BIOSFER: Jurnal Tadris Biologi Vol. 15 No. 2 (2024) 279-292

BIOSFER: JURNAL TADRIS BIOLOGI
p-ISSN: 2086-5945 (print), e-ISSN: 2580-4960 (online), DOI 10.24042/biosfer.v15i2.22924
http://ejournal.radenintan.ac.id/index.php/biosfer/index

Narrative Literature Review: Analysis of E-Module Development of Biodiversity Material as a Student Learning Resource

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ARTICLE INFO

Article History
Received : 12-09-2024
Accepted : 10-12-2024
Published : 31-12-2024

Keywords:
E-Module; Biodiversity material; Learning resource.

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ABSTRACT

The education system in Indonesia has undergone many changes. The change is due to various reform efforts in the world of education. E-Module can be used as an alternative teaching material for the teaching and learning process. E-Module is a teaching material that is packaged more flexibly so that it can be accessed anytime and anywhere by students. The purpose of this study is to find out the feasibility of E-Modules from various bases, both the local potential and the type of learning method. This research was conducted using the Systematic Literature Review (SLR) method. The stages of preparing research with the SLR method generally consist of 3 steps, namely the planning stage, the implementation stage, and the reporting stage. Based on these results, the E-Module from various bases is categorized as adequate and excellent in terms of effectiveness and can be developed based on student learning outcomes.

Kajian Pustaka Naratif: Analisis Pengembangan E-Modul Materi Keanekaragaman Hayati sebagai Sumber Belajar Siswa

ABSTRAK: *Sistem Pendidikan di Indonesia telah mengalami banyak perubahan. Perubahan tersebut karena berbagai upaya pembaharuan telah dilakukan dalam dunia Pendidikan. E-Modul dapat digunakan sebagai salah satu alternatif bahan ajar untuk proses belajar mengajar. E-Modul merupakan bahan ajar yang dikemas secara lebih fleksibel sehingga dapat diakses kapanpun dan dimanapun oleh peserta didik. Tujuan dari penelitian ini adalah untuk mengatahui kelayakan E-Modul dari berbagai basis, baik berdasarkan potensi lokal hingga berdasarkan jenis metode pembelajaran. Penelitian ini dilakukan dengan menggunakan metode Systematic Literature Review (SLR). Tahapan penyusunan penelitian dengan metode SLR umumnya terdiri dari 3 langkah, yaitu: tahap perencanaan, tahap implementasi dan tahap pelaporan. Berdasarkan hasil tersebut, kalayakan E-Modul dari berbagai basis dikategorikan memadai dan sangat baik dari segi ke-efektifan dan dapat dikembangkan berdasarkan hasil belajar siswa.*

INTRODUCTION

Indonesia is known as a country with a very high level of biodiversity in terms of diverse vegetation. This diversity must be utilized as well as possible to provide new knowledge insights for prospective students (Maskun et al., 2021). Indonesia has a wealth and diversity of plant species and ecosystems, making this country have important and strategic potential as the center of world biodiversity, commonly referred to as a mega biodiversity country (Wartini et al., 2022). This is proven by a number of 29,375 types of vascular plants, or about 7.5% of the world's species population, and animal diversity, including

670 types of mammals, or about 10.5% of the world's species population. Then 4,782 species of fish, or about 1.2% of the world population; 1,711 species of birds, or about 15.5% of the world population; 755 species of reptiles, or about 6.7% of the world population, and 365 species of amphibians, or about 4.6% of the world population (Dasgupta et al., 2024). Biodiversity can be a natural wealth that can provide versatile benefits and vital and strategic benefits, as it is a basic capital for national development and is the lungs of the world that are absolutely needed both now and in the future.

Biodiversity plays an important role in the balance of life on earth and in a country's development. The management and conservation of biodiversity in Indonesia are faced with various complex problems, including the lack of identification of biodiversity and measurement methods that represent each ecosystem (Hoffmann, 2022). One way to conserve biodiversity is to know ecological information well, including the structure and composition of vegetation in an ecosystem (Khairul, 2020).

Biodiversity is one of the main materials that can be studied in biology. This biodiversity material covers a wide and deep learning object (Ataky & Koerich, 2021). The rapid development of science and technology has affected various fields, including the field of education. Teachers must be good at adapting to learning by integrating technology both in the learning process and teaching materials (Onggirawan et al., 2022). Through these developments, science and technology learning now allow students to do independent learning (Khodaei et al., 2022). As a result of these influences, national education is progressing. In addition, education in schools has shown very rapid development. These efforts include almost all components of education, such as the procurement of textbooks, improving the quality of teachers, the learning process, curriculum renewal, and efforts related to the quality of education (Altinyelken & Hoeksma, 2021). In addition, to meet the needs of teaching materials, educators must provide their own according to the needs of students and the subjects they teach.

