PUSTAKA DIDAKTIS
JURNAL MEDIA DAN MODEL PEMBELAJARAN

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

Development of a PBL-Based Science E-Module Assisted by Heyzine Flipbook on Temperature and Heat: Evaluation of Validity and Practicality

Fitriana Lugi*
Science Education Study Program, Faculty of Teacher Training and Education (FKIP), Samawa University
*Corresponding Author: fitrianalugi@samawa-university.ac.id

Abstract: This study aimed to develop and evaluate the validity and practicality of a Problem-Based Learning (PBL)-based Science E-Module assisted by Heyzine Flipbook on temperature and heat. The study employed a Research and Development (R&D) method using the 4D model, which comprises the Define, Design, Develop, and Disseminate stages, while the article focuses on evaluating product validity and practicality. Validity was assessed by three expert validators using Aiken's V, whereas the practicality test involved 36 Grade VII students at MTsN 4 East Lombok and used a teacher response questionnaire, a student response questionnaire, and a learning implementation observation sheet. The Science E-Module obtained a mean Aiken's V of 0.783 and was classified as valid. Visual design and presentation (0.833), content (0.817), and student motivation (0.806) were classified as highly valid, whereas language (0.792) and construct (0.667) were classified as valid. The practicality results showed a mean student response of 85.53%, classified as highly practical; teacher responses across the evaluated components ranged from 90.00% to 95.45%, also classified as highly practical; and the average learning implementation across three sessions was 84.07%, likewise classified as highly practical. Therefore, the PBL-based Science E-Module assisted by Heyzine Flipbook on temperature and heat was considered valid and highly practical for use in learning.

Article History
Received: July, 2026
Reviewed: July, 2026
Published: August, 2026

Key Words
Science E-Module, Problem-Based Learning, Heyzine Flipbook, temperature and heat.

How to Cite: Lugi, F. (2026). Development of a PBL-Based Science E-Module Assisted by Heyzine Flipbook on Temperature and Heat: Evaluation of Validity and Practicality. *PUSTAKA DIDAKTIS: Jurnal Media dan Model Pembelajaran,* 2(1). 36-54.

This is an open-access article under the CC-BY-SA License.

INTRODUCTION

Digital transformation in education requires teaching materials that not only convey information but are also accessible, engaging, and supportive of independent learning. The use of digital technologies in instruction has expanded through e-modules, online learning, and technology integration across various educational contexts (Ahmad et al., 2024; Daulay et al., 2020; Cronje, 2020; Cahyanto et al., 2022). In science learning, digital teaching materials are particularly important because scientific concepts often require visual representations, step-by-step explanations, and learning resources that students can revisit as needed.

An e-module is a form of digital teaching material that can integrate text, images, illustrations, links, and multimedia elements into a single learning resource. Previous studies have shown that e-modules developed for science and physics learning can produce appropriate teaching materials and support more structured learning experiences (Latifah et al., 2020; Fatimah et al., 2020; Seruni et al., 2019; Hayati et al., 2019; Husna et al., 2020). Therefore, the quality of an e-module should be evaluated in terms of content, presentation, language, visual design, and ease of use before it is implemented more widely.

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

Heyzine Flipbook is one platform that can be used to present e-modules in a digital flipbook format. The platform allows teaching materials to be displayed like a digital book with page navigation and multimedia support, thereby enhancing visual appeal and interactivity. Heyzine-assisted media have been used in integrated science and social studies (IPAS) and physics learning, both as digital flipbooks and e-modules, and have demonstrated good levels of appropriateness and positive user responses (Denisa & Astimar, 2024; Ramdhani, 2025; Fatonah et al., 2025; Pratiwi & Fitria, 2026).

In addition to selecting an appropriate medium, the instructional design embedded in an e-module should encourage students to actively construct knowledge. Problem-Based Learning (PBL) uses problems as the starting point for learning and guides students to identify problems, seek information, conduct investigations, discuss alternative solutions, and communicate their findings. PBL is widely used in science learning because it supports student-centered activities and the development of higher-order thinking skills (Pratiwi & Setyaningtyas, 2020; Kristiana & Radia, 2021; Novianti et al., 2023). Science learning experiences supported by project-based practical activities also highlight the importance of active student engagement in the learning process (Arifin et al., 2023).

Temperature and heat were selected because these topics are closely related to everyday life while still involving a considerable level of abstraction. Students need to distinguish conceptually among temperature, heat, changes in temperature, heat transfer, and changes of state rather than merely memorizing formulas. Research indicates that misconceptions about temperature and heat remain common across educational levels, suggesting a need for representations and learning activities that help students connect observable phenomena with physics concepts (Muliyani et al., 2024). The development of e-modules on temperature and heat using various approaches also indicates that these topics are well suited to structured and contextual digital teaching materials (Wijaya et al., 2023; Hanifa et al., 2024; Sasauw, 2022).

A preliminary study at MTsN 4 East Lombok identified several challenges in the learning process, including inadequate learning media, suboptimal student engagement, and the use of instructional models or methods that were not yet fully aligned with student characteristics and the subject matter. These conditions indicate the need for digital teaching materials that are easy to use, visually engaging, and capable of organizing problem-based learning on temperature and heat.

The integration of PBL with Heyzine Flipbook is considered relevant because the two components serve complementary functions. PBL provides an instructional sequence built around contextual problems, whereas Heyzine Flipbook provides a digital environment for organizing content, illustrations, activities, and learning resources. Studies on Heyzine have shown that digital flipbooks can receive valid and practical ratings from experts and users (Denisa & Astimar, 2024; Fatonah et al., 2025), while PBL-based e-modules assisted by Heyzine have also been reported to demonstrate high validity and practicality in other subject areas (Pratiwi & Fitria, 2026). For temperature and heat, PBL-oriented e-modules have been developed as an alternative form of digital teaching material (Wijaya et al., 2023), and e-modules on the same topic have received favorable user responses when developed using other approaches (Hanifa et al., 2024).

