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Development of a Science Module Based on Local Wisdom of Dried Octopus to Improve Students' Cognitive Learning Outcomes on the Material of Temperature, Heat, and Expansion

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Abstract

Background: Science teaching at the junior high school (SMP) level still struggles to connect scientific concepts with students' everyday experiences. The absence of local wisdom integration contributes to low motivation and poor understanding of scientific material. One underutilized local potential is the traditional drying process of octopus practiced by coastal communities in Kaur Regency, Bengkulu.
Aims: This study aims to develop and assess the feasibility of a science learning module based on the local wisdom of dried octopus, focusing on the concepts of temperature, heat, and expansion for seventh-grade students.
Method: Using a Research and Development (R&D) approach with the ADDIE model, the study involves five stages: analysis of student and teacher needs, module design, expert-validated development, implementation through a readability test involving 21 seventh-grade students at SMP Negeri 24 Kaur, and final evaluation.
Results: The results of the expert validation showed a module feasibility level of 95% with the category "very feasible," while the student readability test obtained an average score of 97% with the category "very easy to understand." The developed module also received positive responses from students regarding engagement, content clarity, language, and usefulness.
Conclusion: The science module based on the local wisdom of octopus drying is considered highly feasible and practical for teaching temperature, heat, and expansion. Integrating local wisdom into science learning has been proven to improve students' cognitive learning outcomes and foster awareness of local cultural values.

A. Introduction

Education is the main foundation for the development of globally competitive human resources. The development of technology and social changes demand that the education system continuously adapt, not only in terms of curriculum but also in the strategies and media used for learning (Abbas et al., 2023). At the Junior High School (SMP) level, the subject of Natural Sciences (*Ilmu Pengetahuan Alam*/IPA) plays a crucial role in laying the foundation for students' science literacy, encompassing critical thinking skills, problem-solving abilities, and an understanding of natural phenomena and technology. Natural Science is a combination of scientific processes and scientific products that encompass various types of knowledge, including factual, conceptual, procedural, and metacognitive knowledge (Arsinah et al., 2024).

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The teaching of Natural Sciences (*Ilmu Pengetahuan Alam/* IPA) at the Junior High School (SMP) level still faces various crucial challenges. The tendency to abstract the material makes it difficult for students to understand concepts concretely, and the lack of local relevance in the learning process makes science feel distant from everyday life, as well as the low motivation of students in participating in science lessons (Rehiara et al., 2024). Science material is often presented theoretically without real contexts familiar to students, making it difficult for them to understand concepts such as temperature, heat, and expansion.

The implementation of science education in Indonesia still faces a number of fundamental challenges. The content of science education often tends to be abstract and theoretical, making it difficult for students to understand, especially in subjects such as temperature, heat, and expansion (Cristiana et al., 2021). Natural Science (*Ilmu Pengetahuan Alam*/ IPA) material is often delivered without considering the local context, making it difficult for students to relate scientific concepts to their daily experiences. A study by Septina et al., (2025) in Science & Education highlights the importance of a context-based approach to avoid cultural disconnection in science education. The gap between science content and local realities has been shown to hinder student engagement, even in developed countries. One innovative solution is to develop learning based on local wisdom.

Local wisdom is considered to be in harmony with science learning, as it represents a cultural product that reflects life philosophy, values, norms, ethics, rituals, belief systems, habits, and traditional customs. It also encompasses various ideas, beliefs, and cultural values that play a crucial role in instilling attitudes and life values in students through the learning process (Ratuanik et al, 2024). When local values are integrated into learning, students not only learn science but also understand its relevance and application in their real lives. Local wisdom is a form of knowledge that embodies noble values and has been used as a guide, practiced, and obeyed by communities across generations. It has proven effective in managing coastal and marine resources, making it highly relevant to explore and adopt within modern management systems (Paulangan, et al., 2021).

The local wisdom-based science learning module is a medium designed to bridge the gap between science theory and local cultural practices. This module serves not only as an independent learning resource but also as a tool to build cultural awareness, foster local identity, and enhance learning motivation (Irfandi et al., 2023). Research by Yarmalinda et al. (2025) in Papua proves that the science module incorporating local culture is effective in improving students' learning outcomes, conceptual understanding, and critical thinking skills.

Kaur Regency in Bengkulu Province possesses local wisdom potential that can be integrated into science education, one of which is the traditional practice of drying octopus by the coastal community of Linau Village. This process involves sun-drying octopus for several days and implicitly reflects scientific principles, such as heat transfer, evaporation, and the expansion of materials used as drying tools, like bamboo. Although this practice contains science concepts that are highly relevant-particularly to the topics of temperature, heat, and expansion taught in seventh-grade junior high school it has not been widely utilized in science learning at schools. Developing science learning media based on local wisdom can be an effective strategy to create a contextual and meaningful learning environment, while also providing students with learning experiences that incorporate cultural values into the science learning process (Pangestu et al., 2020).

