Jurnal Ilmiah Pendidikan Fisika
https://ppjp.ulm.ac.id/journals/index.php/jipf/index
e-ISSN: 2549-9963 p-ISSN: 2549-9955
Vol 9 No 2 2025
DOI: https://doi.org/10.20527/jipf.v9i2.15298

Design of Integrated Science Electronic Book Temperature and Heat Material Loaded with Ethnoscience Batik Besurek Bengkulu

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Article Info

Article history:
Received: May 9, 2025
Accepted: May 28, 2025
Published: June 9, 2025

Keywords:
Batik besurek
Electronic book
Ethnoscience
Integrated science

Abstract

Science learning in schools tends to be theoretical and less related to real contexts, so students have difficulty understanding the application of concepts in everyday life. One of the causes is the lack of teaching materials that integrate local wisdom. This study aims to examine the concepts of science in the local wisdom of making Batik Besurek to be developed as ethnoscience content in integrated science e-books and to determine the level of validity and student response to the product. The method used is research and development (R&D), according to Borg and Gall (1983), using the Model of Educational Reconstruction (MER) approach. Data were obtained through questionnaires, observations, and interviews. The results of the study showed that the process of making Batik Besurek contains the concepts of temperature and heat, expansion, changes in the state of matter, physical changes, heat transfer, and Black's principle, which can be integrated into the content of the Integrated Science Electronic Book. The developed electronic book obtained a very high level of validity with an average V index of 0.86 and a percent agreement of 89.27%. The students' response to the book was also excellent, with an average percentage of 89.42%. The results concluded that the Integrated Science electronic book containing the ethnoscience of Batik Besurek Bengkulu was considered valid teaching material worthy of being tested for effectiveness in future research.

To cite this article: Triana, D. F., Sutarno, S., Karyadi, B., Mahardiani, L., & Mayub, A. (2025). Design of integrated science electronic book temperature and heat material loaded with ethnoscience batik besurek Bengkulu. *Jurnal Ilmiah Pendidikan Fisika, 9*(2), 200-214.

INTRODUCTION

Natural Sciences combines several disciplines, such as physics, chemistry, and biology, so its learning requires integrating various concepts from these three fields. The contextual approach is often applied in science learning because it can relate the material to real-life situations, making it easier for students to understand. Contextual-based science learning could enrich the learning experience and improve students' ability to understand the environment to find concepts in a whole, meaningful, authentic, and active manner (Suryawati & Osman, 2018; Widiastuti, 2020).

The learning process with a contextual approach is used because of the awareness that some students understand concepts textually but experience difficulties when asked to

relate them to real conditions. The complexity of science theories is one reason why students only memorize without understanding their functions and applications (Jundu et al., 2020). Learning will be more effective if students can relate the material's content to relevant learning contexts and processes (Putri et al., 2023; Samsudin et al., 2023). Scientific concepts with real-life conditions can be strengthened by applying ethnoscience approaches, which integrate local knowledge and culture into teaching and learning (Lestari, 2025).

Local wisdom from Bengkulu that can be integrated into science learning is making Batik Besurek fabric. Batik Besurek has been recognized as Indonesia's Intangible Cultural Heritage since 2015 (Khalish & Solihat, 2023). Making Batik Besurek Bengkulu fabric is carried out in stages such as *mencanting*, *mencolet*, *menembok*, *mewarna*, *melorod*, and *menjemur*. The stages of making Batik Besurek are related to the material in science learning, including temperature and heat. This temperature and heat material is also integrated with other science concepts, including expansion, measurement, changes in the form of substances, and physical changes. These materials can be developed as science teaching material.

Based on the results of observations made in Bengkulu City, no science teaching materials integrate Batik Besurek Bengkulu either in the form of conventional books or electronic books. Previous studies have shown the effectiveness of contextual and ethnoscience approaches in science learning, such as research by Dewi et al. (2021), who developed contextual science teaching materials for junior high school students and were proven to increase students' relevance to the material. Paul and Tamaela (2023) also succeeded in creating a science teaching module based on a contextual approach that makes it easier for students to understand science concepts through authentic experiences. The availability of teaching materials with science materials integrating Batik Besurek Bengkulu is very important to develop, especially by utilizing digital technology to enrich students' learning experiences. Digital teaching materials are expected to increase time efficiency in teaching and learning activities and support aspects of accessibility, flexibility, and interactivity so that the learning process becomes more dynamic (Hidayah, 2022; Simangunsong, 2024). One of the innovations that can be applied to learning is using integrated science electronic books as teaching materials. Integrated Science e-books are one of the media designed with materials that are integrated and interconnected between one concept and another.

