

Development of A Science Module Based on Local Culture of NTT to Enhance Critical Thinking Skills of Prospective Elementary School Teachers

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Received: July 24, 2024

Revised: October 8, 2024

Accepted: November 25, 2024

Published: November 30, 2024

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DOI: [10.29303/jppipa.v10i11.8629](https://doi.org/10.29303/jppipa.v10i11.8629)

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Abstract: The research aims to develop a Science Module based on Local Culture to enhance the Critical Thinking Skills of prospective Elementary School Teachers. This type of research is development research, using the 4D model (Define, Design, Develop, and Disseminate). The subjects of this study were 30 fifth-semester students of the Elementary School Teacher Education Program, who acted as prospective teachers and used the Local Culture-Based Science Module in their coursework as part of a trial of the module's use. The data collection methods employed were questionnaires to gather information on validation, attractiveness, and practicality, as well as tests to assess effectiveness. The data analysis technique used was descriptive quantitative analysis, where total scores and values were calculated and then averaged to be interpreted according to predetermined criteria. The results obtained from the research process showed that the Local Culture-Based Science Module was valid with a validity score of 3.85, attractive with a score of 82.2, practical with a score of 80, and effective with an average final test score of 83.06. In conclusion, the Local Culture-Based Science Module is valid, attractive, practical, and effective for use as a teaching guide for prospective elementary school teachers.

Keywords: Critical Thinking Skills; Local Culture; Science Module.

Introduction

Education has become a fundamental need for humans in the era of Society 5.0 to improve the quality of life. As a necessity, education has become a lifestyle that can be accessed from basic education levels to higher education institutions. Higher education institutions, as educational organizations, face challenges that must be acknowledged, such as introducing innovations in the fields of science and technology (IPTEKS) without neglecting local culture. This effort represents an action to preserve and protect the culture and traditions of the community amid the forces of globalization, which brings many influences (Syafaruddin et al., 2012). The advancement of

technology greatly supports the educational process; however, if its use is not properly regulated and considered, it may conflict with local culture. This is something that must be avoided—local culture must remain firmly upheld, as it is the identity of the nation and cannot be separated from both individuals and education.

The rapid development and progress of society have made cultural preservation increasingly difficult. The impact of globalization has altered society, especially the younger generation. Although culture is a heritage that must be preserved, its impact can be seen in the community through lifestyle changes and a decline in cultural appreciation (Amalia & Agustin, 2022). Therefore, it is crucial to preserve culture in the

How to Cite:

Lehan, A. A. D., Wonda, H., Koro, M., Lala, S. G. U., Ratu, K. T. R., Adoe, T. Y. N., ... Pada, D. A. (2024). Development of A Science Module Based on Local Culture of NTT to Enhance Critical Thinking Skills of Prospective Elementary School Teachers. *Jurnal Penelitian Pendidikan IPA*, 10(11), 9044–9053. <https://doi.org/10.29303/jppipa.v10i11.8629>

face of the relentless march of modernization. The inclusion of local culture in education is essential, as students, as the nation's future generation, are expected to understand and preserve their cultural heritage (Rahmadani et al., 2023). Education serves as an effective tool for preserving local culture, which requires prospective educators who can develop strategies to integrate local culture into the learning process.

Local culture, as a source of information and essential content, needs to be understood by students. Examples include the socio-cultural environment, natural surroundings, daily life activities, lifestyle, and other aspects of life (Saputra et al., 2022). Many potentials within society can be explored and used as references to supplement knowledge, integrating with learning materials to develop teaching modules (Faiz & Soleh, 2021). Integrating cultural information and community practices into teaching materials is highly effective in helping students develop competencies, especially related to understanding (Yanti et al., 2022). One of the competencies that can be developed through learning with materials integrated with experiences and daily life practices is critical thinking skills. Critical thinking is a high-level thinking skill that must be developed and nurtured from an early age and supported throughout a person's education (Makhrus et al., 2018; Ramdani et al., 2019). It is crucial for teachers to incorporate local culture into lessons, as this provides students with a faster development of critical thinking skills (Syamsuriana Basri, 2022).