Therefore, the integration of the dried octopus drying tradition into science learning is not merely a pedagogical innovation, but also a strategic effort to preserve local culture in line with educational goals. According to Ihsan & Pahmi (2022), modern science education must establish meaningful connections between formal scientific concepts and students' real-life contexts. Embedding local wisdom into science lessons encourages students to view science as an integral part of their daily experiences, rather than as distant or abstract knowledge. This type of learning approach fosters a deeper conceptual understanding and promotes cultural relevance. In line with Syam et al., (2024), learning that incorporates local cultural values not only enhances students' grasp of scientific concepts but also supports the development of character aligned with the Pancasila student profile. Thus, the development of science modules based on the octopus drying tradition serves not only educational purposes but also plays a vital role in strengthening science literacy and instilling cultural awareness among students.

The research has novelty because it highlights a local context that has not been extensively studied scientifically. Most previous research has focused more on ethnoscience based on the cultures of major ethnic groups such as Batak, Javanese, and Minangkabau (Mukti et al., 2022). Meanwhile, octopus drying

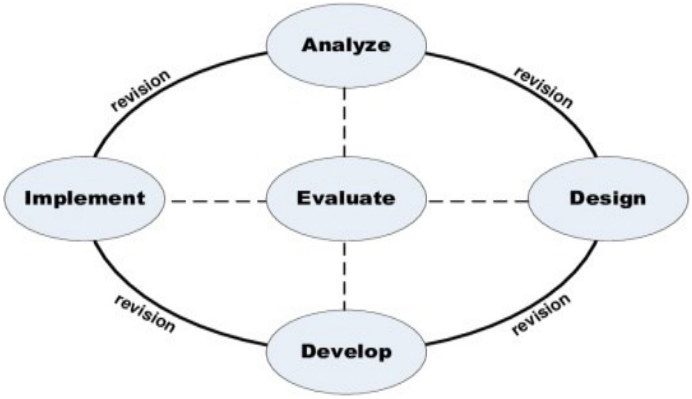
in Kaur, which involves direct interaction between environmental temperature, biological materials, and traditional tools such as bamboo, has rarely been explored as an approach to science learning. In fact, this phenomenon is rich in scientific value and has the potential to become a strong teaching material. Integrating the local culture of indigenous communities into science education in schools has proven effective, as shown by significant increases in students' conceptual understanding, sense of cultural ownership, and the meaningfulness of learning.

The module developed in this research not only presents science content but also includes Student Worksheets (LKPD), practice questions, interactive videos via QR codes, and reflection sections designed to promote active student engagement. The Student Worksheet (LKPD) specifically guides students to analyze the relationship between the octopus drying process and the concepts of heat and temperature, as well as to observe the effects of expansion on the traditional drying tools. This learning approach strengthens the contextual relevance of the material while promoting hands-on exploration of scientific phenomena. Through this integration, the module supports the development of students' science process skills in accordance with the demands of 21st-century scientific literacy (Rosiyati et al., 2025).

The development of modules based on local wisdom also contributes to instilling character values. Students are not only guided to appreciate their local culture, but also encouraged to think scientifically about practices they may have previously viewed as mere tradition. This approach brings science closer to students' everyday lives without diminishing their cultural identity, while also enhancing the relevance of science in daily contexts. Fuad et al, (2024) emphasize that integrating local wisdom into science learning helps students better understand the learning material, while also shaping their values, character, and scientific literacy. In this context, this research aims to develop a science learning module based on the local wisdom of dried octopus that can be used for teaching the concepts of temperature, heat, and expansion in seventh-grade junior high school. The module is expected to improve students' engagement in learning, deepen their conceptual understanding, and foster a sense of pride in their local culture. Furthermore, it can serve as a relevant, applicable, and open educational resource aligned with today's academic needs.

B. Research Method

This research employed a Research and Development (R&D) approach, utilizing the ADDIE development model, which comprises five stages: Analysis, Design, Development, Implementation, and Evaluation (Chang and Abidin, 2024). This model was selected because it provides a structured and systematic framework for developing instructional materials based on local wisdom, specifically a science learning module for seventh-grade junior high school students, focusing on temperature, heat, and expansion. This method consists of five stages, namely:



(Satria & Sutabri, 2025).

In the analysis stage, the researcher conducted interviews with science teachers and distributed questionnaires to students to identify the need for learning materials. The results indicated that students require contextual teaching resources that connect scientific concepts with their local environment. The content of the module was aligned with the independent curriculum and local phenomena, particularly the traditional process of drying octopus in Kaur Regency. During the design stage, the researchers structured the module to include a cover page, introduction, table of contents, concept map, student learning plan, learning objectives (KI and KD), materials, student worksheets (LKPD), evaluation exercises, summary,

and additional media such as QR codes. The aim was to create a precise and contextual sequence of learning activities to enhance students' understanding.