One of the efforts to overcome learning independence is to utilize information communication technology through E-Modules. E-Modules are teaching materials in the form of modules that are displayed in electronic format (Diartika et al., 2024). The use of E-Modules can increase student interest and motivation to learn. E-Module is a presentation of material that is systematically made to make it easier for students to learn independently (Apriansyah et al., 2024). Various learning activities contained in the E-Module can be connected with links that make it easier for educators and students to use them. E-Modules must also be filled with videos related to learning, animation, images, or audio so that they can provide learning experiences to students, motivate them, and interest them (Haka et al., 2020). Creative thinking skills can be correlated with problem-solving skills, whereby by thinking creatively, one can overcome the problems faced based on the ideas generated. The low creative thinking ability of students is caused by teacher-centered learning and a lack of student activeness (Handoko et al., 2024). Another cause is low student participation and difficulty in student understanding.

Some research results include E-Modules conducted by Erita (2022) developing E-Modules with the overall questionnaire results stating "very interesting ."The development of the E-Module resulted in the response of students or teachers obtaining very strong criteria, while the student response data obtained very strong criteria. It can be interpreted that educators and students can implement the e-module learning media produced as media used in the learning process. Learning is a series of activities carried out based on the learning system. Some of the advantages of the E-Module itself are its more

interactive nature, making it easier to navigate, allowing it to display images or load images, audio, video, and animation equipped with formative text with the aim that feedback can occur directly and automatically (Shen et al., 2024). In addition, it is also explained that E-Module is an information display packaged in a book-like format and presented electronically using a hard disk, diskette, CD, or flash disk so that it can be read easily via a computer or electronic book reader (Cahyani et al., 2022). E-Module has benefits for learning activities in the classroom. Therefore, in this study, data from previous research related to the use of E-Module as a source of student learning was collected.

METHOD

This research was conducted using the Systematic Literature Review (SLR) method. The SLR method refers to a specific research methodology and development to collect and evaluate research related to the focus of a particular topic (Azarian et al., 2023).

The stages of compiling research with the SLR method generally consist of 3 steps, namely, the planning stage, the implementation stage, and the reporting stage (Butarbutar et al., 2023). The planning stage includes the stage of identifying the need for a systematic review (scheme 1), developing a review protocol (scheme 2), and evaluating the review protocol (scheme 3). The implementation stage includes the stage of finding the main materials for review (scheme 4), selecting and selecting the main materials for review (scheme 5), digging data from the main materials for review (scheme 6), assessing quality (scheme 7) and synthesizing data (scheme 8). The reporting stage consists of the stage of dissemination of ideas (main ideas) (Scheme 9). The research stage with the SLR method is shown in Figure 1.

The SLR method in this study refers to the principles of OFPA, namely Object, Focus, Purpose, and Aspects. The object of this study is teachers and students from elementary school to high school. The focus of this research is the Development of E-Modules as a learning resource (Scheme 1). The purpose of this study is to review the use of e-modules in learning, while the aspect studied is the use of e-modules for biology learning activities for students (Scheme 2), which is accompanied by protocol evaluation (Scheme 3).

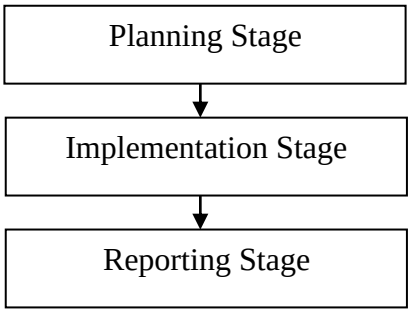

Figure 1. Research Scheme

The process of searching for staples (Scheme 4) is an activity with the aim of obtaining relevant sources by using search engines (Google Chrome) and https://scholar.google.com/ sites to search for digital traces regarding citations and publisher journal names. The selection of staples (scheme 5) consists of criteria that include Sinta-accredited national journals for the 2019-2024 publication year and international journals. Data mining on staples (scheme 6) is carried out by studying incoming data that is closely related to the focus of the research (scheme 7).

Data synthesis (scheme 8) is a process of analyzing money data for the interpretation of various findings from research results on basic materials. Data synthesis generally uses quantitative data and qualitative data, but in general, the review process usually uses the narrative synthesis method. The results of the synthesis are then used to review various analyses regarding e-modules. The review is a collection of various national journals accredited by Sinta and international journals, so indirectly, the results of this review are an effort to disseminate the idea of the importance of using e-modules as a source of student learning.

RESULTS AND DISCUSSION

The results of selecting or calcifying manuscripts based on criteria were obtained from 15 journals, listed in Table 1 below.

