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Development of Aquatic Biology E-Module Based on Potential of Lake Lebo Taliwang

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Abstract: The need for using digital technology such as E-Modules in learning is becoming increasingly important. Learning integrated with local potential such as Lake Lebo in Taliwang, which is located in the area, can create a unique learning environment and learning experiences. Therefore, development research needs to be conducted by utilizing the ease of access to technology in the form of E-Modules, with the main goal of developing a feasible and valid E-Module for Aquatic Biology, leveraging local potential such as Lake Lebo. The method in this research is development research referring to the 4D development model with 4 stages: Define, Design, Develop, and Disseminate. In this study, the stages to be carried out will only reach the Develop stage. The result indicates that the developed E-Module for Aquatic Biology is highly suitable for implementation in the learning process. Which is the score of 92 from Validator 1 falls into the very feasible category, while a score of 85 from Validator 2 falls into the feasible category. The readability test aspect of the developed E-Module on Aquatic Biology Based on the Potential of Lake Lebo Taliwang also got average 86, which falls into the very feasible criteria. This result indicates that the developed E-Module for Aquatic Biology is highly suitable for implementation in the learning process.

Keywords: Aquatic biology; Development; E-module; Lake Lebo Taliwang; Potential

Introduction

The need for using digital technology such as E-Modules in learning is becoming increasingly important. Developing e-module learning media based on local potential is becoming increasingly important in the world of education (Ali et al., 2023; Hartatiana et al., 2024). An e-module is digital learning material (Pramana et al., 2020). It contains a set of planned and designed learning experiences to help students master specific learning objectives (Haryanto, 2018; Tanjung et al., 2023). An e-module based on local potential is an e-module integrated with the local potential available in a certain area (Aprilia et al., 2022; Aufa et al., 2021; Imtihana & Djukri, 2020), in this case, the potential of Lake Lebo Taliwang. E-modules are an effective tool for delivering lecture material interactively and engagingly, both in face-to-face and online settings, as has already been implemented at Cordova University.

Learning integrated with local potential such as Lake Lebo in Taliwang, which is located in the area, can create a unique learning environment and learning experiences (Nurjanah et al., 2024; Kamila et al., 2024) and can improve students' understanding (Carolina et al., 2024) because they are directly involved in the learning process (Saputra et al., 2024). This ensures continuity between the material and daily life activities in the students' living environment, which is used as a learning resource (Hamdani et al., 2024; Solikin, 2018). In the context of education, utilizing the local potential of an area, such as traditions, culture, natural environment, tourist attractions, historical sites, local plants, and

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traditional foods, as learning resources is important because it can provide relevant and authentic learning experiences that are directly related to the reality of the environment where the individual is located. This is because, essentially, learning that utilizes the environment can foster a sense of caring within students (Afnan et al., 2024), just like Lake Lebo, which is one of the natural potentials in West Sumbawa, NTB.

This lake, which covers an area of approximately 752 hectares, is a natural wetland, the largest inland wetland in West Nusa Tenggara Province (NTB) and holds high potential for natural resources that can benefit the local community's economy, including as an area for freshwater fishing and aquaculture, a source of irrigation water for agriculture, a domestic water source, and a tourism destination (Ashari at al., 2017; Mahmudah et al., 2022; Puspitasari, 2019). However, the fact is that no one has studied the potential of Lake Lebo Taliwang for integration into the learning process so far.

This potential is one of the unique attractions for further study from a scientific perspective, especially at the university level. The material in the aquatic biology course is very suitable to be combined with local potential such as Lake Lebo Taliwang. Local potential can be an object of scientific research and development, which is particularly challenging for maintaining sustainability in education, meaning efforts to integrate sustainability principles into the learning process by utilizing the environment and natural resources sustainably (Masruroh, 2021) so that future generations have the ability to overcome environmental challenges, with the ultimate goal of teaching the importance of preserving and protecting the environment (Situmorang, 2016; Khairani & Amprasto, 2023), including the local potential in their respective areas.

The observation results regarding the availability of E-Modules in the Biology Education Study Program are also still at 10%, and there are no E-Modules based on local potential in the Biology Education Study Program either. The results of interviews with students about their need for E-Modules on Aquatic Biology and their knowledge of the potential of Lake Lebo are also still lacking. Students consider E-Modules to be very necessary because they will help them understand lecture material and are also easily accessible via mobile phones. Additionally, students' knowledge about Lake Lebo Taliwang is still limited to the fact that Lake Lebo is only a tourist destination and a place for local residents to catch fish.