Several other studies that also develop ethnoscience-based teaching materials, such as (Rahayu & Sudarmin, 2015), use the Yogyakarta batik-making process to associate the concepts of solution and mixture. Fahrozy et al. (2022) developed teaching materials from the tempeh fermentation process as a context to explain biological materials. However, these teaching materials generally only raise one branch of science and have not integrated all concepts in an integrated manner. In addition, the cultural focus raised does not include the local heritage of Bengkulu.

Based on the description of the problems and potentials above, the purpose of this study is to examine the scientific concepts contained in the process of making Batik Besurek to become the content of the Integrated Science Electronic Book containing the ethnoscience of Batik Besurek Bengkulu and test the validity and response of students to the electronic books that have been developed. The results of this research are expected to produce teaching materials in the form of integrated science electronic books and temperature and heat materials containing valid ethnoscience of Batik Besurek Bengkulu. The implications of learning using integrated science teaching materials that integrate local culture can increase students' understanding of science concepts (Nuur & Ahsani, 2025), foster a sense of love for the nation's culture, and make science learning more contextual and meaningful

(Luthfi et al., 2024). This research lies in the direct integration of the process of making Besurek Batik, which has never been used as a source of ethnoscience in digital science teaching materials as the main context in the development of integrated science e-books so that it becomes a unique contribution to the development of local culture-based teaching materials in the Bengkulu area.

METHODS

The type of research used in this study is research and development using the steps of the development model of Borg and Gall (1983) (Aka, 2019). The research stage consists of ten stages, but the research is limited to the fifth stage. This development model has stages that can be associated with the MER (Model of Educational Reconstruction) model, with systematic and detailed but straightforward stages, so that it is easy to understand. Table 1 presents the relationship between the research and development model of Borg and Gall (1983) and the MER model, as well as details of the research activities carried out at each stage of the research and development model.

Table 1 The Relationship of the RnD model of Borg and Gall (1983) with the MER model

Stages R&D	Component of MER	Activity
Research and information collecting	Classification and analysis of science content	- Identification of the concept of science, temperature, and heat material in Batik Besurek Bengkulu - Analysis of conceptions related to temperature and heat matter
Planning	Teaching design in learning	- Preparation of learning objectives and content based on Batik Besurek ethnoscience - Designing component designs from teaching materials
Develop a preliminary form of the product	Learning development	- Product design of teaching materials - Validation of teaching material products by experts - Design revision based on expert advice
Preliminary field testing	Evaluation of Learning Products	Initial trial (test of student response through questionnaires, observations, and interviews)
Main product revision		Product revision based on initial test results

Seven validators validated teaching materials at the developing preliminary form of the product stage. Content validation includes content relevance, material coverage, presentation sequence, integration with science concepts, motivational ability, image presentation, and video presentation. The validation test results were analyzed using the Aiken formula (Nurhidayah, 2024), and the V index obtained for the validity level is interpreted in Table 2.

Table 2 Product validation test interpretation

V Index	Validity Level
$0.8 < V \leq 1.00$	Very high
$0.6 < V \leq 0.8$	High
$0.4 < V \leq 0.6$	Moderate
$0.2 < V \leq 0.4$	Low
≤ 0.2	Very low

Arikunto (2010); Kartikaningrum & Muhtarom (2024)

The validation results from the validator will be calculated as a percentage agreement to see the reliability of the validation data, using the formula from Borich (1994). The PA score is calculated by comparing the agreement between validators against each assessment item. The validation data is reliable, and the product is considered valid if the PA value reaches more than or equal to 75% (Ngurahrai et al., 2019). Product revisions are carried out based on the results of the validators' suggestions.

The preliminary field testing phase was conducted in 1 to 3 schools involving 6 to 12 samples, and data were collected through interviews, observations, and questionnaires (Borg & Gall, 1983). In this study, the preliminary field testing stage was carried out through questionnaires to 32 respondents and observations and interviews with 10 respondents. The data obtained were analyzed using the percentage formula, and then the results were interpreted into categories as seen in Table 3.

