation of the galleys, is restricted to correcting typographical and layout errors.

If you are unable to undertake this work at this time or have any questions, please contact me. Thank you for your contribution to this journal.



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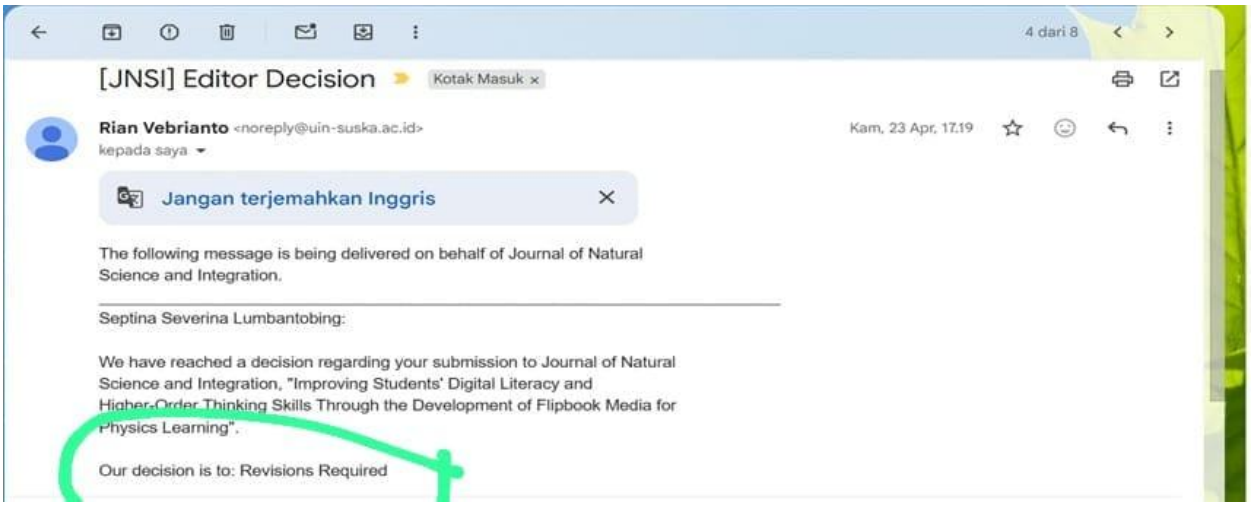

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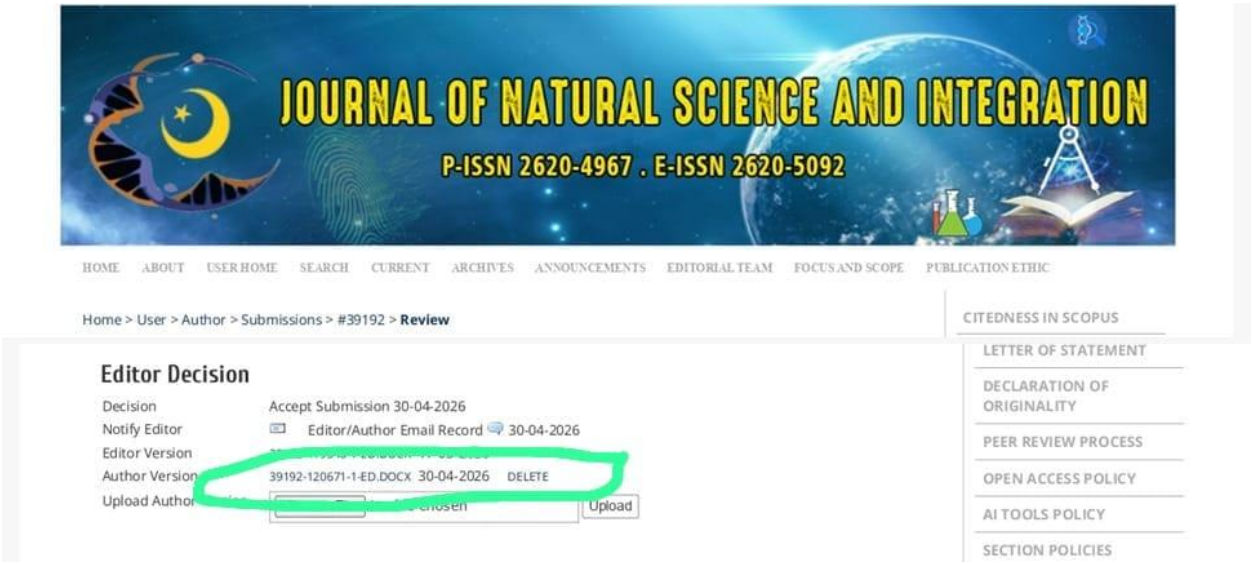

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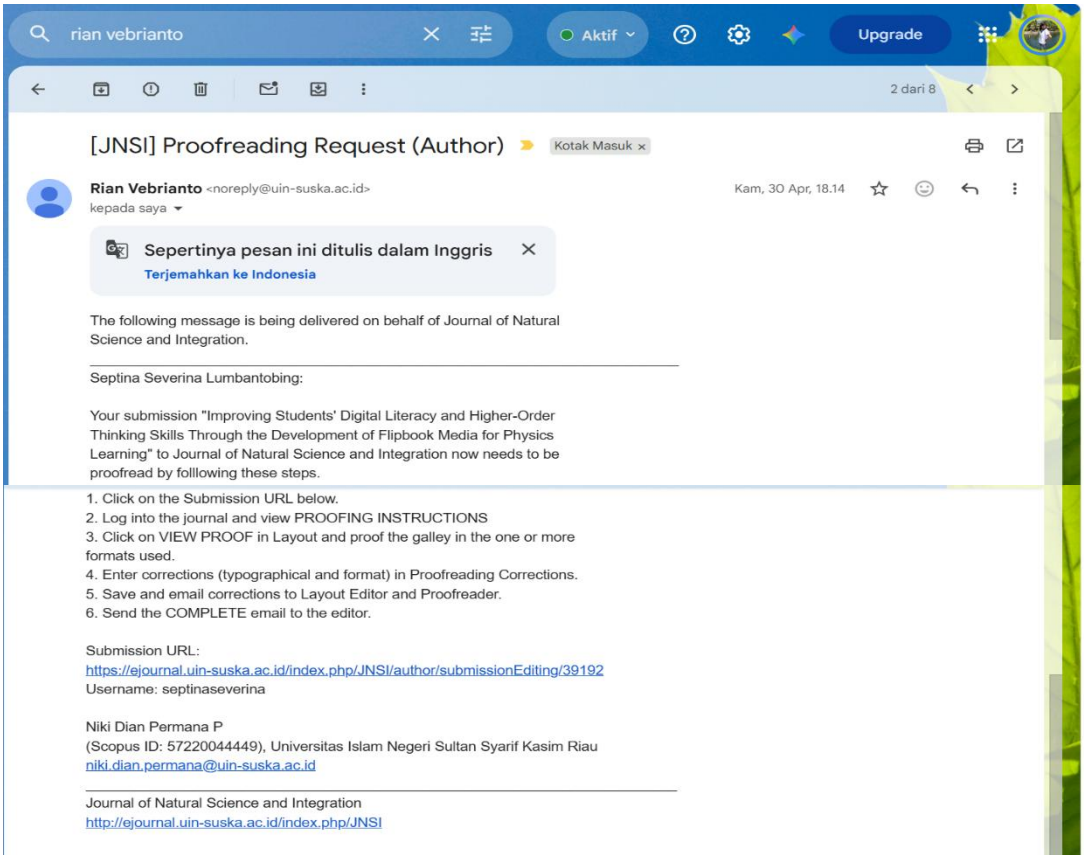

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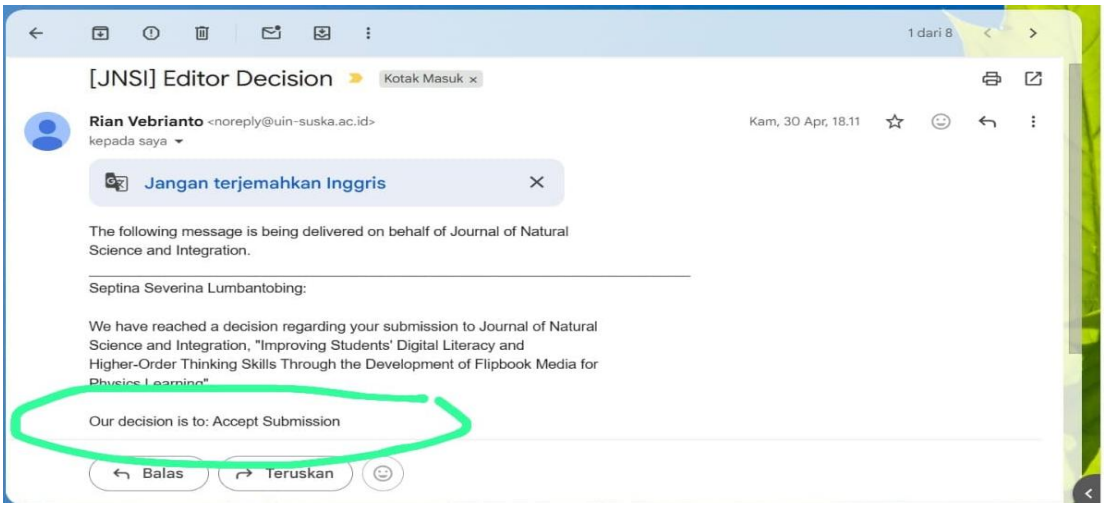

ASSESSMENT SHEET

Title : Improving Students' Digital Literacy and Higher-Order Thinking Skills Through the Development of Flipbook Media for Physics Learning

Systematic	Rubric	Assessment (√)/(x)	Comment
Research Data Requirements	**Data Requirements Based on Research Type, If:** ❖ Development Research and quasi experiment must include a large-scale test with at least 60 participants from two different classes. ❖ Instrument development research requires the use of modern Item Response Theory (IRT) analysis with data from at least 150 participants. The literature review must analyze at least 50 articles from nationally indexed journals (Sinta 2) or internationally indexed journals (Scopus or WoS)	**√**	The study partially meets the requirement. Although it reports a sufficient sample size in some parts, there is inconsistency in reported sample size (e.g., 32 vs larger sample in different sections). Experimental design also needs clearer specification (one-group design issue).
Title	❖ Informative and brief, not too short or too long (5-12 words)	**√**	
	❖ Contain the variables studied and describe the research topic	**√**	
	❖ Do not contain the term "Analysis"	**√**	
	❖ Do not contain mathematical patterns	**√**	
Abstract	❖ Research objectives	**√**	
	❖ Research methodology	**x**	Method stated, but design inconsistency (R&D + quasi-experiment unclear).
	❖ Data Analysis Techniques	**√**	
	❖ Respondents/Data Sources	**√**	

Systematic	Rubric	Assessment (√)/(x)	Comment
	❖ Main findings	√	
	❖ Conclusion	√	
	❖ Do not contain abbreviations without extensions	√	
Introduction	❖ Describe a preliminary study thus the urgency of the research is presented and Avoid predefining	x	Some repetition and too descriptive; urgency exists but not sharply defined.
	❖ Cite the latest research literatures (maximum of the last 10 years) that is correct and appropriate related to the research topic ❖ Ensure to create a consecutive citation system	√	
	❖ Demonstrate a gap analysis that has not been filled by research/literature, or inconsistencies and controversies that arise between the existing literature and the facts on the field study	x	Gap analysis is weak and not explicitly formulated.
	❖ Contain problems, research objectives, context, and the unit of analysis used	√	
Methodology	❖ Describe the type/approach/ research method that refers to references but does not define	√	
	❖ Describe the research subjects and objects/variables, population and research samples/data sources/informants in detail and detail	x	Sampling technique, grouping, and demographic details are incomplete/inconsistent.
	❖ Explain in detail the research objectives, characteristics such as (related to the researched) the total number, the number of men, women, the reasons why they were chosen as data	x	Gender distribution and selection rationale not provided.

