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Development of Integrated Biology Learning Tools with Guided Inquiry Based on the Local Environmental Potential of Lake Lebo Taliwang

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Abstract

Contextual biology learning allows students to connect scientific concepts with real-life conditions, making the learning more meaningful and relevant to everyday life. One of the learning models that supports this is guided inquiry with the teacher acting as a facilitator. The application of guided inquiry will be more meaningful when combined with the utilization of the surrounding environment as a learning resource. This research aims to develop biology learning tools integrated with guided inquiry based on the local potential of Lake Lebo Taliwang, which meet the criteria of being valid, practical, and effective for use in biology education using the 4D development model. Data were obtained thru expert assessment stages and collected thru validation sheets. Data analysis included the analysis of expert assessment results. Based on the development results, it was found that the development of biology learning tools based on guided inquiry utilizing Lake Lebo Taliwang as a learning resource is categorized as very feasible with the following average expert assessment results: 1) average syllabus validation result of 85.9% categorized as very good; 2) average RPP validation result of 84.7% categorized as very good; and 3) average module validation result of 85.7% categorized as very good

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1. INTRODUCTION

21st-century education demands that students develop critical, creative, collaborative, and communicative thinking skills to address various life challenges. In the context of biology learning, achieving these competencies requires a learning process that focuses not only on conceptual mastery but also provides opportunities for students to conduct scientific investigations into phenomena occurring in their environment. Contextual biology learning enables students to connect scientific concepts with real-world situations, making learning more meaningful and relevant to everyday life. Therefore, biology learning tools that utilize the potential of the environment as a learning resource are crucial for education (Ali et al., 2023), especially for students, as they are highly relevant and closely related to their lives (Hartatiana et al., 2024).

However, biology learning in schools is still dominated by theoretical delivery of concepts and lacks a connection between the material and the context of the students' environment (Anjelia et al., 2025). As a result, students tend to have difficulty connecting biological concepts to real-world phenomena they encounter in their daily lives. One learning model considered effective for developing students' scientific abilities is the guided inquiry model (Ulva, 2017). This model

provides opportunities for students to conduct observations, formulate problems, formulate hypotheses, collect data, analyze data, and draw conclusions under the guidance of the teacher as a facilitator (Abdullah et al., 2022).

In biology learning, guided inquiry becomes more meaningful when combined with the use of the surrounding environment as a learning resource (Azizah et al., 2021), especially when applied to topics on biodiversity and the classification of living things. The local environment provides real-world objects, phenomena, and problems that students can use to conduct scientific investigations (Remindima et al., 2024). Utilizing local potential not only helps students understand biological concepts contextually but also fosters environmental awareness and strengthens local identity and wisdom.

One local resource with high educational value is Lake Lebo Taliwang, located in West Sumbawa Regency, West Nusa Tenggara. This lake is an aquatic ecosystem with diverse biodiversity and various ecological phenomena relevant to biology, including biodiversity and classification. These characteristics make Lake Lebo Taliwang a potential contextual learning resource to support inquiry-based learning.

By utilizing the lake environment as a learning object, students can gain direct experience in conducting observations, collecting data, analyzing, and drawing conclusions based on real phenomena found in the field, especially on the material of biodiversity and classification of living things. Therefore, this study aims to develop an integrated biology learning tool with guided inquiry based on the local potential of Lake Lebo Taliwang that meets the criteria of validity, practicality, and effectiveness for use in biology learning.

2. METHOD

This research is a research *and Development* (RnD) using the 4D model from Thiagarajan (1974), whose stages consist of *Define, Design, Develop, and Disseminate. However*, in this research, the development stages carried out only reached the stage *Develop.* Data was obtained through an expert assessment process involving lecturers who are learning design experts, lecturers who are subject matter experts, and education practitioners. Data were collected through validation sheets. Data analysis included analysis of the data from the expert assessment results.

3. RESULTS AND DISCUSSION

Syllabus Development Assessment Results

Syllabus validation by lecturers who are experts in learning design, lecturers who are experts in learning materials, and educational practitioners was conducted using a syllabus validation sheet that had been developed. The assessment indicators used to assess the suitability of the syllabus by lecturers who are experts in learning design, lecturers who are experts in learning materials, and educational practitioners included the completeness of syllabus components, competencies to be achieved, indicators of competency achievement, learning materials, learning activities, assessment of learning outcomes, time allocation, learning resources, language, and benefits. The average results of syllabus validation by lecturers who are experts and educational practitioners are presented in Table 1.1.

Table 1. Average Results of Syllabus Validation by Expert Lecturers and Education Practitioners

No	Rated aspect	Mean Score (%)		Mean Score
		Expert Lecturer	Education Practitioner	
1	Completeness of Syllabus Components (Format)	87,5	100,0	93.7
2	Competencies to be Achieved	78,1	96,8	87.5
3	Indicators of Competence Achievement	79,1	91,6	85.4
4	Learning materials	81,2	87,5	84.3
5	Learning Activities	80,0	90,0	85.0
6	Assessment of Learning Outcomes	75,0	84,3	79.6
7	Time Allocation	75,00	87,5	81.2
8	Learning Resources	87,5	87,5	87.5
9	Linguistics	87,5	87,5	87.5
10	Benefit	87,5	87,5	87.5
	Mean Score		**85,9**	
	Category		**Very good**	

The syllabus validation results obtained the highest score, namely **85.9%**. This value indicates that the developed syllabus has met the aspects of suitability with learning outcomes, materials, learning activities, assessments, and integration of the local environmental potential of Lake Lebo as a learning resource. The high level of syllabus validity indicates that the structure and content of the syllabus are in accordance with the principles of curriculum development that emphasize relevance, consistency, and adequacy of material.

