

Analysis of the Need for Developing an Ethnoscience-Based Module on Plant Material Biology (*Plantae*) to Improving Learning Outcomes

Lega Anattri*, Upik Yelianti, Agus Subagyo, Ilham Falani

Master of Science Education Study Program, Postgraduate Program Jambi University, Jambi, Indonesia.

*E-mail: legaanattri@gmail.com

Received: December 26, 2023. Accepted: January 10, 2024. Published: January 18, 2024

Abstract: The development of ethnoscience-based modules in biology learning, especially on plant material (*Plantae*), is an essential aspect of efforts to improve learning outcomes. By combining ethnographic and scientific approaches, this module is expected to consider students' cultural context better so as to increase their engagement and understanding of the material. This research aims to analyze the need to develop ethnoscience-based modules, and the importance of analyzing module needs today as an effort to improve biology learning outcomes on plant material (*Plantae*). This research uses qualitative research with a descriptive approach. The research method used is development research with stages that include identifying needs, planning, development, testing, and evaluation. The sampling technique was carried out using purposive sampling, with a sample of 60 students, and only 10 students, as well as 3 biology subject teachers at SMAN 1 Sungai Penuh, were selected for interviews. Data was collected through observation, field studies, documentation, and interviews and analyzed descriptively. The needs identification results show that there is a high need for the development of ethnoscience-based modules to strengthen students' understanding of plant material. The module is designed by considering the local cultural context and traditional knowledge, which can increase students' absorption of learning material. Module trials were carried out involving students as research subjects, and the results showed a significant increase in understanding of plant material. In addition, the positive response from students and teachers to the module confirms its effectiveness in improving biology learning outcomes. The newest thing in this research is a module developed with elements of ethnoscience by combining scientific concepts with scientific concepts that exist in society so that they can be expressed in a module. So, it can be concluded that the analysis of module needs is indeed critical and necessary in biology learning, especially plant material, which teachers and students can use.

Keywords: Biology; Ethnoscience; Learning outcomes; Modules; Plants.

Introduction

Indonesia is a society that has diverse cultures. So that culture in the form of wisdom towards nature does not become extinct, noble values need to be instilled and socialized to students through the learning process [1]. The ethnoscience approach is learning that combines indigenous scientific knowledge and scientific knowledge, which is able to increase students' understanding of scientific concepts [2]. An ethnoscience-based methodology was adopted in this study since it makes use of community-owned local knowledge, precisely the Kerinci batik *incung* motif.

An ethnoscience approach in the learning process needs to be carried out in order to minimize the erosion of local Indonesian cultural values as a result of the rapid flow of globalization, which has the impact of causing friction between cultural values and local wisdom [3]. Ethnoscience learning is essential to study specifically because this can be a bridge towards good science learning as a study of learning in schools [4]. Teachers need to explore local wisdom in their respective regions as a tool or learning resource to drive educational development according to the supporting capacity and conditions of the region, including solving existing problems in education and learning [5].

The ethnoscience approach can integrate character values into learning [6]. Learning with an ethnoscience

approach emphasizes achieving an integrated understanding rather than just an in-depth understanding [7].

One form of local culture in the Sungai Penuh region of Jambi Province is *Incung batik*. The *incung batik* pattern is taken from the *incung* script, which is an ancient Kerinci script. That is the uniqueness of batik that developed in the City of Sungai Penuh. Furthermore, the *incung* pattern developed on batik cloth in Sungai Penuh City is not only in the form of *incung* script but also an explanation of an object or plant found on the batik cloth. The city of Sungai Penuh was used as a batik motif because it is the center of the development of the batik industry [8].

The *incung* script used as a motif in batik is an original form made according to the name of the motif. It is a characteristic of Kerinci's social and cultural identity. "Culture as national identity shows that culture is an essential aspect for a country because it is clear that culture is also national identity" [9]. The *incung* script is an ancient Kerinci script that the Kuntum people previously used to write spells on palm leaves, buffalo palanquins, and wood. Along with its development, the *incung* script was used as a batik motif for the Kerinci people [10].

Education is a conscious and planned effort to create an active learning atmosphere so that students can develop their potential and personality in a better direction. Education can grow one's potential intellectually and emotionally,

How to Cite:

Anattri, L., Yelianti, U., Subagyo, A., & Falani, I. (2024). Analysis of the Need for Developing an Ethnoscience-Based Module on Plant Material Biology (*Plantae*) to Improving Learning Outcomes. *Jurnal Pijar Mipa*, 19(1), 60–66. <https://doi.org/10.29303/jpm.v19i1.6378>

which can make a person better. Based on this, it can be said that education has a vital role in preparing quality human resources [11].