Table 3 Initial trial interpretation

Percentage (%)	Interpretation
81-100	Very good
61-80	Good
41-60	Moderate
21-40	Poor
0-20	Very poor

(Arikunto, 2010; Akhyaruddin et al., 2024)

Observation was carried out using observation sheets containing motivation and understanding aspects with a "Yes" and "No" answer scale. The motivation and understanding aspects contain several indicators outlined in Table 4.

Table 4 Indicators observed during the observation

Aspects	Indicator
Motivation	Students open and read e-books enthusiastically and carefully.
	Students explore content independently.
	Students show curiosity by asking questions or seeking additional information.
	Students show curiosity by asking questions or looking for additional information.
	Students actively discuss the content of e-books with friends or teachers.
Understanding	Students can re-explain the concepts of temperature and heat presented in the book.
	Students can mention examples of temperature and heat phenomena in the Batik Besurek Bengkulu process.
	Students could explain the concepts of temperature and heat exemplified in making Batik Besurek Bengkulu.

The observation data obtained were analyzed using the percentage formula and interpreted into categories (Table 3). The interview data were analyzed descriptively to reveal students' in-depth responses regarding the electronic books developed.

RESULTS AND DISCUSSION

The Concepts of Science in the Local Wisdom of Making Batik Besurek

Based on the observations with many Batik Besurek Bengkulu craftsmen in several locations, information was obtained that the process of making Batik Besurek consists of nine stages. The process of making Batik Besurek Bengkulu can be seen in Figure 1.

The first stage is *mendesain*, where Batik Besurek's typical motifs are drawn manually as an initial design. The second stage is to *menyalin* onto the fabric's surface with the help of a pencil and ruler. The third stage is *mencanting*, which is drawing motifs on the fabric using canting and *malam* (batik wax). The fourth stage is *mencolet*, which is the process of

coloring details on specific motifs using brushes, followed by the fifth stage, *menembok*. *Menembok* is coating certain parts with *malam* so they are not exposed to the basic color in the following process. *Menembok*'s primary function is as a protector so that the previous color is maintained in its original color during the basic or additional coloring process. The sixth stage is *mewarna*, the fabric's base, dyed in a solution of naphthol dye. The seventh stage is *membilas* the fabric in water, to clean the fabric of dye residues. The eighth stage is *melorod*, which is the *malam* removal of the fabric by boiling the fabric in hot water. The ninth stage is *menjemur*, which is the drying process of the fabric in the sun.
Based on the analysis of the nine stages in the process of making Bat

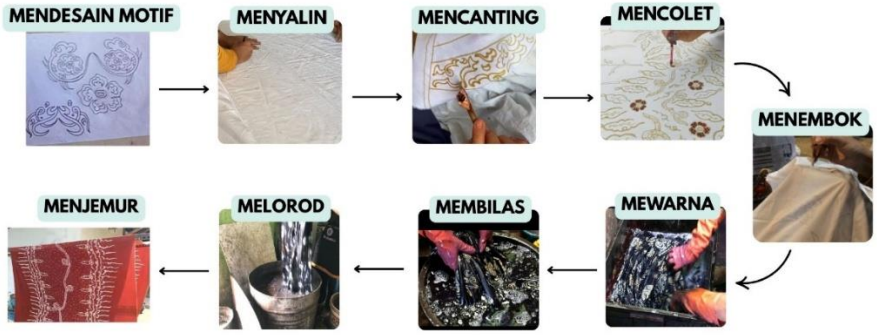

Figure 1 Stages in the process of making Batik Besurek Bengkulu

ik Besurek Bengkulu, relevant science concepts are to be applied in science learning, especially on temperature and heat and their influence on changes in the form of substances. The relationship of science concepts in Batik Besurek Bengkulu is outlined in Figure 2.