The development of modules is one approach and tool for integrating local culture into the content or materials of lectures to guide students toward achieving the desired educational objectives. Lufiah et al. (2022) explain that the module, in its use, meets 97% of the practical requirements during the learning process based on students' reactions. The module created can be used as teaching material to motivate students to learn more and socialize with one another about local culture. Yulianti et al. (2023) also explain that by using modules, learning outcomes become more relevant and foster a love for local culture. The learning process using modules involves activities such as reading, understanding, and learning, which become the knowledge that educators need to convey to students (Komalasari et al., 2019; Wardani et al., 2023; Rosyidi et al., 2023). In learning with modules, students can also improve their critical thinking skills by discovering, understanding, and constructing their own knowledge.

Critical thinking is a skill or competence that must be instilled in students today, as it is one of the 21st-century competencies. Critical thinking enables students to adapt by connecting what they know with new information obtained to meet needs and solve problems they encounter (Seruni et al., 2020; Merma-Molina et al.,

2022). Rohita et al. (2023) explain that critical thinking skills have not yet developed maximally, even though educators have introduced culture into the learning process. In this context, educators need to enhance their ability to stimulate students' critical thinking skills with cultural content. Critical thinking skills cannot develop on their own; rather, they need to be continuously honed and are required for progressing from one educational level to the next. As a result, critical thinking skills can be used to solve problems or overcome obstacles.

Indicators of low critical thinking ability are signs that students have not received comprehensive education in applying critical thinking techniques (Endaryati et al., 2021). Therefore, it is crucial to improve the quality of prospective teachers, as the quality of education heavily depends on the quality of teachers in planning, designing, implementing, and evaluating the learning process. For this reason, Suroto et al. (2021) explain that higher education institutions must strive to help prospective teachers develop their critical thinking abilities. Higher education institutions need to recognize the opportunity to incorporate culture as one alternative way to develop students' thinking skills. Culture can enhance human thinking patterns because it contains values for life. By integrating culture to develop critical thinking skills, it is hoped that a generation that is both educated and cultured will be created in the future.

Culture is not just limited to customs and traditions that define the identity of a specific ethnic group or region; it can also be understood as the patterns, values, and daily habits of the people in a particular area or place (Mujahidin et al., 2023). Daily life habits are closely related to the surrounding nature and environment. The interaction between humans and their natural surroundings, which becomes a routine, is specifically studied in Science education (IPA). IPA is a subject that integrates various branches of science, including chemistry, which studies matter, focusing on its form, properties, and changes; physics, which is a branch of science that specifically studies matter and its movement in space and time; and biology, which studies the Earth and all its contents, along with the processes that occur (Agustami et al., 2017). Therefore, it is appropriate to present IPA learning by incorporating relevant local cultural content into it.

Observations and interviews with prospective teachers from the Elementary School Teacher Education Program at Nusa Cendana University, Kupang, involving around 30 students, revealed that culture has not yet been considered a significant factor in enhancing critical thinking skills. Prospective teachers are more familiar with foreign cultural trends than with their own culture, particularly the culture of East Nusa Tenggara (NTT). There has been no specific guide developed that integrates learning content with local culture for use in

the learning process. This gap is the basis for the urgency of developing a specialized guide that integrates local culture with educational content.

The development of a Local Wisdom-Based IPA Learning Module is a new form of research, especially in Kupang, East Nusa Tenggara. While IPA learning has often been integrated with the daily habits and activities of local communities to develop critical thinking skills, this concept has not been widely written about or turned into a standard reference book to assist in self-directed learning. The development of a Local Wisdom-Based IPA Learning Module reflects a commitment in the field of knowledge and science, affirming that events, phenomena, and daily occurrences in human life, which vary across different places, regions, and areas, are strongly connected to the concepts in IPA. For prospective elementary school teachers, who are the target of this IPA module development, it is particularly interesting because their strong understanding of content and concepts not only in IPA but also in its application to the daily lives and habits of people in certain areas can have a significant impact on how they present lessons to students in the future. This will make learning more engaging and effective, as it will be more contextual. The development of the module is therefore crucial in guiding the implementation of IPA learning, especially for students in the PGSD (Elementary School Teacher Education) program.