Table 1. Manuscript Classification Results

No.	Author's Name and Year	Title of the Research	Research Objectives	Sample Characteristics	Design and Data Collection Methods	Results
1.	(Wahyuningsih et al., 2020)	Development of Biodiversity E-Module Based on Learning Forest Prototype	To develop a biodiversity e-module based on a learning forest prototype.	The tenth-grade students of SMA Negeri 03 Metro.	Research and development with 4D models (define, design, develop, and disseminate)	The latest teaching material innovation, the development of electronic modules commonly known as e-modules, has helped achieve the 2013 curriculum.
2.	(Zam, 2022)	Education for Sustainable Development-Based Biodiversity e-Module to Support the Implementation of Flipped Learning	To support the implementation of flipped learning so that students can be independent in learning, make them aware, and empower humans to solve global problems.	The fifth-grade students at SDN Songgokerto 03 Kota Batu.	This research method was carried out with the ADDIE development model (analysis, design, development, implementation, and evaluation)	Learning using this E-Module shows changes in aspects of student learning outcomes in the Education for Sustainable Development (ESD) content.
3.	(Widya et al., 2024)	Developing e-modules local wisdom based on PBL elementary school	To develop PBL-based e-modules	Teachers and students at SD Ngasem 5, SD Ngasem 4, and SD Ngasem 1 Jepara.	The research method used is the research and development (R&D) method with the Borg and Gall model, which is adopted in seven stages: identifying potential and problems, data collection, product design, design validation, design	The e-module is feasible for implementation in learning activities, with the average assessment results from the three schools, 97.3%, indicating that it is very feasible. The PBL model approach can increase the effectiveness of learning

No.	Author's Name and Year	Title of the Research	Research Objectives	Sample Characteristics	Design and Data Collection Methods	Results
					revision, initial testing, and product revision.	activities if school facilities and other technological resources support it.
4.	(Choirunnisa' et al., 2023)	Effectiveness of Remap-TPS-based Biodiversity E-Module on Students' Creative Thinking Skills	To produce remap-TPS-based biodiversity e-modules to improve students' effective creative thinking skills	The tenth-grade first-semester high school students.	The model used is the Lee & Owens development model, which has five stages: analysis, design, development, implementation, and evaluation.	The effectiveness of the Remap TPS-based biodiversity e-module in improving students' creative thinking skills has met the effectiveness requirements, namely the medium category effective in improving creative thinking skills.
5.	(Rahma et al., 2023)	Biodiversity E-Module as an Implementation of Research Results on Medicinal Plant Types and Their Utilization in Kayen Village	To find out whether the e-module as the implementation of research results is feasible or not to be used as a learning e-module	Various types of medicinal plants are located in Kayen Village, Kayen District, Pati Regency, Central Java.	The method used is a quantitative descriptive method	The types and utilization of medicinal plants by the Kayen Village Community, Kayen District, Central Java Regency, were declared "feasible" to be used as teaching materials.
6.	(Adilah et al., 2022)	Development of Biodiversity Concept E-Module on Sonneratia Caseolaris Rambai Center Mangrove Area	To describe Sonneratia caseolaris in the Rambai Center Mangrove Area as a material for enriching the concept of biodiversity in high school.	Students of SMA Negeri 1 Alalak and Students of the Biology Education Study Program FKIP ULM.	The method used is the research and development (R&D) method	Sonneratia caseolaris (rambai) has a root in the form of a cone-like breathing root. The stem belongs to the sympodial branching type. The layouts of the leaves are facing each other. The rambai flower is shaped like a cup, and the type of fruit is a buni fruit.

No.	Author's Name and Year	Title of the Research	Research Objectives	Sample Characteristics	Design and Data Collection Methods	Results
						This e-module is suitable for use as enrichment material on the concept of biodiversity in high school.
7.	(Syafril et al., 2023)	Analysis of Discovery Learning-Based E-Module Learning Media Needs	To analyze the need for the development of discovery learning-based e-modules in SMA/MA	Twenty-five tenth-grade MIPA students at MAN 4 Tanah Datar and one biology teacher at MAN 4 Tanah Datar.	The ADDIE model is at the analysis stage, with one of the stages being student analysis.	The results of this analysis found that the development of electronic learning media, such as e-modules, is needed to increase students' learning motivation in schools.
8.	(Azmi et al., 2023)	Development of Biodiversity E-Module Based on Local Potentials in Labuhan Batu Utara Regency to Train Science Literacy of High School Students	To produce local potential-based e-modules in Labuhan Batu Utara Regency that are feasible based on validity, readability, and effectiveness to train student literacy	Tenth-grade high school student.	Research and development with 4D models (define, design, develop, and disseminate)	The biodiversity e-module can be developed based on the local potential of Labuhan Batu Utara Regency so that it can train high school grade X students to learn more effectively and increase student literacy.
9.	(Lema & Dewi, 2023)	Development of Biodiversity E-Module in Kelimutu National Park Area to Improve Learning Outcomes of High School Student	To analyze biodiversity in the Kelimutu National Park Area, Ende as a material in the development of biodiversity e-modules	Tenth-grade MIPA 2 students.	Research and development with 4D models (define, design, develop, and disseminate)	Biodiversity in the Kelimutu National Park Area includes the level of biodiversity (genes, species, and ecosystems), threats, conservation efforts, and utilization of biodiversity. The e-modules that are developed are very good and feasible because they can improve student