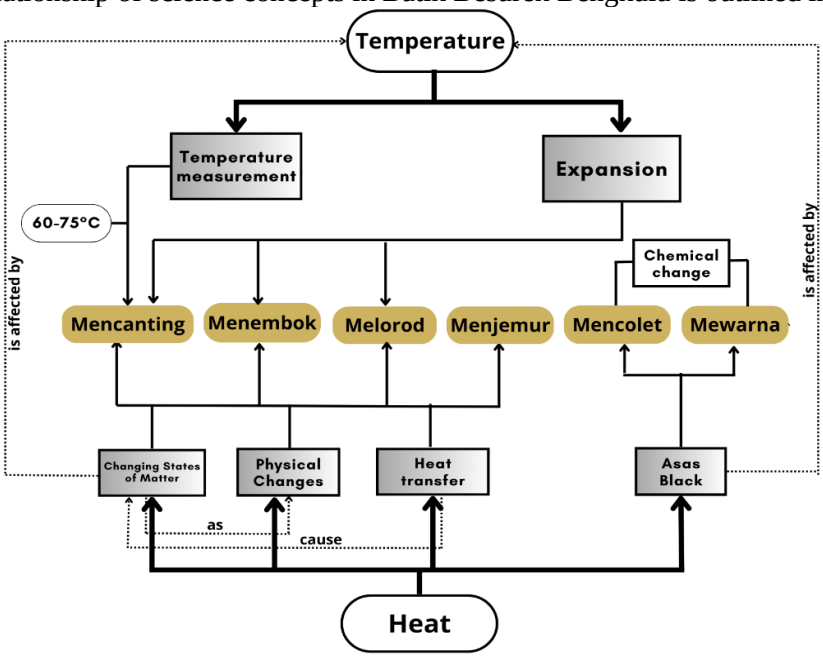

Figure 2 The relationship between the science of temperature and heat concepts in making batik besurek bengkulu.

Temperature plays a vital role in *mencanting*, *menembok*, *melorod*, *mewarna* and *menjemur*. Temperature is the degree of heat and cold of an object or substance. Temperature is a physical quantity that can be measured using a measuring instrument such as a thermometer (Serway & Jewett, 2018). At the *mencanting* stage, *malam* (batik wax) is

heated to a temperature of 60-75°C using a metal pan placed on the stove. When the bottom of the pan comes into direct contact with the heat source, heat transfer occurs from the stove to the pan, then passes into *malam* through the conduction process. *Malam* molecules at the bottom that receive heat move faster and transfer energy to the molecules above them. When heating takes place, *malam* (batik wax) melts. According to Tipler dan Mosca (2021), liquefaction occurs when a solid substance turns into a liquid due to heating or heat absorption. *Malam* (batik wax), which initially existed as solids, became liquid. The form of a substance is the physical condition of a material that can undergo physical or chemical processes (Serway & Jewett, 2018).

The change in *malam* (batik wax) from solid to liquid in the process of *mencanting* is an example of a change in physics. Changes in physics are reversible (Halliday et al., 2013), meaning that batik wax can refreeze when cooled without changing its chemical composition. In addition, physical changes also occur in the *melorod* stage, where the *malam* attached to the fabric is dissolved again by heating the water above 60°C. *Malam* (batik wax) changes shape or phase.

The process of physical change in the making of Batik Besurek occurs not only at the stage of *mencanting*, but also at the stage of *menembok*, *melorod*, and *menjemur* of the fabric. At the *menembok* stage, the *malam* is again used to cover certain parts of the fabric so that it is not exposed to the base dyes. This process involves heating the *malam* until it melts, then applying it to the fabric, after which the *malam* will harden again as the temperature drops. The change in the *malam* from liquid to solid is an example of a change in physics because it does not change the basic properties of the substance.

In the *melorod* stage, heat transfer occurs through conduction and convection. Conduction is the process of transferring heat through solids without the movement of these substances (Tipler & Mosca, 2008). Heat energy moves from particles with high energy (high temperatures) to particles with lower energy (low temperatures) through interactions between particles. Conduction usually occurs in materials that are good conductors, such as metals, whereas convection is a heat transfer process involving fluid particles (liquid or gas). The heat energy in the convection process moves through the fluid flow, where the fluid particles move from an area with high temperatures to an area with low temperatures (Nabila et al., 2023). Heat transfer through conduction occurs when heat from a fire source or stove moves to a metal container to boil water. Metals are good conductors of heat, so heat energy quickly transfers to the water inside the container. Heat transfer through convection occurs in water during the boiling process. When water is boiled in a boiler, the water at the bottom of the container is heated, and the water molecules absorb the heat energy and become lighter, thus moving upwards (Tipler & Mosca, 2008). This movement creates convection currents that help even the water's temperature and accelerate the fabric's wax melting. In the slugging stage, there is a process of expansion in the water used to boil the fabric. When water is heated to a boiling point, the water molecules acquire heat energy and move faster, causing the water to expand. The volume of water will increase slightly due to the increase in distance between molecules. The expansion of water during heating is an example of the thermal properties of liquid substances that change volume when the temperature increases.