Systematic	Rubric	Assessment (√)/(x)	Comment
	❖ Explain the main data, supporting data, and why the data is important	**x**	Limited explanation of data relevance.
	❖ Contains the data collection and analysis techniques used in the research	**√**	
	❖ Minimum 5 Paragraphs	**√**	
Result and Discussion	❖ Reload research main objectives	**√**	
	❖ Reaffirm the importance of research by stating its main contribution	**√**	
	❖ The research data and discussion have a logical relationship to focus on the conclusion	**√**	
	❖ Summarize findings related to research objectives or hypotheses	**√**	
	❖ Connect/compare findings with literature and results found by other researchers, especially international articles	**√**	
	❖ Show the novelty of the research topics carried out and have important significance for the development of the field of science	**x**	Novelty is implied but not clearly and explicitly stated. A stronger statement of what makes this study different is needed.
	❖ Explain the implications of the research	**√**	
	❖ Explain the limitations of the study	**x**	No clear limitation section is included. This is a major missing component.
	❖ Explain the continuation of research that can be conducted	**x**	No explicit suggestions for future research are provided
Conclusion	❖ Contain answers to the formulation of the problem	**√**	
	❖ Design it in one paragraph and not each point	**√**	

Systematic	Rubric	Assessment (√)/(x)	Comment
	❖ The conclusion claimed by the researcher is supported by sufficient research and analysis data	√	
enhance the credibility of the manuscript, and facilitate accurate indexing and retrieval of the references.**References**	❖ Minimum number of references are 30 with a percentage of 80% journal articles and 20% books. Maximum references are within the last 10 years. using several articles from Scopus indexed international journals as references	√	Check the comment
	❖ Use Mendeley reference management system	x	Please review the reference list carefully and ensure that all entries are formatted according to APA style guidelines. If available, kindly include the DOI link for each reference. Providing DOIs is important because they offer permanent and direct access to the cited sources.

Assessment results :

1. Manuscripts can be published with revisions according to suggestions

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Improving Students' Digital Literacy and Higher-Order Thinking Skills Through the Development of Flipbook Media for Physics Learning

ABSTRACT

This study aims to develop a feasible and effective flipbook learning media in improving digital literacy and students' higher-order thinking skills (HOTS) in Physics learning. The study was conducted at SMA Negeri 1 Jonggol with a sample of 32 students and determined by purposive sampling technique. The research method for module development uses the Research and Development (R&D) type with the ADDIE development model which has five stages, namely: analysis, design, development, implementation, and evaluation. To improve HOTS using a quasi-experimental method. The research design used is a randomized one group pretest–posttest design. The research instruments include a questionnaire to assess the feasibility of the flipbook media, digital literacy questionnaire and test questions to measure students' HOTS abilities. The results of the study show that the developed flipbook media is in the very good category based on student assessments with a percentage of 89.94% and teacher assessments of 86.6%. Students consider this media interesting because it is equipped with images, audio, video, and YouTube links that support interactive and contextual learning. For the improvement of students' literacy skills, it is in the good category with a percentage of 80% indicating that the development of flipbook media is effective in supporting the improvement of students' digital literacy comprehensively, both in technical, cognitive, and socio-ethical aspects. The N-Gain score criteria for using flipbooks to improve HOTS skills are in the moderate category (N-gain = 0.62). Thus, flipbook media is effectively used as a learning innovation to support students' digital literacy and HOTS.

Keywords: *flipbook, HOTS, literacy digital, learning.*

INTRODUCTION

Twenty-first-century skills have fundamentally transformed education, particularly in the areas of literacy and technology. Advances in information and communication technology have not only provided sophisticated digital devices but also demanded changes in the way we learn and teach. The digital era demands that students possess new competencies, one of which is digital literacy. Digital literacy is a crucial skill in managing and utilizing digital media and devices. Digital literacy encompasses not only technical skills in operating devices but also critical thinking about digitally available information. Digital literacy encompasses the skills to find, evaluate, create information, and use it responsibly to build effective communication in everyday life (Nasrullah et al, 2017). Similarly, digital literacy encompasses an understanding of various technologies, the ability to apply them, and an awareness of their impact on oneself and others (Liansari & Nuroh, 2018).

Dikomentari [RJ1]: Check whether this title already exists in other journals and adjust it according to the research findings obtai

Dikomentari [RJ2]: The abstract must contain:
- Introductory sentence (optional)
- Objective
- Methods → participant
- Results → customize based on research questions/purposes
- Implications/conclusions

Dikomentari [RJ3]: The abstract addresses a relevant topic an presents quantitative results; however, several issues need revision. First, there are grammatical inconsistencies, including tense shifts, awkward phrasing, and a sentence fragment ("To improve HOTS u a quasi-experimental method"). The phrase "randomized one-grou pretest–posttest design" is methodologically inaccurate and should clarified. Second, terms such as "very good category" and "good category" require clear benchmarks. The abstract is also overly descriptive in places (e.g., multimedia features) and should adopt a more academic tone. The claim of effectiveness appears too strong given the one-group design and small sample size. Finally, the struc should be streamlined to improve clarity, coherence, and concisene

Dikomentari [RJ4]: Digital Literacy?

Dikomentari [RJ5]: The introduction contains the basic eleme of research, the urgency of research, references (relevant literature o research), objectives, and benefits of research. The novelty/urgency research is shown in the discussion in a separate paragraph with a statement that the research conducted is different from national and international research in the last eight years (at least 10 comparative articles) that have been published and are important to do.

Dikomentari [RJ6]: INTRODUCTION should:
• contain urgency (importance) to research
• contain a carrying capacity in the form of supporting data and fac
• contain a preliminary study as a basis for the importance of the research conducted
• contain a GAP ANALYSIS Departing from the preliminary study analysis of published articles formulated in the Gap analysis
GAP ANALYSIS refers to articles published in various internationa reputable journals to emphasize the novelty of research.
• clear limitation of research objectives

Dikomentari [RJ7]: Sources?

Dikomentari [RJ8]: The paragraph is generally clear, but it is highly repetitive, especially with the frequent use of "digital literacy" and repeated use of "encompasses," which makes the writing less concise. The definitions are also somewhat redundant and could be merged into a single, more focused explanation.

Digital literacy is the ability to find, evaluate, create, and communicate information on digital platforms, including computers and mobile devices. It does not replace traditional literacy concepts but rather develops them to remain relevant in improving the ability to access and utilize digital devices such as computers, social media, and the internet (Taufan, 2021). Furthermore, digital literacy encompasses eight essential elements: cultural, cognitive, constructive, communicative, trustworthy, creative, critical, and responsible (Belshaw, 2012).

Digital literacy is increasingly needed in line with the rapid growth of internet users worldwide year after year. According to a survey by the Indonesian Internet Service Providers Association, internet user growth has reached 171.17 million people, or 64.8% of Indonesia's total population (Jati, 2021). Unfortunately, the high number of smartphone users among students is not accompanied by an understanding of how to use them. Field evidence from various studies indicates that digital literacy among students is still suboptimal. Research conducted in several secondary schools showed that although students are accustomed to using gadgets, they still have low abilities to evaluate the credibility of digital information and utilize it productively in learning activities (Wijaya et al., 2021). This indicates that exposure to technology does not necessarily translate into good digital literacy skills. This finding is reinforced by a report highlighting that many students in developing countries still face limitations in accessing and utilizing digital learning resources effectively, primarily due to limited infrastructure and the lack of engaging and interactive digital learning media (UNESCO, 2022).

Dikomentari [RJ9]: Some claims are too general (e.g., stateme about low digital literacy or teacher-centered practices) and would benefit from stronger alignment with the specific research context. Additionally, several recent references (e.g., 2025–2026) should be carefully verified for credibility and accessibility.

One way to improve students' digital literacy skills is to integrate technology into the learning process. One example of this is the use of technology in the learning process, such as the Flipbook application. Flipbooks are digital learning media that present content in the form of interactive e-books, similar to printed books, but with additional features such as animation, video, and hyperlinks that can enrich students' learning experiences. Visually appealing and interactive learning media can increase students' attention, motivation, and learning retention (Arsyad, 2019). Flipbooks can facilitate this because they are able to present visually rich learning materials while being easily accessible through various digital devices.

Research shows that using flipbooks in learning significantly increases student engagement and helps students understand complex concepts through interactive visualizations (Utami & Nugroho, 2021). Another study demonstrated that students who learned using flipbooks showed greater improvements in digital literacy skills compared to a control group using conventional media (Wahyuni, 2025).

Furthermore, the use of digital technology through flipbooks allows for a more interactive and engaging presentation of material by incorporating multimedia elements such as images, animations, and interactive videos. This advantage makes flipbooks an innovative solution to support student-centered learning models, where students have control over their own learning pace. In other words, flipbooks are not just visual aids but also media that can be used to build critical, creative, and collaborative thinking skills—competencies included in the scope of digital literacy within the 21st Century Skills framework (OECD, 2023).

Higher-Order Thinking Skills (HOTS) are one of the 21st-century skills that need to be developed in learning, especially in physics. The revised 2013 curriculum emphasizes that higher-order thinking skills (HOTS) must be integrated into learning (Hanifah, 2019). Therefore, learning must provide space for students to discover knowledge concepts, practice their ability to analyze, evaluate, and create solutions to complex problems they face. Modern learning emphasizes students' abilities to think critically, communicate, collaborate, and master information technology (Angraini & Sriyati, 2019). Teachers need to innovate to support the development of higher-order thinking skills (HOTS) in the teaching and learning process, starting

from learning methods and techniques, media, teaching materials and various other supporting aspects. This demand then gave rise to ideas about the importance of digital literacy (Abdullah, 2018).

Student learning media was chosen because it has advantages in developing students' abilities to learn facts and understand general principles and abstract concepts using realistic reasoning (Yennita et al., 2018). To support these higher-order thinking skills, students need to have a careful attitude, as this attitude is very important in analyzing a problem in the early stages of the critical thinking process (Paputungan et al., 2022).

From an instructional design perspective, multimedia learning research shows that integrating verbal and visual representations improves understanding of abstract scientific concepts. Mayer (2002) asserts, "People can learn more deeply when they receive an explanation in words and pictures rather than words alone." This principle is particularly relevant for physics materials, which require connecting symbolic equations, graphical representations, and physical phenomena.

Physics, as a science subject, is characterized by its abstract nature, requiring a deep understanding of concepts, and strong problem-solving skills. Research shows that mastery of physics concepts is an important foundation for students' learning and problem-solving (Doyan et al., 2024; Sulman et al., 2023). However, in practice, physics learning in schools is often dominated by lecture methods and the use of conventional learning media that do not facilitate active student engagement. Research shows that teacher-centered learning practices and the limited use of interactive digital media contribute to students' low creative and critical thinking skills in physics (Suci Rizki, Pakhrur Razi et al., 2026). Other studies also state that the use of digital technology in science learning is still suboptimal, thus unable to maximally improve students' thinking skills in the digital era (Rahmantika et al., 2025). In addition, learning still utilizes static media such as PowerPoint, which contributes to students' low critical thinking skills (Ahzari & Akmam, 2025) and a high need for digital media to support students' thinking skills (Wafa et al., 2025)

One innovative alternative that can be used to address these issues is the development of digital flipbooks as a learning tool. Digital flipbooks are technology-based learning tools that visualize material in the form of interactive books, complemented by text, images, animations, audio, video, simulations, and external links that can enrich the learning experience. This medium can present learning content in a structured, engaging manner, and is easily accessible through digital devices such as laptops, tablets, and smartphones

Research shows that interactive digital flipbooks can improve students' critical thinking skills because students respond positively to the implementation of this media in learning (Velinda et al., 2024). In fact, the development of digital flipbooks based on local wisdom has proven effective in facilitating the improvement of students' critical thinking skills (Rini Febriani et al., 2025). Furthermore, flash flipbook media is a digital learning medium that can provide an interactive and immersive learning experience, including the use of text, animation, and interactive features, thereby helping students become more active in learning and think critically (Hamidah & Hanun Asrohah, 2025). Furthermore, digital flipbooks can also support students' digital literacy development by integrating text, images, and interactive media into a single digital learning medium (Juliana et al., 2025). Thus, flipbooks serve not only as a source of information but also as a tool to facilitate interaction, independent exploration, and the strengthening of students' higher-order thinking skills.

Dikomentari [RJ10]: APA style/

Dikomentari [RJ11]: Delete this

Considering the various explanations above, it is important to conduct further research on the use of flipbook applications in learning, particularly in the context of improving digital literacy and higher-order thinking skills in students in the digital age. This research is expected to provide theoretical contributions to the development of digital learning media and also have practical implications for improving the quality of learning in schools.

METHODOLOGY

This research uses a Research and Development (R&D) approach with the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) development model to produce flipbook learning media. The ADDIE steps are as shown in Figure 1.