The science learning process contains various physics, chemistry, biology, and space concepts, which provide students with experience and competence to understand their natural surroundings. Natural science is essentially empirical knowledge about phenomena and facts found in the natural environment obtained through specific methods. Put, learning science discusses phenomena in the natural environment [12].

Several problems found today, especially in the field of education, only focus on the scientific concepts studied without being accompanied by the concept of local wisdom. Local wisdom values have been marginalized and are starting to fade in society. Most do not recognize the local wisdom and cultural values that they possess because of the influence of very sophisticated and rapid technological developments, so both society and the world of education no longer consider local wisdom values.

Based on observations with Kerinci incung batik makers, results were obtained in the form of the origin of the incung script in Kerinci and the history of the incung script. The *incung* script comes from the traditional architectural philosophy of Rumah Larik. The architecture of Rumah Larik is a reflection of society and is a building that was formed because of the cultural background of the community. Therefore, traditional buildings are an expression of the culture and way of life of the community and are a direct reflection of the community in trying to express something.

The results of observations at SMAN 1 Kota Sungai Penuh, which has begun to implement an independent curriculum in its implementation require additional learning resources that can support existing learning resources, making it difficult for students to understand the learning material, and the learning outcomes obtained decrease. Completeness of teaching materials can help teachers and students in the teaching and learning process. The teaching materials used can determine the achievement of learning objectives. One example of teaching materials that can be used is modules [13], just like the module in Biology learning. Additional modules are needed in implementing an independent curriculum where learning resources are pretty limited.

Modules are a type of printed teaching material. The difference between modules and printed teaching materials is that the modules contain teaching materials that students can study themselves so that they can learn independently and actively. The module minimizes teacher assistance to students because the module is structured systematically and consists of a series of student learning activities [14].

The reality in the field shows that science learning outcomes and student character are different from the expectations desired by the government. Based on the results of the 2018 PISA survey, Indonesian students' science scores were ranked 70th out of 78 countries. This shows that the science learning outcomes of Indonesian students are still low. The results of the National Examination for junior high school students had decreased in the field of science study from 2018 when they obtained an average score of 47.45 to 46.22 in 2019. The low science learning outcomes are thought to be caused by some factors. The first is related to

the teacher's way of teaching. Teachers in schools more often use teacher-centered teaching patterns. In the teacher-teaching pattern, the teacher plays more of a role as the primary source for providing information in learning, so most students become passive in learning. This causes student learning outcomes to be less than optimal [15].

Learning outcomes are things related to learning activities because learning activities are a process. Learning outcomes consist of all psychological domains. This occurs as a result or impact of students' experiences and learning processes in school classrooms. Another opinion is that learning outcomes are the abilities possessed by students after receiving learning experiences. A number of experiences gained by students include the cognitive domain, affective domain, and psychomotor domain. Learning outcomes have an essential role in the learning process because they will provide information to teachers about students' progress in achieving their learning goals through the process of subsequent teaching and learning activities [16].

However, the reality on the ground shows that not all students like biology as a subject. This is because the biology material contains many Latin terms and specifically discusses systems that exist in humans, making it difficult for students to understand and memorize [17].

Through the development of an ethnosience-based teaching module in the form of *batik incung*, this research will be further developed regarding the development of an ethnosience-based teaching module as a learning resource. By using the teaching module, it is hoped that the material studied will focus on what is being studied because, in the teaching module, only one unique material is studied, namely regarding plants and the classification of plants, both Monocotyledoneae and Dicotyledoneae plants.

The module is also able to encourage students to learn independently and guide students to discover concepts through discovery. Apart from learning that can make students more active, learning also requires a contribution to the surrounding environment (Local wisdom) so that students can also think scientifically about existing phenomena in the surrounding environment. One solution is to provide ethnosience-based learning [18]. Therefore, the module has four main functions, namely independent teaching materials, substitute educators, evaluation tools, and reference materials. The feasibility of the module is divided into four, which include the feasibility of the content, presentation, linguistic, and graphic components [19].

