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Problem-Based Module Biodiversity Learning Materials To Improve 4c Skills

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Abstrak

Tujuan penelitian ini adalah untuk mengetahui valid atau tidaknya modul pembelajaran biologi, praktis atau tidaknya, dan efektif atau tidaknya dalam meningkatkan keterampilan 4C biologi siswa. Berdasarkan model pengembangan ADDIE, penelitian semacam ini tergolong penelitian pengembangan. Tempat dan lokasi penelitian ini adalah di SMA Islam Al Ulum Medan. Partisipan dalam penelitian ini adalah tiga puluh siswa yang terdaftar di kelas X SMA Al Ulum Medan. Hasil penelitian ini menunjukkan bahwa validitas modul pembelajaran berbasis masalah yang berbasis model berbasis masalah termasuk dalam kategori valid. Artinya, modul pembelajaran yang dikembangkan telah memenuhi indikator validitas. Terkait keterampilan 4C siswa, kepraktisan modul pembelajaran berbasis masalah termasuk dalam kategori praktis. Berdasarkan model berbasis masalah, efektivitas modul pembelajaran berbasis masalah terhadap keterampilan 4C siswa cukup memenuhi kriteria efektivitas.

Kata Kunci; *Pengembangan Modul, Pembelajran berbasis masalah, Keterampilan 4C.*

Abstract

The goal of this study is to establish whether or not the biology learning module is valid, whether or not it is practical, and whether or not it is effective in improving students' 4C biology skills. According to the ADDIE model of development, this kind of research is considered to be development research. The place and location of this research is at Al Ulum Islamic High School in Medan. The participants in this study are thirty students who are enrolled in class X at Al Ulum High School in Medan. The findings of this research indicate that the validity of the problem-based learning module, which is based on the problem-based model, is included in the valid category. This means that the learning module that was developed has satisfied the validity indicators. With regard to the students' 4C skills, the practicality of the problem-based learning module is included in the category of practical. Based on the problem-based model, the effectiveness of the problem-based learning module for students' 4C skills is sufficient to meet the effectiveness criterion.

Keywords*: Module Development, Problem-based Learning, 4C Skills.*

1. INTRODUCTION

A preliminary study at SMA Islam Al-Ulum Terpadu Medan indicated that biology teachers and students only used handbooks (packages) and LKS, which described materials and practice questions for individual work. Because the materials and practice questions concentrated on rote memorization rather than understanding

and application and did not encourage 4C skills and scientific literacy, students' books and LKS did not teach them to think critically, creatively, communicatively, and cooperatively According to student interviews, current books' vocabulary and sentences were still hard to understand, making them less interested and slower to read and learn (Farisi, A., Hamid, A., 2017). Grade X SMA biodiversity PBL modules are needed due to the above difficulties. Module-based teaching materials were chosen because they are organized in a language kids can understand according to their age and knowledge, allowing them to learn freely with little teacher direction (Puspitasari, 2019). Modules can be used alone or in a class to assist students achieve goals (Imran et al., 2021). We picked biodiversity because pupils struggle to understand. According to Barus, E. M., Ritonga, I. S., & Siregar (2018), students are less interested in difficult biology materials with scientific jargon. Students still struggle to assess gene and species diversity and propose practical biodiversity degradation solutions (Yunanda, I., Susilo, H., & Ghofur, 2020). Tamimu, S., Nurlia, & Kenta (2022) found that students scored low on biodiversity content because the teacher still utilized a direct and teacher-centered learning strategy, which bored, slept, and distracted them.

The student-centered 21st-century learning model prompted PBL selection. PBL also improves students' thinking, science understanding, problem-solving, and learning outcomes (Ariani, 2020). Blended-PBL increases students' critical thinking (Darwis, Latif, & Rahman, 2020). According to Setyasih et al. (2022), PBL boosts students' scientific literacy. PBL boosts students' scientific knowledge (Nuzula, N. F., & Sudibyo, 2023) Several scholars have created PBL-based teaching resources, including (Asma, Z., 2018). Research shows that PBL-based teaching materials (LKPD, e-LKPD, and e-modules) are viable, practical, and effective in improving students' skills. Yes, PBL-based educational tools have been thoroughly investigated and developed. No PBL-based biodiversity modules have been developed to improve students' 4C skills (critical thinking, creativity, communication, and cooperation) and scientific literacy, making this study unique. Improving 4C and scientific literacy is essential for post-graduation student life. Everyone, especially youth, requires 4C skills for 21st-century problems, issues, and careers. To compete globally, you need 4C skills. Since life capitals can develop knowledge individually and socially, 4C skills will benefit students, especially when they participate in society.

Every student needs scientific literacy in community life to connect science issues to their citizenship values. Science literacy helps students think critically, use science concepts, and make balanced and sufficient decisions on real-world issues. In social scientific difficulties, science literacy requires collaboration, self-development through communication, and clear and convincing reasoning (Marpaung, C. P., & Suyanti, 2023). The study "Development of Problem-Based Learning Modules for Biodiversity Material to Improve 4C Skills and Science Literacy of Class X Students of SMA Islam Al-Ulum Terpadu" addressed the importance of 4C skills and science literacy in 21st-century student-focused learning. The chosen R&D aims to provide effective training modules that boost 4C skills and scientific literacy. Analysis, Design, Development, Implementation, and Evaluation (ADDIE) is used to create instructional materials and learning media. The sequential and logical architecture of ADDIE incorporates review and change at each stage, showing a reciprocal relationship.