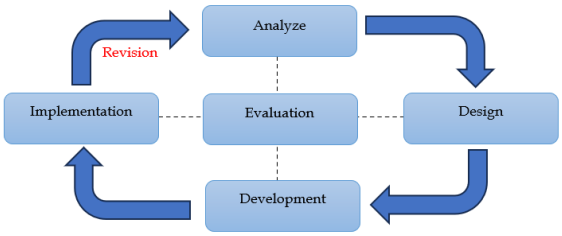


Figure 1. Steps of the ADDIE Method

The analyze stage is the stage of analyzing problems that occur through a structured process, namely interviews and questionnaires. At this stage, the problem identification process is carried out and the recapitulation of the results of the student needs survey is carried out. The second stage is design, which is designing and identifying the components involved in the development of flipbook media on the Renewable Energy material. Development is the stage of creating learning media based on the design that has been made. The next stage is implementation, which is the stage of applying the media that has been developed to determine the feasibility and effectiveness of the media. The final stage is evaluation, which is the stage to determine the final results obtained during the development of flipbook media as seen from the teacher and student response questionnaires

This research was conducted at SMAN 1 Jonggol in the odd semester of 2024/2025. The experimental design used in this study was a randomized one-group pretest-posttest design (Hake, 1998). To implement this design, the study was conducted on one class with a pretest and posttest to see the differences before and after treatment in the implementation of the electronic flipbook module. Data collection was carried out by distributing questionnaires and HOTS questions to students with a total of 32 students.

The instruments for this study are (1) Questionnaire, namely data collection carried out by providing a series of written statements to be answered by respondents to assess the feasibility of flipbook media. Researchers used 12 statements for teachers and 17 statements for students in writing which were filled in by respondents by giving a check mark (√) according to the respondent's opinion. The model used in this questionnaire uses a Likert scale with five alternative answers, namely: strongly agree (point 5), agree (point 4), sufficient (point 3), disagree (point 2), and strongly disagree (point 1). (2). digital literacy questionnaire to measure students' literacy skills (3) The HOTS test is used to determine the level of students' high-level thinking skills by measuring initial achievement before being given treatment and measuring final achievement after being given treatment. This treatment shows an increase in high-level thinking skills after using flipbook media for renewable energy material.

Dikomentari [RJ12]: The introduction should end with a clea problem statement and explicit research objectives or research questions. Currently, the purpose is implied but not sharply formulated. Overall, the section needs condensation, stronger synth of literature, clearer identification of the research gap, and a more focused lead-in to the study objectives.

Dikomentari [RJ13]: This framework by? Please put the sour here.

Dikomentari [RJ14]: Is this figure is created by the authors or from the literature? If this figure is from the literature, please add th source.

Dikomentari [RJ15]: The methodology section generally outl the development procedure and research design; however, several aspects require clarification and refinement. First, the description o the ADDIE stages is overly procedural and descriptive, and should condensed while emphasizing how each stage was operationalized i this study. The reference to "Figure 1" should ensure clarity and relevance rather than merely repeating standard ADDIE steps.

Dikomentari [RJ16]: The term "randomized one-group prete posttest design" is methodologically inaccurate, as a one-group desi does not involve randomization. This must be corrected. In additio the rationale for using only one class with 32 students should be justified, particularly regarding internal validity and generalizability.

Dikomentari [RJ17]: The instrumentation section lacks important psychometric information. There is no explanation of validity and reliability testing for the questionnaires or the HOTS te The source of the instruments (self-developed or adapted) and evidence of content or construct validity should be reported.

Dikomentari [RJ18]: The description of data analysis is incomplete. The statistical procedures used to analyze pretest–postt differences (e.g., t-test, N-gain calculation) should be clearly stated.

RESULT AND DISCUSSION

This research was conducted to develop a flipbook which was implemented through various stages in accordance with the steps of the ADDIE model.

Analysis Stage

In the analysis stage, an initial diagnosis is conducted to improve the efficiency and effectiveness of learning. Material analysis is conducted by identifying the main material that needs to be taught, collecting and selecting relevant material, and systematically reorganizing it. The outcomes students must attain are reflected in core competencies and basic competencies, which are then translated into indicators and learning objectives. Basic competencies consist of attitudes, knowledge, and skills developed by considering core competencies; these competencies are developed by considering the initial abilities and characteristics of students.

Design Stage

The design stage involves designing the flipbook's materials and appearance. During the design stage, adjustments are made to the analysis stage to determine the learning flow for presenting the material. The flipbook design involves developing a framework consisting of a cover, foreword, table of contents, core competencies, basic competencies, competency achievement indicators, learning objectives, concept maps, learning materials, learning activities, videos and animations, practice questions, quizzes, and a bibliography.

Dikomentari [RJ19]: The Analysis and Design stages are acceptable but could be more concise and better linked to instructio decisions rather than repeating general curriculum structures.

Development Stage

The development stage implements the design created in the design stage, namely importing the material design into the supporting application with the following stages: (1) First, import the file to PDF, which converts it from a Word file to a PDF file; (2) Second, edit the book's appearance or design the book's appearance using the edit page according to the desired appearance; (3) Third, change the file format using Apply Changes; (4) Fourth, publish, which includes parts of the digital book such as adding videos and images; (5) Fifth, online upload, which saves or uploads the material online; (6) Sixth, HTML5 Version, which changes the version of the digital book file to your liking; (7) Seventh, Flip, which changes the text display in the digital book. The final stage is Slide, which selects the desired slide format

Dikomentari [RJ20]: The Development stage is overly detaile and reads like a software manual rather than a research methodolog The step-by-step explanation (PDF conversion, editing, HTML5 version, etc.) is not necessary for an academic journal and should be summarized into key development procedures only.

In addition, there are some language issues and inconsistent academ tone, particularly in phrases such as "initial diagnosis," "apply changes," and "flip changes the text display," which are unclear or standard academic terminology.

Implementation Stage

After the development stage, the media will undergo a validation process conducted by experts. This validation process aims to assess the media's feasibility so that it can proceed to the trial phase. The feasibility assessment is calculated using the following percentage formula: (Purwanto, 2016).

$$NP = \frac{R}{SM} x\ 100\%$$

Description:

NP: percentage figure sought; R: score obtained; SM: maximum score

The material validation was conducted by two validators from the Physics Education Study Program, while the learning media validation was conducted by two validators from the Physics Education and Guidance and Counseling Study Programs. The results of the flipbook media validation are as follows:

Table 1. Results of Validation by Learning Material Experts

No.	Aspect	Score obtained	Score max	Percentace	Criteria
1	Relevance	8	10	80	Good
2	Completeness	8	10	80	Good
3	View	9	10	90	Very good
	Amount	27	30	90	Very good

Table 2. Results of Learning Media Expert Validation

No.	Aspek	Score obtained	Score max	Percentace	Criteria
1	Ease of using media	9	10	90	Very good
2	Design	5	5	100	Very good
3	Interface	18	20	90	Very good
	Amount	32	35	91,42	Very good

Based on Tables 1 and 2, the assessment results from the material expert validator and the media expert validator obtained scores in the excellent category. The material expert validator's score was 90%, while the media expert validator's score was 91.42%. Both scores fall within the excellent category. The assessment of the flipbook media covered aspects of appearance, content, and language, design, relevance, ease of use, and completeness of the materials used in the media.

Next, a limited trial was conducted with respondents, namely students and teachers. The trial was conducted on a small scale, involving 2 physics teachers and 10 students. The researchers then distributed a questionnaire via WhatsApp in the form of a gform. The questionnaire contained several statement indicators.

Evaluation Stage

The evaluation phase aims to assess the feasibility, practicality, and effectiveness of the developed flipbook media in improving digital literacy and higher-order thinking skills (HOTS) in high school students. The results of the pilot testing with students and teachers are shown in Tables 3 and 4.

Table 3. Data analysis of student questionnaire results

Indicator	Percenrase	Criteria
Flipbook learning media has a very attractive design.	90	Very good
Material according to flipbook media	88	Very good
Flipbook learning media is easy to use	89	Very good
By using flipbook media I find it easier to learn	90	Very good
The animation contained in the flipbook media attracted my attention to learning	94	Very good
Videos in flipbook learning media are in accordance with the learning material	90	Very good
The concepts contained in flipbook media are very easy to understand	95	Very good
The sound on the flipbook is clear	93	Very good
Flipbook media helps me analyze the relationship between physics concepts.	88	Very good
Flipbook media can be accessed anywhere	90	Very good
The vocabulary used in the media is easy to understand	88	Very good
Flipbook learning media is very fun	90	Very good

Dikomentari [RJ21]: Percentage

Dikomentari [RJ22]: Inconsistencies in terminology and structure between tables and descriptions (e.g., "Aspek" should be "Aspect"). The presentation of table results is clear but somewhat repetitive in the narrative explanation, which restates the same percentages multiple times without adding analytical interpretation.

Dikomentari [RJ23]: The formula explanation is acceptable, b it should be formatted more clearly and consistently with academic standards. The term "Percentace" in Tables 1 and 2 is a spelling err and should be corrected to "Percentage," and decimal notation sho be standardized (e.g., 91.42 instead of 91,42).

Dikomentari [RJ24]: The methodology description of the validation process is brief but lacks detail regarding the validity criteria or standards used to categorize "good" and "very good." This should be clarified.

The description of the limited trial is too minimal and should incl more methodological detail (e.g., purpose of the trial, instrument validation, or analysis method).

Dikomentari [RJ25]: Table 3 is very detailed but somewhat redundant, as many indicators are similar in meaning. The table cou be more concise by grouping related items or presenting only key indicators. The same applies to Table 4, where some statements are repetitive and could be synthesized.

Dikomentari [RJ27]: Consistent spelling and formatting error such as "Percenrase" (should be "Percentage") and "Avarage" (sho be "Average"), as well as inconsistent decimal notation (e.g., 89,94 v 89.94). These should be standardized to academic English formattin

The questions or activities in the flipbook encourage me to identify the causes and effects of a physical event.	88	Very good
I can explain physics problems presented in flipbooks more systematically.	87	Very good
Flipbook media helps me evaluate the truth of a concept or answer based on the existing explanation	90	Very good
Quizzes in flipbook media train me to assess and choose the most appropriate answer	90	Very good
After using flipbooks, I was able to relate physics concepts to everyday life phenomena.	89	Very good
Avarage	89,94	Very good

Table 4. Data analysis of teacher questionnaire results.

Indicator	Percenrase	Criteria
Flipbook media is easy to use in physics learning	90	Very good
The use of flipbook media in renewable energy material helps students understand learning objectives.	80	Good
The description of the learning material, images and videos contained in the flipbook media are clear and easy to teach.	87	Very good
Flipbook learning media is very effective for online learning	90	Very good
Flipbook learning media contains clear and accurate information.	80	Good
Giving assignments/evaluations becomes more interesting by using flipbook media.	90	Very good
The activities and example questions in the flipbook encourage students to identify physics problems and variables.	80	Good
Flipbook media does not help students in achieving learning objectives	88	Very good
Students feel happy when taught using flipbook learning media.	90	Very good
Questions and assignments in flipbook media train students to assess the accuracy of procedures and calculation results..	87	Very good
Flipbook media helps students relate measurement concepts to everyday life phenomena.	85	Very good
Students showed increased engagement and active thinking during learning using flipbooks.	90	Very good
Avarage	86,41	Very good

Dikomentari [RJ26]: It should be 86.4

Based on Table 3, the results of the trial evaluation of the flipbook learning media developed by students to improve HOTS (Host-Skilled Thinking) were categorized as very good. This is evident from the percentage score obtained of 89.94%. Students considered the flipbook media very engaging because it included images, audio, video, and YouTube links. These results indicate that the flipbook learning resource developed in physics learning is practical and can be used as a learning resource.

Dikomentari [RJ28]: the statement "Host-Skilled Thinking" i incorrect and should be corrected to "Higher-Order Thinking Skills (HOTS)."

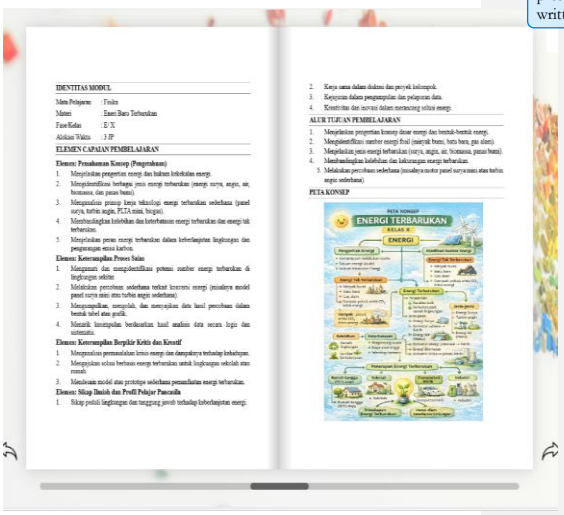
Furthermore, the use of digital flipbooks not only impacts the practicality and attractiveness of the media but also plays a significant role in improving students' higher-order thinking skills (HOTS). Digital flipbooks allow for visual and interactive presentation of material, thus encouraging students to engage in higher-order thinking activities such as analyzing information, evaluating concepts, and linking theories to contextual phenomena. This finding aligns with research showing that interactive digital flipbooks can facilitate critical thinking through structured, contextual, and easily accessible content presentation (Velinda, Kurnianti, & Hasanah, 2024).