Modules developed with elements of local knowledge (local wisdom) will make it easier for students to study because they are familiar with and close to phenomena in the surrounding environment. It will make learning more accessible, and student learning outcomes can improve [18]. Local wisdom is closely related to the traditional culture of a local area. It is appropriate for this local traditional culture to continue to be maintained and preserved for future generations. This local wisdom is a wealth of local culture, which also enriches national culture. There are many benefits to be gained in preserving local culture; apart from being able to attract tourists, it can also generate regional income [20].

This research is fundamental to carry out because the study is specifically on typical Kerinci batik cloth, namely *incung batik*, which uses motifs in the form of plant motifs. These motifs can indicate various specific studies in plants.

Apart from that, the study carried out on *Kerinci incung batik* cloth can combine scientific concepts with local wisdom values possessed by a community. Thus, knowledge of local wisdom can be developed and preserved because of the integration between scientific concepts and local wisdom values and concepts.

Therefore, researchers want to develop teaching materials in the form of modules that are based on student needs. The module is structured systematically using language that is easy for students to understand according to their level of knowledge and age so that when using the module, students can use it as independent teaching material without a teacher [21].

The latest in this research is a module developed with elements of ethnosience by combining scientific concepts with scientific concepts that exist in society in the form of motifs on incung kerinci batik, which are used as images in the form of images of plants in the motif, so that they can be included in a The module in the Biology subject is Plant material.

Based on the background description, it is necessary to research the Analysis of Needs for the Development of Ethnosience-Based Modules to Improve Biology Learning Outcomes in Plant Material (*Plantae*).

Research Methods

This research uses a qualitative type of research with a descriptive approach [22]. This research is research in the early stages of development, so the design of this research is a development design [23]. This research is limited to a needs assessment in order to find out the initial analysis of developing a science learning model based on local wisdom through an ethnosience learning approach. The research subjects are students of class with the superior XA class, consisting of 30 people, and the non-superior class XB, consisting of 30 people. The data was taken by purposive sampling from 60 students, and only 10 students were selected for interviews and 3 Biology subject teachers. Data collection techniques used in this research were observation, field studies, documentation, and interviews [24]. The data analysis technique carried out is data analysis developed using the theory of Matthew B. Miles, A. Michael Huberman, and Johny Saldana in the form of data condensation, data display, and conclusion drawing and verification). This research data is in the form of qualitative data. Therefore, data processing uses qualitative descriptive methods.

Results And Discussion

Based on the results of interviews with 3 Biology subject teachers and 10 students from 60 students of SMAN 1 Sungai Penuh who were selected using the purposive sampling method, regarding the analysis of the need for developing ethnosience-based modules to improve Biology learning outcomes regarding Plants (*Plantae*), the following are the results of the interviews in this research (Table 1 and Table 2).

Kerinci is now starting to produce a lot of Kerinci batik because there is quite a lot of interest in it. One of the most famous today is Batik with Incung writing motifs, namely the ancient Kerinci script. The characteristic of Kerinci batik is that the batik motif has many themes ranging

from agriculture, plantations, tourism, and cultural heritage, for example, such as incung batik motifs, coffee and coffee leaf motifs, clove motifs, betel leaf motifs, and the Kerinci mountain motif, of course, there are still motifs. Others show the uniqueness of Kerinci's culture and nature [25].

Table 1. Results of Needs Analysis Interviews for Teachers

No	Statement
1	The teacher prepares learning devices
2	Teachers use teaching modules as Biology teaching materials.
3	Teachers master Plant material (<i>Plantae</i>)
4	The teacher explains the material well to the students
5	The teacher provides an explanation of the material accompanied by practical work.
6	The teacher explains the various classifications of plants.
7	The teacher explains the differences between Monocotyledoneae and Dicotyledoneae plants.
8	The teacher explains the material quickly and in detail.
9	Teachers relate learning to everyday life.
10	The module explains in detail about Plants.
11	The module explains various types of Monocotyledoneae and Dicotyledoneae plants.
12	In addition to scientific concepts in the module, there are also elements of local community culture.
13	The module uses images in the form of plant motifs.
14	The module is associated with elements of ethnosience or local culture.
15	The module is very helpful in implementing learning.