The fabric drying stage also shows the concept of a change in physics. Batik Besurek fabric is dried in the sun. Sun-dried fabric experiences an increase in temperature, causing the water in the fabric to turn into steam and change its form from liquid to gas. This drying does not alter the structure of the fabric or the dye that has been absorbed, so it is still categorized as a physical change. The stage of drying Batik Besurek fabric in the sun is a phenomenon of heat transfer through radiation. Sunlight, as a heat source, emits energy through electromagnetic waves that the fabric absorbs. This energy increases the

temperature of the fabric, accelerates water evaporation, and speeds up the drying process. Heat transfer through this radiation does not require a conducting medium, so the fabric can directly receive heat from the sun without intermediaries (Halliday et al., 2013).

The concept of chemical change occurs in the *mewarna* process of Batik Besurek, as shown by the reaction between the use of naphthol dye and caustic soda. Dyeing begins by dipping fabric in a naphthalic solution that has reacted with caustic soda, forming a naphtholate compound. Naphtholate compounds have different properties than pure naphthol, indicating chemical changes because they produce new substances that cannot return to their original form (irreversible) (Atkins & de Paula, 2018). Black's basic concept plays a role in the dissolution stage of naphthalic dyes. The dye of naphthol is dissolved in a small amount of hot water, and then cold water is added to lower the temperature of the solution and make it safer to use in the dyeing process of fabrics. This mixing of hot and cold water reflects Black's principle, which states that when two different temperatures are mixed, the heat will move from a higher-temperature substance to a lower temperature until it reaches thermal equilibrium (Serway & Jewett, 2018). When diluting the naphthol dye, hot water will release heat, while cold water absorbs heat.

The process of making Batik Besurek Bengkulu described above contains various concepts in science learning, including temperature, heat, changes in the form of substances, heat transfer (conduction, convection, and radiation), expansion, physical changes, chemical changes, and the Asas Black Theory. Based on this phenomenon, science learning can be integrated into making Batik Besurek Bengkulu more contextual and relevant to daily life. Therefore, this concept was developed into teaching materials as an electronic book.

The electronic book design developed consists of three parts, namely the beginning (introduction), the core part (the content of the material), and the final part (the end). The e-book begins with a front page (cover), introduction, instructions for use, a learning outcomes page, a concept map, and an introduction to the material. The front page (cover) displays the text of the book's title in a large size with contrasting colors to attract the reader's attention and clarify the content of the electronic book. The temperature icon and the formula "Q = m.c.ΔT" are also displayed to reinforce the scientific content. According to Al-Khalidi (2021), familiar scientific symbols in digital design can strengthen students' conceptual understanding. The introduction page contains the initial information of the book for the reader to know, the purpose of the book's development, and a thank you. The instructions contain how to operate the book during the learning process. The learning outcomes and objectives page is used to find out the competencies achieved after studying the material in the book. The concept map page contains a mapping of the relationships between the topics studied in the book. The layout of the Integrated Science electronic book of temperature and heat materials containing the ethnoscience of Batik Besurek Bengkulu can be seen in Figure 3.

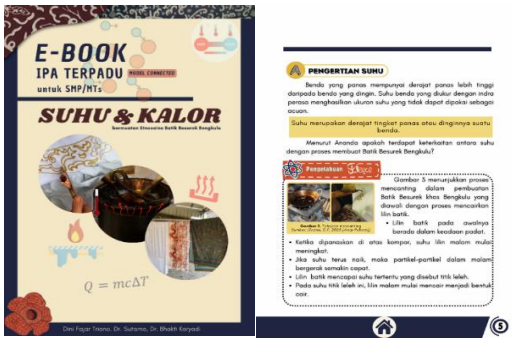

Figure 3 Layout of the Integrated Science electronic book of temperature and heat material containing Ethnoscience Batik Besurek Bengkulu

The introductory section of the material is structured in an engaging layout to build students' initial understanding of the concepts of temperature and heat. Writing titles or subheadings using different font sizes and colors from writing content creates a firm impression. According to the theory of *Color Psychology*, using contrasting typefaces and colors shows strength and clarity (Zufic & Pogarcic, 2019). The visual icons stimulate students' curiosity per the principle of *Attention* in *the ARCS Model*, which states that attention is obtained through an attractive visual presentation (Chang et al., 2019).