During the development stage, validation was conducted by three expert validators who assessed the module from the perspectives of content, language, and graphics. The validators used an instrument consisting of 16 statements rated on a 5-point Likert scale. The validity percentage was calculated using the formula:

$$Validity\ Percentage = \left(\frac{Total\ Score\ Obtained}{Maxsimum\ Score}\right) \times 100\%$$

The average result from expert validation reached 95%, which falls into the "very valid" category (Fernanda et al., 2024)

In the implementation stage, a readability test was conducted on 21 students from Class VII of SMPN 24 Kaur. The students received the developed module and completed a response questionnaire assessing five aspects: content, language, presentation, graphics, and usefulness. The readability score was calculated using the formula:

$$Readability\ Percentage = \left(\frac{Total\ Score\ Obtained}{Maxsimum\ Score}\right) \times 100\%$$

The average readability score was 97%, which indicates that the module is "very easy to understand" (Maktum et al., 2025).

In the evaluation stage, revisions were made based on expert suggestions and student feedback to improve the quality and usability of the module. Adjustments included enlarging the concept map visuals, adding explicit descriptions of learning outcomes for each activity, refining the evaluation questions into structured practice exercises, and incorporating QR codes linked to local video demonstrations. These enhancements aimed to increase contextual relevance and student engagement, ensuring that the module is not only valid but also practical for use in real classroom settings.

C. Results and Discussion

1. Results

1.1 Analysis

Product Needs Analysis

The initial analysis stage in this study was conducted through interviews with junior high school science teachers, where the researcher had prepared questions in advance as a reference to ensure a structured interview process. This stage aims to identify the needs of suitable teaching materials in the learning process, especially in science subjects in grade VII. Based on the interview results, it was determined that contextual teaching materials were needed that could effectively link scientific concepts with the students' environment. The researcher analyzed the learning outcomes contained in the temperature, heat, and expansion material in accordance with the independent curriculum for grade VII SMP. The learning outcomes in this material require students to understand the basic concepts of temperature and heat, temperature changes due to heat, and changes in the form of substances and expansion resulting from the application of heat. Students are also expected to be able to relate these concepts to phenomena in the surrounding environment, one of which is through local wisdom in their area.

The method used in analyzing student learning outcomes on the local wisdom of dry octopus in Kaur District was conducted with 21 Grade 7 students at SMPN 24 Kaur. This was achieved by administering a questionnaire to assess students' understanding of the local wisdom surrounding dried octopus, yielding results indicating that only a few students understood the typical dried octopus from the local community. A summary of the questionnaire results on the understanding of temperature, heat, and expansion materials, based on the local wisdom of dried octopus, can be seen in Table 1.

Table 1. Learner Needs Analysis Questionnaire

Aspect	Percentage	Interpretation
Student participation in science learning	87%	Very Responsive
Local wisdom-based science learning experience	56%	Less Responsive
Module needs in the learning process	93%	Very Responsive

The results of Table 1 indicate that student participation in science learning is high, at 87%, while student experience in local wisdom-based science learning remains relatively low, at 56%. On the other hand, the need for modules in the learning process is very high, reaching 93%. Overall, this data indicates the need for the development of local wisdom-based science learning modules on the concepts of temperature, heat, and expansion.

Material Analysis

The material analysis stage of the research involved interviews with the community, which revealed that drying octopus is an activity that has been carried out for generations and is an integral part of the daily life of coastal communities. This process is carried out by drying the octopus in the sun for 2 to 4 days, depending on the intensity of the sun's heat. Drying is done using bamboo, which is considered a practical method that does not affect the quality of the dried octopus. Hung on bamboo poles mounted horizontally, this method is considered adequate because it minimizes physical impact, thereby maintaining quality and making the drying process more efficient (Lekrati and Vezaz, 2021).

The octopus drying process is a natural preservation method that utilizes heat from sunlight. The cleaned octopus will be dried in the open air, allowing the water in its body to evaporate. In this process, the ambient temperature has a significant impact on the drying speed. Temperature is a measure of how hot or cold an object is, and high-water temperatures will cause the water molecules in the Octopus meat to dry quickly. In hot weather, the drying process will proceed more quickly.

Heat plays a vital role in the drying process. Heat is thermal energy that moves from a high-temperature object to a low-temperature object. Heat comes from sunlight that is absorbed by the surface of the octopus. The heat is used to convert the water in the octopus's body. The more heat the octopus receives, the more water it can evaporate. This is the reason why an octopus dried in the hot sun will dry faster than one dried in the shade.

The concept of expansion in the drying process of dried octopus generally occurs not in the octopus itself, but in the tools used to dry it, such as bamboo frames. When bamboo is exposed to the sun for a long time, the temperature of the bamboo increases, causing the particles in it to move faster and causing the bamboo to expand, i.e., slightly increase in length or bend. Bamboo exposed to the heat of the sun and changing humidity conditions can experience expansion and shrinkage, which may cause uneven drying surfaces or looseness in the positioning of the straps. Therefore, care must be taken to maintain an optimal and stable drying process. This expansion of the bamboo can affect the stability or firmness of the drying device, such as making the drying surface uneven or the straps loose, which can ultimately affect the position and comfort of the Octopus placement during the drying process.

1.2 Design

The design shows the systematic structure of a learning module. This module is divided into three main parts: Introduction, Content, and Conclusion. Each part has essential components that support a structured and integrated learning process. The detailed design of the learning module is illustrated in Figure 1.