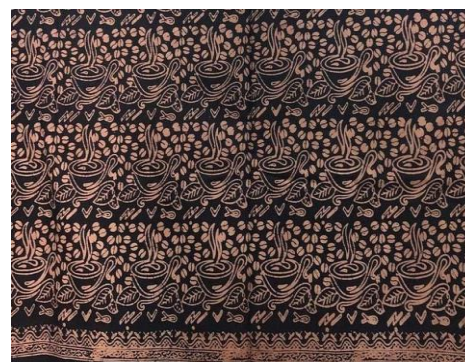


Figure 1. Coffee Motif



Figure 2. Rice Motif

Table 2. Results of Needs Analysis Interviews for Students

No	Statement
1	Students Have printed books for studying Biology
2	Students need other teaching materials besides books from school to help them understand Biology subjects.
3	Students need a Biology Module about Plants to study Biology.
4	Students have difficulty studying biology because there is only one learning source.
5	Students have difficulty studying plant material, especially in classifying it.
6	Plant Material (Plantae) has been successfully implemented in simple practicums in the school environment.
7	Students are able to recognize various plants (plantae) in the surrounding environment.
8	Students can understand the material directly if there are plant objects.
9	Batik motifs in the form of plants are essential in this module.
10	Students can find out the application of batik motifs, which lead to images of plants.
11	Students can easily understand plant material if the teacher takes it directly to the field for observation.
12	Plant material is easier to understand if appropriate and relevant teaching materials are used.
13	With batik motifs, local culture can be preserved.
14	Batik motifs in the form of plants can be used in this module.
15	The plant motifs in the module describe the morphological form of the plant.

The motifs found on Incung batik cloth basically show the unique culture, nature, and activities of the people of Kerinci Regency itself. Looking at the Kerinci Regency area, which is in a mountainous area, the people of the Kerinci Regency themselves primarily work as farmers. So it is not surprising that most batik cloth from Kerinci Regency is made following the activities of the local community. Two of the plant motifs that are most widely used in Kerinci incung batik are coffee and rice motifs. Coffee beans are one of the plantation products and livelihoods of the people of Kerinci Regency because the area is surrounded by high mountains and hills, which are the main factors in which coffee can grow. Well, in this area.

Meanwhile, rice itself is also the main livelihood of the people of Kerinci Regency. It is not surprising that there are still many rice plantations on the sides of major roads. Rice has also become a symbol for the government in Kerinci Regency to create conditions for a prosperous society in terms of clothing and food [26].

For this reason, in this article, the researcher is interested in adding elements of ethnosience in the form of the Kerinci incung batik motif into the Biology teaching module in the form of plant material, namely in the form of Monocotyledoneae (*Oryza sativa*) and Dicotyledoneae (*Coffea Sp*) plants by combining original science concepts with scientific concepts in this module as additional Biology teaching materials [27]. Modules can be used according to student needs. Learning using modules has many benefits; students can be responsible for their learning activities [28].

Ethnosience is generally acquired through experience, and passed down from generation to generation through non-formal education processes. Even though it was not produced through a scientific process using scientific methods, this ethnoscientific framework has been used by various tribes in the world. It helps them solve various problems they encounter in everyday life. The existence of people from various tribes proves this. More ethnoscientific knowledge has been proven to be confirmed through the scientific research process so that it becomes scientific knowledge [29].

Field studies were carried out using interviews and observations. Interviews and observations involving teachers and students were carried out at SMAN 1 Sungai Penuh. These interviews and observations were carried out to determine the importance of using modules in Biology subjects, and by applying ethnosience elements in them, they can be used to make the appearance of the module more attractive.

The results of teacher interviews found that at SMAN 1 Sungai Penuh, the teacher prepared learning tools, the teacher used teaching modules such as Biology teaching materials, the teacher mastered plant material, the teacher explained the material well to students, the teacher gave explanations of the material accompanied by practicums, the teacher explains various classifications of plants, the teacher explains the differences between monocotyledonous and dicotyledonous plants, the teacher explains the material quickly and in detail, the teacher relates learning to everyday life, the module explains in detail about plants, the module explains the various types of monocotyledonous and dicotyledonous plants, in the module other than there is a scientific science concept and there are also cultural elements of the local community. The module uses images in the form of plant motifs. The module is linked to elements of ethnosience or local culture and is very helpful in implementing learning.