The core part or content of the material contains a definition of the concept of the topic, an explanation of scientific phenomena related to Batik Besurek Bengkulu, and an activity sheet. The explanation of the material is presented with an emphasis on keywords. The keywords can help students focus on important information (Yeung, 1999). The forms of keywords used are statements and keywords as questions. Keywords in the form of questions act as *advance organizers* in Ausubel's theory, which can help students prepare a framework of thinking before studying the material in-depth and as a marker of learning focus that clarifies the direction of exploration of science concepts (Sunahrowi, 2016).

The material illustrates the phenomenon of temperature and heat in making Batik Besurek Bengkulu, which is very contextual for science learning and helps students build a connection between science concepts and authentic experiences. The *contextual teaching and learning* (CTL) approach will improve students' understanding of science concepts associated with real-life situations (Kristidhika et al., 2020). The core part of the book is also equipped with multimedia in the form of videos. This video utilizes the multimedia learning principle from Mayer (2009), which states that learning is more effective when information is received simultaneously through visual and auditory channels (Çeken & Taşkın, 2022).

The core section (the book's content) has discussion and exploration activities. Discussion activities help students practice critical thinking and communication skills, while exploration provides space for students to explore information independently through various sources of information. According to the *active learning* theory, students' active involvement in learning through discussions, experiments, problem-based learning, or exploring additional resources can help build knowledge (Keengwe & Onchwari, 2015).

The end of the book contains several components, including evaluations, bibliographies, and glossaries. The evaluation in the book is intended to measure students' understanding of the material studied, as well as a reflection tool to determine the extent to which the learning goals are achieved. According to Arifin (2022), Learning evaluation functions as a tool to assess the success of the learning process and outcomes and as the basis for decision-making regarding learning follow-up. The bibliography provides information on reference sources used in preparing the material, thereby strengthening the validity of the book's content and becoming a reference for students if they want to explore the material studied more broadly. Glossaries are provided to help students understand important or scientific terms that appear in the material, thus facilitating independent student learning.

Validation Test

Seven experts carried out validation by assessing three component aspects: the feasibility of the material's content, language, and graphics. The validation results showed that the teaching materials developed had met the eligibility criteria with an average V index of 0.86, which was included in the very high level of validity, making them suitable for use in learning. The results of the validation test can be seen in Table 4.

Table 4 Results of electronic book validation test

Aspects	V	Criterion	PA (%)
Content	0.89	Very high	88
Linguistics	0.81	Very high	85.71
Graphic	0.90	Very high	94.12
Average	**0.86**	**Very high**	**89.27**

The feasibility aspect of content and language in teaching materials contributes significantly to improving students' understanding and learning outcomes (Putri et al., 2025) while the graphic aspect, an attractive visual display, has been proven to be able to increase students' interest in learning and help them focus more on understanding the material (Tanjung & Faiza, 2019). The validation data was analyzed by percentage agreement to see the extent to which the data obtained from the validators' assessments was consistent and reliable. Based on the reliability test, all aspects assessed, namely content, language, and graphography, obtained a percentage above 75%, with an average of 89.27%, showing that the data from the validation of the Integrated Science electronic book teaching material product containing Batik Besurek Bengkulu was declared reliable. After the validation stage is carried out and the product receives various inputs and suggestions from experts, the researcher revises the teaching materials' design to improve the content's quality and suitability. This revision process is important before the teaching materials are further tested through student responses to the product.

Initial Trial

The initial trial involved a student response test to assess student responses to electronic books as a product of development. Thirty-two students in grade VII of SMP Negeri 4 Bengkulu City took the test. The results of the readability response are shown in Table 5.

Table 5. Results of the electronic book readability response test

Aspects	Percentage (%)	Criterion
Content	90.73	Very good
Linguistics	90.36	Very good
Attraction	87.18	Very good
Average	**89.42**	**Very good**

The average percentage of response to the Integrated Science eBook of Temperature and Heat material with the content of Batik Besurek Bengkulu was 89.42%, which shows that students responded well to the use of the Integrated Science electronic book of temperature and heat material loaded with Batik Besurek Bengkulu.

Observations on Using Electronic Books

The results of observations on using electronic books in the classroom can be seen in Table 6.

Table 6 Observation results of the use of electronic books

Aspects	Percentage	Criterion
Motivation	86.67%	Very good
Understanding	73.33%	Good

The observation results, based on two main aspects, namely motivation and understanding, show that the use of science electronic books based on ethnoscience Batik Besurek received a very good response to the motivation aspect. The motivation aspect

shows students' enthusiasm when opening and reading e-books, exploring content, and completing tasks in books independently and actively in discussions with friends.

