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Electronics Module Development Using Heyzine Flipbook on Materials that Change Energy Form

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Abstract
This research aims to create teaching materials on energy conversion for fourth graders at SDN Cilangkap 08 Elementary School in Depok. The development of these materials uses the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). It started with analyzing the needs, studying the students, designing the product, developing the e-module, getting expert validation, and then testing the e-module on energy transformation. The results from the experts in media, language, and subject matter showed that the e-module using Heyzine flipbooks was valid for use, with an average percentage of 96%. In the testing phase, 32 students provided responses that were highly suitable for use, with an average percentage of 96%. Based on the research results, it can be concluded that the e-module learning material using Heyzine flipbooks on the topic of energy transformation developed in this study is proven to be valid, easy, and engaging for students to use, and highly suitable for study.

Abstrak
Tujuan penelitian ini adalah untuk menghasilkan produk bahan ajar pada materi mengubah bentuk energi di kelas IV SDN Cilangkap 08 Kota Depok. Pengembangan produk ini menggunakan model ADDIE (Analysis, Design, Development, Implementation, Evaluation). Penelitian diawali dengan melakukan analisis kebutuhan, analisis peserta didik, membuat desain produk, kemudian mengembangkan produk e-modul, melakukan validasi ahli, setalah itu melakukan uji coba e-modul materi mengubah bentuk energi. Hasil penelitian validasi ahli media, ahli bahasa, dan ahli materi menunjukkan bahwa e-modul menggunakan heyzine flipbook valid sangat layak digunakan dengan memperoleh persentase rata-rata sebesar 96%. Pada tahap uji coba dilakukan 32 peserta didik memberikan responden yang sangat layak digunakan dengan memperoleh persentase rata-rata sebesar 96%. Berdasarkan hasil penelitian dapat disimpulkan bahwa bahan ajar e-modul menggunakan heyzine flipbook pada materi mengubah bentuk energi yang dikembangkan penelitian ini terbukti valid, mudah dan menarik untuk digunakan peserta didik serta sangat layak untuk dipelajari.

Kata Kunci : *E-modul*, bahan ajar, *Heyzine flipbook*, Pengambangan

INTRODUCTION

Leading is a learning activity process that serves to determine the success of student learning, so that in this case, there is interaction between teachers, students, and learning resources in the learning environment. Regarding its implementation, it seems that the learning process must be in accordance with the characteristics of science subjects. Social studies subjects in elementary school aim to prepare students to face ever-changing scientific and social developments. However, some students still consider social studies subjects uninteresting. Social studies learning can help students think critically, especially in understanding their environment, making it very important for them. Teachers must have the ability to make social studies learning interesting for students. The use of various learning media during learning activities is one way to make learning interesting. Therefore, it is important for teachers to use electronic learning media in learning activities. Digital learning is necessary today to support the learning process and ensure that the established learning objectives are achieved. There are many types of electronic-based learning, one of which is e-modules.

The electronic module can help students achieve a series of predetermined learning objectives. A module is a learning tool or facility that contains material, methods, limitations, and evaluation methods that are systematically and attractively arranged to achieve the expected competencies. Based on observations conducted on November 13, 2024, several issues were identified, including in the learning

process, where teachers dominate the learning process more than students. In the learning process, teachers have not yet utilized engaging learning media. Teachers only use government-provided textbooks in their lessons, making the learning process seem less engaging. Meanwhile, during the learning process, students are active, critical, and have a strong desire to learn. However, the available learning materials are very limited, with only worksheets (LKS) being provided. These worksheets are considered incomplete and uninteresting. Insufficient teaching materials are available for teachers to support the learning process in the classroom, resulting in students not fully understandable the learning materials.