No.	Author's Name and Year	Title of the Research	Research Objectives	Sample Characteristics	Design and Data Collection Methods	Results
						learning outcomes.
10.	(Chasanah et al., 2019)	The Effectiveness of Project-Based Learning Biodiversity Module in an Effort to Improve Cognitive Learning Outcomes of High School Students	To test the effectiveness of PJBL (project-based learning) based modules on biodiversity materials and high school classification that are valid and practical using the ADDIE development research method	Twenty students, namely classes XI MIA and XI IIS SMAN 1 Nglames.	ADDIE's research & development model includes five stages, namely analyzing, designing, developing, implementing, and evaluating	PJBL-based biodiversity modules are feasible and practical for use in biology learning. Influence student learning outcomes such as students interacting more directly with what is observed.
11.	(Nurhaliza et al., 2024)	Development of ecosystem and environmental change e-modules based on PBL to improve high school students' critical thinking.	To develop a valid and practical PBL-based e-module for ecosystem and environmental change	Tenth-grade students at SMAN 1 Lingsar, West Lombok Regency.	Research and Development (R&D) involves modifying the Lee and Owens model in five stages: assessment and analysis, design, development, implementation, and evaluation.	PBL-based ecosystem and environmental change e-modules are proven to be feasible and can be used in the learning process.
12.	(Fauziah & Ningrum, 2023)	Development of e-modules using the STAD learning model to improve ecological competence (aspects of knowledge and attitudes)	To find out the use of e-modules with the STAD learning model on the achievement of ecological competence, aspects of knowledge, and attitudes in	Tenth-grade social studies students at SMAN 1 Kertasari.	The research uses the Quasi Experiment method with a Nonequivalent (pretest and posttest) control group design.	The use of e-modules with STAD learning modules improves students' ecological competence in terms of knowledge. Likewise, the percentage of results obtained in attitude is very high.

No.	Author's Name and Year	Title of the Research	Research Objectives	Sample Characteristics	Design and Data Collection Methods	Results
			geography subjects			
13.	(Haerullah et al., 2023)	Analysis of needs for biology e-module based on local wisdom North Maluku, Indonesia	To analyze students' needs for interactive digital modules based on local wisdom of North Maluku	Eighty-eight students are spread across several high schools in Ternate City, North Maluku, Indonesia.	Research and development (R&D) using the ADDIE model.	The results of this analysis found that the biology e-module needs to be developed based on the local wisdom of Ternate, North Maluku, as a supporting learning resource for biology in high school.
14.	(Sari et al., 2024)	Identification of vegetation in Lio Mountain Proune Areas in Brebes Regency and its implementation as a learning e-module plant diversity	To find out the application of teaching materials in the e-module of plant diversity material in grade X students of high school	All vegetation that is able to prevent landslides in the Lio Mountains area, Brebes Regency	The method used in this study is qualitative.	The study's results show that living vegetation and plants in the Lio Mountains landslide area of Brebes Regency, including grass, shrubs, and trees, can be used as e-module teaching materials in the plant diversity material.
15.	(Nukhbatul Bidayati Haka et al., 2024)	Desain, development, and evaluation of biology e-module website based on local wisdom of the Baduy Tribe: strengthening Pancasila student profiles on ecosystem material	To develop a biology e-module based on the local wisdom of the Baduy Tribe to strengthen the profile of Pancasila in students	Forty-three tenth-grade students of SMAN 1 Rangkasbitung	Research and development (R&D) using Borg and Gall designs with nine stages	The results of the study show that the e-module website based on the local knowledge of the Baduy Tribe is very suitable for use in biology learning and has received a positive response from teachers and students.

Based on the literature review conducted by researchers, in general, biodiversity e-modules from various bases conducted by researchers are suitable for use as teaching materials for students ranging from elementary school students and junior high school students to senior high school students. So, biodiversity e-modules can be developed by researchers as the results of research from Kusumasari et al. (2022) show that the feasibility of using biodiversity e-modules is obtained from the results of teacher and student responses with very good / very efficient criteria levels. Students also have a broader insight after studying e-modules on biodiversity material from various bases. The effectiveness of e-modules is indicated by an increase in creative thinking skills scores after learning to use biodiversity e-modules. The learning steps taken are reading, designing, concept maps, thinking, grouping in pairs, and sharing in front of the class.