Table 4 shows that teachers' assessment of the developed flipbook learning resource was very good, with a percentage of 86.6%. Observers assessed that the developed flipbook learning resource can assist teachers in delivering material on renewable energy and is very practical to use as a learning resource, both in terms of appearance and use, as well as in terms of material and learning

These results align with research showing that the use of HOTS-based interactive e-books significantly improves students' critical thinking and problem-solving skills in science learning (Sari, Lestari, & Kurniawan, 2021). Furthermore, studies in science education indicate that flipbook-based digital learning media is effective in improving students' analytical and evaluation skills because it provides interactive features, contextual exercises, and immediate feedback (Utari, 2024).

The appearance of the module used in this study is shown in Figure 2.

Dikomentari [RJ29]: I think the module images should be presented in both Indonesian and English versions, since the article written in English.



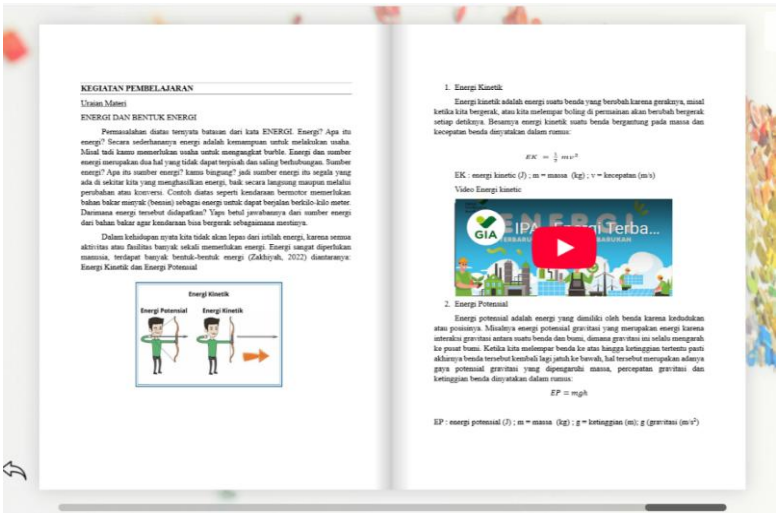


Figure 2. Example of e-module display (a) cover, (b) concept map and (c) material with video

Based on the results of processing the digital literacy questionnaire data (15 statements), the overall average percentage was 80%, which is in the good category. This indicates that students have sufficient digital literacy competencies to support physics learning through flipbooks.

Table 5. Distribution of Percentage of Students' Digital Literacy per Indicator

Digital Literacy Indicators	Persentase (%)	Category
Digital Media Access & Operations	82	Good
Evaluation of Digital Information	79	Good
Utilization & Production of Digital Information	81	Good
Digital Communication & Collaboration	78	Good
Digital Ethics & Security	80	Good
Avarage	80	Good

Based on Table 5, the results of the digital literacy questionnaire data processing, an average overall percentage of 80% was obtained, categorized as good. This achievement indicates that students have adequate digital literacy competencies to support flipbook-based physics learning. In the digital media access and operation indicator (82%), students were able to access, operate, and utilize interactive features independently. The digital information evaluation indicator (79%) showed that students were quite good at understanding the material, comparing sources, and verifying information. Meanwhile, the digital information utilization and production indicator (81%) showed that students were able to use information to solve problems and present material in digital form. These results are in line with the view (Spires & Bartlett, 2012) which emphasizes that digital literacy includes the ability to access, evaluate, and use information effectively in a learning context.

In addition, the digital communication and collaboration indicator (78%) shows that students are quite active in online discussions and are able to collaborate digitally. The digital ethics and security indicator (80%) is also in the good category, which indicates student awareness in citing sources and maintaining the security of personal data. These evaluative, collaborative, and ethical dimensions strengthen the cognitive aspect of digital literacy as stated by (Rany, et al., 2025) that digital literacy refers not only to technical mastery of digital devices, but also to the ability to understand, analyze, and critically evaluate information in the context of information technology. Overall, the 80% achievement shows that the development of flipbook media is effective in supporting the improvement of students' digital literacy comprehensively, both in technical, cognitive, and socio-ethical aspects.

Improving Students' Higher Order Thinking Skills (HOTS)

Based on the HOTS test instrument that was distributed to 32 students as research samples, the pretest and posttest results of students' high-level thinking skills were obtained as in Table 5.

Dikomentari [RJ30]: The interpretation of results is generally clear, but some parts are too explanatory and should be more conci and focused on key findings rather than repeating the function of th flipbook. The discussion of HOTS is appropriate, but it should be more tightly linked to the data instead of general conceptual explanation at the end.

Table 6. Pretest and posttest scores for high-order thinking skills (HOTS)

	Pretest	Posttest
Mean	50,26	84,13
Median	37	78
Max	60	90
Min	30	60

Std. Deviasi	11.4	10.9

Based on the calculation using the average formula above, the average pre-test score was 50.26, and the average post-test score was 84.13. This indicates that the post-test score was better than the pre-test score. This means that there is a difference in students' high-level skills after using flipbook media. From table 5, we can see that the average score of students during the pre-test was 50.26 out of a total score of 100. This score indicates that students' higher-order thinking skills are still in the low category. The low pre-test results are because students are still not trained in higher-order thinking skills from renewable energy material so that when the questions given are modified, they often result in confusion for students.

Furthermore, students' learning style, which tends to be based on memorization without understanding the material, results in their ability to solve problems. Sometimes, students are able to answer correctly not because they understand the concept but because they memorize it. Consequently, when presented with the same concept but with different questions, almost all students are unable to answer correctly. The result of this learning style is evident in the minimum score of students on the pretest, which is only 30.00 and the maximum score is only 60.00

However, after being given treatment with the help of electronic modules with the Flipbook application, there was an increase in the average posttest score of students to 84.13. Providing e-modules with the help of Flipbooks to students is an alternative to help students' higher-level skills because in addition to presenting teaching materials, the Flipbook e-modules are also equipped with videos and even animations. When students do not understand the concept of the material only through text, students can deepen their understanding by watching videos or animations. Flipbooks are also equipped with assignments and evaluations that can stimulate and train students in higher-level thinking so that they become more skilled in finding solutions to existing problems. The combination of the use of text, video and animation in e-modules helps students build relationships between concepts

The use of digital flipbooks can improve students' critical thinking skills because it helps them make connections between concepts and solve problems (Prasasti & Anas, 2023). Research findings also showed that in Cycle I, 46.67% of students achieved learning success, which increased to 90% in Cycle II, indicating a significant improvement in learning outcomes through HOTS-oriented learning assisted by flipbooks (Yusri & Hariani, 2024). To see the improvement in students' overall high-level thinking skills, the average normalized gain value from students' pretest and posttest data is calculated as in Table 6

Table 7. Normalized gain values.

Students' Higher Order Thinking Skills	Pretest	Posttest	Gain Score	category
	50.26	84.13	0,62	Moderate

Table 7 shows that the improvement in students' higher-order thinking skills is in the moderate category. Although the improvement in students' higher-order thinking skills is only in the moderate category, students have already made significant progress. With the help of the flipbook e-module, students ultimately understand the material better and are able to solve problems because in addition to presenting the lesson material in text form, the Flipbook e-module is also accompanied by videos and audio that support students' critical thinking. The videos and audio provided in the Flipbook e-module can be directly connected to other applications such as YouTube, Google, and other virtual applications. In addition, learning using the Flipbook e-module can improve student responses through stimulation when students work

on practice questions. Providing repeated practice questions along with reinforcement can make students who have difficulty in understanding the lesson material feel interested and happy so that their understanding of the concept improves. This statement is in line with findings that learning which emphasizes practice questions through the use of computers provides direct feedback to students—especially those who experience difficulties—thereby helping them improve their learning process (Chaucan, 2011). In addition, the use of e-modules as learning materials to replace printed books can improve students' critical thinking skills (Sugiharti, 2019).

So, HOTS is actually defined as the ability to use critical and creative thinking to solve a problem. Someone with higher-order thinking skills must be able to analyze, connect, analyze, and interpret problems to find solutions or new ideas. HOTS itself is part of the cognitive domain in the revised Bloom's Taxonomy. HOTS is at the level of analyzing, evaluating, and creating.

CONCLUSION

Based on the research results using the ADDIE development model, the developed flipbook learning media proved to be feasible, interesting, and effective in improving students' digital literacy and higher-order thinking skills (HOTS) in Physics learning. The results of the trial with students showed that the flipbook media was in the very good category with a score of 89.94%. Students considered this media very interesting because it was equipped with images, audio, video, and YouTube links that supported a more interactive and contextual understanding of concepts. Teachers' assessments of the developed learning resources also showed a very good category with a percentage of 86.6%, so this media was considered suitable for use in the learning process. The increase in HOTS was seen from the increase in the average pre-test score of 50.26 (low category) to 84.13 (high category) in the post-test. This indicates that the use of flipbooks significantly improved students' higher-order thinking skills. For the improvement of students' literacy skills, it is in the good category with a percentage of 80% indicating that the development of flipbook media is effective in supporting the improvement of students' digital literacy comprehensively, both in technical, cognitive, and socio-ethical aspectsThe N-Gain score criteria for using flipbooks to improve students' digital literacy and HOTS skills are in the moderate category (N-gain = 0.62). Thus, flipbook media is effectively used as a learning innovation to support students' digital literacy and HOTS.

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REFERENCES

Abdullah, W. (2018). Model Blended Learning dalam Meningkatkan Efektifitas. Pembelajaran. *Fikrotuna*, 7(1), 855–866.

Angraini, G., & Sriyati, S. (2019). Analisis Kemampuan Berpikir Tingkat Tinggi Siswa SMAN Kelas X di Kota Solok pada Konten Biologi. *Journal of Education Informatic Technology and Science (JeITS),* 1(1), 114–124.

Arsyad, A. (2013). Media Pembelajaran. PT Raja Grafindo

Dikomentari [RJ31]: There are still some issues with language consistency, as several Indonesian words and phrases remain in the (e.g., *"Std. Deviasi," "category," and some mixed terminology usage*). These should be fully translated into academic English for consistency (e.g "Standard Deviation"). In addition, some sentences are overly repetitive and descriptive, especially the explanations of why studen improved, which are stated multiple times with similar wording.

Dikomentari [RJ32]: Please add more explanation of the limitations, research recommendations, and suggestions.

Dikomentari [RJ33]: The paragraph presents promising resul however, several issues need revision. The claims of effectiveness a overstated, especially if no control group was used. Terms such as "very good," "low," and "high" categories require clear criteria or benchmarks. The use of "significantly improved" must be supporte by statistical evidence. Some sentences are overly descriptive and promotional in tone and should be made more objective. There are also grammatical issues, including a run-on sentence and incorrect parallel structure ("both in technical, cognitive, and socio-ethical aspects"). The conclusion should be more cautious and reflect the study's methodological limitations.

Dikomentari [RJ34]: 1. Please provide at least **30 references,** which 80% of them are taken from **the last 10 years (>2016)** articl of non-predatory journals, written in accordance with the APA Standard. You may go to Google Scholar and find the APA Style format provided.

2. For books, please refer to the original/primary book reference, n matter the date.

3. All of the listed references must be cited in the body of the articl and vice versa.

4. Add more international sources.

Dikomentari [RJ35]: Example: Errabo, D. D., & Ongoc A. A. (2024). Effects of interactive-mobile learning modules in students' engagement and understanding genetics. *Journal of Research in Innovative Teaching a Learning*, *17*(2), 327–351. https://doi.org/10.1108/JRIT-2024-0023

You can see the journal template to see the detailed information regarding how to write the references list.

Belshaw, D. A. J. (2012). What is' digital literacy?: a pragmatic investigation. Durham University.

Chauhan S (2011). Slow Learners: Their Psychology And Educational Programmes *International Journal of Multidisciplinary Research* 1, 279-28.

Doyan, A., Susilawati, S., Annam, S., Muliyadi, L., Megahati, R. R. P., Hutabarat, R. A., & Ardianti, N. R. (2024). The Trends Research of Conceptual Mastery in Students' Physics Learning (2015–2024): A Systematic Review. *Jurnal Penelitian Pendidikan IPA*, 10(6), 323–332.

Fadia Velinda, Endang M. Kurnianti, Uswatun Hasanah. (2024). Analisis Kebutuhan Media Digital Flipbook Interaktif Berbasis Web untuk Meningkatkan Keterampilan Berpikir Kritis Siswa Sekolah Dasar , *Jurnal Basicedu*, 8(2),1308–1316.