Meanwhile, the results of student interviews showed that at SMAN 1 Sungai Penuh, students had printed books to study Biology, students needed other teaching materials besides books from school to help them understand Biology subjects, students needed Biology Modules about Plants to study Biology, Students had difficulty in studying Biology because it is only one learning source, Students have difficulty studying Plant material, especially in its classification. Plant Material (Plantae) has been successfully implemented in simple practicums in the school environment. Students are able to recognize various Plants (Plantae) in the environment. Students can understand the material directly if there are plant objects. Batik motifs in the form of plants are essential in the module, and Students can understand the application of these batik motifs, which lead to images of plants; students can easily understand plant material if the teacher brings them directly to the field for observation. Plant material is easier to understand if appropriate and relevant teaching materials are used. Having batik motifs can preserve local culture. Batik motifs in the form of plants can be used in the module, and plant motifs in the module depict the morphological form of the plant.

Based on the results of a needs analysis interview with Biology subject teachers and several selected students at SMAN 1 Sungai Penuh, from the 15 teacher and student interview questions. Module needs analysis is really

necessary for biology learning because these modules are really needed to support various theories from printed books used by teachers and students in schools. Students often have difficulty understanding Biology material presented in class because this knowledge is considered foreign and previously unknown. So, by implementing ethnoscience-based biology learning, the material presented in class can be linked to local cultures that are close to students so that students understand it more easily. Learning like this will be more meaningful because students really understand the material they are studying. Ethnoscience-based learning is also able to improve student learning achievement.

There is an alternative solution to this problem: students are invited to recognize local wisdom, which is linked to the concept of science. It can be said that playing while learning. Local wisdom is closely related to the traditional culture of a local area. It is appropriate for this local traditional culture to continue to be maintained and preserved for future generations. This local wisdom is a wealth of local culture, which also enriches national culture [30]. Apart from that, students can understand, and it is hoped that this culture will not disappear and will continue to be carried out [31].

This research is in accordance with research conducted previously regarding the Analysis of Needs for the Development of Integrated Science Modules Based on Integrated Blended Learning for Flood Disasters. The results of the research state that Educators and Students agree that during the pandemic, science learning was carried out using the blended learning model. Educators and students also agree that science learning is integrated with events in the school environment, one of which is the flood disaster. Based on the research results, it can be concluded that it is necessary to develop an integrated science module that helps implement learning during the pandemic and integrates disasters in the school environment [32].

The same research was also carried out by other researchers regarding the Needs Analysis for the Development of a Web Module for Natural Sciences Integrated with Local Plants for Middle School Class VIII. The results of the research stated that the development of a web module for natural sciences integrated with local plants is one of the solutions needed to face science learning problems. Problems that can be overcome include learning using web modules. Students will be more active in independent learning. Student learning will become more contextual with integrated science with local plants [33].

Apart from that, research is the same as this research regarding Analysis of the Need for Biology Teaching Materials for High School Students in View of the Level of Difficulty of the Material, Higher Level Thinking Skills, and Student Learning Activeness. The results of the research stated that (1) students experienced difficulties in studying animal tissue material (55.71 %), plant tissue (54.29%), movement system (54.29%), cells (48.57%), blood circulation system (42.86%), and coordination system (32.86%); (2) the biology learning carried out has not been able to develop high-level thinking skills optimally, and (3) students are less active in participating in learning activities. This research concludes that biology teaching materials are needed for high school, which can overcome student difficulties, develop high-level thinking skills, and increase student activity/involvement in learning [34].

The advantage of learning using modules is that modules can provide feedback so that in the learning process, there is interaction that occurs, so teachers can directly interact with students, find out the shortcomings of what they encounter, and immediately correct them. Modules must have clear learning objectives so that student's performance in the learning process is directed towards achieving the objectives of the learning carried out in class. Modules that are designed as attractively as possible will be easy for students to learn and will certainly arouse students' interest and motivation to learn. Modules are also flexible because the material content in the module can be studied by students in different ways and speeds from one student to another [35].

The module is also able to help students collaborate with other fellow students. Practicing questions can also help students see their abilities in solving the practice questions and then discussing them with other students. This makes students discover their weaknesses in solving questions and improves their abilities to solve other questions [36]. The module supports the learning process to be better, one of which is in terms of independent learning skills [37].

In designing learning materials, students can learn five categories of capabilities, namely verbal information, intellectual skills, cognitive strategies, attitudes, and motor skills. These five things can then be studied for weaknesses and strengths in each learning implementation so that a good learning case analysis can be obtained [38].