Therefore, development research needs to be conducted by utilizing the ease of access to technology in the form of E-Modules, with the main goal of developing a feasible and valid E-Module for Aquatic Biology, leveraging local potential such as Lake Lebo. This not only makes it easier for students to understand aquatic biology material but also fosters a sense of care and love within students to be able to maintain and preserve the natural potential of their own region, thus ensuring the sustainability aspect of education.

Method

The method in this research is development research referring to the 4D development model by Thiagarajan with 4 stages: Define, Design, Develop, and Disseminate (Thiagarajan et al., 1974). In this study, the stages to be carried out will only reach the Develop stage, which is the development of the E-Module for Aquatic Biology, followed by validation and readability assessment of the E-Module.

In the first stage, which is Define, there are two steps that are taken. First, the research team conducted initial observations by observing the availability of E-Modules in the Biology Education Study Program at the Faculty of Teacher Training and Education, Cordova University. Interviews were also conducted with students about their need for E-Modules in the Aquatic Biology course and their initial knowledge of the potential of Lake Lebo Taliwang. The observation stage for E-Module availability in the Study Program and interviews with students have already been completed by the research team. Second, the results of the observations and interviews will serve as the basis for the researcher to conduct further studies. The researcher will conduct field observations into Lake Lebo Taliwang to inventory all biotic (living) and abiotic (physical and chemical conditions of the water) potential at three points in Lake Lebo Taliwang: the lake inlet (water source entering), the lake outlet (water source exiting), and the middle point of Lake Lebo Taliwang.

The second stage is Design. The data obtained and analyzed in the Define stage will then be used as the basis for the researcher to compile and develop a prototype of the Aquatic Biology E-Module. The materials used in compiling and developing the Aquatic Biology E-Module prototype are the results of field observations, laboratory tests of biotic (living) and abiotic (physical and chemical conditions of the water) potential from Lake Lebo Taliwang, and interviews with relevant parties.

In the Develop stage, based on the E-Module prototype for Aquatic Biology that was already completed in the previous stage, the researcher began to develop the E-Module for Aquatic Biology using the potential of Lake Lebo Taliwang and conducted a validity test assessment of the E-Module by an expert team and a readability test. The instruments to be used are the E-Module Validation Sheet for Aquatic Biology by expert validators and the readability test

questionnaire for Biology Education students regarding the developed Aquatic Biology E-Module.

Result and Discussion

The E-Module validation by the validator was carried out using the E-Module validation sheet that had been developed. The assessment indicators used to evaluate the feasibility of the E-Module include self-instruction, self-contained, stand-alone, adaptive, and user-friendly. The validation results show that the e-module developed received a very good rating from both validators. A score of 92 from Validator 1 falls into the very feasible category, while a score of 85 from Validator 2 falls into the feasible category.

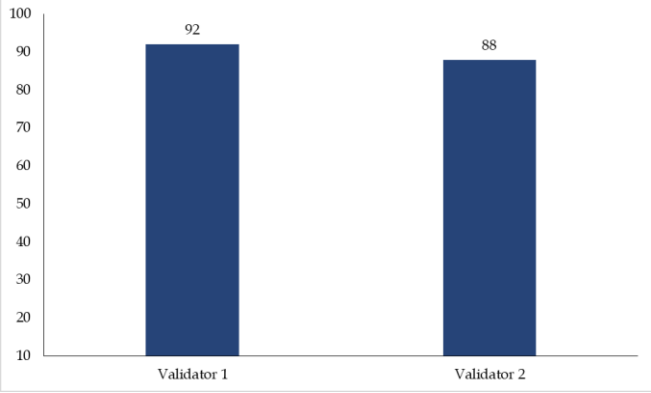

Figure 1. The result of validation of e-module

This result indicates that the developed E-Module for Aquatic Biology is highly suitable for implementation in the learning process. Additionally, the validation results also indicate that the content, appearance, and presentation of the material in the E-Module are appropriate for learning needs and student characteristics. High qualifications are the basis for E-Modules making learning more interesting (Pedaste et al., 2015; Lestari & Cintamulya, 2022; Kumalasari et al., 2023; Herditiya et al., 2023). Additionally, it not only supports understanding of aquatic biology concepts but also has the potential to increase learning motivation thru a local potential-based approach using Lake Lebo in Taliwang.