The Heyzine Flipbook is used to determine quality based on expert assessment, as well as to analyze student responses to its suitability. An alternative solution to the problem of learning media applied to elementary school students is an electronic module using the Heyzine Flipbook. This research is supported by previous research conducted (Manzil & Anas Thohir, 2022) in "The Development of Interactive Electronic Modules Using Heyzine Flipbook Based on Scientific Material on the Water Cycle for Fifth-Grade Elementary School Students." based on the results of the research conducted, an average of 93% was obtained, categorized as highly valid, and can be used without further improvement. This electronic module is easy to use, featuring simple and easy-to-understand language and commonly used terms (Hidayati Azkiya, M. Tamrin, Arlina Yuza, & Ade Sri Madona. (2022).

Following the alternative problem-solving method described above, the researcher decided to select the e-module medium using Heyzine Flipbook to address issues related to creative and innovative learning among fourth-grade elementary school students. It is recommended that the researcher conduct further research on the development of E-Modules using Heyzine Flipbook for the topic of Energy Transformation for fourth-grade elementary school students.

METODE

These research procedures use the ADDIE development model, with the ADDIE approach standing for Analysis, Design, Development, Implementation, and Evaluation (Abror, M., Suryani, N., & Ardianto, D. T. (2020). It's a product developed in this research in the form of an e-module using the HeyZine Flipbook app on material discussing changes in energy forms. The ADDIE model development consists of five stages: analysis, design, development, implementation, and evaluation. This can be seen in the following figure. Development steps can be seen in Figure 1 as follows:

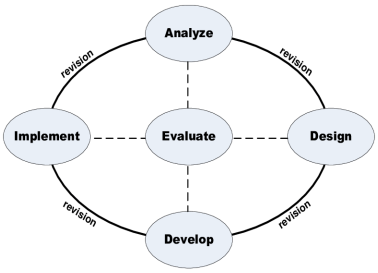


Figure 1. ADDIE Model Stages
Source: Anggraeni, et al (2022)

These are the steps in developing an e-module:

Analysis Stage

To assess students' understanding, teachers still use textbooks, so the methods used in teaching are not very varied, which makes students less active during the learning process. The solution to this problem is to develop e-modules using Heyzine Flipbook, which are attractive so that learning is not monotonous and easy for students to use.

Design Stage

The design of this electronic module uses Heyzine flipbook on the following pages: page 1, which contains the cover title "E-Module Changing Energy Forms for Grade IV Elementary School" with a harmonious color combination and additional image 2, as follows:

Figure 2. Desain Cover e-module

Page 2, contains the name of the compiler and the name of the developer; page 3, contains an introduction with interesting pictures; page 4, contains a table of contents of the e-module with pictures; page 5, contains motivation accompanied by interesting animations; page 6, contains learning instructions with interesting elements and animations; the 7th page contains a profile of Pancasila learning with interesting elements and animations; the 8th page contains learning objectives accompanied by diverse elements; the 9th page contains a concept map accompanied by interesting elements and animations; pages 10-21 contain an understanding of the material on "energy transformation around us" with interesting and engaging learning videos, image elements, and diverse animations; page 22, contains practice questions; pages 23–31, contain material understanding; accompanied by engaging and non-boring educational videos, image elements, and diverse animations; page 32, contains assignment practice questions; pages 33–34, contain evaluations and follow-up assignments such as enrichment and remediation; page 35, contains conclusions; page 36, contains a bibliography; pages 37, contains a glossary of terms; pages 38–40, contains the author's profile and the developer's profile.

Development Stage

Development stages in realizing product design. Once the product is complete, it undergoes validation by experts, including material, media, and language expertise.