The application of this e-module can increase students' interest in learning and creative thinking skills because learning is not only carried out in the classroom but can also be carried out outside the classroom. Students' thinking skills will be stimulated through the discovery of new things in the surrounding environment that have never been noticed by students, giving rise to broader knowledge and different points of view. E-modules can be applied to students not only based on learning methods but also based on local potential. The implied feasibility for students is a very feasible category. It can be proven through research by Lema & Dewi (2023), who conducted research on biodiversity e-modules based on local potential in the Kelimutu National Park Area. The development of e-modules on biodiversity material was carried out based on several potentials and problems found in preliminary studies at the beginning of the research. Erita (2022) stated that e-modules are seen as one of the right solutions to support distance learning because of the nature of e-modules that can carry out learning independently.

In addition, there are other local potential-based e-modules researched by Leksikowati et al. (2019) where this e-module was developed based on the local potential of Labuhan Batu Utara Regency to train science literacy for grade X high school students. In addition, this e-module can help students and teachers in the learning process. In line with research, Bulkani et al. (2022) state that learning resources obtained from local potential help teachers improve student abilities. The e-modules used are based on real, local potential (contextual). Contextual learning by solving everyday problems is one of the explanations of the competency aspects of science literacy. In addition, learning that utilizes local potential in the learning process can have a positive influence on students' cognitive scores (Hikmawati et al., 2021). By designing local wisdom learning, students not only develop character but are also able to find knowledge related to aspects of competence and application of knowledge in solving surrounding problems. Local wisdom-based learning will create meaningful and embedded learning as a long-term memory that will have an impact on increasing student knowledge.

E-modules of biodiversity material can also be developed and implemented specifically based on the level of plant species studied by Rahma et al. (2023). Researchers produce teaching materials in the form of e-modules based on the potential of plant species used as medicine and their utilization in Kayen Village to be applied to grade X high school students. This has a good effect because the e-module is suitable for use as teaching material for grade X high school students with biodiversity material on the level of medicinal plant species and their utilization in Kayen Village. Quoted from Hjort et al. (2022) that the level of biodiversity is divided into 3 with different characteristics according to the classification. Based on the results of

research related to the types and utilization of medicinal plants conducted in Kayen Village, Kayen District, Pati Regency, the results show that there are 46 types of medicinal plants, which are divided into 31 types of families. There are 44 types of medicinal plants used by the Kayen Village Community, and they can be categorized into biodiversity at the species level.

The concept of e-modules based on local potential at the plant level in mangrove forest areas can be said to be feasible and developed for student teaching materials such as research conducted by Adilah et al. (2022) that the e-module concept of biodiversity at the Sonneratia caseolaris plant level in mangrove forest areas is feasible to use as an enrichment material for the concept of high school biodiversity. This e-module specifically explains that Sonneratia caseolaris plants are used as content material in the e-module biodiversity Plant level by measuring environmental parameters in the Rambai center mangrove forest area, validity test, and readability test. Environmental factors that affect its survival include air temperature, air humidity, soil moisture, pH, water, light intensity, and aging speed. The validity test and readability test include five aspects of assessment of the e-module, which consists of aspects of navigational feasibility. A module is said to be valid if the problem or information in the module is strong enough to say something that will be evaluated in the research module. The readability test is carried out to determine the applicability, usefulness, and effectiveness of the use of teaching materials in supporting learning. According to Irasuti & Bachtiar (2024), testing teaching materials for students helps researchers identify parts that need to be improved to create teaching materials that students can easily understand.

Through e-modules, examples of facts or phenomena that are in accordance with the surrounding environment can be presented to students. The potential of the surrounding environment can be used to present phenomena or observe the environment to find solutions to various problems (Djebali et al., 2021). The advantages of e-modules, according to Widya et al. (2021), include 1) making students more motivated to learn because they contain videos, animations, and others that are not found in printed modules, 2) facilitating the evaluation process for students, and teachers, 3) can be arranged with the material available in each semester, 4) learning is more effective, 5) more interactive and dynamic and 6) the presentation is more converted into visual forms. Before developing an e-module, it must pay attention to several development guidelines such as e-modules can foster student interest in learning, are easy to use by students, are equipped with learning objectives that must be achieved, based on learning flexibility, the language used is communicative and interactive and equipped with instructions for use. So, in developing e-modules, it is necessary to pay attention to the content presented so that learning objectives can be achieved, the material can be conveyed properly, and it is easier for students to learn independently according to their respective abilities (Ardianti et al., 2023)

This literature review has the advantage that the implication is that each e-module from various bases has a feasibility level and can be developed as student teaching materials, both based on local potential and based on learning methods that can be used as a reference for similar research. Researchers have tried their best in writing this literature review. However, the writing of this literature review does not escape many shortcomings. Namely, the limitations of researchers in accessing journals that are considered more in accordance with the needs and variables studied so that they do not cover every researcher's reference needs.

