

Development of Local Wisdom-Based Physics Supplement Books to Improve Science Literacy of Students at SMAN 5 Wajo

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Abstract: One of the local wisdoms of the Bugis tribe that is still often found in Wajo district is a traditional food that they call Putu Soppa' or Putu Tongka. The objectives of this study were: to describe the profile of a valid local wisdom-based physics supplement book for students of SMAN 5 Wajo; to describe teacher responses to the use of local wisdom-based physics supplement books for students of SMAN 5 Wajo that have been developed; to describe student responses to the use of local wisdom-based physics supplement books for students of SMAN 5 Wajo that have been developed. This study is a development researches using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). This research was implemented in class XI IPA 2 of SMAN 5 Wajo. Data collection was carried out through observation/interviews, expert assessments, questionnaires and science literacy tests. Then analyzed using descriptive analysis. The results of this study indicate that: the developed teaching materials are declared valid with a reliability level of 0.72; the practicality of teaching materials reviewed from the practitioner's response shows that the developed teaching materials are practical with a percentage of 0.90; the effectiveness of the developed teaching materials is reviewed from the learning outcomes of students obtained through learning outcome tests (science literacy tests). A classical percentage of 80.64% or 25 out of 31 students achieved the learning completion criteria was obtained. So, reviewed from the number of students who achieved completion, the teaching materials are declared effective.

Keywords: Development research; Local wisdom; Physics supplement books; Putu soppa

Introduction

The most important momentum in the history of the Indonesian nation occurred in 2045, because at that time Indonesia was exactly 100 years old. This is the reason for the emergence of ideas, discourses and concepts about the Golden Generation 2045. The great hope is that in 2045, 70% of Indonesia's population will be of productive age (15-64 years), while the remaining 30% will be unproductive (aged 14 years and under and over 65 years) in the period 2020-2045. This means that this masterplan is indeed prepared to face the demographic bonus where 70% of Indonesia's

population is of productive age, namely 15-45 years or can be said to be dominated by young people. So to face this phenomenon depends on how all parties prepare the younger generation (Yuliati, 2017). One of the most crucial efforts to realize the golden generation in 2045 is through education (Sulistyo et al., 2019). Through education, the potential of students according to their nature is developed based on the foundation they have through planned learning so that they can live properly with the surrounding community including the world community (Harris, 2021; Yemini et al., 2025; Kamalov et al., 2023). This is in accordance with the objectives of National education, namely to develop the potential of

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students to become human beings who believe and fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens (Ristekdikti).

To realize the Golden Generation in 2045, since 2016 the Ministry of Education and Culture has been promoting the National Literacy Movement (GLN) as one of the definite steps taken by the government and is part of the implementation of the Regulation of the Minister of Education and Culture Number 23 of 2015 concerning the development of character. There are six basic literacies in GLN, one of which is science literacy. In Lestari et al. (2020) and Putri et al. (2022), indicators of scientific literacy include: identifying valid scientific opinions, conducting effective literature searches, understanding elements of research design and how they impact findings making graphs accurately from data, solving problems using quantitative skills, including basic statistics, understanding and interpreting basic statistics, making inferences, predictions, and drawing conclusions based on quantitative data. The basic principles of scientific literacy formulated by Indonesia are: contextual, in accordance with local wisdom and developments; fulfillment of social, cultural, and state integrity; in accordance with learning quality standards that are in line with 21st century learning; holistic and based on various other literacies; and collaborative and participatory. These principles must exist in the context of Virtič (2022), defines scientific literacy as knowledge of science and understanding of the relationship between science, technology, society, and the environment.

Meanwhile, the basic principles of scientific literacy formulated by Indonesia are: contextual, in accordance with local wisdom and developments in the era; fulfillment of social, cultural, and state integrity; in accordance with learning quality standards that are in line with 21st century learning; holistic and based on various other literacies; and collaborative and participatory. These principles must be present in the science learning process in schools, including in the physics learning process in high school (Hardyanti et al., 2018; Tunga & Jumadi, 2022; Safaah et al., 2017). In the learning process, including physics learning. Books as one of the printed teaching materials and are one of the learning resources that can help students achieve the specified learning objectives. Thus, the professional responsibility of educators (teachers) must be implemented so that the learning that is managed becomes more qualified, in accordance with the demands of the 21st century. This is in accordance with Permendiknas No.16 of 2007, where one of the points in

it states that physics subject educators must be able to develop student physics books as one of the learning resources (Kemdikbud). Good teaching materials are teaching materials that contain balanced components of science literacy in the physics learning process in high school education units, the books used are almost the same as Rusilowati et al. (2019), Iswanti et al. (2024), and Marôco et al. (2024), regarding textbooks, namely high school physics textbooks have a percentage of science literacy categories that are not evenly distributed, the science knowledge category has 56.2% compared to other science categories.