Implementation Stage

Following validation by media, language, and material experts, it was determined that there were deficiencies in the electronic teaching materials. Revisions and improvements were made, and trials were conducted with 32 fourth-grade students at SDN Cilangkap 08. The list of validators was as follows:

No	Name of Validator	Team Expert	Institusi
1.	Mutfi Alfiana Delisa, S.Pd.	Material Expert	SDN Cilangkap 08
2.	Iqbal Suriansyah, M. Kom.	Media Expeert	Universitas Pakuan
3.	Aniyah Ekowati, M.Pd.	Linguist Expert	Universitas Pakuan

Evaluative Stage

In the evaluation stage, students are given a feedback questionnaire to determine educators' responses to the suitability of using the e-module with Heyzine Flipbook. This evaluation aims to provide learning data to address the problem formulation. Student feedback from the questionnaire is used as input for product improvement. The results of the questionnaire indicate that the e-module product using Heyzine Flipbook is good and interesting, it can be said that the product has been developed.

Qualitative analysis techniques in this study were obtained from data in the form of written interviews, critiques, and suggestions provided by subject matter experts, media experts, language experts, teachers, and fourth-grade students. These techniques were used to improve the development of e-module products using HeyZine flipbooks. The quantitative data analysis in this study was obtained by analyzing the results of questionnaires distributed to experts, teachers, and students regarding the development of e-modules using HeyZine flipbooks.

To assess the suitability of the developed product. We used a Likert scale with five levels, interpreted as scores ranging from 1 to 5, as explained in the following table:

Table 1. Likert Scale Assessment

Information	Skor
Excellent	5
Good	4
Enough	3
Less	2
Very Less	1

Source; (Rianto, 2020)

RESULTS AND DISCUSSION

Results and discussion E-Module development using Heyzine Flipbook uses the ADDIE model, which has five stages: Analysis, Design, Development, Implementation, and Evaluation. This section explains each stage of the ADDIE model.

Analysis Stage

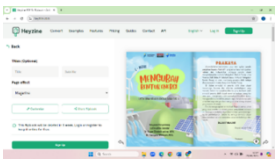
For information related to the issues that have arisen. This phase was conducted on May 21, 2024, including: the need for teaching materials in the learning process at SDN Cilangkap 8 in Depok City to conduct interviews, the finding that SDN Cilangkap 08 only relies on government-provided textbooks, and that the learning process is not yet engaging or innovative.

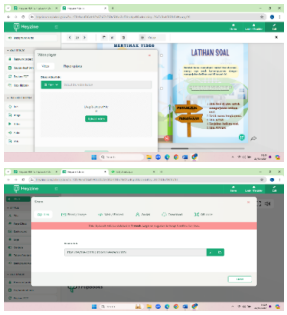
Self-directed curriculum analysis creates a pleasant learning environment, with simple yet meaningful content delivery, while weaknesses in the development of the learning system are not yet fully addressed. All learning materials come from textbooks, making participants less enthusiastic, and teaching materials are not diverse enough, so the use of teaching materials is necessary.

Analysis of the needs of 32 students in class IV-A at SDN Cilangkap 08 in Depok shows that they need interactive teaching materials that utilize technological developments known as e-modules using Heyzine flipbooks. The students, however, tend to lack enthusiasm and quickly become bored during the learning process.

Design Stage

In this first stage, the definition stage (Define) is carried out by analyzing the needs of teachers, students, and problems that arise during the learning process. In the second stage, the planning stage (Design), the concept is selected and the initial format is designed in the development of the e-module, in accordance with the opinion (Gani, R. A., Windiyani, T., Hikmah, N., & Sabila, F. H. (2024)) which states that it must be designed in such a way that students' understanding is achieved in accordance with the learning objectives, as shown in Figure 2 below:

Desain	Description
	Opens the Heyzine flipbook, then clicks “Upload,” and then uploads the prepared PDF file. https://heyzine.com/
	Once you have successfully imported the PDF, click “customize” to add interesting features to the e-module. If the e-module is too large, you can reduce the resolution to 600x400 pixels. After successfully importing the PDF, click on “Customize” to add



interesting features to the e-module. If you want to add videos, links, and audio, you go to the "Interaction" menu. For example, to insert YouTube.
If you've finished editing and want to *save/share* , it's in the top left corner of the menu.