CONCLUSIONS AND SUGGESTIONS

The conclusion of this literature review from all articles shows that there is an increase in student learning outcomes regarding e-modules on biodiversity material based on local potential and based on learning methods. This e-module development can be developed into different media for students ranging from elementary school (SD) to high school (SMA) and has a high feasibility category in each e-module. Each e-module on biodiversity material provides good support and positive responses from students so that it can overcome biodiversity problems and also learning problems at school by implementing it.

REFERENCES

Adilah, N. A., Hardiansyah, H., & Amintarti, S. (2022). Pengembangan E-Modul Konsep Keanekaragaman Hayati tentang Sonneratia Caseolaris Kawasan Mangrove Rambai Center. *Edukatif : Jurnal Ilmu Pendidikan*, *4*(5), 7029–7041. https://doi.org/10.31004/edukatif.v4i5.3504

Altinyelken, H. K., & Hoeksma, M. (2021). Improving educational quality through active learning: Perspectives from secondary school teachers in Malawi. *Research in Comparative and International Education*, *16*(2), 117–139. https://doi.org/10.1177/1745499921992904

Apriansyah, M. A., Syarif, S. H., Anugra, N., & Nikmatullah, M. (2024). Development of an Ethnoscience Based E-Module on the Diversity Material of Medicinal Plants of the Bugis Tribe. *Biosfer: Jurnal Tadris Biologi*, *15*(1), 1. https://doi.org/10.24042/biosfer.v15i1.22412

Ardianti, S. D., Wanabuliandari, S., & Tanghal, A. B. (2023). Implementation the Ethnoscience-Based Smart Module To Improve Students' Patriotism. *Jurnal Pendidikan IPA Indonesia*, *12*(2), 293–300. https://doi.org/10.15294/jpii.v12i2.43789

Ataky, S. T. M., & Koerich, A. L. (2021). A Novel Bio-Inspired Texture Descriptor based on Biodiversity and Taxonomic Measures. *Pattern Recognition*, *1*(123), 1–34. http://arxiv.org/abs/2102.06997

Azarian, M., Yu, H., Shiferaw, A. T., & Stevik, T. K. (2023). Do We Perform Systematic Literature Review Right? A Scientific Mapping and Methodological Assessment. *Logistics*, *7*(4). https://doi.org/10.3390/logistics7040089

Azmi, N., Ngabekti, S., & Rahayuningsih, M. (2023). Development of Biodiversity E-Module Based on Local Potentials in Labuhanbatu Utara Regency to Train Science Literacy of High School Students. *Journal of Innovative Science Education*, *12*(2), 237–244. https://doi.org/10.15294/jise.v12i2.71602

Bulkani, F. M., Adella, H., & Andi, S. M. (2022). Development of animation learning media based on local wisdom to improve student learning outcomes in elementary schools. *International Journal of Instruction*, *15*(1), 55–72. https://doi.org/10.29333/iji.2022.1514a

Butarbutar, Z. T., Handayani, P. W., Suryono, R. R., & Wibowo, W. S. (2023). Systematic literature review of Critical success factors on enterprise resource planning post implementation. *Cogent Business and Management*, *10*(3). https://doi.org/10.1080/23311975.2023.2264001

Cahyani, E. R., Martini, M., & Purnomo, A. R. (2022). Analisis Kemampuan Berpikir Kreatif Siswa SMP terhadap Konsep

Pencemaran Lingkungan Ditinjau dari Perbedaan Gender. *Pensa E-Jurnal: Pendidikan Sains*, *10*(1), 8–15. https://ejournal.unesa.ac.id/index.php/pensa/article/view/41109

Chasanah, Y., Rohman, F., & Zubaidah, S. (2019). Efektivitas Modul Keanekaragaman Hayati Berbasis Project Based Learning dalam Upaya Peningkatkan Hasil Belajar Kognitif Siswa SMA. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *4*(4), 531. https://doi.org/10.17977/jptpp.v4i4.12358

Choirunnisa', L., Susriyati Mahanal, & Fatchur Rohman. (2023). Keefektifan E-Module Keanekaragaman Hayati berbasis Remap-TPS terhadap Keterampilan Berpikir Kreatif Peserta Didik. *Jurnal Kajian Penelitian Pendidikan Dan Kebudayaan*, *1*(2), 10–19. https://doi.org/10.59031/jkppk.v1i2.96

Dasgupta, S., Blankespoor, B., & Wheeler, D. (2024). Toward Better Conservation: A Spatial Analysis of Species Occurrence Data from the Global Biodiversity Information Facility. *Open Access Earth System Science Data Discussions*, *18*(9), 1–27. https://doi.org/10.1596/1813-9450-10821