Thus, this E-Module is expected to be an innovative learning resource alternative relevant to the surrounding environmental context, as well as a bridge to introduce local potential in learning. In addition to strengthening the link between theory and practice in the field by introducing local potential (Nurhayati et al., 2022; Muzijah et al., 2020), including for students.

The data obtained is also data on the readability of the E-Module on Aquatic Biology based on the Potential of Lake Lebo Taliwang from students. This readability test covers several assessment aspects, namely the content presentation aspect, which assesses the structure and organization of the E-Module, making it important for facilitating understanding (Widana, 2017; Abidinsyah et al., 2019). Furthermore, aspects of language use and appearance that can support effective visual learning and presentation can enhance understanding (Anggriani et al., 2024; Liana et al., 2024; Ahdhianto et al., 2021; Najib et al., 2025). Finally, the aspect of benefits is crucial for achieving learning objectives (Nikita et al., 2018). Here is the data on the readability results of the E-Module on Aquatic Biology based on the Potential of Lake Lebo Taliwang.

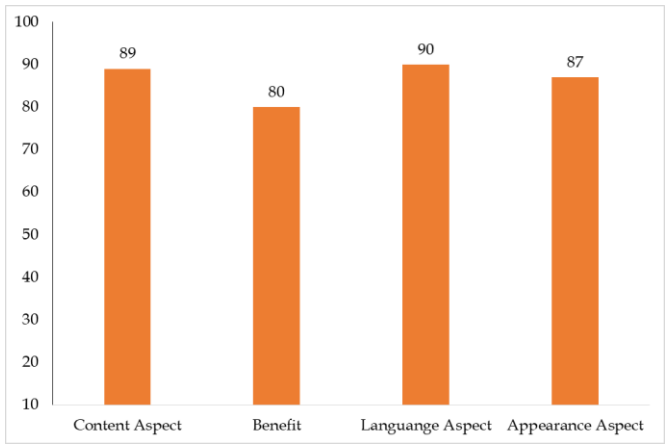

Figure 2. The result of readability of e-module

The results of the readability test for the E-Module on Aquatic Biology based on the Local Potential of Lake Lebo Taliwang show good averages. The readability assessment for the content aspect of the presentation was 89. The readability assessment for the benefit aspect was 80. The readability assessment for the language aspect of the E-Module was 90, and the readability assessment for the appearance aspect of the E-Module was 87. Overall, the readability test aspect of the developed E-Module on Aquatic Biology Based on the Potential of Lake Lebo Taliwang was 86, which falls into the very feasible criteria. According to Hamdani et al. (2021), the results of readability tests will provide insights into the user experience and effectiveness of a developed learning medium. Ariyanti et al. (2022) added that teaching materials should be easy to use and have an attractive appearance to increase students' interest in learning them. In addition, E-Modules also have interesting and easy-to-understand content (Mardhiyah et al., 2021).

The validation results indicate that the developed e-module has met the eligibility criteria for validity, content, presentation, language, and graphics. Thus, this e-module is not only relevant to students' needs but also aligns with the characteristics of Aquatic Biology material, which emphasizes the connection between theoretical concepts and local potential. Additionally, the high average score reinforces the belief that this e-

module can be an innovative, interactive alternative teaching material that can increase students' motivation and understanding in the learning process. Thematic teaching materials based on local potential can introduce students to the local potential available in their area. Additionally, it also enhances collaboration and creative thinking skills (Cahyanti et al., 2023; Aprillia et al., 2022). A structured e-module also allows students to easily understand the material (Rukmana et al., 2024).

Conclusion

With score of 92 from Validator 1 falls into the very feasible category, while a score of 85 from Validator 2 falls into the feasible category for E-Modul Validity and the readability test aspect of the developed E-Module on Aquatic Biology Based on the Potential of Lake Lebo Taliwang was 86, which falls into the very feasible criteria. This result indicates that the developed E-Module for Aquatic Biology is highly suitable for implementation in the learning process.

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Author Contributions
Supervision of the research process, observation, drafting e-module, A.A.; Data Analysis, A.A. and H.; creating research instruments, interviews, documentation of research activities, drafting articles, H.

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Conflicts of Interest
The author declares that there is no conflict of interest regarding the publication of this article.

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