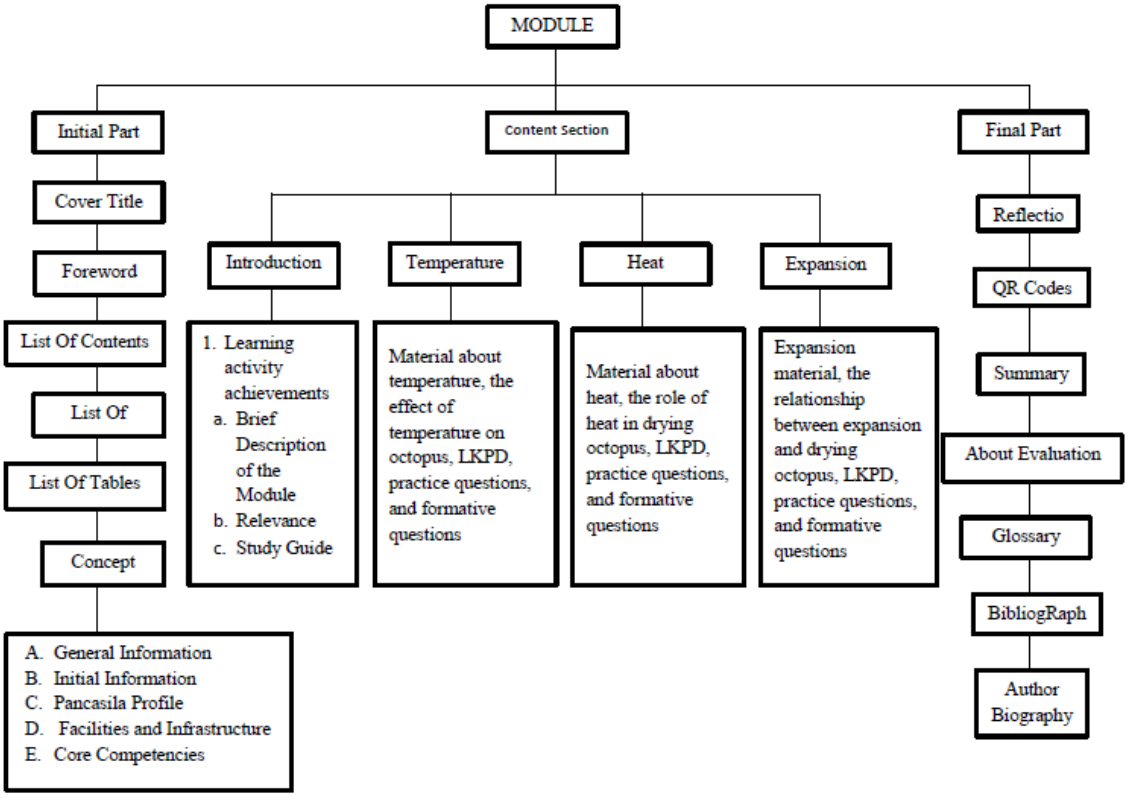


Figure 1. Product Design

The structure of the module in this image is organized hierarchically and systematically to support an effective learning process. The Initial Section serves as an introduction and orientation for the module users. Its components include: Cover Title, Preface, Table of Contents, List of Figures, List of Tables, and Concept Map. The Concept Map itself includes general information, initial information, Pancasila student profile, facilities and infrastructure, as well as the core competencies to be achieved in learning. The Content section is the core of the module that contains the main learning materials. Starting with an Introduction that includes learning objectives, module description, material relevance, and study instructions. The main material consists of three main topics: Temperature, Heat, and Evaporation Theoretical explanations accompany each topic, the influence on the octopus drying process, Student Worksheet (*Lembar Kerja Peserta Didik*/LKPD), practice questions, and formative questions to measure students' understanding. The Final Section is the module's conclusion, which supports reflection and reinforces the material. Its elements include: Reflection, QR Code for access to additional materials or videos, Summary, Evaluation Questions, Glossary, Bibliography, and Author Biography. With this structure, the module not only provides in-depth material but also guides students through the entire learning process in a directed and comprehensive manner.

1.3 Development

The development in this study is based on a design that was previously created as a basic form of module content for researchers to build upon. The front page or front cover of the module is equipped with a university logo, module title, images tailored to the content of the material in the module, sub-chapter information, faculty name, author's name, and additional information for Grade VII SMP/MTs. The science module based on local wisdom also contains a learning plan that includes the stages of the context itself. This local wisdom-based science module includes three learning activities, among others, on temperature, heat, and expansion. The initial design of the Science Learning module, based on local wisdom, contains an initial plan of what will be written in the module in general, including the initial page (cover), Foreword, Table of Contents, list of images, list of tables, Concept Map, and instructions for using the module.

Figure 2. Initial design of the module

This science module consists of three learning activities: Learning Activity One, Temperature; Learning Activity Two, Heat; and Learning Activity Three, Expansion. Each activity is organized systematically and sequentially to gradually build students' understanding. In each learning activity, there are chapter titles and a clear presentation of material, including material about dry octopus related to the concepts of temperature, heat, expansion, and learning objectives designed following the applicable curriculum. This presentation aims to ensure the achievement of measurable and directed learning achievements, and help students understand the interrelationships between concepts in temperature, heat, and expansion material as a whole. The existence of LKPD also makes it easier for educators to design learning and assess the process and results of student learning comprehensively.