Then the options available are copy link, send email, website, sociale media, download, and QR code.

Figure 2. E-module Design Using *Heyzine Flipbook*

The Develop stage was carried out by developing aspects of media display, audio, and video design through assessment by obtaining information, criticism, and suggestions so that the e-module developed by researchers could become a better product. Media expert involved in this development is M. Iqbal Suriansyah, M. Kom., as a lecturer at Pakuan University. The aspects evaluated include e-module design and the use of the Heyzein Flipbook application.

This development product received a score of 74%, meaning that the e-module development product for the "Changing Energy Forms" material using Heyzine Flipbook is considered suitable for use in the field. However, there are still several things that need to be considered and improved so that the e-module development product for the "Changing Energy Forms" material using Heyzine Flipbook can be developed further so that it can be used by students. The second validation result after the product was revised. The language expert in this development is Ainiyah Ekowati, M.Pd., as a lecturer in the Indonesian Language and Literature Education Program at Pakuan University. The aspects evaluated include the e-module design and the use of the Heyzine Flipbook application. The criticisms and suggestions provided by the language expert are as follows. This second assessment of the development product received a score of 100%, meaning that the e-module material development product on energy transformation using Heyzine Flipbook is considered "very suitable, no revision required" with a score between 80-100%, indicating that the product is deemed highly suitable for field testing without revision.

The subject matter expert in this development is Mutfi Alfiana Delisa, S. Pd, a fourth-grade teacher at SDN Cilangkap 08 in Depok City. The aspects evaluated include the design of the electronic module (e-module) and the use of the Heyzine Flipbook application. The initial evaluation of this development product was rated as "Very suitable, revised as needed" with a score between 80-100%, meaning that the e-module material development product that converts energy forms using the heyzine flipbook application is considered suitable for use in the field. The evaluation also noted that there are several aspects that need to be considered and improved to enhance the e-module material development product that converts energy forms, making it more effective for use by students.

Results of the second validation after the product was revised. The second evaluation of this development product received a score of 98%, meaning the e-module material development product that converts energy forms using the Heyzine Flipbook is considered "highly suitable, no revision needed" with a score between 80-100%, meaning the product is deemed highly suitable for field testing without revision.

Average scores for the overall validity of both items were then converted into expert ratings to arrive at conclusions regarding the electronic module on materials which change energy form using Heyzine flipbooks, as presented in Table 1, as follows:

Table 1. Validator Assessment Results After Revision Regarding Feasibility Aspects

Validator	Evaluation of E-modules Using *Heyzine Flipbook*
Media Expert	84%
Linguist Expert	100%
Materi Expert	98%
Total average	94%

Validation results by media, linguistics, and subject matter experts were obtained with an average percentage of the total with the criteria "Very feasible, no revision needed," which means that the electronic module for changing energy forms using Heyzine Flipbook is very feasible for testing in elementary schools. Furthermore, the trial results will be discussed in the form of a questionnaire from students.

Implementation Stage

Following validation by a team of experts, including media experts, language experts, and subject matter experts, you can identify the weaknesses of the e-module using Heyzine Flipbook and then improve it to enhance the product. In addition, a limited trial will be conducted with 32 fourth-grade elementary school students.

Evaluation Stage

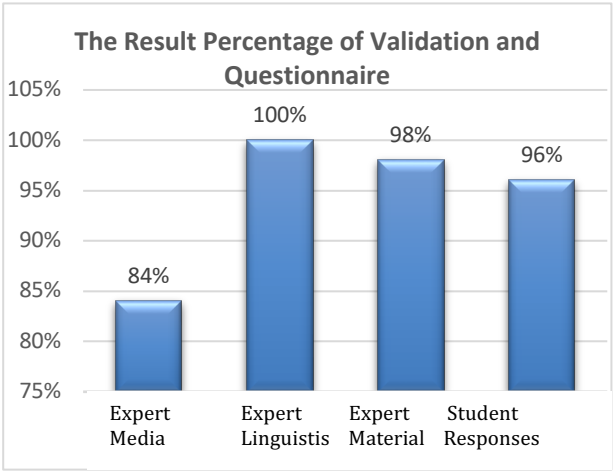
The field test was conducted at SDN Cilangkap 8 Kota Depok in class IV-A, based on issues related to teaching materials that were not yet varied. A summary of student response data using the e-heyzine flipbook 2 module table is as follows:

Table 2. Recapitulation of Learner Responses

Respond	Total Score	Maximum Score	Percentage	Average Percentage
1	10	10	100%	
2	10	10	100%	
3	10	10	100%	
4	09	10	90%	
5	09	10	90%	
6	10	10	100%	
7	09	10	90%	
8	10	10	100%	**96%**
9	10	10	100%	
10	09	10	90%	
11	09	10	90%	
12	10	10	100%	
13	08	10	80%	
14	09	10	90%	
15	10	10	100%	
16	10	10	100%	
17	10	10	100%	
18	10	10	100%	
19	10	10	100%	
20	10	10	100%	
21	10	10	100%	
22	10	10	100%	
23	10	10	100%	
24	10	10	100%	
25	09	10	90%	
26	10	10	100%	
27	10	10	100%	
28	09	10	90%	
29	10	10	100%	

Respond	Total Score	Maximum Score	Percentage	Average Percentage
30	09	10	90%	
31	10	10	100%	
32	08	10	80%	

According to the data collected from 32 students, the e-module material on energy conversion using Heyzine Flipbook received an excellent response score of 96% and was categorized as very good. With a percentage ranging from 90-100%, the use of the e-module material on energy transformation using the Heyzine Flipbook is deemed highly suitable for educational purposes, as shown in the graph below:



Graph 1. Teacher Material Expert Validation

Elements evaluated by subject matter experts include self-directed learning (self-directed), completeness (complete), independence (independent), adaptability (adaptive), and user-friendliness (easy to use). Following are the results of the validation conducted by subject matter experts.

Table 3. Results of the 1st Validation of Teacher Subject Matter Experts

Validation Results of Teacher Material Experts	
Total Score	36
Total Maximum Score	50
Percentage	x 100%
Overall Score	(36:50) x 100% = 72%
Average Total Validation	72%
Criterion	Highly Worth It

Table 3 shows the results of the first validation conducted by subject matter experts on the e-module using a bookmaker, with an explanation that in the initial assessment, subject matter experts obtained a percentage of 72% with acceptable criteria, and there were several notes for improvement.

The following are the results of the validation conducted by subject matter experts, which can be seen in Table 4, as follows:

Table 4. Results of the 2nd Validation of Teacher Subject Matter Experts

Validation Results of Teacher Material Experts	
Total Score	38
Total Maxsimum Score	50

Precentage Overall Score	X 100% (38:50) x 100% = 76%
Average Total Validation	76%
Criterion	Highly Worth It

Figure 4 shows this second validation result, which was done by subject matter experts, who said that 76% of the e-module met the criteria. So, we can say that e-modules made with the book creator are worth testing.

Evaluations obtained from the validation results by media experts, language experts, and subject matter experts on the e-module using flipbook for the material on changing forms of energy, were prepared based on suggestions and input from four validators who presented data on the product validity test results. Total score data was obtained from the average percentage of each validator. The following is the overall validation percentage by media experts, language experts, and subject matter experts, as shown in the following Table 5:

Table 5. Percentage of Total Validity Average Value After Revision

Validator	Total Validity Average Value (RTV)	Criteria *for Using E-modules Heyzine Flipbook*
Ahli Media	80%	Valid/eligible/unrevised.
hli Bahasa	100%	Valid/very feasible/not revised
Ahli Materi Dosen	98%	Valid/very feasible/not revised.
Ahli Materi Guru	76%	Valid/eligible/not revised.
Rata-rata total	88.5%	

According to Table 5, based on the results of validation by media experts, language experts, and subject experts, an average percentage of 88.5% was obtained with the criterion of "Highly feasible." It can therefore be concluded that the electronic module developed using book creator material to change forms of energy is highly feasible for testing in elementary schools.