Koto et al. (2024) also conducted a test on three physics textbooks for grade XI high school students used in Pati district with the results of the study showing that the physics textbooks used in the learning process generally emphasize the aspect of scientific knowledge with a percentage of science components as the body of knowledge of 70.94%, science as a way to investigate 7.08%, science as a way of thinking of 19.08% and the interaction between science, technology and society of 2.90%. Furthermore, Zentveld (2025) revealed that physics textbooks circulating in schools have not fully accommodated the basic principles of scientific literacy, especially principle number one, namely (contextual, in accordance with local wisdom and the development of the times). Therefore, it is necessary to provide physics books that are in accordance with contextual principles that are in accordance with local wisdom. The book in question is in the form of a supplementary book for students (Noble et al., 2019). This supplementary book is expected to be a companion book for students that not only contains material about physics but also local content material. In accordance with Permendikbud No. Article (2) of Law No. 79 of 2014 concerning Local Content in the 2013 Curriculum states that local content is study material or subjects in educational units which contain content and learning processes about local potential and uniqueness which are intended to form students' understanding of the advantages and local wisdom in the area where they live.

Suastra (2013) stated that if science/physics learning in schools does not pay attention to children's local culture, then the consequence is that students will "reject" or only accept some of the science concepts they learn. According to Safitri et al. (2024) and Nadlir (2016), local wisdom-based education is a conscious, planned effort through the exploration and utilization of local potential wisely in an effort to create a learning atmosphere and learning process, so that students actively develop their potential to have skills, knowledge and attitudes in an effort to participate in building the nation and state. Local wisdom can be understood as ideas, values, local views that are wise,

full of wisdom, have good values, which are embedded and followed by members of the community (Harahap & Harahap, 2024). Talking about local wisdom, one of the provinces in Indonesia that is still thick with local wisdom values both in terms of expressions, artifacts, actions and traditional food is South Sulawesi (Osawa, 2023). The Bugis tribe in Wajo Regency is one of the tribes. An area that has a development vision of "Wajo with a Religious, Productive, Superior, Prosperous and Safe Character." Departing from this vision, SMA Negeri 5 Wajo formulated a vision that is in line with the local government, namely "The realization of intellectually, emotionally and spiritually intelligent people." To realize this vision, one of its missions is "to increase the active role of related elements in improving quality".

The purpose of this mission is the effort of all personnel to develop various aspects of studies that can improve the quality of educators and students without leaving the local wisdom values of their region. One of the local wisdoms of the Bugis tribe that is still often found in Wajo Regency is traditional food which they call Putu Soppa' or Putu Tongka. From the results of brief interviews obtained from several cake sellers at the traditional market in Belawa District, it is known that putu soppa is a breakfast for people in the past, no one knows for sure the origin of the food, what they know is that the food has been passed down from generation to generation. If you pay attention, the process of cooking putu soppa' or putu tongka' cannot be separated from the concept of physics. Based on this, initial observations were carried out at SMA Negeri 5 Wajo and information was obtained that: the scientific literacy skills of students in physics learning are in accordance with the findings of Husna et al. (2022), namely the initial scientific literacy skills of students at SMAN 8 Maros are still low; there is local wisdom in the type of traditional food putu soppa' or putu tongka which is rich in physics principles and is oriented towards increasing the scientific literacy of students at SMA Negeri 5 Wajo if packaged in the form of a physics textbook.

Many students and educators claim to like traditional food putu soppa' or putu tongka for breakfast before doing activities in the morning, but they do not understand that in the process of making this food there are physics principles that can be raised in the learning process to enrich or deepen the physics knowledge being studied; educators (teachers) still use general books, there are no books made by physics subject teachers that are oriented towards improving the science literacy of students at SMA Negeri 5 Wajo; and educators or physics subject teachers at SMAN 5 Wajo have not had the inspiration to develop or compile physics books based on local wisdom to improve students' science literacy. Based on the description above, the researcher

designed the research "Development of Local Wisdom-Based Physics Supplement Books to Improve Science Literacy of Students at SMAN 5 Wajo".

Method

This type of research is research and development with the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) (Arsita & Astawan, 2022). This development research was carried out in the even semester of the 2020/2021 academic year in class XI MIPA 2 SMA Negeri 5 Wajo. The stages of development with the ADDIE model can be detailed as follows.

Needs Analysis Stage (Analyze)

The needs analysis stage is the initial stage or first step of the ADDIE model. At this stage, the researcher determines and analyzes the learning requirements. Activities at this stage consist of 4 steps, namely: initial-final analysis, local wisdom analysis, student analysis, learning material analysis.