Based on the background above, it is important to introduce an innovation as a strategy to integrate local culture and the habits of the NTT community into the content or materials of education, while also helping students to develop their critical thinking skills. This research aims to develop a product in the form of a module containing IPA materials integrated with the local culture of East Nusa Tenggara (NTT). This research is a new innovation, especially conducted at the higher education level, and aims to equip prospective teachers with a guide in the form of a module containing essential materials, particularly about IPA education, such as the nature of IPA learning in elementary school, characteristics of IPA education in elementary school, identification of IPA content in the curriculum, 21st-century learning, approaches, models, and methods of IPA learning, media/teaching aids for IPA in elementary school based on local culture, assessment of IPA learning, and the development of IPA teaching devices. All of this content is integrated with local culture, making it highly valuable in preparing students for their practical teaching experiences in the field.

Method

The research type used is development research, with the product produced being a Local Culture-Based

IPA Learning Module. The subjects of this research are fifth-semester prospective elementary school teachers from the Elementary School Teacher Education Program at Nusa Cendana University. The choice of this group was based on the ease of obtaining information, as the entire academic community, including students and lecturers, is supportive and responsive to efforts to innovate in the learning process, which is constructivist in nature. The module development follows the Thiagarajan development model (1974), known as the 4-D model (Define, Design, Develop, and Disseminate), which in this study has been simplified.

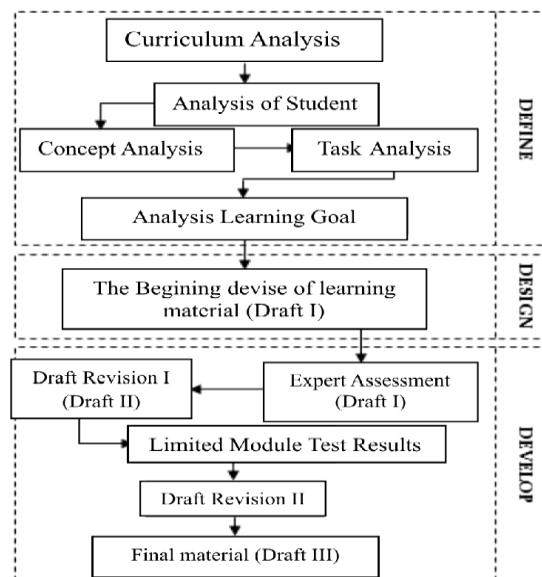


Figure 1. Steps in Developing the Local Culture-Based IPA Learning Module

The first step is “define” this step involves conducting a needs analysis by gathering information and reviewing relevant literature to make decisions about the product to be developed. The second step is “design” this step is the process of generating the design or draft of the product, as decided in the first step. The third step is “develop” in this step, the design concept is turned into a real product, and testing is conducted to ensure that the concept meets the required criteria before the product is finalized. The last step is “disseminate” this is the distribution of the tested product for use by others (Haristah et al., 2019). In this research, the dissemination step was not conducted because the study was limited to development and trial testing, and the module had already met the established criteria.

The data collection methods used were questionnaires to gather information about validation, attractiveness, and practicality, as well as tests to assess effectiveness. The instruments used in this research include validation sheets, questionnaires, and test questions. The data analysis technique used was

descriptive quantitative analysis, which involves calculating the total scores and values obtained, averaging them, and interpreting the results based on predetermined criteria.

Result and Discussion

The Validity of the Local Culture-Based IPA Module

This research focuses on the development of a Local Culture-Based IPA Learning Module. The IPA module was developed through a validation process and review by experts, including experts in the field of IPA and local culture, before conducting a limited trial or pilot test. The validation was carried out by Fembriani, M.Pd, who

has worked in the field of PGSD (Elementary School Teacher Education), particularly in IPA, for 9 years, and Dr. Hiwa Wonda, M.Pd, an expert in local culture for elementary school education, with around 30 years of experience in the field. After the module was validated and reviewed by the experts, their suggestions were used to revise the IPA module. The goal of this validation process was to assess the quality of the module developed by the researcher.