Diartika, E. I. A., Sueb, S., Al-Muhdar, M. H. I., & Suhadi, S. (2024). Development of a Waste Pollution Module using the Argument Driven Inquiry (ADI) Model for Students. *Biosfer: Jurnal Tadris Biologi*, *15*(1), 15. https://doi.org/10.24042/biosfer.v15i1.20381

Djebali, R., Mebarek-Oudina, F., & Rajashekhar, C. (2021). Similarity solution analysis of dynamic and thermal boundary layers: Further formulation along a vertical flat plate. *Physica Scripta*, *96*(8). https://doi.org/10.1088/1402-4896/abfe31

Erita, S. (2022). Development of an e-modules for learning mathematics based on a scientific approach to help the online learning process. *International Journal of Trends in Mathematics Education Research*, *5*(4), 411–416. https://doi.org/10.33122/ijtmer.v5i4.170

Fauziah, Y. N., & Ningrum, E. (2023). Development of E-Modules Using the Stad Learning Model To Improve Ecological Competence (Aspects of Knowledge and Attitudes), *Proceedings of International Conference on Education Teacher Training & Education Faculity Universitas Serambi Mekkah*, *1*(1), 4–7. https://doi.org/https://doi.org/10.32672/pice.v1i1.429

Haerullah, A., Hasan, S., & Sahil, J. (2023). Analysis of Needs for Biology E-Module Based on Local Wisdom North Maluku, Indonesia. *International Journal of Social Service and Research*, *3*(6), 1551–1559. https://doi.org/10.46799/ijssr.v3i6.395

Haka, N. B., Anggoro, B. S., Hamid, A., Novitasari, A., Handoko, A., & Puspita, L. (2020). The Development of Biology Module Based on Local Wisdom of West Lampung: Study of Ecosystem Material. *Journal of Physics: Conference Series*, *1467*(1). https://doi.org/10.1088/1742-6596/1467/1/012013

Haka, N. B., Pamungkas, M. F., Masya, H., Rakhmawati, I., & Hidayah, N. (2024). Desain, Development, and Evaluation of Biology E-Modules Website Based on Local Wisdom of the Baduy Tribe: Strengthening Pancasila Student Profiles on Ecosystem Material. *E3S Web of Conferences*, *482*(05005), 1–12.

https://doi.org/10.1051/e3sconf/202448205005

Handoko, A., Pratama, A. O. S., Haka, N. B., Puspita, L., Wulandari, E., Marzuki, Z. A. W., & Anggoro, B. S. (2024). Creative thinking: The Effect of Green School-Based Project Based Learning (PjBL) Model. *E3S Web of Conferences*, *482*. https://doi.org/10.1051/e3sconf/202448204016

Hikmawati, H., Suastra, I. W., Suma, K., Sudiatmika, A. A. I. A. R., & Rohani, R. (2021). Effect of Problem-Based Learning Integrated Local Wisdom on Student Hots and Scientific Attitude. *Jurnal Penelitian Pendidikan IPA*, *7*(SpecialIssue), 233–239. https://doi.org/10.29303/jppipa.v7ispecialissue.1118

Hjort, J., Tukiainen, H., Salminen, H., Kemppinen, J., Kiilunen, P., Snåre, H., Alahuhta, J., & Maliniemi, T. (2022). A methodological guide to observe local-scale geodiversity for biodiversity research and management. *Journal of Applied Ecology*, *59*(7), 1756–1768. https://doi.org/10.1111/1365-2664.14183

Hoffmann, S. (2022). Challenges and opportunities of area-based conservation in reaching biodiversity and sustainability goals. *Biodiversity and Conservation*, *31*(2), 325–352. https://doi.org/10.1007/s10531-021-02340-2

Irasuti & Bachtiar. (2024). Empowering Indonesian EFL Teachers: The Transformative Impact of Visual Literacy Training on Teaching Materials. *International Journal of Learning, Teaching and Educational Research*, *23*(8), 116–136. https://doi.org/10.26803/ijlter.23.8.7

Khairul, K. (2020). Fish Biodiversity in the Swamp Ecosystem of Barumun River Area. *International Journal of Applied Biology*, *4*(1), 94–99. https://doi.org/10.20956/ijab.v4i1.10222

Khodaei, S., Hasanvand, S., Gholami, M., Mokhayeri, Y., & Amini, M. (2022). The effect of the online flipped classroom on self-directed learning readiness and metacognitive awareness in nursing students during the COVID-19 pandemic. *BMC Nursing*, *21*(1), 1–10. https://doi.org/10.1186/s12912-022-00804-6

Kusumasari, A., Suryawati, E., & Anwar, L. (2022). Development of SSIBL e-modules on ecology and biodiversity materials to improve critical thinking and motivation. *Research and Development in Education*, *4*(2), 1066–1082. https://doi.org/https://doi.org/10.22219/raden.v4i2.33775