Figure 3. Learning Activities 1, 2 and 3

This local wisdom-based module on dried octopus features an LKPD (Learner Worksheet) that is thematically designed to integrate concepts of temperature, heat, and expansion with the community's dried octopus drying activities. This LKPD not only facilitates understanding of science concepts but also encourages students to observe real phenomena, analyze data, and link theory with local practices. Through this LKPD, students are invited to think critically and actively in contextual learning activities that are relevant to their daily lives, as can be seen in Figure 4, which shows the content of the LKPD, which contains learning outcomes and objectives based on real experiences in the students' environment.

Figure 4. LKPD Learning Activities 1, 2 and 3

The final activity section in this dried Octopus local wisdom-based module is designed to strengthen students' understanding through reflection, summary, learning evaluation, and answer key. In the summary, students are provided with a brief and concise explanation of the concepts of temperature, heat, expansion, and their application in both traditional and modern octopus drying processes. There are end-of-learning evaluation questions, arranged in multiple-choice and essay formats, to measure the extent to which students have understood the material they have learned. This final activity is also equipped with interactive media in the form of QR codes, which direct students to the octopus drying process, making learning more contextual and meaningful. This final activity is illustrated in Figure 5.

Figure 5. End of Product Activity

1.4 Implementation

The implementation stage was carried out by researchers using a readability test. A total of 21 students in grade VII of SMP 24 Kaur were used as the implementation of the research readability test. The implementation process involves providing teaching materials modules that have been developed and responding to questionnaires from students. The results of the practicality of the local wisdom-based science module media in the readability test of this product will be evaluated based on the responses of VII-grade students at SMP Negeri 24 Kaur, totaling 21 students. Furthermore, researchers provide a questionnaire containing responses regarding the product of the temperature, heat, and expansion learning module based on the local wisdom of dry octopus.

Table 2. Readability Assessment Sheet

	Percentage	Interpretation	Average Percentage
Content Aspect	98%	Very Worthy	
Language Aspect	96%	Very Worthy	
Presentation Aspect	96%	Very Worthy	**97%**
Graphic aspect	98%	Very Worthy	
Benefit aspect	97%	Very Worthy	

Table 2 presents the results of the learning module readability assessment, covering five aspects: content, language, presentation, graphics, and usefulness. The content and graphical aspects achieved the highest percentage of 98%, followed by the usefulness aspect at 97%, and the language and presentation aspects at 96% each. The overall average rate of module readability is 97%, which indicates that the module is very easy to understand and suitable for use by students.

1.5 Evaluation

The fifth stage, also known as the final stage of the ADDIE model, is the evaluation stage. The product evaluation stage is based on the questionnaire results obtained from the development and implementation stages. Based on data analysis from the three validators, the local wisdom-based temperature, heat, and expansion learning module is suitable for use in learning, with revisions made for validity. Revisions were made based on suggestions and input from expert validators. Following the results of this study, validation aims to assess aspects of material presentation, language, and graphics. The validation instrument used consists of 16 statement items that refer to the learning media assessment criteria. The results of the validation can be seen in Table 3 below;

Table 3. Expert Validation

Aspect	Item Number	Percentage	Interpretation	Average Percentage
Material	1,2,3,4,5,6, 7,8,9,10,	94%	very worthy	
Language	11, 12, 13,	97%	very worthy	**95%**
Graphics	14, 15, 16.	94%	very worthy	

Table 3 shows the results of expert validation of learning modules based on three aspects, namely material, language, and Graphics. The material aspect, consisting of items numbered 1 to 10, obtained a feasibility percentage of 94%. The linguistic aspect, with items 11 to 13, obtained the highest rate of 97%, while the grammatical aspect of items 14 to 16 obtained a rate of 94%. The average rate of expert validation for the module is 95%, indicating that it is very feasible to use.

Although the product was deemed very feasible by the validators, several constructive inputs and suggestions were still provided to further improve the quality of this learning module. The feedback reflects attention to detail and the hope that this product is not only feasible to use but also optimal in supporting the learning process. The revisions include enlarging the images on the concept map to make the text clearer, adding descriptions of learning outcomes to each activity to provide a contextual understanding of the concepts, and changing the test format from essays to practice questions with answer instructions to make it easier for students to work on them independently. Adjusting the font size to ensure consistency, adding a summary to enhance understanding, and incorporating a QR code that links to a video of the process of making dried octopus, which aims to connect the concepts of temperature, heat, and expansion with local wisdom practices.

2. Discussion

2.1 Analysis

Product Needs Analysis

Based on the results of interviews with seventh-grade science teachers, the teaching materials used in learning are still very limited, generally in the form of government textbooks and student worksheets (LKS), which are often general and theoretical. The teacher said that the book has not touched on the local context or real phenomena close to students' lives. Students often struggle to understand the material because they cannot relate it to their own experiences or surroundings. Teachers also highlighted the lack of variety in learning methods and media available. Thematic or wisdom-based learning modules are not yet available at school, so the learning approach becomes less contextual and tends to be less engaging.