Student Response Results Products that had been revised by experts were allowed to be tested in one of the fourth-grade classeswith 20 students at SDN Kebon Pedes 5 in Bogor City. The results of the student responses are summarized in the table below.

Table 6. Recapitulation of Learners' Responses

Respond	Total Score	Maximum Score	Presentase	Average Presentation
1	10	10	100%	
2	9	10	90%	
3	10	10	100%	
4	10	10	100%	
5	9	10	90%	
6	9	10	90%	
7	10	10	100%	
8	10	10	100%	
9	10	10	100%	
10	10	10	100%	97%
11	10	10	100%	

Respond	Total Score	Maximum Score	Presentase	Average Presentation
12	10	10	100%	
13	9	10	90%	
14	10	10	100%	
15	9	10	90%	
16	10	10	100%	
17	10	10	100%	
18	10	10	100%	
19	9	10	90%	
20	9	10	90%	

Table 6. Student response summary above shows that the e-module uses book-making materials to convert energy forms to obtain a response value with an average percentage of 97%. The percentage of student evaluations ranges from 81% to 100%, leading to the conclusion that the use of e-modules with Heyzine flipbooks is highly suitable for students and can enhance their interest in learning and understanding educational materials.

These findings align with the research conducted by Erniwati, E., Sudding, S., & Anwar, M. (2022). titled "Development of Research-Based Learning Modules Using the Book Creator Application in Social Studies Instruction to Support Independent Learning Among Elementary School Students." The study states that the development of e-learning modules can capture students' attention and facilitate their understanding of learning materials.

Similarly, research conducted by Sanjaya et al. (2023) titled "E-Module Book Creator Instructional Materials for Teaching Social History in Driving Schools" states that the development of e-modules can enhance students' motivation, enthusiasm, and interest in learning as they contain diverse media and teaching materials that can meet students' needs and learning styles.

Discussion

e-module teaching materials play a very important role in the learning process; these materials can be used as a guide for teachers and students in the learning process to identify and understand the material that students must learn or master. In the learning process, students have not received diverse teaching materials, and they typically only learn using textbooks provided by the school. According to Chairunisa and Zamhari (2022), e-modules are teaching resources that contain comprehensive material with practice questions, are more diverse, engaging, and practical. e-module teaching materials play a vital role as a tool to assist in the learning process.

Observations and interviews revealed several issues in the learning process, including students lacking focus on the material explained by the teacher, students quickly becoming bored, a lack of interactivity, students not maximizing the use of technology, the teaching materials used by teachers being insufficiently diverse, and students' learning outcomes not meeting the minimum competence criteria (KKM) in the learning process because they do not understand the material presented by the teacher. According to Widiana and Rosy (2021), current teaching materials require innovation to align with advancements in science and technology, thereby facilitating student learning and aligning with the school curriculum.

The findings need to be developed into teaching materials in the form of flipbook-based e-learning modules. According to Atmaja (2021), a flipbook is a technological innovation that combines the experience of opening a physical book with interesting features and can be used with mobile devices or computers. The research and development of flipbook-based e-modules uses the ADDIE model (Analysis, Design, Development, Implementation, Evaluation).

the first stage is to conduct an analysis to gather initial information for analyzing needs. In this stage, to identify issues at SDN Cilangkap 08 Kota Depok among fourth-grade students through observation and interviews, obstacles in the learning process were identified. Stage two is the design of the initial format of Heyzine Flipbook by combining images, animations, text, and videos. The third stage is the

development of the e-module to be used in the learning process before it is tested on a limited basis with students. Once the e-module for learning on Heyzine Flipbook is complete, the next step is validation by media experts, language experts, and subject matter experts to assess the suitability of the e-module using Heyzine Flipbook for use in the learning process. Validers evaluate every aspect and provide suggestions and comments.