Integrating indigenous science learning into school learning is very important to implement. Considering that the values and norms that apply in society are currently increasingly decreasing, it is, therefore, necessary to introduce them from an early age, especially to students in the next generation, through teaching materials in the form of modules [39].

Apart from that, this research has certain limitations, namely that it is only limited to studying Kerinci incung batik motifs in the form of plant motifs. The results of this study can be integrated into Biology material in the form of plants (Plantae), which are divided into two classifications, namely Monocotyledoneae and Dicotyledoneae plants. The final results will be recorded in a teaching module that can be used as the newest learning resource for Class X Science High School students.

Therefore, from the research results above and various supporting research, it can be seen that analysis of teacher and student needs for modules is fundamental. In its implementation, teachers must use modules to support theory and support learning so that students can more easily understand the learning material. The teacher gave them because the biology material has been considered problematic by students, and there is too much memorization and scientific names, which makes it difficult for them to understand the material. This module can contribute to biology learning. Apart from that, it can also improve student learning outcomes because student understanding can increase if they use the module as supporting teaching material in learning.

Conclusion

Based on the aim of this research to analyze the need for developing ethnoscience-based modules and the

importance of analyzing module needs today as an effort to improve biology learning outcomes on plant material (Plantae) from the research results that have been presented, teachers and students do need additional teaching modules as support reference used. The results of this research show that students' understanding of Plant material can be improved through an ethnoscience approach. This needs analysis provides valuable insight into students, the level of difficulty of the material, and cultural and environmental factors that may influence their learning. Ethnoscience-based learning is very influential in creating meaningful biology learning. The author suggests to other authors to deepen and expand the variables of this research regarding the analysis of the need for biology modules to improve student learning outcomes in Plant (Plantae) material.

Acknowledgement

The author expresses his thanks to the Master of Science Education (MIPA) and Postgraduate Master of Science Education (MIPA) Lecturers at Jambi University. Who has provided a platform for writing this scientific article by presenting a Scientific Work course. The author would like to thank other parties who always support and continue to provide support for the completion of this scientific article.