The module, which was validated by the experts, was then tested in a limited trial with 30 students from the fifth semester of the PGSD program at Nusa Cendana University. The results of the validation carried out by both experts are presented as follows:

Table 1. Results of the IPA Module Validation

Aspects reviewed	The value provided by the Validator		Average
	I	II	
A. Content Feasibility			
Coverage and depth of the main material in accordance with CP, CPMK, and Sub-CPMK	4.0	4.0	4.0
Accuracy of content (facts, concepts, theories, and principles/laws	4.0	4.0	4.0
Up-to-date content in line with developments in knowledge and technology	3.0	3.0	3.0
Stimulates curiosity	4.0	3.0	3.5
The material can be used as a guide for both prospective elementary school teachers and lecturers in carrying out teaching activities	4.0	3.0	3.5
Average	3.8	3.4	3.6
B. Presentation			
Systematic presentation of the material	4.0	4.0	4.0
Balance of substance across subtopics	4.0	4.0	4.0
Illustrations or images use effective layout	4.0	4.0	4.0
Accuracy in the use of fonts	4.0	4.0	4.0
Accuracy in numbering and naming tables/figures is appealing	4.0	4.0	4.0
Average	4.0	4.0	4.0
C. Language and Readability			
Language used is appropriate for the cognitive level of the students	4.0	4.0	4.0
The material is presented in an engaging language	4.0	4.0	4.0
The language used can motivate students to learn	4.0	4.0	4.0
Allows students to feel as though they are communicating with the author of the material	3.0	4.0	3.5
Uses correct and proper Indonesian	4.0	4.0	4.0
Terminology used is accurate and understandable	4.0	3.0	3.5
Correct use of terms and symbols	4.0	4.0	4.0
Average	3.85	3.85	3.85

Based on Table 1, from the three aspects evaluated by each validator, the content feasibility received an average score of 3.6, categorized as "Very Good"; the presentation received an average score of 4, also categorized as "Very Good"; and the language and readability received an average score of 3.85, categorized as "Very Good." Based on the average scores from each

aspect, the Local Culture-Based IPA Module is considered suitable for use with minor revisions.

Based on the revision suggestions provided by the validators, the researcher has made revisions accordingly. The details of these revisions are presented in Table 2.

Table 2. Results Before and After Revision of the Local Culture-Based IPA Module

Before Revision	After Revision
The writing still contains some inaccuracies, particularly in font usage (typos)	The writing has been carefully reviewed and corrected
The module lacks images	Images have been added

Attractiveness of the Local Culture-Based IPA Module

The attractiveness of a product is an important factor that needs to be met by developers, including when developing a module as a learning guide (Dewi & Mikaresti, 2019). This was also considered in the development of the Local Culture-Based IPA Module. Attractiveness in this module was addressed through the use of appealing fonts that are easy to read, a well-designed color scheme for both the cover and the content, modern graphic designs, neat and precise

layout of text and images, and illustrations or images that are easy to understand and reinforce the content. The shapes, colors, sizes, and proportions of the images are designed to reflect reality.

To assess the attractiveness of the Local Culture-Based IPA Module, data was collected from prospective elementary school teacher students through a questionnaire regarding the module's appeal. The results of the module's attractiveness are presented in Table 3.

Table 3. Attractiveness of the Local Culture-Based IPA Module

Question	Option	Number	Percentage (%)
The font used in the Local Culture-Based IPA Module is attractive and easy to read	Attractive	30	100
	Not attractive	0	0.0
The color combination of the cover design and the content of the Local Culture-Based IPA Module is attractive.	Attractive	25	83.3
	Not attractive	5	16.7
The design of the Local Culture-Based IPA Module uses modern graphics.	Attractive	20	66.6
	Not attractive	10	33.4
The layout of the text and images is neatly and precisely arranged.	Attractive	24	80.0
	Not attractive	6	20.0
The illustrations or images in the Local Culture-Based IPA Module are easy to understand and reinforce the explanation.	Attractive	27	90.0
	Not attractive	3	10.0
The shape, color, size, and proportions of the image objects are designed to reflect reality.	Attractive	22	73.3
	Not attractive	8	26.7

Based on Table 3 above, it can be seen that the aspect of the font used in the Local Culture-Based IPA Module is attractive and easy to read, the color combination of the cover design and content of the Local Culture-Based IPA Module is attractive, the design of the Local Culture-Based IPA Module uses modern graphics, the layout of the text and images is neatly and precisely arranged, the illustrations or images in the Local Culture-Based IPA Module are easy to understand and reinforce the explanation, and the shape, color, size, and proportions of the image objects are designed to reflect reality. The average final score for "attractive" is 82.2%, while the score for "not attractive" is 17.8%. Based on this average score, it can be concluded that the Local Culture-Based IPA Module is considered attractive.