In research on learning tool development, a syllabus with a high level of validity indicates that the objectives, materials, learning strategies, and assessment components have

been systematically structured and can serve as guidelines for effective learning implementation (Husna et al., 2023). High validity also indicates alignment between the desired competencies and the designed learning experience.

Furthermore, integrating the potential flora and fauna of Lake Lebo into the syllabus provides strong contextual value. Local environment-based learning has been shown to enhance the meaningfulness of learning because students study objects closely related to everyday life. This approach aligns with the paradigm of contextual learning and local wisdom-based education, which is currently widely recommended in the development of daily teaching materials (Muslim et al., 2023).

Lesson Plan Development Assessment Results

Validation of the lesson plan by lecturers who are experts in learning design, lecturers who are experts in learning materials, and educational practitioners was conducted using a previously developed lesson plan validation sheet. The assessment indicators used to assess the suitability of the lesson plan by lecturers who are experts in learning design, lecturers who are experts in learning materials, and educational practitioners included lesson plan components, content suitability, learning materials, learning activities, learning resources, assessment, language, and benefits. The average results of the lesson plan validation by the expert lecturers and educational practitioners are presented in Table 1.2.

Table 2. Average Results of Lesson Plan Validation by Expert Lecturers and Education Practitioners

No	Rated aspect	Mean Score (%)		Mean Score
		Expert Lecturer	Education Practitioner	
1	Lesson Plan Components	87,5	100,0	93,7
2	Content Eligibility	77,5	87,5	82,5
3	Learning materials	84,3	87,5	85,9
4	Learning Activities	75,0	93,7	84,3
5	Learning Resources	83,3	87,5	85,4
6	Rating	70,8	83,3	77,0
7	Linguistics	87,5	87,5	87,5
8	Benefit	75,0	87,5	81,2

Mean Score	**84,7**
Category	**Very good**

The lesson plan achieved a validity score of 84.7%, which is also in the highly valid category. Although this is the lowest score compared to other tools, the difference is relatively small and does not indicate significant weaknesses. This score indicates that the lesson plan components, such as learning objectives, activity steps, methods, media, learning resources, and assessments, have been systematically designed and aligned with student characteristics.

In research on the development of learning tools, the validity of the lesson plan (RPP) is crucial because it determines the quality of classroom learning implementation (Masihu et al., 2021). A valid RPP enables teachers to implement targeted learning and helps students achieve targeted competencies. Research on the development of project-based learning tools and other innovative models, according to Muslim et al. (2023), shows that lesson plans with a validity above 80% meet the eligibility standards for implementation in learning.

Module Development Assessment Results

Module validation by lecturers specializing in learning design, subject matter experts, and educational practitioners was conducted using a pre-developed module validation sheet. The assessment indicators used to assess module suitability by lecturers specializing in learning design, subject matter experts, and educational practitioners include: *self-instruction, self-contained, stand-alone, adaptable, and user-friendly. The* average results of module validation from expert lecturer validators and education practitioners are presented in Table 3.

Table 3. Average Results of Module Validation by Expert Lecturers and Education Practitioners

No	Rated aspect	Mean Score (%)		Mean Score
		Expert Lecturer	Education Practitioner	
1	*Self-Instruction*	80,1	85,2	82,6
2	*Self-Contained*	79,1	81,2	80,2
3	*Stand Alone*	87,5	87,5	87,5
4	*Adaptive*	87,5	93,7	90,6
5	*User Friendly*	81,2	93,7	87,5
	Mean Score		**85,7**	
	Category		**Very good**	

The developed module achieved a validity score of 85.7%, which is considered highly valid. This result indicates that the module meets the requirements for content, presentation, language, graphics, and the appropriateness of the material to the learning objectives.

Modules with a validity level above 85% can be categorized as highly valid and suitable for use as teaching materials in learning. This finding aligns with the module development research conducted by Nursanni et al. (2023). This finding is further supported by Lestari (2023), who stated that high validity is an indicator that a module meets the quality standards for content and learning design.

Overall, the average validity of the biology learning tools integrated with guided inquiry and the local environmental potential of Lake Lebo as a learning resource reached 85.43%, indicating a very valid category. Therefore, the syllabus, lesson plans, and modules based on the local environmental potential of Lake Lebo are suitable for use as biology learning tools, particularly those that support students' introduction to biodiversity and the classification of living things.

These results reinforce the idea that leveraging local potential in developing teaching materials can provide numerous benefits for teachers, including producing learning tools relevant to student needs, as demonstrated by research by Kahar et al. (2019) and Sriyati et al. (2021).

Another benefit of developing learning tools based on local environmental potential also has the potential to improve students' cognitive learning outcomes (Khaerani et al, 2020), which can improve the quality of learning and support the preservation of local biological resources by increasing students' awareness of the importance of natural resource conservation (Anggraini et al, 2023).

4. CONCLUSION

The validation results from the validators showed that the average result of the development of learning devices, namely the syllabus, was 85.9%, with a very good category. The validation of the lesson plan (RPP) was 84.7%, categorized as very good, and the validation of the module was 85.7%, categorized as very good. Based on the assessment results from the experts, it was concluded that the development of guided inquiry-based biology learning with the learning resources of Lake Lebo Taliwang was very feasible.

5. SUGGESTION

The learning tools developed from the results of this development can be used as a reference for further tool development with other materials in biology lessons with different learning resources.

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