References

- [1] Khoerunnisa, R. F., Murbangun, N., & Sudarmin, S. (2016). Pengembangan modul IPA terpadu etnosains untuk menumbuhkan minat kewirausahaan. *Journal of Innovative Science Education*, 5(1), 45-53.
- [2] Damayanti, C., Rusilowati, A., & Linuwih, S. (2017). Pengembangan model pembelajaran IPA terintegrasi etnosains untuk meningkatkan hasil belajar dan kemampuan berpikir kreatif. *Journal of Innovative Science Education*, 6(1), 116-128.
- [3] Puspasari, A., Susilowati, I., Kurniawati, L., Utami, R. R., Gunawan, I., & Sayekti, I. C. (2019). Implementasi Etnosains dalam Pembelajaran IPA di SD Muhammadiyah Alam Surya Mentari Surakarta. *SEJ (Science Education Journal)*. <https://doi.org/10.21070/sej.v3i1.2426>.
- [4] Parmin. (2017). *Etnosains*. Swadaya Manunggal.
- [5] Tomi, D., Anggereini, E., & Muhaimin, M. (2018). Pengembangan Perangkat Pembelajaran Biologi Berbasis Kearifan Lokal Kerinci pada Materi Keanekaragaman Hayati untuk Siswa MAS: The Development of Biology Learning Toolswith Kerinci's Local Wisdom-Based on Biodiversity Material for Senior High Schools. *Edu-Sains: Jurnal Pendidikan Matematika dan Ilmu Pengetahuan Alam*, 7(2), 11-20.
- [6] Adawiyah, R., Andayani, Y., & Savalas, L. R. T. (2022). Pengembangan Modul Kimia Etnosains Terintegrasi Model Culturally Responsive Transformative Teaching (CRTT). *Journal of Classroom Action Research*, 4(4).
- [7] Mardianti, I., Kasmantoni, K., & Walid, A. (2020). Pengembangan Modul Pembelajaran IPA Berbasis Etnosains Materi Pencemaran Lingkungan Untuk Melatih Literasi Sains Siswa Kelas VII di SMP. *BIO-EDU: Jurnal Pendidikan Biologi*, 5(2), 97-106.
- [8] Pitri, N. (2020). Kota Sungaipenuh sebagai Kota Sentral Batik Incung. *HISTORIA: Jurnal Program Studi Pendidikan Sejarah*, 8(1), 29-40.
- [9] Alfian, Henry, M. G., Nuraeni, (2013). *Studi Budaya di Indonesia*, CV Pustaka setia, Bandung.
- [10] Pitri, N. (2019). Batik Incung dan Islam di Kerinci. *Islamika: Jurnal Ilmu-Ilmu Keislaman*, 19(02), 27-39.
- [11] Pramana, M. W. A., Jampel, I. N., & Pudjawan, K. (2020). Meningkatkan hasil belajar biologi melalui e-modul berbasis problem based learning. *Jurnal Edutech Undiksha*, 8(2), 17-32.
- [12] Ilhami, A., Diniya, D., Susilawati, S., Sugianto, R., & Ramadhan, C. F. (2021). Analisis kearifan lokal manongkah kerang di kabupaten indragiri hilir, riau sebagai sumber belajar IPA berbasis etnosains. *Sosial Budaya*, 18(1), 20-27.
- [13] Rahayu, W. E., & Sudarmin, S. (2015). Pengembangan modul IPA terpadu berbasis etnosains tema energi dalam kehidupan untuk menanamkan jiwa konservasi siswa. *Unnes Science Education Journal*, 4(2).
- [14] Vitrianingsih, D., Aulianingsih, I., & Yuliani, H. (2021). Analisis kebutuhan pengembangan modul elektronik (e-module) IPA terintegrasi islam. *Jurnal Ilmiah Pendidikan Fisika*, 5(1), 27-37.
- [15] Agung, I. D. G., Suardana, I. N., & Rapi, N. K. (2022). E-Modul IPA dengan Model STEM-PjBL Berorientasi Pendidikan Karakter untuk Meningkatkan Hasil Belajar Siswa. *Jurnal Ilmiah Pendidikan dan Pembelajaran*, 6(1), 120-133.
- [16] Nasution. (2000). *Berbagai Pendekatan dalam Proses Belajar Mengajar*. Jakarta: Bumi Aksara.
- [17] Yahdiyani, Y., Helendra, H., & Yumna, H. (2022). Kebutuhan e-modul biologi berbasis pendekatan saintifik untuk peserta didik kelas XI. *Jurnal Penelitian dan Pengembangan Pendidikan*, 6(1), 111-120.
- [18] Nihwan, M. T., & Widodo, W. (2020). Penerapan Modul IPA Berbasis Etnosains untuk Meningkatkan Kemampuan Literasi Sains Siswa SMP. *Pensa: E-Jurnal Pendidikan Sains*, 8(3), 288-298.
- [19] Saputro, E. F. H., Eveline, E., & Apsari, N. (2023). Modul IPA Berbasis Etnosains pada Kurikulum Merdeka untuk Penguatan Profil Pelajar Pancasila. *JURNAL PENDIDIKAN MIPA*, 13(3), 797-804.
- [20] Sartika, S. B., Efendi, N., & Wulandari, F. E. (2022). Efektivitas pembelajaran IPA berbasis etno-STEM dalam melatih keterampilan berpikir analisis. *Jurnal Dimensi Pendidikan dan Pembelajaran*, 10(1), 1-9.
- [21] Lubis, M. F., Sunarto, A., & Walid, A. (2021). Pengembangan Modul Pembelajaran IPA Berbasis Etnosains Materi Pemanasan Global Untuk Melatih Kemampuan Literasi Sains Siswa SMP. *Paedagogia: Jurnal Kajian, Penelitian dan Pengembangan Kependidikan*, 12(2), 206-214.
- [22] Sugiyono. (2013). *Metode Penelitian Kuantitatif, Kualitatif, dan R & D (19 ed.)*. ALFABETA, CV. <https://id.scribd.com/document/391327717/Buku-Metode-Penelitian-Sugiyono>
- [23] Plomp, T., Akker, J. Van Den, Gravemeijer, K., Cobb, P., Bannan, B., Kelly, A. E., Nieveen, N., & Folmer, E. (2013). *Educational Design Research Part A: An*