In development research, product quality should not be judged solely from the final appearance; it should also be supported by evidence of validity and practicality. Validity reflects the extent to which the content, construct, language, and presentation of a product align with its development objectives, whereas practicality reflects how easily teachers and students can use the product in learning situations. Evaluating validity and practicality is an

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

important stage before learning materials or instructional tools are implemented more broadly (Arifin et al., 2024; Arifin et al., 2022; Makhrus et al., 2020). The Aiken's V index also provides a quantitative basis for assessing agreement among validators regarding the appropriateness of the content or other aspects of a developed product (Muamar et al., 2021).

Digital e-modules have previously been developed across a range of topics and instructional approaches, including ecosystem e-modules assisted by 3D PageFlip Professional (Ahmad et al., 2024), learning tools evaluated for validity and practicality (Arifin et al., 2024), and research-based modules evaluated for validity (Arifin et al., 2022). However, the specific integration of PBL, Heyzine Flipbook, and temperature and heat for students at the Islamic junior high school level, with a particular focus on validity and practicality, still requires more focused investigation. Previous studies have generally used Heyzine for different topics and grade levels or developed temperature-and-heat e-modules using other platforms and approaches (Denisa & Astimar, 2024; Ramdhani, 2025; Pratiwi & Fitria, 2026; Sasauw, 2022).

Based on this rationale, this study aimed to develop a PBL-based Science E-Module assisted by Heyzine Flipbook on temperature and heat and to evaluate its validity and practicality. The evaluation focused on expert validation, teacher and student responses, and learning implementation as evidence for determining the product's suitability for use.

RESEARCH METHOD

This study employed a Research and Development (R&D) method using the 4D development model, which consists of the Define, Design, Develop, and Disseminate stages (Thiagarajan et al., 1974). The Define stage included analyses of needs, student characteristics, concepts, tasks, and learning objectives. The Design stage involved preparing the initial design of the PBL-based Science E-Module, selecting the format, and integrating temperature-and-heat content into Heyzine Flipbook. The Develop stage included expert validation, product revision, and practicality testing. This article specifically reports the evaluation of product validity and practicality; the Disseminate stage was not the focus of this report.

Product Trial

The product trial was conducted to obtain evidence of the suitability of the PBL-based Science E-Module assisted by Heyzine Flipbook on temperature and heat based on two aspects: validity and practicality. Validity was used to assess the appropriateness of the product and supporting instructional materials based on expert judgment, whereas practicality was used to evaluate ease of use through teacher responses, student responses, and learning implementation.

Implementation of the Practicality Test

After validation and revision based on validator feedback, the PBL-based Science E-Module assisted by Heyzine Flipbook was tested on a limited basis with Grade VII students in the first semester at MTsN 4 East Lombok. The practicality test involved 36 students and was conducted over three learning sessions. Practicality data were collected using a teacher response questionnaire, a student response questionnaire, and a learning implementation observation sheet.

Trial Participants

The study involved three expert validators during the validation stage and 36 Grade VII students at MTsN 4 East Lombok during the practicality-testing stage. A teacher evaluated the practicality of the instructional materials used, while learning implementation was observed across

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

three learning sessions. The main product evaluated was the PBL-based Science E-Module assisted by Heyzine Flipbook on temperature and heat together with its supporting instructional materials.

Types of Data

The study collected validity and practicality data as follows:

1. Validity data consisted of validator ratings of the Learning Objectives Sequence (ATP), the teaching module, and the PBL-based Science E-Module assisted by Heyzine Flipbook.
2. Practicality data consisted of teacher responses, student responses, and observations of learning implementation during the use of the PBL-based Science E-Module assisted by Heyzine Flipbook.

Data Collection Instruments

The data collection instruments used in this study were as follows:

Validity Instrument

The validity instrument was an expert-assessment questionnaire used to obtain evidence of product validity. It included assessments of the Learning Objectives Sequence (ATP), the teaching module, and the PBL-based Science E-Module assisted by Heyzine Flipbook. Relevant aspects included content, presentation, language, visual design, construct, and student motivation.

Practicality Instrument

The practicality instruments consisted of a teacher response questionnaire, a student response questionnaire, and a learning implementation observation sheet. The response questionnaires assessed ease of use, readability, visual design, and the usefulness of the Science E-Module assisted by Heyzine Flipbook, while the observation sheet assessed whether learning activities were implemented in accordance with the PBL stages.

Data Analysis

Validity Analysis

Expert content-validity data were analyzed using Aiken's V. The calculation was based on the scores assigned by the validators to each assessment item (Muamar et al., 2021):

$$V = \frac{\sum s}{[n(c-1)]}$$

Where:
s = r - Lo
n = number of validators
Lo = lowest score on the rating scale
c = number of rating categories
r = score assigned by the validator

Aiken's V coefficients range from 0 to 1. Values closer to 1 indicate stronger agreement among validators regarding the aspect being evaluated. The validity categories used in this study follow the intervals presented in Table 1 (Muamar et al., 2021).

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

Table 1. Aiken's V validity categories

Index	Category
≤ 0.39	Low validity
0.40-0.79	Valid
0.80-1.00	Highly valid

Practicality Analysis

Practicality data were obtained from the teacher response questionnaire, student response questionnaire, and learning implementation observation sheet. The scores were converted into percentages by comparing the total score obtained with the maximum possible score. Practicality percentages were interpreted according to the criteria proposed by Arikunto (2019).

Table 2. Practicality criteria

Percentage Range (%)	Category
0-20	Not Practical
21-40	Less Practical
41-60	Moderately Practical
61-80	Practical
81-100	Highly Practical

(Arikunto, 2019)

RESULT AND DISCUSSION

This study produced a PBL-based Science E-Module assisted by Heyzine Flipbook on temperature and heat. Product evaluation in this article focused on two aspects: validity and practicality. Validity was determined from the assessments of three expert validators of the product and supporting instructional materials, whereas practicality was determined from teacher responses, student responses, and learning implementation during a limited trial.

Expert Validation Results

Validation was conducted by three experts with relevant expertise in science education and instructional-material development. The components validated were the Learning Objectives Sequence (ATP), the teaching module, and the PBL-based Science E-Module assisted by Heyzine Flipbook. The validation results for each component were analyzed using Aiken's V.