In the aspect of understanding, the observation results obtained an average percentage of 73.33%, which is still low compared to the motivation aspect. Students were able to explain the concepts of temperature and heat again and mentioned examples of the phenomenon at the stage of Batik Besurek, but still had difficulty when asked to explain how the concept occurred in the process of making Batik Besurek presented in an electronic book, so it still required assistance and reinforcement of the material so that students' understanding became deeper. According to Thamrin et al., (2024), the ethnoscience approach indicates that applying everyday phenomena in learning can enrich students' contextual understanding. However, its effectiveness still needs to be supported by other learning strategies. Figure 4 shows students' activities during the preliminary field testing stage when they tried out the electronic science teaching materials that had been developed.

Figure 4 Activities to try products by students at the stage of preliminary field testing

Based on the results of the interviews, in general, students responded positively to the electronic books developed. Students revealed that the appearance of electronic books is attractive, creative, modern, not dull, and more varied than school print books. The presence of images, videos, and interactive examples helps reduce boredom and increases enthusiasm for learning science. Electronic books are also considered to help students understand temperature and heat material, especially with explanations accompanied by pictures, videos, and examples from Batik Besurek Bengkulu. Students admitted that gaining new insights from Batik Besurek Bengkulu can be connected to temperature and heat. Images, videos, and illustrations in e-books are pretty straightforward. The language and sentences used are considered easy to understand, short, straightforward, and not long-winded, and the font size and writing style make students comfortable reading. The experience of using electronic books is considered more practical, engaging, and interactive than printed books, so most students want to use electronic books like this to learn other science materials. Research by Ningrum and Jumadi (2024), who developed Google Sites web-based learning media on Newton's Law of Motion of Objects material with a STEM approach. The validity of the e-book content was tested using Aiken's V formula, and a value of 0.92 was obtained, which is included in the high validity category. The practicality of the teaching materials is shown by the positive response rate of students, 87%, and the effectiveness of learning is reflected in 85% of students who achieved learning completion above the KKM. Another study by Aufa and Ridwan (2023) shows that interactive e-books in SMP Negeri 39 Surabaya grade VIII students significantly influence learning outcomes. The results of the paired sample t-test showed an increase in learning outcomes of 16% in the cognitive aspect and 18% in the psychomotor aspect after the implementation of the interactive e-book.

This research can be developed by expanding the research location and the number of student samples to test the effectiveness of teaching materials. In addition, developing

teaching materials similar to utilizing local wisdom from other regions can enrich ethnoscience-based learning approaches so that they are more diverse and by the characteristics of local culture. A long-term evaluation of the impact of these teaching materials on the understanding of science concepts and students' attitudes toward science must also be carried out to ensure sustainability and improve the quality of learning.

CONCLUSION

Based on the results of the research, it can be concluded that the process of making Batik Besurek Bengkulu contains the concept of integrated temperature and heat science, the concepts of measurement, expansion, changes in the form of substances, changes in physics, heat transfer and the concept of the black principle so that it can be designed into the content of an integrated science electronic book containing ethnoscience of Batik Besurek Bengkulu. Based on the validity test by experts, the integrated science electronic book containing the ethnoscience of Batik Besurek Bengkulu received an average V index of 0.86, indicating a very high level of validity. The results of the student response test through the questionnaire received an average percentage of 89.42% in the outstanding category. The observations and interviews showed that students responded positively to the developed electronic books. Based on the validity test and student response, the integrated science electronic book containing Batik Besurek Bengkulu's ethnoscience was declared a valid teaching material worthy of effective testing in future research. This study also has some limitations. The product was only tested in a limited field trial. In addition, the effectiveness of the electronic book has not yet been tested through long-term implementation in real classroom settings. Future studies are encouraged to conduct broader trials in multiple schools and evaluate long-term learning outcomes to strengthen the product's effectiveness. The implications of learning to use integrated science teaching materials that integrate local culture can increase students' understanding of science concepts, foster a sense of love for the nation's culture, and make science learning more contextual and meaningful.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS STATEMENT

All authors' contributions to manuscript preparation are defined by the criteria: Conceptualization, methodology, formal analysis, and writing—preparation of the original draft, writing the manuscript, and others.

ACKNOWLEDGMENTS

To the Besurek Batik artisans in Bengkulu City who have provided information and SMP Negeri 4 Bengkulu City, which has provided permission and support for teaching material trials and all students who have participated.

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