Hanifah, N. (2019). Pengembangan Instrumen Penilaian Higher Order Thinking Skill (HOTS) di Sekolah Dasar. *Current Research in Education: Conference Series Journal*, *1*(1). Retrieved from https:// smartlibrary.elayanan.info/ebook-file/ebook/8af b9052-a4ad-4d02-b60f-4fd974706fd3.pdf.

Hamidah & Hanun Asrohah (2025). Media flash flipbook for an interactive and immersive learning experience. Jurnal: *Journal of Indonesian Progressive Education* , 2(1),1-17.

Hake, R. R. (1998). Interactive-Engagement Versus Traditional Methods: A Six-Thousand-Student Survey of Mechanics Test Data for Introductory Physics Courses. American Journal of Physics, 66(1), 64–74. https://doi.org/10.1119/1.18809

Hiller A. Spires & Cynthia L. Bartlett. (2012). Digital Literacies and Learning: Designing a Path Forward. *Media and Communication*, 7(2),1–3.

Jati, W. D. P. (2021). Literasi Digital Ibu Generasi Milenial Terhadap Isu Kesehatan Anak dan Keluarga. *Jurnal Komunikasi Global*, *10*(1), 1–23.

Liansari, V., & Nuroh, E. Z. (2018). Realitas Penerapan Literasi Digital Bagi Mahasiswa FKIP Universitas Muhammadiyah Sidoarjo. *Proceedings Of The Icecrs, 1(3).* Https://Doi.Org/10.21070/Picecrs.V1i3.1397

Mayer, R. E. (2002). "Multimedia Learning." Dalam *Psychology of Learning and Motivation*, Academic Press.

Nasrullah, R., Aditya, W., Satya, T. I., Nento, M. N., Hanifah, N., Miftahussururi, & Akbari, Q. S. (2017). Materi Pendukung Literasi Digital. *Kementerian Pendidikan Dan Kebudayaan.*

OECD. (2023). PISA 2025 Science Framework. Oxford University Press. https://pisa-framework.oecd.org/science 2025/assets/docs/PISA_2025_Science_Framework.pd

Rafi Eka Wijaya, Mustaji Mustaji, Hari Sugiharto. (2021). Development of Mobile Learning in Learning Media to Improve Digital Literacy and Student Learning Outcomes in Physics Subjects: Systematic Literature Review. *Budapest International Research and Critics Institute-Journal (BIRCI-Journal)*, 4(2), 3087-3098

Paputungan, K., Mamu, H., & Katili, A. S. (2022). Efektivitas Model Discovery Learning dan Model Contextual Teaching and Learning Terhadap Kemampuan Berpikir Tingkat Tinggi Siswa. *Jurnal Penelitian dan Pengembangan*, *6*(3), 415–421.

Prasasti, R. D., & Anas, N. (2023). Pengembangan Media Digital Berbasis Flipbook Untuk Meningkatkan Kemampuan Berpikir Kritis Pada Peserta Didik. Munaddhomah: *Jurnal Manajemen Pendidikan Islam*,4(3), 694-705.

Rahmantika, L. E., Rhisma, R., & Rani, *U.* (2025). Kajian Pemanfaatan Teknologi Digital dan Artificial Intelligence dalam Pembelajaran IPA *Didaktik: Jurnal Ilmiah PGSD STKIP Subang*, 11(4), 212-222.

Rifka Muthia Rany, Elnovani Lusiana, & Fitri Perdana (2025). Peran Literasi Digital dalam Meningkatkan Kemampuan Berpikir Kritis di Era Teknologi Informasi : Philosophiamundi, 3(4), 47–56.

Rini Febriani, Hairunisa & Syafruddin (2025) . Pengembangan Media Flipbook Digital Berbasis Kearifan Lokal untuk Meningkatkan Keterampilan Berpikir Kritis Siswa. *Lambda: Jurnal Ilmiah Pendidikan MIPA dan Aplikasinya*, 5(2), 88-101.

Sari, M., Murti, S. R., Habibi, M., Laswadi, & Rusliah, N. (2021). Pengembangan Bahan Ajar E-book Interaktif Berbantuan 3D Pageflip Profesional Pada Materi Aritmetika Sosial. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 5(1), 789–802.

Serli Ahzari & Akmam Akmam. (2025). Analyzing Students' Critical Thinking as a Basis for Developing Interactive Physics Multimedia with Generative Learning and Cognitive Conflict Strategie. *Jurnal Pendidikan Fisika*,3(2), 163–176.

Suci Rizki, Pakhrur Razi, Fatni Mufit, Fuja Novitra. (2026). Analyzing Students' Creative Thinking Skills as a Basis for Developing Digital Physics Teaching Materials on Renewable Energy Topics. *Jurnal Pendidikan Fisika. JPF*,14(1), 38 -52.

Sugiharti D, Supriadi S, Andriani N & Siska. (2019). Efektivitas Model Learning Cycle 7E Berbantuan E-Modul Untuk Meningkatkan Kemampuan Berpikir Kritis Peserta Didik SMP *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 8(1), 41–48.

Sulman, F., Yuliati, L., Kusairi, S., Hidayat, A., Pentang, J. T., & Mensah, B. (2023) Investigating Concept Mastery of Physics Students During Online Lectures Through Rasch Models on Force and Motion Materials: *Jurnal Inovasi Pendidikan IPA*, 9(1), 95–106.

Taufan. (2021). Manfaat Literasi Digital. UNDIP, 2-16.

UNESCO. (2022). Transforming Education: Global Actions to make Digital Learning Accessible and Inclusive for All. Retrieved from https://media.unesco.org/sites/default/files/webform/ed3002/391657eng.pdf

Utami, W. T., & Yuwaningsih, D. A. (2020). Analisis Kebutuhan Pengembangan E-Modul pada Pokok Bahasan Turunan menggunakan Kvisoft Flipbook Maker Pro untuk Siswa SMA Kelas XI. *Konfrensi Ilmiah Pendidikan Universitas Pekalongan*, 1(1), 149-152.

Wafa, A. S., Abdurrahmat, A. S., Nana, N., Hernawati, D., & Badriah, L. (2025). "Profil Keterampilan Berpikir Kreatif Peserta Didik pada Pembelajaran Fisika".*EDUTECH: Jurnal Inovasi Pendidikan Berbantuan Teknologi*, 5(1), 46–53.

Wahyuni, R. A., Rahmawati, S., & Prasetiyanto, M. A. (2025). Efektivitas Flipbook Digital Berbasis Literasi terhadap Hasil Belajar pada Pembelajaran IPAS kelas IV Sekolah Dasar. *Jurnal Inovasi Pendidikan (JIP)*, 8(12), 269-280.

Yanti, E., Utari, M., & Putra, S. (2024). Media Digital Dalam Memberdayakan Kemampuan Berpikir Kritis Abad 21 Pada Pembelajaran IPA di Sekolah Dasar. *Jurnal Kependidikan Islam Tingkat Dasar*, 11(1), 91-101.

Yennita, Y., Khasyyatillah, I., Gibran, G., & Irianti, M. (2018). Development of Worksheet Based on High-Order Thinking Skills to Improve High-Order Thinking Skills of the Students. *Journal of Educational Sciences*, *2*(1), 37-45.

Yusri, H. &Hariani, F (2024). Upaya Meningkatkan Hasil Belajar Peserta Didik Melalui Pembelajaran Berorientasi HOTS Berbantuan Flipbook : *OPTIKA Jurnal Pendidikan Fisika*, 8(1), 47-52.

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Improving Students' Digital Literacy and Higher-Order Thinking Skills Through the Development of Flipbook Media for Physics Learning

ABSTRACT
This study aims to develop a feasible and effective flipbook learning media in improving digital literacy and students' higher-order thinking skills (HOTS) in Physics learning. The study was conducted at SMA Negeri 1 Jonggol with a sample of 32 students and determined by purposive sampling technique. The research method for module development uses the Research and Development (R&D) type with the ADDIE development model which has five stages, namely: analysis, design, development, implementation, and evaluation. To improve HOTS using a quasi-experimental method. The research design used one group pretest–posttest design. The research instruments include a questionnaire to assess the feasibility of the flipbook media, digital literacy questionnaire and test questions to measure students' HOTS abilities. The results of the study show that the developed flipbook media is in the very good category based on student assessments with a percentage of 89.94% and teacher assessments of 86.6%. Students perceived the developed media as engaging due to its integration of images, audio, and video, which facilitate interactive and contextual learning experiences. The improvement in students' digital literacy was categorized as good, with a percentage score of 80%, indicating that the flipbook media is effective in enhancing digital literacy across technical, cognitive, and socio-ethical dimensions. Furthermore, the N-gain score for the improvement of Higher Order Thinking Skills (HOTS) was 0.62, which falls within the moderate category. These findings suggest that flipbook media is an effective instructional innovation for promoting both students' digital literacy and HOTS.

Keywords: *flipbook, HOTS, digital literacy, learning.*

INTRODUCTION

Twenty-first-century skills have fundamentally transformed education, particularly in the areas of literacy and technology. Advances in information and communication technology have not only provided sophisticated digital devices but also demanded changes in the way we learn and teach. The digital era demands that students possess new competencies, one of which is digital literacy. Digital literacy is a crucial skill in managing and utilizing digital media and devices. Digital literacy encompasses not only technical skills in operating devices but also critical thinking about digitally available information (UNESCO,2022) Digital literacy encompasses the skills to find, evaluate, create information, and use it responsibly to build effective communication in everyday life (Nasrullah et al, 2017). Similarly, digital literacy encompasses an understanding of various technologies, the ability to apply them, and an awareness of their impact on oneself and others (Liansari & Nuroh, 2018).

Digital literacy is the ability to find, evaluate, create, and communicate information on digital platforms, including computers and mobile devices. It does not replace traditional literacy concepts but rather develops them to remain relevant in improving the ability to access and utilize digital devices such as computers, social media, and the internet (Taufan, 2021). Furthermore, digital literacy encompasses eight essential elements: cultural, cognitive, constructive, communicative, trustworthy, creative, critical, and responsible (Belshaw, 2012).

Digital literacy is increasingly needed in line with the rapid growth of internet users worldwide year after year. According to a survey by the Indonesian Internet Service Providers Association, internet user growth has reached 171.17 million people, or 64.8% of Indonesia's total population (Jati, 2021). Unfortunately, the high number of smartphone users among students is not accompanied by an understanding of how to use them. Field evidence from various studies indicates that digital literacy among students is still suboptimal. Research conducted in several secondary schools showed that although students are accustomed to using gadgets, they still have low abilities to evaluate the credibility of digital information and utilize it productively in learning activities (Wijaya et al., 2021). This indicates that exposure to technology does not necessarily translate into good digital literacy skills. This finding is reinforced by a report highlighting that many students in developing countries still face limitations in accessing and utilizing digital learning resources effectively, primarily due to limited infrastructure and the lack of engaging and interactive digital learning media (UNESCO, 2022).

One way to improve students' digital literacy skills is to integrate technology into the learning process. One example of this is the use of technology in the learning process, such as the Flipbook application. Flipbooks are digital learning media that present content in the form of interactive e-books, similar to printed books, but with additional features such as animation, video, and hyperlinks that can enrich students' learning experiences. Visually appealing and interactive learning media can increase students' attention, motivation, and learning retention (Arsyad, 2019). Flipbooks can facilitate this because they are able to present visually rich learning materials while being easily accessible through various digital devices.

Research shows that using flipbooks in learning significantly increases student engagement and helps students understand complex concepts through interactive visualizations (Utami & Nugroho, 2021). Another study demonstrated that students who learned using flipbooks showed greater improvements in digital literacy skills compared to a control group using conventional media (Wahyuni, 2025).

Furthermore, the use of digital technology through flipbooks allows for a more interactive and engaging presentation of material by incorporating multimedia elements such as images, animations, and interactive videos. This advantage makes flipbooks an innovative solution to support student-centered learning models, where students have control over their own learning pace. In other words, flipbooks are not just visual aids but also media that can be used to build critical, creative, and collaborative thinking skills—competencies included in the scope of digital literacy within the 21st Century Skills framework (OECD, 2023).

Higher-Order Thinking Skills (HOTS) are one of the 21st-century skills that need to be developed in learning, especially in physics. The revised 2013 curriculum emphasizes that higher-order thinking skills (HOTS) must be integrated into learning (Hanifah, 2019). Therefore, learning must provide space for students to discover knowledge concepts, practice their ability to analyze, evaluate, and create solutions to complex problems they face. Modern learning emphasizes students' abilities to think critically, communicate, collaborate, and master information technology (Angraini & Sriyati, 2019). Teachers need to innovate to support the development of higher-order thinking skills (HOTS) in the teaching and learning process, starting from learning methods and

techniques, media, teaching materials and various other supporting aspects. This demand then gave rise to ideas about the importance of digital literacy (Abdullah, 2018).