- Introduction (T. Plomp & N. Nieveen (ed.)). Netherlands institute for curriculum development.*
- [24] Sudarto, (1997). *Metodologi Penelitian Filsafat*. Jakarta: Raja Grafindo Persada.
- [25] Sari, N. P., Suhirman, S., & Walid, A. (2020). Pengembangan modul pembelajaran IPA berbasis etnosains materi interaksi makhluk hidup dengan lingkungannya untuk menanamkan jiwa konservasi siswa kelas VII SMP. *Bio-Edu: Jurnal Pendidikan Biologi*, 5(2), 62-73.
- [26] Riza, D. P., Sulaiman, S., & Minawati, R. (2022). Aksara Incung sebagai Identitas Batik Kerinci. *Melayu Arts and Performance Journal*, 5(1), 16-26.
- [27] Fitriani, N. I., & Setiawan, B. (2017). Efektivitas modul IPA berbasis etnosains terhadap peningkatan keterampilan berpikir kritis siswa. *Jurnal Penelitian Pendidikan IPA*, 2(2), 71-76.
- [28] Sahara, R., Johan, H., & Medriati, R. (2022). Analisis Kebutuhan Pengembangan Modul Berbasis Etnosains Materi Suhu dan Kalor Kelas XI SMAN Kota Bengkulu. *Jurnal Ilmiah Pendidikan Fisika*, 6(3), 661-675.
- [29] Syazali, M., & Umar, U. (2022). Peran kebudayaan dalam pembelajaran IPA di indonesia: studi literatur etnosains. *Jurnal Educatio Fkip Unma*, 8(1), 344-354.
- [30] Sartika, S. B., Efendi, N., & Wulandari, F. E. (2022). Efektivitas pembelajaran IPA berbasis etno-STEM dalam melatih keterampilan berpikir analisis. *Jurnal Dimensi Pendidikan dan Pembelajaran*, 10(1), 1-9.
- [31] Sari, A. E., Abdallah, Z., Siswadhi, F., Maryanto, M., & Haryono, G. (2022). IMPROVING FINANCIAL AND MARKETING MANAGEMENT BASED DIGITAL APPLICATION ON SMEs BATIK TULIS INCUNG KERINCI. *International Journal of Engagement and Empowerment*, 2(3), 233-245.
- [32] Alpindo, O., & Oprasmani, E. (2022). Analisis Kebutuhan Pengembangan Modul IPA Terpadu Berbasis Blended Learning Terintegrasi Bencana Banjir. *TUNAS: Jurnal Pendidikan Biologi*, 3(2), 59-65.
- [33] Devitasari, P. I. (2022). Analisis Kebutuhan Pengembangan Web Modul IPA Terintegrasi Tanaman Lokal untuk SMP. *Jurnal Al Mujaddid Humaniora*, 8(2), 75-85.
- [34] Nisak, N. Z. (2021). Analisis Kebutuhan Bahan Ajar Biologi untuk Siswa SMA Ditinjau dari Tingkat Kesulitan Materi, Keterampilan Berpikir Tingkat Tinggi, dan Keaktifan Belajar Siswa. *EduBiologia: Biological Science and Education Journal*, 1(2), 128-133.
- [35] Pratama, R., Alamsyah, M., & Noer, S. (2022). Analisis Kebutuhan Guru Terhadap Pengembangan Modul dalam Meningkatkan Kemampuan Berpikir Kritis Peserta Didik. *EduBiologia: Biological Science and Education Journal*, 2(1), 7-13.
- [36] Lasmiyati (2014). Pengembangan modul pembelajaran untuk meningkatkan pemahaman konsep dan minat siswa. Pythagoras. *Jurnal Pendidikan Matematika*, 9(2), 161-174.
- [37] Linda, R., Zulfarina, Z., & Putra, T. P. (2021). Peningkatan kemandirian dan hasil belajar peserta didik melalui implementasi e-modul interaktif IPA terpadu tipe connected pada materi energi SMP/MTs. *Jurnal Pendidikan Sains Indonesia (Indonesian Journal of Science Education)*, 9(2), 191-200.
- [38] Fradisa, L., & Kartika, K. (2019). Penerapan modul biologi berorientasi problem based learning untuk meningkatkan hasil belajar kognitif mahasiswa keperawatan. *Edubiotik: Jurnal Pendidikan, Biologi dan Terapan*, 4(02), 121-127.
- [39] Utari, R., Andayani, Y., Savalas, L. R. T., & Anwar, Y. A. S. (2021). Pemanfaatan Hasil Pengembangan Modul Kimia Berbasis Etnosains Untuk Menanamkan Sikap Konservasi Lingkungan di Sekolah MAN 2 Lombok Tengah. *Jurnal Pengabdian Magister Pendidikan IPA*, 4(1).