ATP Validation Results

The validity of the Learning Objectives Sequence (ATP) was analyzed using Aiken's V and included three main components: content, presentation, and language. The validation results are presented below.

Table 3. ATP validation results

No.	Component	Aiken's V Index	Category
1	Content Validity	0.625	Valid
2	Presentation Validity	0.565	Valid
3	Language Validity	0.583	Valid
	Mean	0.591	Valid

Copyright © the Author(s)

PUSTAKA DIDAKTIS
JURNAL MEDIA DAN MODEL PEMBELAJARAN
Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

Expert validation of the ATP produced Aiken's V values of 0.625 for content, 0.565 for presentation, and 0.583 for language. All three components were classified as valid because their values fell within the 0.40-0.79 interval. The overall mean Aiken's V was 0.591, indicating that the ATP met the validity criterion. Therefore, the ATP was considered suitable for use in learning after revision based on validator feedback.

Table 4. Expert suggestions and revisions to the ATP

No.	Suggestion	Revision
1	Arrange assessment components and learning resources proportionally	Clarify the assessment in each learning activity
2	Allocate time according to the difficulty of the material	Clarify time allocation according to the complexity of the material

Table 4 summarizes expert suggestions and the revisions made to the ATP. First, the experts recommended that assessment components and learning resources be arranged proportionally. This suggestion was addressed by clarifying the assessment in each learning activity to improve structure and alignment with student needs. Second, the experts emphasized that time allocation should reflect the difficulty of the material. The allocation was therefore clarified according to the complexity of the content to support more focused and efficient learning. These revisions were intended to improve the relevance and applicability of the ATP in classroom instruction.

Teaching Module Validation Results

The validity of the teaching module was analyzed using Aiken's V across three main components: content, presentation, and language. The validation results are presented below.

Table 5. Teaching module validation results

No.	Component	Aiken's V Index	Category
1	Content Validity	0.625	Valid
2	Presentation Validity	0.483	Valid
3	Language Validity	0.563	Valid
	Mean	0.557	Valid

As shown in Table 5, all components of the teaching module were classified as valid. Content obtained an Aiken's V of 0.625, presentation 0.483, and language 0.563. The overall mean Aiken's V was 0.557, indicating that the teaching module was considered suitable for use in learning.

Table 6. Expert suggestions and revisions to the teaching module

No.	Suggestion	Revision
1	Adjust the instructional method	Use a method that matches the characteristics of the material to be studied
2	Revise inaccurate wording or wording that does not fit the context	Rewrite sentences in each learning activity so that they are more operational and consistent with the planned steps
3	Consider the time allocation for each phase	Specify the time allocation, align it with the school schedule, and shorten activities in the learning-community phase

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

No.	Suggestion	Revision
4	Avoid using too many action verbs in one sentence	Rewrite sentences using appropriate operational verbs and remove redundant verbs.

Table 6 presents expert suggestions for the teaching module and the revisions made. First, the instructional method was adjusted to better match the characteristics of the material. Second, wording that was inaccurate or inappropriate for the context was revised to make the instructions more operational. Third, time allocations were clarified and aligned with the school schedule. Finally, sentences containing too many action verbs were simplified by using more precise operational verbs.

Science E-Module Validation Results

The validity of the PBL-based Science E-Module assisted by Heyzine Flipbook was analyzed using Aiken's V across five components: language, visual design and presentation, content, construct, and student motivation. The validation results are presented in Table 7.

Table 7. Science E-Module validation results

No.	Component	Aiken's V Index	Category
1	Language Validity	0.792	Valid
2	Visual Design and Presentation Validity	0.833	Highly Valid
3	Content Validity	0.817	Highly Valid
4	Construct	0.667	Valid
5	Student Motivation	0.806	Highly Valid
	Mean	0.783	Valid

Table 7 shows that three of the five evaluated components were classified as highly valid: visual design and presentation (0.833), content (0.817), and student motivation (0.806). Language (0.792) and construct (0.667) were classified as valid. The overall mean Aiken's V was 0.783, indicating that the Science E-Module was generally valid and suitable for use in learning.

Table 8. Expert suggestions and revisions to the PBL-Based science E-Module assisted by heyzine flipbook

No.	Suggestion	Revision
1	Increase the number of animations	Add animations to the material pages
2	Improve font size	Adjust the font size according to the recommendation
3	Replace the term bibliography with references	Change the bibliography page to a references page
4	Remove the separate frames for objectives and competency-achievement indicators	Place the indicators in the header of each material page

Table 8 presents expert suggestions and revisions to the Science E-Module. First, the recommendation to increase the number of animations was addressed by adding animations to the material pages to make them more engaging and interactive. Second, the font size was adjusted according to expert recommendations to improve readability. Third, the term "bibliography" was

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

replaced with "references" to use more appropriate terminology. Finally, the separate frames for learning objectives and competency indicators were removed, and the indicators were placed directly in the header of each material page. These revisions were intended to improve the appearance, clarity, and attractiveness of the PBL-based Science E-Module.

Validation is an important stage for ensuring that a developed product is aligned with learning objectives, content characteristics, and user needs. In this study, three validators assessed the product and its supporting instructional materials using Aiken's V. The use of multiple validators and expert-agreement analysis provides a more objective basis for evaluating the validity of product content, presentation, language, and construct (Muamar et al., 2021; Arifin et al., 2024).

The validation results showed mean Aiken's V values of 0.591 for the ATP, 0.557 for the teaching module, and 0.783 for the Science E-Module. All values were classified as valid according to the criteria used. For the Science E-Module specifically, visual design and presentation (0.833), content (0.817), and student motivation (0.806) were highly valid, whereas language (0.792) and construct (0.667) were valid.

These findings are consistent with development studies that treat validity as a prerequisite before a product is used in a trial. Arifin et al. (2024) showed that validity and practicality evaluations can be used to assess the readiness of instructional materials, while Arifin et al. (2022) emphasized the importance of content, presentation, and construct validation in module development. In physics education, the validity of instructional materials is also used as a basis for determining suitability prior to implementation (Makhrus et al., 2020).