The impact is low student interest in learning and understanding of science materials, especially abstract concepts such as temperature, heat and expansion. Teachers stated that this material is often difficult to understand because it is not accompanied by concrete examples or direct practice. Teachers welcomed the idea of developing a module that brings the local wisdom of the Kaur community, such as the octopus drying process, into science learning. They consider that contextual learning like this will make students more interested and easier to understand science concepts because it is associated with the reality they are

familiar with. Local wisdom-based modules are also considered to foster a sense of love for regional culture while developing students' scientific thinking skills.

According to the results of interviews with teachers, there is a high demand for innovative teaching materials that integrate local values with science concepts. The incompatibility between the material taught and the students' environment is a strong reason for the need to develop a science learning module based on local wisdom. The implementation of this research is considered highly relevant and necessary to address the challenges in learning science in junior high schools, particularly in the context of the Merdeka Curriculum, which encourages context-based learning and the surrounding environment.

The learner needs questionnaire indicates that most students do not fully understand the process and meaning of local wisdom, as exemplified by the octopus drying practice carried out by the people of Kaur. Although some students are aware that dried octopus is a typical product of their region, their understanding of the drying process and the scientific principles involved, such as the impact of temperature, heat, and expansion, remains very limited. This suggests that local wisdom has not been effectively integrated into science learning at school.

Students' lack of understanding of this local wisdom also indicates a gap between the scientific knowledge taught at school and the cultural practices that exist in the surrounding environment. The octopus drying process encompasses various scientific concepts, including heat transfer, shape change, and expansion, which are highly relevant to the grade VII science subject matter. This disconnect between formal learning and local experience has the potential to reduce student motivation and hinder their understanding of abstract material.

The need for teaching materials that are able to link scientific knowledge with the local context. Modules based on local wisdom, such as octopus drying, can be a means to build students' conceptual understanding more deeply and meaningfully. By integrating real-life phenomena from students' experiences into learning, it is expected to foster curiosity, active participation, and an appreciation for regional culture. Students' lack of knowledge of the scientific processes and principles contained in octopus drying indicates that this local potential has not been optimally utilized in learning. The development of a science learning module that highlights the local wisdom associated with dried octopus is a strategic step to enhance student understanding while preserving local culture.

Material Analysis

The results of interviews with the people of Kaur indicate that the community possesses a form of local knowledge that can be categorized as local wisdom, specifically knowledge derived from daily practices and experiences related to natural phenomena. Although they do not use formal scientific terms, they understand the concepts of temperature, heat, and evaporation in their way. This knowledge has great potential to be used as a context for science learning in schools.

The drying process of dried octopus begins with sun-drying the octopus. At this stage, the ambient temperature plays a crucial role in accelerating the evaporation of water within the octopus's body. The higher the air temperature, the faster the water in the octopus meat evaporates. Temperature plays a vital role in accelerating the drying process by increasing the kinetic energy of air particles, which then evaporate faster. High temperatures cause water molecules to move faster, making it easier for them to change from a liquid to a vapor. This process is reinforced by heat, which is heat energy from sunlight that transfers to the octopus's body. The heat is used to break the bonds between water molecules, allowing water to evaporate into the air. This heat absorption process is by the law of heat transfer, where heat moves from a high-temperature object (the sun) to a lower-temperature object (the octopus). The heat from the environment is transferred to the octopus, which is then used to change the air from a liquid to a gas phase. This displays that heat is the thermal energy required to vaporize air during the drying process (Sitompul et al., 2021).

Bamboo is a drying tool that also experiences the effects of temperature and heat, similar to an octopus. When bamboo is exposed to sunlight for an extended period, it can experience expansion, which is an increase in size as the particles within the bamboo move faster due to the increased temperature. During the drying process, bamboo often shrinks due to the loss of its moisture content. Based on research, sun-dried bamboo can undergo shape changes such as warping or sagging. This is important to note because changes in the shape of the drying equipment can affect the stability of the Octopus position while drying (Sera, 2021). Thus, the octopus drying process not only involves the influence of temperature and heat in evaporating water from the Octopus body, but also shows physical changes in the drying equipment due

to expansion or shrinkage. This is a clear example of the application of concepts related to temperature, heat, and expansion in everyday life. The practice of drying octopus is a clear example of the application of science principles. The drying process is directly related to heat as heat energy, temperature transfer, and evaporation of water from the octopus' body. When the octopus is dried, heat is transferred from the environment to the octopus's body, causing the water to evaporate a process relevant to basic physics concepts.