Practicality of the Local Culture-Based IPA Module

In addition to validity testing, the IPA learning module also needs to undergo a practicality test by collecting feedback from module users, namely the students, through the completion of a practicality questionnaire (Gazali, 2016). The indicators of the module's practicality include efficiency of use, attractiveness of the design, and ease of use. The results from the practicality questionnaire are presented in Table 4.

Table 4. Results of Data Processing on the Practicality of the Local Culture-Based IPA Module

Practicality Aspect	Total score	Average (%)
Efficiency	39.5	79
Attractiveness	40.5	81
Ease to use	40.0	80
Average		80

The data collected from the questionnaire reveals that the aspect of efficiency in usage received a percentage of 79%, the attractiveness aspect received 81%, and the ease-of-use aspect received 80%. The percentages for these three aspects were totaled and averaged, resulting in an overall average percentage of 80%. Therefore, it can be concluded that the developed module is practical to use as a guide in the implementation of learning and helps students achieve the learning objectives, particularly in IPA (Science) education.

The results showing the practicality of the module indicate that students did not encounter difficulties during its use. The module is easy to access and use. The ease of use is also reflected in the organization of the material, where the content is arranged logically, making it easier for students to follow. As they study each chapter, it feels like climbing stairs, where one chapter serves as a prerequisite for the next. An important aspect of developing learning materials, including modules, is the organization of the content,

which enables students to learn effectively (Zhao & Sullivan, 2017).

In using the module as a learning tool, students need to have motivation that drives them to engage in the learning process. The Local Culture-Based IPA Module was designed attractively, using a modern combination of colors and graphics, which serves as a factor that can motivate students to learn from the module (Shieh & Yu, 2016). When students have strong motivation, the learning process is likely to be carried out seriously, with focus and a clear goal to achieve good results.

Effectiveness of the Local Culture-Based IPA Module

Effectiveness is an important aspect that must be fulfilled by the developers of the product (Bararah, 2017). Before a product is deemed suitable for use, it must go through a trial phase to determine its effectiveness. The Local Culture-Based IPA Module was tested in actual learning situations with fifth-semester students from the PGSD program at Universitas Nusa Cendana. The students used the module as a reference and guide in the learning process, as it contained the necessary material and information. To test effectiveness, data was collected from both a pretest and a posttest. The goal was to compare the students' learning outcomes before and after the learning process using the Local Culture-Based IPA Module. The results of the pretest and posttest for 30 fifth-semester PGSD students from Universitas Nusa Cendana are shown in the following table:

Table 5. Pretest and Posttest Results of Students

Type Test	Number of Students	Min Score	Max Score	Total Score	Average
<i>Pretest</i>	30	50	78	1876	62.50
<i>Posttest</i>	30	74	90	2492	83.06

Table 5 above shows the pretest and posttest results, including the total scores and average scores. The total score and average scores indicate that there is a difference between the pretest and posttest results. The lowest score on the pretest was 50, while the highest score was 78. For the posttest, the lowest score was 74, and the highest score was 90. The total score for the pretest was 1876, with an average score of 62.5, while the total score for the posttest was 2492, with an average score of 83.06. This improvement in learning outcomes is evident both in individual scores and in the overall total and average scores. The average score increase between the pretest and posttest was 20.56. With this improvement, it can be concluded that the Local Culture-Based IPA Module, used as the primary guide for students in the learning process is effective.

This research represents the development of a product, namely a module that will be used in the teaching of Science (IPA). The development of the module is an effort to provide a guide for the implementation of a learning activity, which should be aligned with the direction and objectives of the curriculum (Xue et al., 2023; Kustantia et al., 2023). As a learning guide, the module contains all the material to be covered over a specific period (Puspita, 2019). The IPA module developed in this study is one that integrates local culture into its content. The content of this Local Culture-Based IPA module includes the nature of Science learning in primary schools (SD), the characteristics of Science education in primary schools, the identification of Science materials in the curriculum, 21st-century learning, approaches, models, and methods of Science learning, local culture-based teaching media/tools, assessment of Science learning, and the development of Science learning tools. Mastery of all this material is crucial, as it must be fully conveyed during lectures, given that content mastery is one of the most important aspects for prospective teachers (Amelia et al., 2023).