The relatively high validity of the Science E-Module in terms of visual design, presentation, and content indicates that the Heyzine Flipbook format can accommodate the need for systematic and engaging presentation of learning materials. This finding is consistent with Heyzine-based media developed for IPAS learning that received valid expert ratings (Denisa & Astimar, 2024) and with Heyzine-based electronic physics modules that emphasize accessibility and the visual appeal of digital teaching materials (Ramdhani, 2025). E-modules developed using other flipbook software likewise show that visual design and presentation are important components of media validity (Ahmad et al., 2024).

Validator feedback was subsequently used to improve the product, particularly its animations, font size, terminology, learning indicators, sentence clarity, and time allocation. These revisions are important because the practicality of digital media is strongly influenced by readability, navigational clarity, and presentation quality. Fatonah et al. (2025) showed that Heyzine can support flipbook media with clear structure, engaging visuals, and interactive features, while Pratiwi and Fitria (2026) reported that PBL-based e-modules assisted by Heyzine can receive valid and practical ratings from experts and users.

For the temperature-and-heat content, revisions to the material and PBL activities were directed toward presenting everyday phenomena, conceptual representations, and problem-solving steps in a more structured manner. This is important because misconceptions about temperature and heat remain possible (Muliyani et al., 2024). Previous temperature-and-heat e-modules also show that content organization, visualization, and learning activities are important elements in determining the suitability of digital teaching materials (Wijaya et al., 2023; Hanifa et al., 2024; Sasauw, 2022).

Overall, the validation results indicate that the PBL-based Science E-Module assisted by Heyzine Flipbook on temperature and heat, together with its supporting instructional materials, met the validity criteria and was suitable to proceed to practicality testing after revision based on validator suggestions.

Copyright © the Author(s)

PUSTAKA DIDAKTIS
JURNAL MEDIA DAN MODEL PEMBELAJARAN
Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

Practicality Test Results

The practicality test was conducted with one Grade VII class at MTsN 4 East Lombok consisting of 36 students. The trial used the PBL-based Science E-Module assisted by Heyzine Flipbook on temperature and heat. The purpose was to determine ease of use based on teacher responses, student responses, and learning implementation.

Practicality data were collected after the product had been declared valid and revised based on expert feedback. Teacher responses were used to evaluate the practicality of the instructional materials from the educator's perspective, student responses were used to evaluate the user experience, and implementation observations were used to assess whether learning activities followed the intended instructional design.

Teacher Response Results

Teacher responses evaluated the practicality of three components: the ATP, the teaching module, and the PBL-based Science E-Module assisted by Heyzine Flipbook. The results are presented in Figure 1.

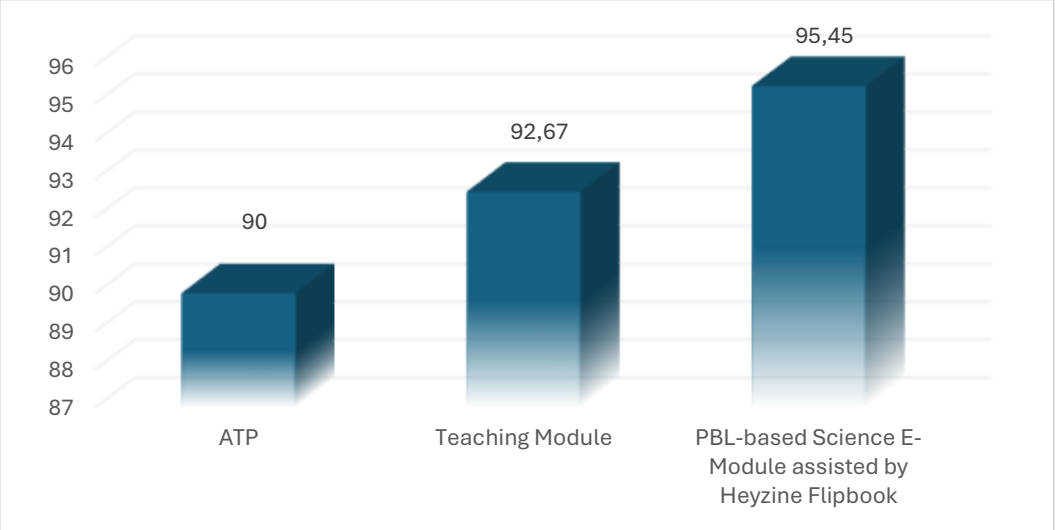

Figure 1. Teacher response results

Detailed percentages for each component in the teacher response questionnaire are presented in Tables 9-11.

Table 9. Teacher responses to the ATP

No.	ATP Aspect	Score Obtained	Maximum Score	Practicality Percentage
1.	The ATP identity is clear and complete	9	10	90.00
2.	The sequence of learning objectives for achieving the expected competencies is clear	8	10	80.00
3.	Learning-outcome assessment is clearly formulated (critical thinking and scientific attitudes)	9	10	90.00
4.	Time allocation is appropriate	10	10	100

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

No.	ATP Aspect	Score Obtained	Maximum Score	Practicality Percentage
	for the lesson period			
5.	The model and methods used support the expected learning outcomes	9	10	90.00
Mean				90.00

Teacher responses to the Learning Objectives Sequence (ATP) produced an average practicality score of 90.00%. The clarity of the ATP identity and the assessment component each received 90.00%, while the clarity of the learning-objective sequence received 80.00%. Time allocation received 100%, and the suitability of the instructional model and method received 90.00%. Overall, the ATP was considered practical for supporting Problem-Based Learning (PBL).