Student learning media was chosen because it has advantages in developing students' abilities to learn facts and understand general principles and abstract concepts using realistic reasoning (Yennita et al., 2018). To support these higher-order thinking skills, students need to have a careful attitude, as this attitude is very important in analyzing a problem in the early stages of the critical thinking process (Paputungan et al., 2022).

From an instructional design perspective, multimedia learning research shows that integrating verbal and visual representations improves understanding of abstract scientific concepts. Mayer (2002) asserts, "People can learn more deeply when they receive an explanation in words and pictures rather than words alone." This principle is particularly relevant for physics materials, which require connecting symbolic equations, graphical representations, and physical phenomena.

Physics, as a science subject, is characterized by its abstract nature, requiring a deep understanding of concepts, and strong problem-solving skills. Research shows that mastery of physics concepts is an important foundation for students' learning and problem-solving (Doyan et al., 2024; Sulman et al., 2023). However, in practice, physics learning in schools is often dominated by lecture methods and the use of conventional learning media that do not facilitate active student engagement. Research shows that teacher-centered learning practices and the limited use of interactive digital media contribute to students' low creative and critical thinking skills in physics (Suci Rizki, Pakhrur Razi et al., 2026). Other studies also state that the use of digital technology in science learning is still suboptimal, thus unable to maximally improve students' thinking skills in the digital era (Rahmantika et al., 2025). In addition, learning still utilizes static media such as PowerPoint, which contributes to students' low critical thinking skills (Ahzari & Akmam, 2025) and a high need for digital media to support students' thinking skills (Wafa et al., 2025)

One innovative alternative that can be used to address these issues is the development of digital flipbooks as a learning tool. Digital flipbooks are technology-based learning tools that visualize material in the form of interactive books, complemented by text, images, animations, audio, video, simulations, and external links that can enrich the learning experience. This medium can present learning content in a structured, engaging manner, and is easily accessible through digital devices such as laptops, tablets, and smartphones

Research shows that interactive digital flipbooks can improve students' critical thinking skills because students respond positively to the implementation of this media in learning (Velinda et al., 2024). In fact, the development of digital flipbooks based on local wisdom has proven effective in facilitating the improvement of students' critical thinking skills (Rini Febriani et al., 2025). Furthermore, flash flipbook media is a digital learning medium that can provide an interactive and immersive learning experience, including the use of text, animation, and interactive features, thereby helping students become more active in learning and think critically (Hamidah & Asrohah, 2025). Furthermore, digital flipbooks can also support students' digital literacy development by integrating text, images, and interactive media into a single digital learning medium (Juliana et al., 2025). Thus, flipbooks serve not only as a source of information but also as a tool to facilitate interaction, independent exploration, and the strengthening of students' higher-order thinking skills.

Considering the various explanations above, it is important to conduct further research on the use of flipbook applications in learning, particularly in the context of improving digital literacy and higher-order thinking skills in students in the digital age. This research is expected to provide

theoretical contributions to the development of digital learning media and also have practical implications for improving the quality of learning in schools.

Based on the background, the research problems can be formulated as follows: (1) how to develop a feasible flipbook-based learning media for Physics instruction; and (2) to what extent the developed flipbook media can enhance students' digital literacy and higher-order thinking skills (HOTS).

METHODOLOGY

This research uses a Research and Development (R&D) approach with the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) development model to produce flipbook learning media. The ADDIE steps are as shown in Figure 1.

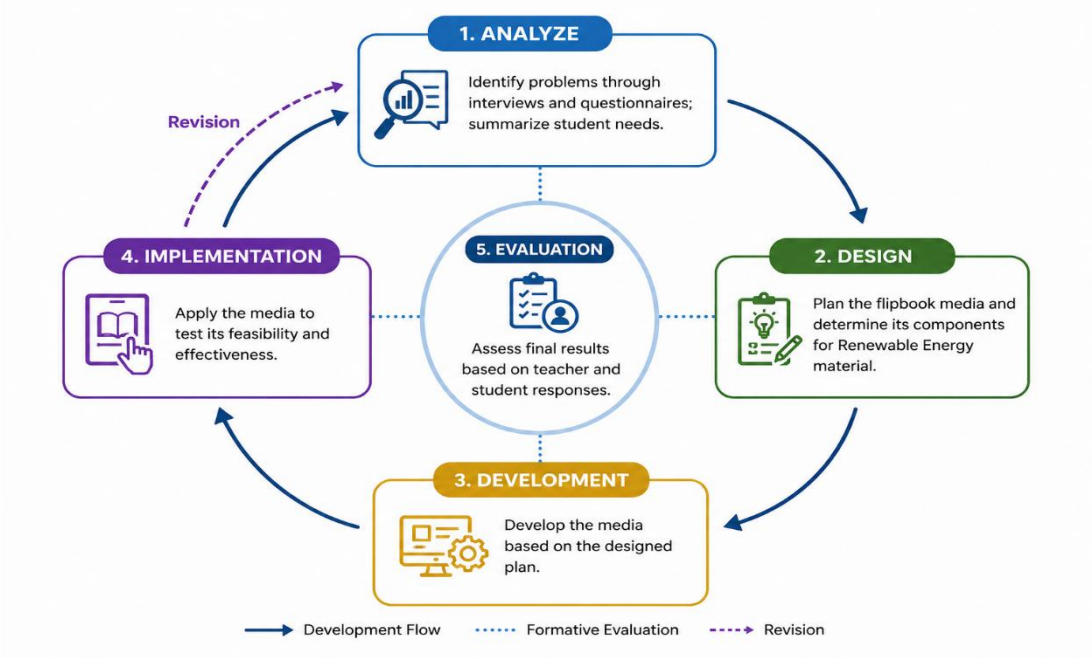


Figure 2. Figure by the autors

This research was conducted at SMAN 1 Jonggol in the odd semester of 2024/2025. The experimental design used in this study was one-group pretest-posttest design (Hake, 1998). The use of a single class consisting of 32 students is considered adequate for preliminary effectiveness testing, as it meets the minimum sample size for basic statistical analysis. Moreover, the participants represent typical characteristics of the target population, allowing for analytical generalization to similar educational contexts. In line with common practices in educational research and development, this study focuses on limited-scale implementation; therefore, the findings are not intended for broad generalization but rather to provide initial empirical evidence. To implement this design, the study was conducted on one class with a pretest and posttest to see the differences before and after treatment in the implementation of the electronic flipbook module. Data collection was carried out by distributing questionnaires and HOTS questions to students with a total of 32 students.

The instruments for this study are (1) Questionnaire, namely data collection carried out by providing a series of written statements to be answered by respondents to assess the feasibility of flipbook media. Researchers used 12 statements for teachers and 17 statements for students in writing which were filled in by respondents by giving a check mark (√) according to the respondent's opinion. The model used in this questionnaire uses a Likert scale with five alternative answers, namely: strongly agree (point 5), agree (point 4), sufficient (point 3), disagree (point 2),

and strongly disagree (point 1). (2). digital literacy questionnaire to measure students' literacy skills (3) The HOTS test is used to determine the level of students' high-level thinking skills by measuring initial achievement before being given treatment and measuring final achievement after being given treatment. This treatment shows an increase in high-level thinking skills after using flipbook media for renewable energy material.

RESULT AND DISCUSSION

This research was conducted to develop a flipbook which was implemented through various stages in accordance with the steps of the ADDIE model.

Analysis Stage

In the analysis stage, a needs diagnosis is conducted to enhance learning efficiency and effectiveness. Material analysis involves identifying key content, selecting relevant materials, and organizing them systematically. Learning outcomes are derived from core and basic competencies, which are translated into indicators and learning objectives, while considering students' prior knowledge and characteristics.

Design Stage

The design stage involves designing the flipbook's materials and appearance. During the design stage, adjustments are made to the analysis stage to determine the learning flow for presenting the material. The flipbook design involves developing a framework consisting of a cover, foreword, table of contents, core competencies, basic competencies, competency achievement indicators, learning objectives, concept maps, learning materials, learning activities, videos and animations, practice questions, quizzes, and a bibliography.

Development Stage

In the development stage, the design developed in the previous stage is implemented into a flipbook-based learning media product. This process includes converting and integrating the material into a digital format, developing the layout and structure of the media, and refining interactive features such as embedding images and videos. The media is then published in an appropriate format for online use, with adjustments to enhance readability and interactivity. This stage results in a flipbook product that is ready for feasibility and effectiveness testing.

Implementation Stage

After the development stage, the media will undergo a validation process conducted by experts. This validation process aims to assess the media's feasibility so that it can proceed to the trial phase. The feasibility assessment is calculated using the following percentage formula: (Purwanto, 2016).

$$NP = \frac{R}{SM} x\ 100\%$$

Description:

NP: percentage figure sought; R: score obtained; SM: maximum score

The material validation was conducted by two validators from the Physics Education Study Program, while the learning media validation was conducted by two validators from the Physics Education and Guidance and Counseling Study Programs. The results of the flipbook media validation are as follows:

Table 1. Results of Validation by Learning Material Experts

No.	Aspect	Score obtained	Score max	Percentage	Criteria
1	Relevance	8	10	80	Good
2	Completeness	8	10	80	Good
3	View	9	10	90	Very good
	Amount	27	30	90	Very good

Table 2. Results of Learning Media Expert Validation

No.	Aspect	Score obtained	Score max	Percentage	Criteria
1	Ease of using media	9	10	90	Very good
2	Design	5	5	100	Very good
3	Interface	18	20	90	Very good
	Amount	32	35	91.42	Very good

Based on Tables 1 and 2 the validation results indicate that the developed flipbook has a high level of feasibility, with scores of 90% (material expert) and 91.42% (media expert), both categorized as *very good*. These findings directly address the first research objective, namely to develop a feasible flipbook-based learning media for Physics instruction.

However, a more detailed analysis reveals variations across aspects. In the material validation, the *view* aspect (90%) reflects strong visual quality in supporting understanding, while *relevance* and *completeness* (80%) indicate that the content still requires refinement to better align with learning objectives and ensure comprehensive coverage. This is important, as content quality plays a crucial role in supporting the improvement of students' digital literacy and higher-order thinking skills (HOTS).

In contrast, the media validation demonstrates consistently high performance across all aspects, particularly in *design* (100%), as well as *ease of use* and *interface* (90%). These strengths suggest that the media has strong potential to facilitate interaction, exploration, and access to information, which are key components in developing digital literacy.

Comparatively, the slightly higher media score indicates that the product is stronger in technical and design aspects, while the instructional content still needs further enhancement. Achieving a balance between content quality and media design is essential in addressing the second research objective, which is to enhance students' digital literacy and HOTS.

Therefore, these validation results provide a solid foundation for proceeding to the limited trial phase to examine the extent to which the media can improve students' digital literacy and HOTS. However, given the limited sample size (2 teachers and 10 students), the findings at this stage should be considered preliminary and not yet generalizable.

Evaluation Stage

The evaluation phase aims to assess the feasibility, practicality, and effectiveness of the developed flipbook media in improving digital literacy and higher-order thinking skills (HOTS) in high school students. The results of the pilot testing with students and teachers are shown in Tables 3 and 4.

Table 3. Data analysis of student questionnaire results

Indicator	Percentage	Criteria
Flipbook learning media has a very attractive design.	90	Very good
Material according to flipbook media	88	Very good

Flipbook learning media is easy to use	89	Very good
By using flipbook media I find it easier to learn	90	Very good
The animation contained in the flipbook media attracted my attention to learning	94	Very good
Videos in flipbook learning media are in accordance with the learning material	90	Very good
The concepts contained in flipbook media are very easy to understand	95	Very good
The sound on the flipbook is clear	93	Very good
Flipbook media helps me analyze the relationship between physics concepts.	88	Very good
Flipbook media can be accessed anywhere	90	Very good
The vocabulary used in the media is easy to understand	88	Very good
Flipbook learning media is very fun	90	Very good
The questions or activities in the flipbook encourage me to identify the causes and effects of a physical event.	88	Very good
I can explain physics problems presented in flipbooks more systematically.	87	Very good
Flipbook media helps me evaluate the truth of a concept or answer based on the existing explanation	90	Very good
Quizzes in flipbook media train me to assess and choose the most appropriate answer	90	Very good
After using flipbooks, I was able to relate physics concepts to everyday life phenomena.	89	Very good
Avarage	89.94	Very good

Table 4. Data analysis of teacher questionnaire results.