The product developed in this research is a Local Culture-Based Science Learning Module that integrates culture and daily life habits of the community, making it easier for students to form connections to the material. It also serves as an effort to preserve and protect the cultural heritage passed down as the nation's wealth. The development model adopted in this study is the 4-D model, which includes the stages of Define, Design, Develop, and Disseminate (Thiagarajan et al., 1974).

At the define stage, preliminary research was conducted in the field through observations and interviews with prospective teachers about existing conditions that did not meet the needs and expectations. The Define stage is a crucial step in determining the initial idea of a development research project (Gunada et al., 2015; Risnawati et al., 2019; Wulandari et al., 2024). Observations and interviews were conducted with students from the PGSD program at Universitas Nusa Cendana, who were also the subjects of this study. In addition to field research, a review of information related to current issues and developments in education was also carried out to form the basis for determining the research topic and writing. The collected literature, in the form of books and accredited articles from sources such as SINTA and SCOPUS, ensured credibility. From both the preliminary research and the literature review, it was found that one of the problems faced in classroom learning among students was the lack of a main guide to direct the learning process, especially in developing critical thinking skills in various courses, including Science education. A key resource, such as a module, teaching material, or a reference book, is necessary for

students to guide them in developing critical thinking skills. This resource would serve as a main guide for students, helping them with both their classroom learning and independent study processes.

After the define stage, the next step is the design phase. In this stage, plans are formulated for what needs to be prepared in the development process (Fajri & Taufiqurrahman, 2017; Hidayat et al., 2022; Wulandari et al., 2024). Based on the results of the initial research and literature review, the idea to develop the module emerged. However, this module has a unique feature – it is integrated with information related to the culture, customs, and values in the daily life of the people of East Nusa Tenggara. In addition to the planned ideas, the content of the book, cover design, content arrangement, materials, illustrations (images and tables), as well as the planning for the stages that would follow (such as validation, practicality survey, attractiveness, and effectiveness testing, along with the subjects and instruments to be used) were all determined.

Once these plans were thoroughly prepared, the next step was the development phase. During the development stage, the researcher developed all aspects that had been planned, particularly the Local Culture-Based IPA Module as the main product to be created (Azka et al., 2019; Öz Aydın et al., 2023; Sulistyana et al., 2023). The module was developed in stages, starting with the content or material, and once that was completed, other additional aspects such as the cover, content design, graphics, images, tables, and diagrams were added. The content in this module includes the following topics: the nature of Science learning in primary schools (SD), characteristics of Science education in primary schools, identification of Science content in the curriculum, 21st-century learning, approaches, models, and methods of Science learning, local culture-based teaching media/tools, assessment of Science learning, and the development of Science teaching materials. These topics will be integrated with the values, customs, and local culture that are closely connected to students' daily lives. This strategy will make it easier for students to understand the learning material, while also equipping them with the competencies needed to become prospective primary school teachers.

The integration of local culture into the module's content is very helpful for the module's users – namely the students – because it aids in developing their critical thinking skills. By studying this module, students will be guided to link the material with their personal experiences and daily habits. As a result, students will try to connect what they are learning with the experiences they already have, leading to a process of knowledge construction that can occur independently. The activity of linking knowledge and reasoning to

everyday experiences is an indicator of critical thinking skills (Koten et al., 2023).

For the development of additional aspects such as the cover, content design, graphics, tables, and diagrams, modern designs with an attractive color combination were used, which were visually motivating for students to engage with the Local Culture-Based IPA Module. The images included in the module are original photographs taken by the researcher, showcasing the culture and daily habits of the people of East Nusa Tenggara that are relevant to the Science material being explained.

At this stage, instruments were also developed to test critical aspects of the study, such as the expert validity instruments for the module, the practicality questionnaire, the attractiveness questionnaire, and the effectiveness test instruments. Development occurred continuously from the early stages until the module was completed, with the expectation that it would meet the highest quality standards. The development process also involved revisions and improvements based on feedback from various stakeholders (Azka et al., 2019). Key figures who provided constructive feedback for the development process included the experts who acted as validators: Dr. Hiwa Wonda, S. Pd, M. Pd, an expert in local culture, and Mrs. Fembriani, M. Pd, an expert in Science. Both validators provided feedback on aspects such as inaccuracies in writing, especially with the use of letters, prepositions, and prefixes, as well as the need to add more images. The final stage would have been dissemination, but this was not pursued in this study as the research aimed only to test the feasibility of the developed product – the Local Culture-Based IPA Module.