Table 10. Teacher responses to the teaching module

No.	Teaching Module Aspect	Score Obtained	Maximum Score	Practicality Percentage
1	The teaching-module identity is written completely and clearly in accordance with the ATP	9	10	90.00
2	Time allocation is determined according to the needs for achieving the learning outcomes	9	10	90.00
3	Alignment of learning objectives with learning outcomes	9	10	90.00
4	Learning objectives are formulated using operational verbs	9	10	90.00
5	The learning-objective formulation includes audience, behavior, conditions, and degree	10	10	100
6	The learning objectives develop students' potential in attitudes, knowledge, and skills	9	10	90.00
7	Relevance of the material to the learning outcomes	9	10	90.00
8	The sequence of material is logical and systematic	10	10	100
9	Encourages students to be active in classroom learning	10	10	100
10	Appropriateness of the methods, models, and approaches used to achieve the learning outcomes	10	10	100
11	Learning activities support the student inquiry process	9	10	90.00

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

No.	Teaching Module Aspect	Score Obtained	Maximum Score	Practicality Percentage
12	Learning activities can improve students' critical thinking skills	10	10	100
13	Learning activities can strengthen students' scientific attitudes	9	10	90.00
14	Alignment of the learning media with the material taught	9	10	90.00
15	Alignment of learning steps with the PBL stages	8	10	80.00
Mean				92.67

Teacher responses to the teaching module yielded an average practicality score of 92.67%, placing it in the highly practical category. Several components received 100%, including the learning-objective format, sequence of content, student engagement, appropriateness of methods/models/approaches, and support for critical thinking skills. Most other components received 90.00%, while alignment of the learning steps with the PBL stages received the lowest score of 80.00%. These results indicate that the teaching module is highly practical, although the alignment of the learning activities with the PBL syntax should be further strengthened.

Table 11. Teacher responses to the PBL-based science E-Module assisted by heyzine flipbook

No.	Science E-Module Aspect	Score Obtained	Maximum Score	Practicality Percentage
1	The e-module design is attractive and appropriate for the temperature-and-heat topic	10	10	100
2	The visual appearance, colors, and image layout in the e-module are attractive	9	10	90.00
3	The PBL stages are easy for students to understand	10	10	100
4	The presentation of temperature-and-heat content is complete, logical, and coherent	10	10	100
5	The questions are aligned with the material presented in the e-module	10	10	100
6	The e-module supports the student inquiry process	10	10	100
7	The e-module can improve students' critical thinking skills	10	10	100
8	The e-module can strengthen students' scientific attitudes	9	10	90.00
9	Contains a student worksheet (LKPD) for simple experiments that support	9	10	90.00

Copyright © the Author(s)

PUSTAKA DIDAKTIS
JURNAL MEDIA DAN MODEL PEMBELAJARAN
Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

No.	Science E-Module Aspect	Score Obtained	Maximum Score	Practicality Percentage
	students' critical thinking and scientific attitudes			
10	The language is easy to understand and appropriate for the educational level	10	10	100
11	The text follows standard Indonesian writing conventions	8	10	80.00
Mean				95.45

Teacher responses to the PBL-based Science E-Module assisted by Heyzine Flipbook yielded an average practicality score of 95.45%, placing it in the highly practical category. Several components received 100%, including the e-module design, completeness and logical sequence of the material, alignment of questions with the material, clarity of the PBL stages, and support for student inquiry and critical thinking. Visual presentation, support for scientific attitudes, and inclusion of worksheets for simple experiments received 90.00%. The lowest score, 80.00%, was assigned to compliance with standard Indonesian writing conventions; therefore, language use remains an area for further refinement.

Student Response Results

Student responses evaluated three aspects: learning activities, the Science E-Module, and the use of interactive digital media in learning. The results are presented in Figure 2.

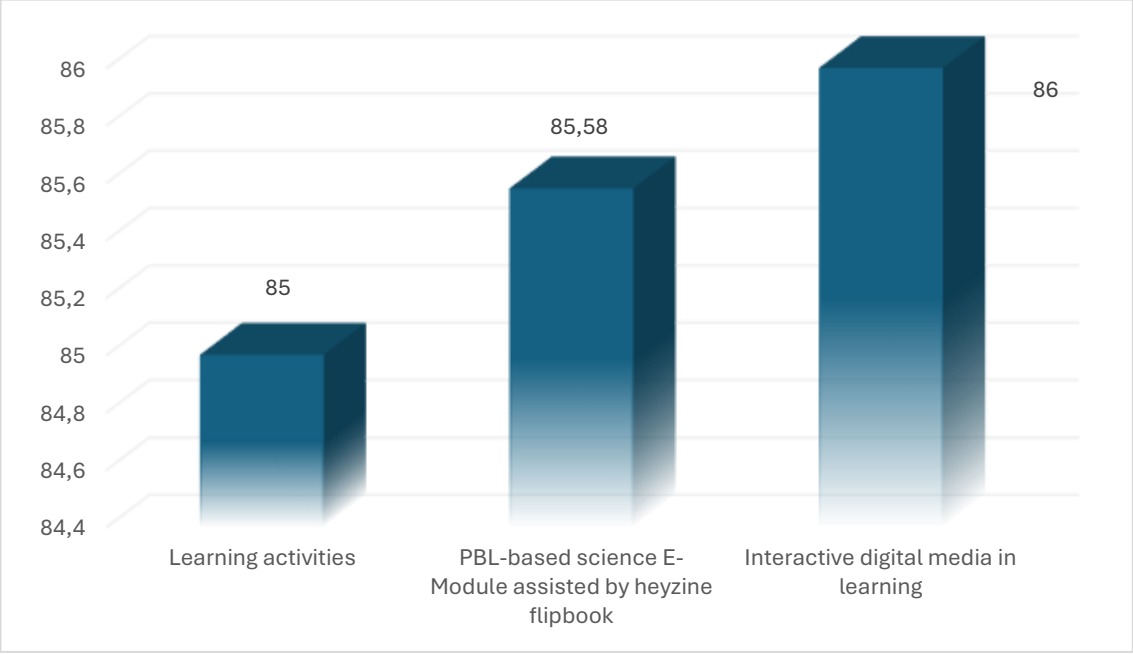

Figure 2. Student response results

Detailed percentages for each aspect of the student response questionnaire are presented in Tables 12-14.