One of the real applications of local wisdom-based science learning can be seen in the octopus drying process, which involves scientific concepts of temperature, heat, and expansion. This activity is not only a traditional economic practice of coastal communities, but also reflects physical phenomena relevant to the 7th-grade science curriculum. Science learning that utilizes local contexts like this provides numerous benefits, as students can understand scientific concepts through real-life experiences that occur in their environment. The involvement of the community as a resource or learning reference makes the education process more inclusive and relevant. At the same time, it helps preserve local culture and instill a sense of pride in their own regional identity. Azizatunnisa et al. (2022) argued that in science learning teachers must actively involve students to develop their thinking skills and learning activities should be. This means that various experiences around students including culture can be a source of knowledge for students who help think and carry out scientific performance for the sake of achieving concepts that are meaningful to their lives. One of the cultural studies that can be used as a source of knowledge in science learning is ethnoscience. Through local wisdom-based science learning, the original knowledge of the community that has not been properly formalized can be transformed into formal science knowledge so that it has an impact on increasing understanding because it is contextually based, high learning motivation and the emergence of love and pride for their own culture in students designed through real activities (Kasi et al, 2024).

2.2 Design

In the module design stage that researchers developed, there are three learning activities, including: (1) temperature, (2) heat, and (3) expansion. In each learning activity, the material is provided according to the KD, and each activity includes an exercise based on local wisdom, such as the use of dried octopus. The evaluation questions at the end of the module also draw on this local wisdom. The material presented features several contextual images that aim to explore students' interest in the module. The material is based on local wisdom, providing new knowledge related to students' real life.

2.3 Development

The module development stage is designed to help students understand the concepts of temperature, heat, and expansion through a local wisdom-based approach, namely the process of drying dried octopus carried out by the community. The octopus drying process carried out by coastal communities, such as those in Kaur Regency, is a real-world example of the application of concepts related to temperature, heat, and expansion in everyday life. When an octopus is dried in the sun, the high ambient temperature causes heat transfer from the sun to the octopus's body. This heat causes the water in the octopus's tissues to evaporate, a process strongly influenced by temperature. The heat also causes changes in the shape and size of the octopus's body due to expansion. This simple activity scientifically illustrates the close relationship between temperature, heat, and expansion, three important concepts in physics that can be understood contextually through local wisdom.

The development stage was carried out by validating the product with three expert validators to obtain suggestions for improvement, which would be very useful for module development. Suggestions and input are used by researchers to improve the developed module, as there are still many shortcomings and mistakes in the preparation of the module that researchers have developed. The occurrence of these errors is due to the researcher being less careful in the development of the module. At this stage of module development, researchers obtained module quality based on the assessment of the three validators for the validity aspects of the local wisdom-based science module.

2.4 Implementation

At the implementation stage, researchers tested the readability of the science module in class VII of SMPN 24 Kaur, which was carried out through a readability test using student response questionnaires. Based on the results of the readability assessment questionnaire administered to 21 seventh-grade students at SMP Negeri 24 Kaur, the following results were obtained: the content aspect scored 98%, the linguistic aspect scored 96%, the graphical aspect scored 96%, and the usefulness aspect scored 97%. On average,

the module's readability score reached 97%, which falls within the "very feasible" category. According to Maktum et al., (2025) student responses to local wisdom-based science learning modules are included in the very practical category. The results of the questionnaire analysis conducted by the researchers indicated that the students' response to the local wisdom-based science learning module developed by the researchers was very positive, suggesting that it could be declared practical and used as a thematic companion book during learning. With this product, students can more easily learn science and solve problems related to real life.

2.5 Evaluation

At the evaluation stage, the researcher analyzes the practicality of the product they have developed, whose data is obtained during the implementation process through a readability trial. The effectiveness of the developed science learning module can be seen in its ability to foster students' thinking in solving problems related to real life, especially by linking temperature, heat, and expansion materials with local wisdom in their area. Based on the results of expert validation, the module obtained a score of 95%, and the validity of the local wisdom-based science learning module they developed was classified as very high (Batigin et al., (2024). This module not only helps students understand concepts theoretically, but also encourages them to think critically and contextually. This indicates that, although there are still areas that require revision, the module is feasible and can be effectively used in classroom learning activities. Measurements are also made so that students can develop their thinking by connecting the material found in class with real-life experiences. This demonstrates the students' interest in the science module, based on the local wisdom of dried octopus that the researchers have developed.

The main advantage of this module is the application of a contextual approach through the incorporation of local wisdom, as exemplified by the Kaur coastal community's octopus drying practices. The phenomenon is associated with temperature, heat, and expansion material, making it easier for students to understand concepts through the reality they recognize. In addition to strengthening conceptual understanding, this approach also builds love for local culture and develops the profile of Pancasila students in accordance with the demands of the Merdeka Curriculum.

Science learning in the independent curriculum aims to develop students' literacy and numeracy competencies in analyzing natural and technological phenomena found in the surrounding environment systematically, critically, and creatively. Science learning based on local wisdom is an effort to make science concepts contained in local wisdom values more accessible and easier to analyze in the environment around students (Suastra et al, 2021). Responses from students during the readability test also supported this validation. Many students stated that the module was very easy to understand and interesting to learn. Some students also suggested the addition of supporting media, such as links or QR code videos of the octopus drying process, as a form of innovation that can enrich the learning experience. This shows that students not only appreciate the content of the module but also have the motivation to learn more deeply through a combination of text and visuals. Based on the expert validators' conclusions, it is stated that the science module, based on local wisdom regarding the use of dried octopus in temperature, heat, and expansion materials, is suitable for use in the field, with revisions made according to suggestions and input from expert validators.