Design Stage (Design)

In the design is the stage of designing the framework of the local wisdom-based physics supplement book that will be developed, this stage is based on the needs analysis stage. The design of the local wisdom physics supplement book to present physics learning related to the local wisdom of the Bugis Wajo community which focuses on the traditional Putu Soppa' food in the form of a Supplement Book.

Development Stage

This stage is the stage of producing supplement books based on local wisdom to improve science literacy that are ready to use. The prototype of the supplement book based on local wisdom and the test instrument developed in this study will be validated by experts before being tested on students. Validation is carried out to determine the feasibility of using the physics supplement book based on local wisdom that has been developed. The components of the supplement book that are validated consist of the cover, foreword, table of contents, and description of the material, all of which have been printed into one unit of the physics supplement book based on local wisdom that has been compiled. This validation is carried out using the Gregory Test analysis. The development stage is important to produce and validate the learning resources that have been developed. After the development stage is carried out, then all resources are identified, namely students who will be needed to carry out learning (at the implementation stage). At the development stage, it can be seen to what extent the

feasibility of the physics supplement book based on local wisdom that has been developed is. From this development stage, a physics supplement book based on local wisdom is also obtained that is suitable for use in physics learning through the results of the validity test by experts. The results of the validity test are then used as a basis for making improvements to the physics supplement book that will be tested on students.

Implementation Stage

The implementation stage is the stage where the local wisdom-based physics supplement book is tested on students of SMA Negeri 5 Wajo. The trial process for using this supplement book was carried out on class XI MIPA 2 students with 27 participants. The trial was carried out online because considering that access to carry out direct face-to-face learning was not yet allowed, the researcher distributed soft copies of the local wisdom-based physics supplement book to students to be used in learning. After distributing the local wisdom-based physics supplement book to students, the researcher then gave a test to determine the students' scientific literacy skills.

Evaluation Stage

At this stage, the physics supplement book that has been developed and tested will be evaluated. Evaluation is carried out to determine the teacher's assessment or response to the implementation of the local wisdom-based physics supplement book that was developed. The results of the assessment will then be analyzed according to the established criteria. Criticism and suggestions from respondents on the local wisdom-based physics supplement book that was developed will be reviewed as material for evaluating the product as a whole to be revised so that the local wisdom-based physics supplement book can be used by students as a learning resource that is more contextual to the conditions and circumstances of the surrounding environment. Data collection techniques are stages containing the process of collecting data to support research. The collection techniques used are as follows.

Initial Observation and Interview

Observation is a process of direct observation of the research object. This stage is carried out to find out the problems being studied. After conducting observations, the researcher conducts interviews with parties who are considered related to the problems being studied. To find out what the traditional food *putu soppa* is like, the researcher conducts a search in the market and then conducts short interviews with several *putu soppa*' sellers and several Belawa community leaders. Meanwhile, to find out the use of learning resources

used in schools, the targets of the interview were physics teachers at SMAN 5 Wajo and several students.

Instrument Validation Sheet

The validation sheet in this study was used to measure the validity of the content of a local wisdom-based physics supplement book. Content validity sees the extent to which an instrument is suitable as a sample to be measured using the Likert scale model.

Educator and Student Response Questionnaire Sheet

The educator and student response questionnaire sheet were used to determine the responses of educators and students to the physics supplement book that was developed.

Science Literacy Test

Written test instrument used to determine the completeness of student learning outcomes after learning using a local wisdom-based physics supplement book.

Result and Discussion

Profile of Local Wisdom-Based Physics Supplement Book

At this stage, the results of Draft 1 of the local wisdom-based physics supplement book (*putu soppa*) were then assessed by educators using a validation sheet. The aspects assessed were; Content Feasibility, Presentation Feasibility, Language Feasibility (Hodges et al., 2022). In the aspect of content feasibility, there are several indicators, namely the suitability of the material, the accuracy of the material, and supporting materials. In the aspect of presentation feasibility, there are several indicators, namely, presentation techniques, presentation of learning and completeness of presentation (Valls-Ratés et al., 2022). In the aspect of language feasibility, there are two assessment items, namely clarity of information and accuracy of sentence structure (Utami et al., 2024). The results of the validator's assessment are as follows.

Content Feasibility Aspect

In the aspect of content feasibility, there are 5 assessment items, as stated in the following table 1.

Presentation Feasibility Aspect

In the aspect of presentation feasibility, there are 8 assessment points as stated in the following table 2.

Language Feasibility Aspect

In the feasibility aspect, there are 2 assessment items as stated in the following table 3. The obtained score was then tested using the Gregori test. The supplement book that was developed obtained an internal consistency

coefficient of 0.72. Therefore, the local wisdom-based physics supplement book that was developed has met the requirements for a valid category (Radianti et al.,

2020; Winangun et al., 2025), because the valid requirement is if the internal consistency coefficient obtained is ≥ 0.70 .