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

Table 12. Student responses to learning activities

No.	Learning Activity Aspect	Score Obtained	Maximum Score	Practicality Percentage
1	Motivation while participating in learning activities using the Science E-Module assisted by interactive digital media on temperature and heat	114	150	76.00
2	Active participation during learning activities	134	150	89.00
3	The problems presented encourage me to investigate	108	150	72.00
4	Students are given opportunities to ask and answer questions orally	132	150	88.00
5	Students are given opportunities to strengthen their understanding of temperature and heat through practical activities using interactive digital media	132	150	88.00
6	Students are given opportunities to use experimental equipment	132	150	88.00
7	Students are given opportunities to conduct careful examinations to evaluate the proposed hypothesis	114	150	76.00
8	Students are given opportunities to draw conclusions from the discussion	133	150	88.70
9	Students are more active in group work during learning activities	139	150	92.70
10	Experimental activities conducted during learning stimulate curiosity	132	150	88.00
11	Provides a meaningful learning experience	128	150	85.30
12	Helps students understand the material	132	150	88.00
Mean				85.00

Table 12 shows that student responses to the practicality of learning activities using the Science E-Module averaged 85.00%, placing them in the highly practical category. The highest percentage, 92.70%, was obtained for active participation in group work, whereas the lowest percentage, 72.00%, was obtained for the extent to which the problems encouraged investigation. These results indicate that the learning activities were generally practical to implement, although the problem scenarios should be strengthened to better stimulate student inquiry.

Table 13. Student Responses to the Science E-Module

No.	Science E-Module Aspect	Score Obtained	Maximum Score	Practicality Percentage
1	The e-module design is attractive and appropriate for the temperature-and-heat topic	120	150	80.00

Copyright © the Author(s)

PUSTAKA DIDAKTIS
JURNAL MEDIA DAN MODEL PEMBELAJARAN
Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

No.	Science E-Module Aspect	Score Obtained	Maximum Score	Practicality Percentage
2	The visual appearance, colors, and image layout in the e-module are attractive	125	150	83.33
3	The PBL stages are easy for students to understand	120	150	80.00
4	The presentation of temperature-and-heat content is complete, logical, and coherent	122	150	81.33
5	The questions are aligned with the material presented in the e-module	129	150	86.00
6	The e-module supports the student inquiry process	129	150	86.00
7	The e-module can improve students' critical thinking skills	127	150	84.67
8	The e-module can strengthen students' scientific attitudes	132	150	88.00
9	Contains a student worksheet (LKPD) for simple experiments that support students' critical thinking and scientific attitudes	135	150	90.00
10	The language is easy to understand and appropriate for the educational level	138	150	92.00
11	The text follows standard Indonesian writing conventions	135	150	90.00
Mean				85.58

Table 13 shows that student responses to the practicality of the Science E-Module on temperature and heat averaged 85.58%, placing it in the highly practical category. The highest percentage, 92.00%, was obtained for language that was easy to understand and appropriate for the students' educational level. A score of 90.00% was obtained for appropriate text writing and for the inclusion of worksheets for simple experiments. The lowest percentage, 80.00%, was obtained for e-module design and the clarity of the PBL stages. These findings indicate that the e-module is practical to use, although its visual design and presentation of the PBL sequence can still be improved.

Table 14. Student responses to interactive digital media

No	Interactive Digital Media Aspect	Score Obtained	Maximum Score	Practicality Percentage
1	The interactive digital media design for temperature and heat is attractive	127	150	84.70
2	The interactive digital media on temperature and heat are easy to use	127	150	84.70
3	Practical activities are easier and more engaging when using the learning media	133	150	88.70
4	The interactive digital media make it easier for me to understand the concepts of temperature and heat	131	150	87.30
5	Problems in the student worksheet	133	150	89.00

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

No	Interactive Digital Media Aspect	Score Obtained	Maximum Score	Practicality Percentage
	(LKPD) can be investigated through experiments using interactive digital media on temperature and heat			
6	Practical activities using the media help students conduct systematic observations and investigations	117	150	78.00
7	Practical activities using the media can improve critical thinking skills	130	150	86.70
8	Practical activities using the media can strengthen scientific attitudes	126	150	84.00
9	Learning with interactive digital media on temperature and heat illustrates the relevance of these concepts to everyday life	137	150	91.00
Mean				86.00

Table 14 shows that student responses to the practicality of interactive digital media averaged 86.00%, placing it in the highly practical category. The highest percentage, 91.00%, was obtained for the media's ability to illustrate the relevance of temperature and heat to everyday life. The lowest percentage, 78.00%, was obtained for the extent to which practical activities supported systematic observation and inquiry. These results indicate that the interactive digital media helped students understand temperature and heat and supported learning activities, although the inquiry instructions should be made clearer.

Learning Implementation Observation Results

The learning implementation observations assessed the extent to which the PBL-based Science E-Module could be used according to the intended instructional design. The observations focused on teacher activities and the alignment of the learning stages with the teaching module. The results from three sessions are presented in Figure 3.

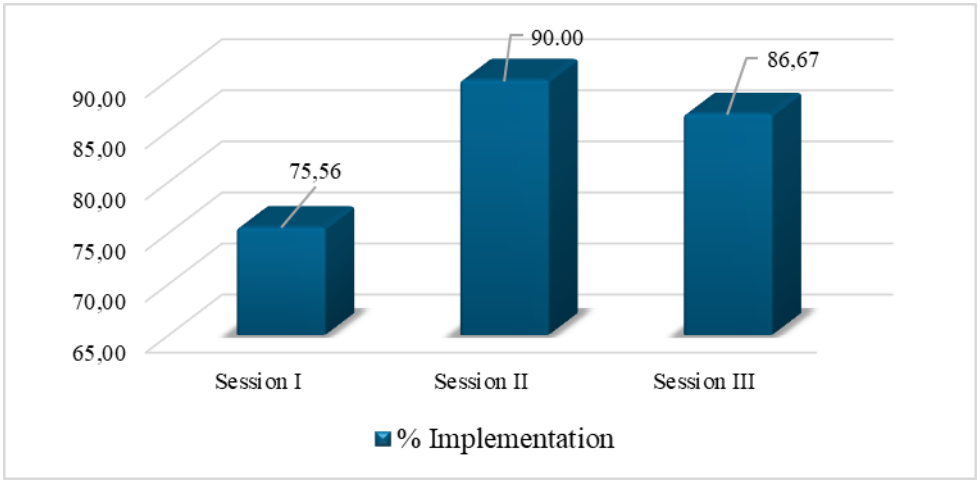

Figure 3. Learning implementation observation results

As shown in Figure 3, learning implementation was 75.56% in Session I, increased to 90.00% in Session II, and reached 86.67% in Session III. The average implementation across the

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

three sessions was 84.07%, placing it in the highly practical category. Variation across sessions suggests an adaptation process in using the Science E-Module and following the PBL sequence; overall, however, the learning activities were implemented according to the planned design.