Results of the media design validation test on the e-module material on energy transformation using Heyzine Flipbook conducted by Mr. M. Iqbal Suriansyah, M. Kom., indicate that the e-module material of energy transformation using Heyzine Flipbook is highly suitable for use. This conclusion is based on the results of the questionnaire assessment that has been completed. the total score obtained was 47 out of a maximum score of 50, representing 84%. From this media test, several criticisms and suggestions were obtained, as written above, including paying attention to colors and fonts that are appropriate for the text in the e-module, as well as adding self-made videos with self-made audio.

The language validation test conducted by language expert Mrs. Aniyah Ekowati, M.Pd., received several criticisms and suggestions as mentioned above. The language prepared in the e-module material on energy transformation using Heyzine Flipbook has met the criteria for high suitability, with a questionnaire score of 50 out of a maximum of 50, representing a percentage of 100%. The suggestions provided to the researcher aim to make the e-module on energy transformation using Heyzine Flipbook more appropriate. Attention should be paid to capitalization, punctuation, and punctuation marks.

Results of material validation conducted by materials expert Mutfi Alfiana Delisa, S.Pd. Received several criticisms and suggestions as written above, the material prepared in the e-module on energy conversion using Heyzine Flipbook has met very feasible criteria with a feasibility questionnaire score of 49 out of a maximum score of 50, with a percentage of 98%. The suggestions provided to the researcher aim to improve the e-module material on energy transformation using Heyzine Flipbook by adding concept maps and images to attract more students' attention.

After undergoing expert validation, the product is ready for testing. During this implementation phase, a limited trial was conducted with 32 fourth-grade students at an elementary school. On this occasion, the researcher provided the students with a link via WhatsApp and coordinated the use of the module. Following the students' use of the e-module on Heyzine Flipbook, they completed a questionnaire with ten questions to assess their responses after using the e-module on the energy transformation material developed using the Heyzine Flipbook. The students' responses demonstrated excellent results, achieving a percentage score of 95.9%, thereby confirming that the use of the e-module via Heyzine Flipbook is highly suitable and effective for student learning.

This finding is corroborated by the findings of Manzil and Anas Thohir (2022), which are documented in their paper entitled "Development of Heyzine Flipbook Interactive E-Module Based on Scientific Water Cycle Materials for Grade V Elementary School Students." The development of e-modules using Heyzine flipbooks is equally effective in increasing students' interest in learning activities. However, the difference in this research lies in the use of different materials and classes for the study. The results of relevant research by Naharin and Zainuddin (2023), entitled 'Development of Heyzine Flipbook-Based E-Modules with Character Education for Elementary School Class IV Social Studies Materials', also support the use of e-modules based on Heyzine flipbooks in elementary school materials and their effectiveness in increasing learning interest. However, the difference in the research lies in the materials used.

CONCLUSION

Based on the development and results of trials and research into e-modules, the following conclusions can be drawn regarding the use of heyzine flipbooks to change the form of energy. The e-modules for changing the form of energy using Heyzine Flipbooks were developed at SDN Cilangkap 08 in the city of Depok using the ADDIE development model.

The results of the validity testing of the e-modules for changing the form of energy using Heyzine Flipbooks are as follows:(1) According to media experts, the qualification is very feasible at 84%; (2) According to linguists, the qualification is very feasible at 100%; (3) According to material experts, the qualification is feasible at 98%. (4) Based on field trials, the qualification is feasible at 96%. It was

concluded that the e-module using a HeyZine Flipbook was feasible and effective in teaching the subject of energy conversion at SDN Cilangkap 08 in the city of Depok.

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