Leksikowati, S. S., Oktaviani, I., Ariyanti, Y., & Akhmad, A. D. (2019). Ethnobotanical Study of Plants Used by People in Labuhan Ratu Village, East Lampung Regency. *IOP Conference Series: Earth and Environmental Science*, *258*(1). https://doi.org/10.1088/1755-1315/258/1/012027

Lema, Y., & Dewi, N. K. (2023). Development of Biodiversity E-Module in Kelimutu National Park Area to Improve Learning Outcomes of High School Students. *Journal of Biology Education*, *12*(1), 1–8. https://doi.org/10.15294/jbe.v11i3.56275

Maskun, Assidiq, H., Mukarramah, N. H. Al, & Bachril, S. N. (2021). Threats to the sustainability of biodiversity in Indonesia by the utilization of forest areas for national strategic projects: A normative review. *IOP Conference Series: Earth and Environmental Science*, *886*(1). https://doi.org/10.1088/1755-1315/886/1/012071

Nurhaliza, S., Sueb, S., & Ibrohim, I. (2024).

Development of ecosystem and environmental change e-modules based on PBL to improve high school student's critical thinking. *AIP Conference Proceedings*, *3106*(1), 1–8. https://doi.org/https://doi.org/10.1063/5.0215340

Onggirawan, C. A., Kho, J. M., Kartiwa, A. P., Anderies, & Gunawan, A. A. S. (2022). Systematic literature review: The adaptation of distance learning process during the COVID-19 pandemic using virtual educational spaces in metaverse. *Procedia Computer Science*, *216*(2022), 274–283. https://doi.org/10.1016/j.procs.2022.12.137

Rahma, K. A., Nugroho, A. S., & Mulyaningrum, E. R. (2023). E - Modul Keanekaragaman Hayati Sebagai Implementasi Hasil Penelitian Jenis Tumbuhan Obat dan Pemanfaatannya Desa Kayen. *Titian Ilmu: Jurnal Ilmiah Multi Sciences*, *15*(1), 71–75. https://doi.org/https://doi.org/10.30599/jti.v15i1.1750

Sari, M. P., Nugroho, A. S., & Mulyaningrum, E. R. (2024). Identification of Vegetation in Lio Mountain Prone Areas in Brebes Regency and its Implementation as A Learning E-Module Plant Diversity. *Proceeding of International Conference on Mathematics, Science, Informatics and Education*, *1*(1), 62–75.

Shen, L., Zhang, Y., Zhang, H., & Wang, Y. (2024). Data Player: Automatic Generation of Data Videos with Narration-Animation Interplay. *IEEE Transactions on Visualization and Computer Graphics*, *30*(1), 109–119. https://doi.org/10.1109/TVCG.2023.3327197

Syafril, M., Yogica, R., Fitri, R., & Selaras, G. H. (2023). Analisis Kebutuhan Media Pembelajaran E-Modul Berbasis Discovery Learning. *Journal On Teacher Education*, *4*(4), 242–246. https://doi.org/https://doi.org/10.31004/jote.v4i4.13971

Wahyuningsih, S., Muhfahroyin, & Lepiyanto, A. (2020). Pengembangan E-Modul Keanekaragaman Hayati Berbasis Prototype Hutan Pembelajaran. *Jurnal Lentera Pendidikan Pusat Penelitian LPPM UM METRO*, *5*(2), 121–135. https://doi.org/http://dx.doi.org/10.24127/jlpp.v5i2.1546

Wartini, S., Alfaqiih, A., Riswandi, B. A., & Park, J. (2022). The Impacts of Eco-Tourism and Agrotourism Based on Plant Variety Protection to Sustain Biological Diversity and Green Economic Growth in Indonesia. *International Journal of Law and Politics Studies*, *4*(2), 136–148. https://doi.org/10.32996/ijlps.2022.4.2.15

Widya, Maielfi, D., & Alfiyandri. (2021). Need Analysis for Physics E-Module Based on Creative Problem Solving Integrated 21st Century Skills. *Journal of Physics: Conference Series*, *1940*(1). https://doi.org/10.1088/1742-6596/1940/1/012110

Widya, S., Aditia, E., Shokib, W., & Ardianto, I. (2024). Developing E-Modules Local Wisdom Based on PBL for Elementary School. *Journal Of Technology And Humanities*, *5*(1), 64–70. https://doi.org/https://doi.org/10.53797/jthkkss.v5i1.8.2024

Zam, Z. J. (2022). E-Modul Keanekaragaman Hayati Berbasis Education for Sustanable Development Untuk Mendukung Implementasi Flipped Learning. *Jurnal Cakrawala Pendas*, *8*(4), 1550–1570. https://doi.org/10.31949/jcp.v8i4.3090