The limited trial showed consistency between user responses and learning implementation. Teachers rated all components as practical to highly practical, student responses across the three aspects ranged from 85.00% to 86.00%, and average learning implementation reached 84.07%. These three sources of evidence indicate that the product could be used effectively in the trial classroom.

These practicality findings are consistent with Denisa and Astimar (2024), who reported that digital flipbook media developed using Heyzine received practical ratings from teachers and students. Fatonah et al. (2025) likewise emphasized that clear structure, engaging visuals, and interactive features are important characteristics of Heyzine media that support classroom use. In the development of PBL-based e-modules assisted by Heyzine, Pratiwi and Fitria (2026) reported high practicality based on teacher and student responses.

For temperature and heat, product practicality was also supported by the alignment between PBL activities and digital presentation. Contextual problems can be used to initiate learning activities, while Heyzine Flipbook provides a platform for presenting conceptual explanations, images, and activities in a logical sequence. This is consistent with the development of PBL-oriented temperature-and-heat e-modules (Wijaya et al., 2023) and with temperature-and-heat e-modules developed using other approaches that received positive user responses (Hanifa et al., 2024). Thus, product practicality is related not only to the technical usability of the media but also to the integration of instructional design, content, and digital format.

CONCLUSION

Based on the findings, the PBL-based Science E-Module assisted by Heyzine Flipbook on temperature and heat met the criteria for validity and high practicality.

1. The Science E-Module obtained a mean Aiken's V of 0.783 and was classified as valid. Visual design and presentation, content, and student motivation were classified as highly valid, whereas language and construct were classified as valid.
2. The practicality results showed that student responses across three aspects ranged from 85.00% to 86.00% and were classified as highly practical, teacher responses to the evaluated components ranged from 90.00% to 95.45%, and average learning implementation was 84.07%, also classified as highly practical. These results indicate that the product is suitable for use as a digital teaching material for learning temperature and heat.

RECOMMENDATIONS

Based on the findings, the PBL-based Science E-Module assisted by Heyzine Flipbook is recommended as an alternative digital teaching material for learning temperature and heat due to its high validity and practicality. Further research is recommended to evaluate its effectiveness in improving students' conceptual understanding, critical thinking skills, and scientific literacy using experimental or quasi-experimental designs. Future developments may also expand the content coverage and integrate additional interactive features to enhance students' engagement and learning experiences.

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

ACKNOWLEDGMENTS

The authors express their gratitude to the expert validators, teachers, Grade VII students at MTsN 4 East Lombok, and all parties who supported the development and practicality testing of the PBL-based Science E-Module assisted by Heyzine Flipbook on temperature and heat.

REFERENCES

Ahmad, A. A., Ramdani, A., Andayani, Y., & Hariadi, I. (2024). Pengembangan E-Modul Ekosistem Berbasis Model *Culturally Responsive Transformative Teaching* dengan Pendekatan *Socio-Scientific Issues* Berbantuan Software 3D Pageflip Professional. *Journal of Classroom Action Research, 6*(3), 673–685. https://doi.org/10.29303/jcar.v6i3.9035

Arifin, A. A., Armiani, S., Fitriani, H., & Efendi, M. H. (2022). Validitas Modul Biologi Terapan Berbasis Riset Pada Konsep Pemanfaatan Antosianin Kulit Terong Ungu Sebagai Biosensor. *Reflection Journal, 2*(2), 82–96. https://doi.org/10.36312/rj.v2i2.727

Arifin, A. A., Doyan, A., Mahrus, M., Susilawati, S., Andayani, Y., & Muntari, M. (2023). PjBL Learning Training Based on Science Practicum Tools DNA and RNA Structures at the Attohiriyah Alfadiliyah Islamic Boarding School. *Unram Journal of Community Service, 4*(2), 37–43. https://doi.org/10.29303/ujcs.v4i2.453

Arifin, A. A., Ramdani, A., & Andayani, Y. (2024). Development of Learning Tools Based on the *Culturally Responsive Transformative Teaching* Model with a *Socio-Scientific Issues* Approach: Evaluation of Validity and Practicality. *Jurnal Penelitian Pendidikan IPA, 10*(11), 9141–9155. https://doi.org/10.29303/jppipa.v10i11.9188

Arikunto, S. (2019). *Prosedur Penelitian*. Rineka Cipta.

Cahyanto, A., Lesmono, A. D., & Handayani, R. D. (2022). Pengembangan E-Modul Interaktif Berbasis Articulate Storyline 3 untuk Melatihkan Kemampuan Berfikir Kritis pada Pokok Bahasan Gelombang Bunyi. *Jurnal Literasi Pendidikan Fisika, 3*(2), 154–164. https://doi.org/10.30872/jlpf.v3i2.1551

Cronje, J. C. (2020). Towards a new definition of blended learning. *Electronic Journal of E-Learning, 18*(2). https://doi.org/10.34190/EJEL.20.18.2.001

Daulay, R. S., Pulungan, H., Noviana, A., & Hurhaliza, S. (2020). Manfaat Teknologi Smartphone di Kalangan Pelajar sebagai Akses Pembelajaran di Masa Pandemi Corona-19. *Jurnal Pendidikan Islam, 1*(15). https://doi.org/10.56114/al-ulum.v1i1.7