Indicator	Percentage	Criteria
Flipbook media is easy to use in physics learning	90	Very good
The use of flipbook media in renewable energy material helps students understand learning objectives.	80	Good
The description of the learning material, images and videos contained in the flipbook media are clear and easy to teach.	87	Very good
Flipbook learning media is very effective for online learning	90	Very good
Flipbook learning media contains clear and accurate information.	80	Good
Giving assignments/evaluations becomes more interesting by using flipbook media.	90	Very good
The activities and example questions in the flipbook encourage students to identify physics problems and variables.	80	Good
Flipbook media does not help students in achieving learning objectives	88	Very good
Students feel happy when taught using flipbook learning media.	90	Very good
Questions and assignments in flipbook media train students to assess the accuracy of procedures and calculation results..	87	Very good
Flipbook media helps students relate measurement concepts to everyday life phenomena.	85	Very good
Students showed increased engagement and active thinking during learning using flipbooks.	90	Very good
Avarage	86.4	Very good

Based on Table 3, the results of the trial evaluation of the flipbook learning media developed by students to improve HOTS (High Order Thingking Skill) were categorized as very good. This is evident from the percentage score obtained of 89.94%. Students considered the

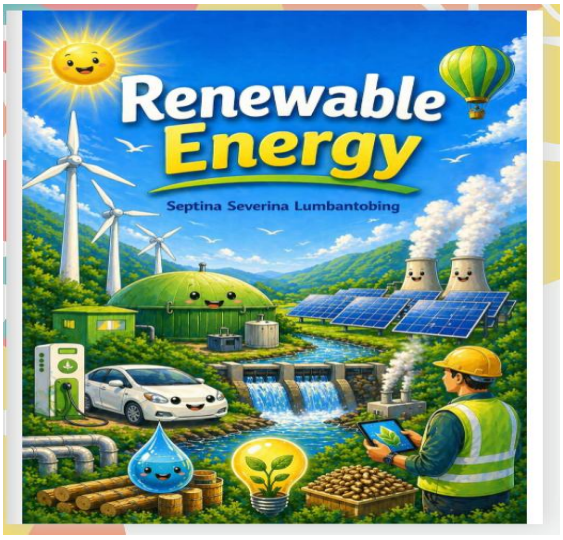
flipbook media very engaging because it included images, audio, video, and YouTube links. These results indicate that the flipbook learning resource developed in physics learning is practical and can be used as a learning resource.

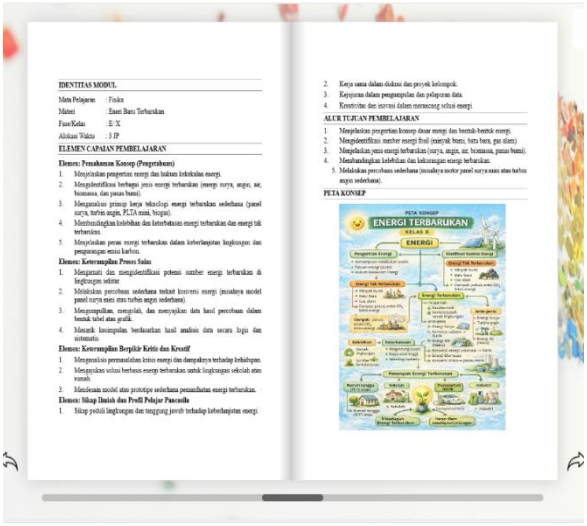
Furthermore, the use of digital flipbooks not only impacts the practicality and attractiveness of the media but also plays a significant role in improving students' higher-order thinking skills (HOTS). Digital flipbooks allow for visual and interactive presentation of material, thus encouraging students to engage in higher-order thinking activities such as analyzing information, evaluating concepts, and linking theories to contextual phenomena. This finding aligns with research showing that interactive digital flipbooks can facilitate critical thinking through structured, contextual, and easily accessible content presentation (Velinda, Kurnianti, & Hasanah, 2024).

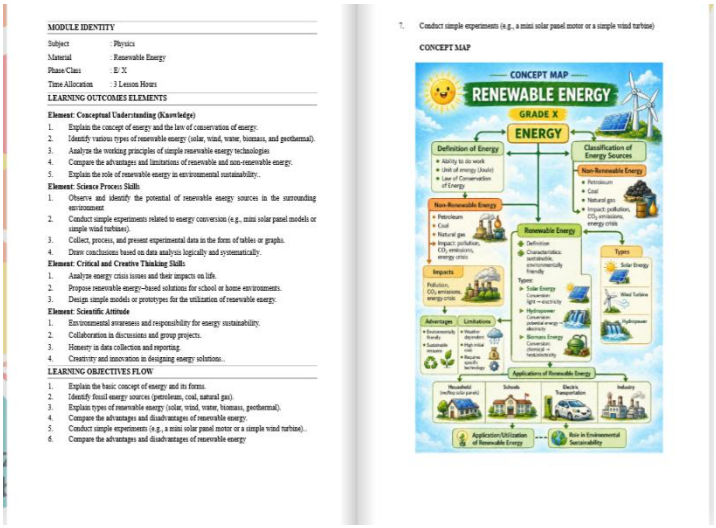
Table 4 shows that teachers' assessment of the developed flipbook learning resource was very good, with a percentage of 86.6%. Observers assessed that the developed flipbook learning resource can assist teachers in delivering material on renewable energy and is very practical to use as a learning resource, both in terms of appearance and use, as well as in terms of material and learning

These results align with research showing that the use of HOTS-based interactive e-books significantly improves students' critical thinking and problem-solving skills in science learning (Sari, Lestari, & Kurniawan, 2021). Furthermore, studies in science education indicate that flipbook-based digital learning media is effective in improving students' analytical and evaluation skills because it provides interactive features, contextual exercises, and immediate feedback (Utari, 2024).

The appearance of the module used in this study is shown in Figure 2.







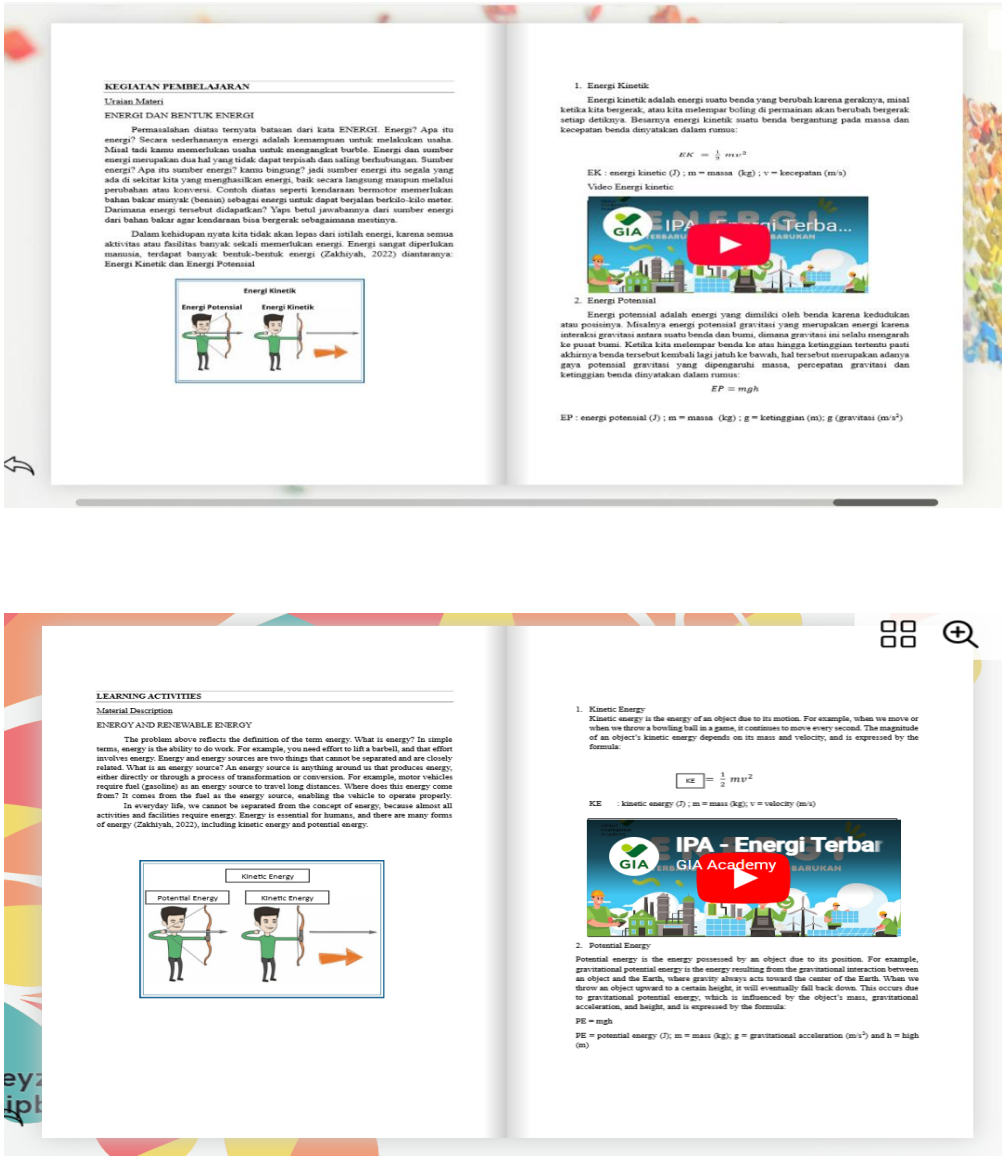


Figure 2. Example of e-module display (a) cover, (b) concept map and (c) material with video

Based on the results of processing the digital literacy questionnaire data (15 statements), the overall average percentage was 80%, which is in the good category. This indicates that students have sufficient digital literacy competencies to support physics learning through flipbooks.

Table 5. Distribution of Percentage of Students' Digital Literacy per Indicator

Digital Literacy Indicators	Persentage (%)	Category
Digital Media Access & Operations	82	Good
Evaluation of Digital Information	79	Good
Utilization & Production of Digital Information	81	Good
Digital Communication & Collaboration	78	Good
Digital Ethics & Security	80	Good
Avarage	80	Good

Based on Table 5, the results of the digital literacy questionnaire data processing, an average overall percentage of 80% was obtained, categorized as good. This achievement indicates that students have adequate digital literacy competencies to support flipbook-based physics learning. In the digital media access and operation indicator (82%), students were able to access, operate, and utilize interactive features independently. The digital information evaluation indicator (79%) showed that students were quite good at understanding the material, comparing sources, and verifying information. Meanwhile, the digital information utilization and production indicator (81%) showed that students were able to use information to solve problems and present material in digital form. These results are in line with the view (Spires & Bartlett, 2012) which emphasizes that digital literacy includes the ability to access, evaluate, and use information effectively in a learning context.

In addition, the digital communication and collaboration indicator (78%) shows that students are quite active in online discussions and are able to collaborate digitally. The digital ethics and security indicator (80%) is also in the good category, which indicates student awareness in citing sources and maintaining the security of personal data. These evaluative, collaborative, and ethical dimensions strengthen the cognitive aspect of digital literacy as stated by (Rany, et al., 2025) that digital literacy refers not only to technical mastery of digital devices, but also to the ability to understand, analyze, and critically evaluate information in the context of information technology. Overall, the 80% achievement shows that the development of flipbook media is effective in supporting the improvement of students' digital literacy comprehensively, both in technical, cognitive, and socio-ethical aspects.

Improving Students' Higher Order Thinking Skills (HOTS)

Based on the HOTS test instrument that was distributed to 32 students as research samples, the pretest and posttest results of students' high-level thinking skills were obtained as in Table 6.

Table 6. Pretest and posttest scores for high-order thinking skills (HOTS)

	Pretest	Posttest
Mean	50.26	84.13
Median	37	78
Max	60	90
Min	30	60
Std. Deviation	11.4	10.9

Based on the calculation using the average formula above, the average pre-test score was 50.26, and the average post-test score was 84.13. This indicates that the post-test score was better than the pre-test score. This means that there is a difference in students' high-level skills after using flipbook media. From table 5, we can see that the average score of students during the pre-test was 50.26 out of a total score of 100. This score indicates that students' higher-order thinking skills are still in the low category. The low pre-test results are because students are still not trained in higher-order thinking skills from renewable energy material so that when the questions given are modified, they often result in confusion for students.