The results obtained provide an overview that the Local Culture-Based IPA Module is considered practical from the aspect of practicality, as evaluated by the users, in this case, the fifth-semester students of the PGSD program at Nusa Cendana University. The evaluation showed that, across several assessed aspects, the total score of the assessment reached 80%, indicating that the module is very practical. This level of practicality was achieved because the module is highly efficient in its use. The module is designed in an A3 format, similar to books published by well-known publishers, making it easy to carry anywhere and simple to use.

The module also excels in terms of attractiveness, as it features a modern design, combined with the integration of local culture and customs with the learning material. By using the Local Culture-Based IPA Module, students are invited to recall the cultures and customs of the various regions in East Nusa Tenggara. The module is easy to access because it is widely available on campus, and it is also easy to use and understand, as the content has been intentionally

simplified without compromising the core substance of the IPA (Science) learning material.

Attractiveness is another aspect assessed in the Local Culture-Based IPA Module, and it is found to meet several important criteria. The typeface used is easy to read, and the design is modern, featuring the Baar Metanoia font. This font is often used in books published by well-known publishers, especially primary school textbooks. The color combination is also an important aspect, and from the evaluation, it is evident that the Local Culture-Based IPA Module scores highly in this area. From the cover to the content, the color scheme is visually appealing and consistent. In addition to the typeface and color scheme, the aspects of graphic design, the layout of text and images, the appropriateness of illustrations and pictures in clarifying the material, as well as the form, color, size, and proportions of the images, all received a high score in the evaluation. This indicates that the Local Culture-Based IPA Module is indeed attractive.

All aspects of the module have been met, but to determine if this module contributes to improving students' abilities and learning outcomes, an effectiveness test is necessary. The effectiveness test was conducted by implementing the module in a learning environment and assessing student progress before and after using the module. The results of the tests showed that students' initial abilities were less than optimal, but improved significantly after the learning process using the Local Culture-Based IPA Module. The complexity of the material within the module played a key role in increasing students' understanding and learning outcomes. The content and topics covered in the module are comprehensive, addressing the nature, characteristics, and learning material for IPA (Science) in primary schools, 21st-century learning relevant to IPA, as well as approaches, models, methods, media/tools, assessment, and the design of IPA teaching materials. All of these topics are highly relevant in preparing students with the necessary competencies to deliver effective IPA lessons in the field in the future.

Conclusion

Local Culture-Based IPA Module is an innovative development of a module designed to guide students in supporting the implementation of learning that provides knowledge about science education (IPA) in elementary schools while also fostering students' critical thinking skills. The Local Culture-Based IPA Module was developed using the 4-D development model, consisting of four phases: Define, Design, Develop, and Disseminate. After going through all the stages, the module was tested for feasibility, which included validation, attractiveness, practicality, and effectiveness

testing. The results of the testing indicated that the Local Culture-Based IPA Module was valid with a validity score of 3.85, attractive with a score of 82.2, practical with a score of 80, and effective with an average post-test score of 83.06.

Acknowledgments

The authors would like to thank Nusa Cendana University for providing the research grant that made this study possible. Thanks also to all the team members who contributed their roles and efforts throughout the process, culminating in the completion of this article.

Author Contributions

Conceptualization: A.A.D.L.; Methodology: S.G.U.L. and K.T.R.A.R.; Validation: H.W.; Formal Analysis: T.Y.N.A.; Investigation: M.K.; Resources: M.N. and D.A.P.; Data Curation: S.G.U.L. and K.T.R.A.R.; Writing—Original Draft Preparation: A.A.D.L.; Writing—Review and Editing: G.K.; Visualization: T.Y.N.A. All authors have read and approved the final manuscript.

Funding

This research was funded by an internal research grant from Nusa Cendana University.

Conflicts of Interest

The funders had no role in the study design; data collection, analysis, or interpretation; manuscript writing; or decision to publish the results.

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