Denisa, S. B., & Astimar, N. (2024). Pengembangan media flipbook digital menggunakan aplikasi Heyzine pada pembelajaran IPAS di kelas V sekolah dasar. *Pendas: Jurnal Ilmiah Pendidikan Dasar, 9*(4), 112–126. https://doi.org/10.23969/jp.v9i4.17140

Fatonah, K., Fadli, M. R., Sadikin, I. S., & Mujazi. (2025). Media Flipbook Based on Heyzine Application by Elementary School Teachers in Supporting Interactive Learning. *Journal of Education and Teaching (JET), 6*(3), 792–812. https://doi.org/10.51454/jet.v6i3.697

Fatimah, S., Serevina, V., & Sunaryo. (2020). Pengembangan Modul Elektronik Fisika Berbasis I-SETS Berbantuan Articulate Storyline pada Materi Gelombang Cahaya. *Prosiding Seminar Nasional Fisika (E-Journal), 9*, 16–24.

Hanifa, H. N., Putri, D. H., & Hamdani, D. (2024). Pengembangan e-modul fisika berbasis *Contextual Teaching and Learning* (CTL) pada materi suhu dan kalor untuk

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

meningkatkan motivasi belajar siswa SMA. *Navigation Physics: Journal of Physics Education, 6*(1). https://doi.org/10.30998/npjpe.v6i1.2453

Hayati, I. A., Rosana, D., & Sukardiyono, S. (2019). Pengembangan modul potensi lokal berbasis SETS untuk meningkatkan keterampilan proses IPA. *Jurnal Inovasi Pendidikan IPA, 5*(2), 248–257. http://dx.doi.org/10.21831/jipi.v5i2.27519

Husna, A., Hasan, M., Mustafa, M., Syukri, M., & Yusrizal, Y. (2020). Pengembangan modul fisika berbasis integrasi Islam-sains pada materi gerak lurus untuk meningkatkan hasil belajar peserta didik. *Jurnal Pendidikan Sains Indonesia, 8*(1), 55–66. https://doi.org/10.24815/jpsi.v8i1.15539

Kristiana, T. F., & Radia, E. H. (2021). Meta analisis penerapan model *Problem Based Learning* dalam meningkatkan hasil belajar IPA siswa sekolah dasar. *Jurnal Basicedu, 5*(2), 818–826.

Latifah, N., Ashari, A., & Kurniawan, E. S. (2020). Pengembangan e-Modul Fisika untuk meningkatkan kemampuan berpikir kritis peserta didik. *Jurnal Inovasi Pendidikan Sains (JIPS), 1*(1), 1–7.

Makhrus, M., Wahyudi, M., Taufik, M., & Zuhdi, M. (2020). Validitas perangkat pembelajaran berbasis CCM-CCA pada materi dinamika partikel. *Jurnal Pijar MIPA, 15*(1), 54–58. http://dx.doi.org/10.29303/jpm.v14i3.1230

Muamar, A., Retnoningsih, A., & Anggraito, Y. U. (2021). Content validity test on moss plant e-book media with Aiken formula. *Journal of Science Education Research, 5*(1), 6–13.

Muliyani, R., Suhandi, A., Prima, E. C., & Muslim. (2024). Unveiling heat and temperature misconceptions: A multilocation study on first-year college students in Indonesia. *Jurnal Ilmiah Pendidikan Fisika, 8*(3), 361–371. https://doi.org/10.20527/jipf.v8i3.13278

Novianti, N., Zaiyar, M. Z., Khaulah, S., Fitri, H., & Jannah, R. (2023). Pengembangan E-Modul Berbasis *Problem Based Learning* terhadap kemampuan berfikir kritis siswa. *JISIP (Jurnal Ilmu Sosial dan Pendidikan), 7*(3), 2369–2375.

Pratiwi, E. T., & Setyaningtyas, E. W. (2020). Kemampuan berpikir kritis siswa melalui model pembelajaran *Problem Based Learning* dan model pembelajaran *Project Based Learning*. *Jurnal Basicedu, 4*(2). https://doi.org/10.31004/basicedu.v4i2.362

Pratiwi, R., & Fitria, Y. (2026). Pengembangan e-modul berbasis *Problem Based Learning* berbantuan Heyzine Flipbook pada materi sistem pernapasan manusia di kelas V sekolah dasar. *Pendas: Jurnal Ilmiah Pendidikan Dasar, 11*(2), 241–251. https://doi.org/10.23969/jp.v11i02.45780

Ramdhani, N. D. (2025). The creation of flipbook-based electronic teaching modules using the Heyzine website on static electricity material for class XII students. *Journal of Advances in Physics Education, 1*(1), 1–12. https://doi.org/10.23960/jape.v1i1.361

Sasauw, D. P. (2022). Pengembangan E-Modul pada materi suhu dan kalor berbasis Brain-Based Learning. *KUANTUM: Jurnal Pembelajaran dan Sains Fisika, 3*(2), 28–36. https://doi.org/10.5281/zenodo.10052214

Seruni, R., Munawarah, S., Kurniadewi, F., & Nurjayadi, M. (2019). Pengembangan Modul Elektronik (E-Modul) Biokimia pada materi metabolisme lipid menggunakan Flip PDF Professional. *JTK: Jurnal Tadris Kimiya, 4*(1), 48–56.

Thiagarajan, S., Semmel, D. S., & Semmel, M. I. (1974). *Instructional Development for Training Teachers of Exceptional Children: A Sourcebook*. Indiana University.

Copyright © the Author(s)

Vol.2, No.1 (*August* – 2026)
E-ISSN: 3110-1429
pp.36-54

Wijaya, F. W., Suyanto, Taufiqqurachman, & Febriansyah, M. R. (2023). Pengembangan E-Modul Suhu dan Kalor Berorientasi *Problem Based Learning* (PBL) untuk Meningkatkan Higher Order Thinking Skills (HOTS). *Jurnal Genta Mulia, 14*(2). https://doi.org/10.61290/gm.v14i2.661

Copyright © the Author(s)