Furthermore, students' learning style, which tends to be based on memorization without understanding the material, results in their ability to solve problems. Sometimes, students are able to answer correctly not because they understand the concept but because they memorize it. Consequently, when presented with the same concept but with different questions, almost all students are unable to answer correctly. The result of this learning style is evident in the minimum score of students on the pretest, which is only 30.00 and the maximum score is only 60.00

However, after being given treatment with the help of electronic modules with the Flipbook application, there was an increase in the average posttest score of students to 84.13. Providing e-modules with the help of Flipbooks to students is an alternative to help students' higher-level skills because in addition to presenting teaching materials, the Flipbook e-modules are also equipped with videos and even animations. When students do not understand the concept of the material only through text, students can deepen their understanding by watching videos or animations. Flipbooks are also equipped with assignments and evaluations that can stimulate and train students in higher-level thinking so that they become more skilled in finding solutions to existing problems. The combination of the use of text, video and animation in e-modules helps students build relationships between concepts

The use of digital flipbooks can improve students' critical thinking skills because it helps them make connections between concepts and solve problems (Prasasti & Anas, 2023). Research findings also showed that in Cycle I, 46.67% of students achieved learning success, which increased to 90% in Cycle II, indicating a significant improvement in learning outcomes through HOTS-oriented learning assisted by flipbooks (Yusri & Hariani, 2024). To see the improvement in students' overall high-level thinking skills, the average normalized gain value from students' pretest and posttest data is calculated as in Table 6

Table 7. Normalized gain values.

Students' Higher Order Thinking Skills	Pretest	Posttest	Gain Score	Category
	50.26	84.13	0.62	Moderate

Table 7 shows that the improvement in students' higher-order thinking skills is in the moderate category. Although the improvement in students' higher-order thinking skills is only in the moderate category, students have already made significant progress. With the help of the flipbook e-module, students ultimately understand the material better and are able to solve problems because in addition to presenting the lesson material in text form, the Flipbook e-module is also accompanied by videos and audio that support students' critical thinking. The videos and audio provided in the Flipbook e-module can be directly connected to other applications such as YouTube, Google, and other virtual applications. In addition, learning using the Flipbook e-module can improve student responses through stimulation when students work on practice questions. Providing repeated practice questions along with reinforcement can make students who have difficulty in understanding the lesson material feel interested and happy so that their understanding of the concept improves. This statement is in line with findings that learning which emphasizes practice questions through the use of computers provides direct feedback to students—especially those who experience difficulties—thereby helping them improve their learning process (Chaucan, 2011). In addition, the use of e-modules as learning materials to replace printed books can improve students' critical thinking skills (Sugiharti, 2019).

So, HOTS is actually defined as the ability to use critical and creative thinking to solve a problem. Someone with higher-order thinking skills must be able to analyze, connect, analyze, and interpret problems to find solutions or new ideas. HOTS itself is part of the cognitive domain in the revised Bloom's Taxonomy. HOTS is at the level of analyzing, evaluating, and creating.

CONCLUSION

Based on the research results using the ADDIE development model, the developed flipbook learning media proved to be feasible, interesting, and effective in improving students' digital literacy and higher-order thinking skills (HOTS) in Physics learning. The results of the trial

with students showed that the flipbook media was in the very good category with a score of 89.94%. Students considered this media very interesting because it was equipped with images, audio, video, and YouTube links that supported a more interactive and contextual understanding of concepts. Teachers' assessments of the developed learning resources also showed a very good category with a percentage of 86.6%, so this media was considered suitable for use in the learning process. The increase in HOTS was seen from the increase in the average pre-test score of 50.26 (low category) to 84.13 (high category) in the post-test. This indicates that the use of flipbooks significantly improved students' higher-order thinking skills. For the improvement of students' literacy skills, it is in the good category with a percentage of 80% indicating that the development of flipbook media is effective in supporting the improvement of students' digital literacy comprehensively, both in technical, cognitive, and socio-ethical aspectsThe N-Gain score criteria for using flipbooks to improve students' digital literacy and HOTS skills are in the moderate category (N-gain = 0.62). Thus, flipbook media is effectively used as a learning innovation to support students' digital literacy and HOTS. However, the findings should be interpreted cautiously due to several limitations, including the absence of a control group, a relatively small sample size, and a single research context, which limit causal inference and generalizability. Future research should employ more rigorous experimental designs with control groups and larger, more diverse samples. Practically, flipbook media may serve as an interactive learning resource, particularly when integrated with student-centered approaches to enhance learning outcomes.

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REFERENCES

Abdullah, W. (2018). Model Blended Learning dalam Meningkatkan Efektifitas. Pembelajaran. *Fikrotuna*, 7(1), 855–866.

Angraini, G., & Sriyati, S. (2019). Analisis Kemampuan Berpikir Tingkat Tinggi Siswa SMAN Kelas X di Kota Solok pada Konten Biologi. *Journal of Education Informatic Technology and Science (JeITS),* 1(1), 114–124.

Arsyad, A. (2013). Media Pembelajaran. PT Raja Grafindo

Belshaw, D. A. J. (2012). What is' digital literacy?: a pragmatic investigation. Durham University.

Chauhan S (2011). Slow Learners: Their Psychology And Educational Programmes *International Journal of Multidisciplinary Research* 1, 279-28.

Doyan, A., Susilawati, S., Annam, S., Muliyadi, L., Megahati, R. R. P., Hutabarat, R. A., & Ardianti, N. R. (2024). The Trends Research of Conceptual Mastery in Students' Physics Learning (2015–2024): A Systematic Review. *Jurnal Penelitian Pendidikan IPA*, 10(6), 323–332.

Fadia Velinda, Endang M. Kurnianti, Uswatun Hasanah. (2024). Analisis Kebutuhan Media Digital Flipbook Interaktif Berbasis Web untuk Meningkatkan Keterampilan Berpikir Kritis Siswa Sekolah Dasar , *Jurnal Basicedu*, 8(2),1308–1316.

Hanifah, N. (2019). Pengembangan Instrumen Penilaian Higher Order Thinking Skill (HOTS) di Sekolah Dasar. *Current Research in Education: Conference Series Journal*, *1*(1). Retrieved from https:// smartlibrary.elayanan.info/ebook-file/ebook/8af b9052-a4ad-4d02-b60f-4fd974706fd3.pdf.

Hamidah & Hanun Asrohah (2025). Media flash flipbook for an interactive and immersive learning experience. Jurnal: *Journal of Indonesian Progressive Education* , 2(1),1-17.

Hake, R. R. (1998). Interactive-Engagement Versus Traditional Methods: A Six-Thousand-Student Survey of Mechanics Test Data for Introductory Physics Courses. American Journal of Physics, 66(1), 64–74. https://doi.org/10.1119/1.18809

Hiller A. Spires & Cynthia L. Bartlett. (2012). Digital Literacies and Learning: Designing a Path Forward. *Media and Communication*, 7(2),1–3.

Jati, W. D. P. (2021). Literasi Digital Ibu Generasi Milenial Terhadap Isu Kesehatan Anak dan Keluarga. *Jurnal Komunikasi Global*, *10*(1), 1–23.

Liansari, V., & Nuroh, E. Z. (2018). Realitas Penerapan Literasi Digital Bagi Mahasiswa FKIP Universitas Muhammadiyah Sidoarjo. *Proceedings Of The Icecrs, 1(3).* Https://Doi.Org/10.21070/Picecrs.V1i3.1397

Mayer, R. E. (2002). "Multimedia Learning." Dalam *Psychology of Learning and Motivation*, Academic Press.

Nasrullah, R., Aditya, W., Satya, T. I., Nento, M. N., Hanifah, N., Miftahussururi, & Akbari, Q. S. (2017). Materi Pendukung Literasi Digital. *Kementerian Pendidikan Dan Kebudayaan*.

OECD. (2023). PISA 2025 Science Framework. Oxford University Press. https://pisa-framework.oecd.org/science 2025/assets/docs/PISA_2025_Science_Framework.pd

Rafi Eka Wijaya, Mustaji Mustaji, Hari Sugiharto. (2021). Development of Mobile Learning in Learning Media to Improve Digital Literacy and Student Learning Outcomes in Physics Subjects: Systematic Literature Review. *Budapest International Research and Critics Institute-Journal (BIRCI-Journal)*, 4(2), 3087-3098

Paputungan, K., Mamu, H., & Katili, A. S. (2022). Efektivitas Model Discovery Learning dan Model Contextual Teaching and Learning Terhadap Kemampuan Berpikir Tingkat Tinggi Siswa. *Jurnal Penelitian dan Pengembangan*, *6*(3), 415–421.

Prasasti, R. D., & Anas, N. (2023). Pengembangan Media Digital Berbasis Flipbook Untuk Meningkatkan Kemampuan Berpikir Kritis Pada Peserta Didik. Munaddhomah: *Jurnal Manajemen Pendidikan Islam*,4(3), 694-705.

Rahmantika, L. E., Rhisma, R., & Rani, *U.* (2025). Kajian Pemanfaatan Teknologi Digital dan Artificial Intelligence dalam Pembelajaran IPA *Didaktik: Jurnal Ilmiah PGSD STKIP Subang*, 11(4), 212-222.

Rifka Muthia Rany, Elnovani Lusiana, & Fitri Perdana (2025). Peran Literasi Digital dalam Meningkatkan Kemampuan Berpikir Kritis di Era Teknologi Informasi : Philosophiamundi, 3(4), 47–56.

Rini Febriani, Hairunisa & Syafruddin (2025) . Pengembangan Media Flipbook Digital Berbasis Kearifan Lokal untuk Meningkatkan Keterampilan Berpikir Kritis Siswa. *Lambda: Jurnal Ilmiah Pendidikan MIPA dan Aplikasinya*, 5(2), 88-101.

Sari, M., Murti, S. R., Habibi, M., Laswadi, & Rusliah, N. (2021). Pengembangan Bahan Ajar E-book Interaktif Berbantuan 3D Pageflip Profesional Pada Materi Aritmetika Sosial. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 5(1), 789–802.

Serli Ahzari & Akmam Akmam. (2025). Analyzing Students' Critical Thinking as a Basis for Developing Interactive Physics Multimedia with Generative Learning and Cognitive Conflict Strategie. *Jurnal Pendidikan Fisika*,3(2), 163–176.

Suci Rizki, Pakhrur Razi, Fatni Mufit, Fuja Novitra. (2026). Analyzing Students' Creative Thinking Skills as a Basis for Developing Digital Physics Teaching Materials on Renewable Energy Topics. *Jurnal Pendidikan Fisika. JPF*,14(1), 38 -52.

Sugiharti D, Supriadi S, Andriani N & Siska. (2019). Efektivitas Model Learning Cycle 7E Berbantuan E-Modul Untuk Meningkatkan Kemampuan Berpikir Kritis Peserta Didik SMP *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 8(1), 41–48.

Sulman, F., Yuliati, L., Kusairi, S., Hidayat, A., Pentang, J. T., & Mensah, B. (2023) Investigating Concept Mastery of Physics Students During Online Lectures Through Rasch Models on Force and Motion Materials: *Jurnal Inovasi Pendidikan IPA*, 9(1), 95–106.

Taufan. (2021). Manfaat Literasi Digital. UNDIP, 2-16.

UNESCO. (2022). Transforming Education: Global Actions to make Digital Learning Accessible and Inclusive for All. Retrieved from https://media.unesco.org/sites/default/files/webform/ed3002/391657eng.pdf

Utami, W. T., & Yuwaningsih, D. A. (2020). Analisis Kebutuhan Pengembangan E-Modul pada Pokok Bahasan Turunan menggunakan Kvisoft Flipbook Maker Pro untuk Siswa SMA Kelas XI. *Konfrensi Ilmiah Pendidikan Universitas Pekalongan*, 1(1), 149-152.

Wafa, A. S., Abdurrahmat, A. S., Nana, N., Hernawati, D., & Badriah, L. (2025). "Profil Keterampilan Berpikir Kreatif Peserta Didik pada Pembelajaran Fisika".*EDUTECH: Jurnal Inovasi Pendidikan Berbantuan Teknologi*, 5(1), 46–53.

Wahyuni, R. A., Rahmawati, S., & Prasetiyanto, M. A. (2025). Efektivitas Flipbook Digital Berbasis Literasi terhadap Hasil Belajar pada Pembelajaran IPAS kelas IV Sekolah Dasar. *Jurnal Inovasi Pendidikan (JIP)*, 8(12), 269-280.

Yanti, E., Utari, M., & Putra, S. (2024). Media Digital Dalam Memberdayakan Kemampuan Berpikir Kritis Abad 21 Pada Pembelajaran IPA di Sekolah Dasar. *Jurnal Kependidikan Islam Tingkat Dasar*, 11(1), 91-101.

Yennita, Y., Khasyyatillah, I., Gibran, G., & Irianti, M. (2018). Development of Worksheet Based on High-Order Thinking Skills to Improve High-Order Thinking Skills of the Students. *Journal of Educational Sciences*, *2*(1), 37-45.

Yusri, H. &Hariani, F (2024). Upaya Meningkatkan Hasil Belajar Peserta Didik Melalui Pembelajaran Berorientasi HOTS Berbantuan Flipbook : *OPTIKA Jurnal Pendidikan Fisika*, 8(1), 47-52.