Table 1. Content Feasibility

Assessment Items	Assessment score			Information
	Validator 1	Validator 2	Average	
Depth of material	3	3	3.00	C
Clarity of learning activity procedures	3	3	3.00	C
Accuracy of facts and concepts	3	4	3.50	D
In accordance with the development of science	3	4	3.50	D
Contextual	3	4	3.50	D

Table 2. Presentation Feasibility

Assessment Items	Assessment score			Information
	Validator 1	Validator 2	Average	
Conceptual Sequence	3	3	3.00	C
Centered on supplement book users	3	3	3.00	C
Leading to concept discovery	3	3	3.00	C
Title	3	3	3.00	C
Achievement indicators	3	3	3.00	C
Completeness of materials	3	3	3.00	C
Illustrations and images	3	4	3.50	D
Example questions	3	3	3.00	C

Table 3. Language Feasibility Aspect

Assessment Items	Assessment score			Information
	Validator 1	Validator 2	Average	
Clarity of Information	4	4	4.00	D
Accuracy of sentence structure	4	3	3.50	D

Practitioner Response

The previously validated local wisdom-based physics supplement book was then tested in the field (HI et al., 2025; Woods & Copur-Gencturk, 2024). After being tested, the practicality of the local wisdom-based physics supplement book will be known by using a questionnaire for practitioners. Practitioners in this case are subject teachers, of which in this study there were 3 teachers who were asked for responses (Stenberg & Maaranen, 2022; Leeuwen & Janssen, 2019; Lakkala et al., 2021). The questionnaire given to the three subject teachers contained several aspects, namely about attractiveness, material content, language, and usefulness (Zulifah et al., 2021; Yuendita & Dina, 2024). The results of data analysis from the responses obtained from the three teachers showed an average of 0.91 or 91%. This shows that the response is in the very good category.

Student Response

The trial of the local wisdom-based physics supplement book in the school environment was also conducted to determine the effectiveness of the book developed. The researcher then used the responses from

students and also the learning outcome test. Based on the questionnaire that had been distributed to 31 students, the following graph was obtained.

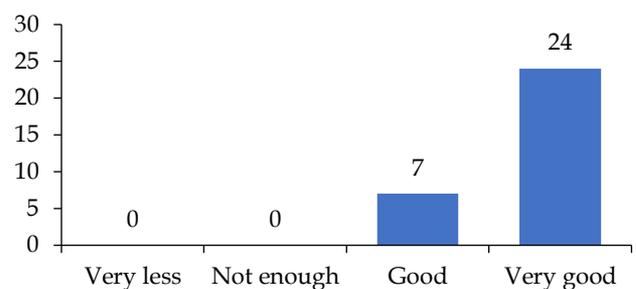


Figure 1. Student response graph

In addition to being given a questionnaire, students were also tested for their learning outcomes using a test instrument (Buntins et al., 2021; Asmayawati et al., 2024). The learning outcome test used was a formative test in the form of an essay (Escalante et al., 2023). The results of this test as previously shown that out of 31 students, there were 25 students who met the completion criteria. Then it was analyzed to calculate the percentage of classical completion and the percentage of classical completion was 80.64%. This percentage score

is in the very good category. With a completion of 80.64%, the results indicate that the local wisdom-based physics supplement book that was developed has been able to provide optimal learning outcomes. The ability of the supplement book developed to provide optimal learning outcomes and as expected is called the effectiveness of the local wisdom-based physics supplement book (Kim et al., 2022). Results should be clear and concise. The discussion should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

Conclusion

Based on the results of the analysis and discussion in this study, it can be concluded that: The results of expert validation of the local wisdom-based physics supplement book have an internal consistency coefficient of 0.72. This score indicates that the supplement book developed has met valid standards for testing; Based on the results of the practitioner response analysis, it is known that the developed physics supplement book is considered practical with a practicality percentage of 0.91 or 91%. This score is in the very practical category, which indicates that the developed teaching materials are considered practical by practitioners to be used in the learning process; The developed teaching materials are declared effective in terms of student learning outcomes, with a student completion percentage of 80.64%. Thus, in theory it is considered that the developed teaching materials are effective in terms of providing the expected learning outcomes. The suggestions that the researcher puts forward for this study are: the study produces a local wisdom-based physics supplement book specifically discussing temperature and heat materials. For future research, it can be developed more widely on other material discussions; For further research, an experimental design can be used to assess the extent to which local wisdom-based physics supplement books can provide a positive impact on both the cognitive and affective aspects of students.

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Author Contributions

Concept, writing – original draft preparation, F.; methodology and software, project administration, J.D.M.; validation and formal analysis, funding acquisition, M.A.M.

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Conflicts of Interest

The authors declare no conflict of interest.

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