2.6 Implications

The development of science learning modules based on the local wisdom of dried octopus has significant implications for contextual and meaningful learning processes. In its implementation, this module facilitates students' understanding of abstract concepts such as temperature, heat, and expansion through a real-life approach that is close to their environment. Students are not only invited to understand the theory but also to see the direct connection with community activities, such as the process of drying octopus, which has become part of the local culture of the Kaur community.

This module also has positive implications for the development of students' science literacy. By involving local cultural aspects, students become more active, creative, and critical in analyzing the phenomena around them (Zainuri et al, 2025). This supports the creation of the Pancasila student profile in line with the direction of the Merdeka Curriculum, which emphasizes student-centered learning rooted in the nation's culture. For teachers, this module becomes an alternative learning resource that is relevant, innovative, and can foster higher teaching motivation. Teachers are encouraged to explore the local potential around them and connect it with the learning material, thereby enhancing students' emotional and intellectual engagement in the learning process. Thus, the use of this module can be one solution to

improve the quality of science education in the region by strengthening the local context as part of the curriculum.

2.7 Research Contribution

This research makes a significant contribution to the development of locally wisdom-based teaching materials, which are still limited, especially in science education at the junior high school level. The developed module combines scientific concepts with local culture, directly supporting efforts to preserve community cultural values while also strengthening students' understanding of science material.

Another contribution lies in the use of the structured and systematic ADDIE development model. The process, which begins with analysis and evaluation, provides an overview of how a learning product can be developed validly and reliably based on input from experts and the results of readability tests conducted by students. This shows that a model-based development approach can produce effective and applicable educational products. This research also serves as a vital reference for the implementation of the Merdeka Curriculum. This module demonstrates how local values can be integrated into science education without compromising its academic quality. Thus, the results of this research can serve as a reference for other researchers and educators in developing similar modules in various regions with their respective local characteristics.

2.8 Limitations

Like other studies, this research also has several limitations that need to be considered. The module trial was conducted in only one class at one school, so the scope and generalizability of the research results are limited. The diversity of student characteristics in other regions has not been fully accommodated in this testing, so the effectiveness of the module outside the research context cannot yet be determined. The evaluation of this module was only conducted over a short period, specifically during the readability and validation testing phase. The long-term impact on student learning outcomes, changes in scientific attitudes, and the enhancement of science process skills have not yet been part of the evaluation. Therefore, further research with a quantitative approach or long-term experiments is highly recommended. The limitations in using additional learning media are also noteworthy. Although this module contains text and images, it has not yet made much use of interactive media such as videos of the octopus drying process or digital simulations. Those media can enhance understanding and increase students' interest in learning science.

2.9 Suggestions

Based on the findings and limitations identified, several recommendations can be made for further development. First, this research needs to be replicated in other schools with different geographical and socio-cultural contexts to determine if this module remains effective in diverse settings. This is crucial for determining the level of flexibility and broader acceptance of the module. The further development of the module is expected to be complemented with supporting media such as videos, animations, or the use of digital-based interactive technology. This aligns with the development of educational technology and the needs of today's student generation, which tends to be responsive to visual and multimedia learning. For teachers who will use this module, training or usage guidelines need to be provided to ensure optimal utilization of the module. Teachers are also advised to adjust the module's content to local conditions in their respective areas, making the learning more relevant and contextual. For future researchers, it is recommended to evaluate the impact of this module quantitatively on student learning outcomes, as well as to investigate how it influences students' scientific attitudes and critical thinking skills. Thus, the research results can provide a more comprehensive and in-depth picture regarding the effectiveness of local wisdom-based modules in science education.

D. Conclusion

Based on the results of this local wisdom-based science module research, using the type of R&D *(Research and Development) research* using the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). The learning module on temperature, heat, and expansion, based on local wisdom from the octopus, is feasible and practical for use in grade VII junior high school learning. This is supported by the results of expert validation, with an average score of 95%, which is classified as very valid. Additionally, a readability test conducted by students yielded an average score of 97%, indicating that the module is very easy to understand. Positive student responses to the readability questionnaire for this module indicate that integrating local contexts can increase learning

interest, enhance concept understanding, and promote active student involvement. Therefore, this module can be used as an effective thematic companion book to support science learning for seventh-grade junior high school students.

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F. Author Contribution Statement

The author is responsible for the entire research process, from problem formulation and theoretical study to data collection, analysis, and article preparation. The author also designed a science learning module based on local wisdom about dried octopus and conducted readability tests and a small-scale implementation at SMPN 24 Kaur. The supervisor plays an active role in providing conceptual and methodological direction from the beginning of the preparation of the proposal to the completion of the article. He also conducted substantive reviews of the article content and provided critical feedback that strengthened the study's quality. Both parties work together in revising the manuscript, validating the content, and ensuring the article is scientifically suitable for publication. Contributions are made collaboratively and proportionally according to the duties and responsibilities of each party.

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