2. RESEARCH METHODS

Development and validation of instructional products (Setyosari, 2016) and testing their efficacy (Sugiyono, 2018) are part of this research. A PBL-based biology lesson on biodiversity for grade X high school students with 4C skills innovations was designed. Since the school still uses traditional learning modules, researchers performed study in the form of modules to help students understand the subject and enhance their skills. This study was conducted in Al-Ulum High School Medan, Jl. Tuasan, No. 35, Sidorejo Hilir, Medan Tembung District, North Sumatra. Research occurred in the 2024/2025 even semester. This study included grade X Al-Ulum High School Medan students. Al-Ulum High School Medan selected 30 grade X students. Problem-based learning is used to apply 4C skills and scientific literacy in this research. The research instrument was a

problem-based learning 4C skills module. Module development in this study follows the ADDIE approach and teaching material development (Amthari, W., Muhammad, D., & Anggereini, 2021). The five steps of ADDIE development are analysis, design, development, implementation, and evaluation.

3. RESULTS AND DISCUSSION

Data analysis and study outcomes from each development step are shown:

Analysis

The researcher analyzes the necessity for a learning development model, its practicality, and its prerequisites. The study examined student needs, character, and curriculum. Student Needs Analysis: Initial observations of student learning at Al Ulum Islamic High School showed that the PBL learning paradigm was not utilized, resulting in low 4C capabilities. Al Ulum Islamic High School students were assessed for cognitive development, academic aptitude, and social skills connected to the learning theme, media, format, and language. I followed the recognized cognitive growth stages for Al Ulum Islamic High School students. This study analyzed the textbook curriculum and compared it to student needs and the 2013 curriculum for grade 10 Al Ulum Islamic High School courses.

Design

This step designs learning media to create a biodiversity material prototype. This stage includes storyboarding, learning content compilation, lesson planning, and module development.

Development

Transforming the idea into a usable product. This step incorporates the design phase frameworks into a PBL-based biodiversity module for 10th-grade high school students, ready for expert validators to assess until a marketable product is obtained. The following modules were created:

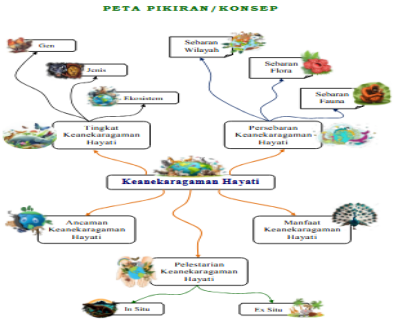

Figure 1. Learning Module Display

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Table 1. Validation Results

No	Aspect	Average	Category
1	Learning Module	4,6	Valid
2	4C Skills	4,7	Valid

Table 1 shows that the "4 C skills, science literacy" module averaged 4.5 "valid" points. Descriptive statistical analysis was employed to evaluate study data. Descriptive statistics summarizes facts without judgments or predictions, according to Sheskin (2004). To measure data centre and distribution, descriptive statistics employs tables, graphs, infographics, and calculations. Common methods are used in descriptive statistics.

Implementation

The research moved to implementation after the learning model fulfilled validity criteria (draft II). Trial I involved piloting draft II of the learning model and all learning materials with 10th graders from SMA Al-Ulum Medan. The study ended if the success criteria were met. If they weren't fulfilled, the research went to trial II after improvements. If all success markers were met, the research was complete. Based on learning implementation criteria, trial I materials exhibited a moderate learning implementation level (IO = 3.0, 4 ≤ GPA < 5). Trial II showed high learning implementation (4 ≤ GPA < 5) with IO = 3.8. Thus, most learning materials satisfied empirical practical standards. This study used a multiple-choice test to assess student learning mastery of the 4C skills. Table 2 summarizes trial I students' 4C skills:

Table 2 Description of the Results of 4C Skills Ability in the Trial

Interval	Category	Pretest		Posttest	
		Number of students	Presentation	Number of students	Presentation
76-100	Very Good	4	13,3 %	12	40%
51-75	Good	15	50%	17	56 %
26-50	Quite Good	11	36,6%	1	3 %
0-25	Not Good	0	0%	0	0%
Total		30	100%	32	100%

Table 2 reveals that before treatment, 4 students (13.3%) were very good, 15 (50%) were good enough, 11 (36.6%) were pretty good, and 0 (0%) were less good. After treatment, 12 pupils (40%) were very good, 17 (56%) were good enough, and a0 (0%) were less good.

DISCUSSION

The testing findings show that the problem-based learning module meets (1) classical student learning accomplishment requirements. Each problem-based learning module effectiveness indicator is discussed below. In trial II, students' classical achievement was 26% in the pretest and 93% in the posttest. This meets classical learning accomplishment criteria, which need 85% of pupils to score 75 or better. With a 93% completion rate, the posttest findings met classical achievement requirements. Thus, the trial deployment of the problem-based learning module met conventional learning achievement criteria.

The research results above show that the produced learning tools' classical student achievement satisfied efficacy standards. Students actively used the 4C skills after applying the problem-based learning module. Prior study by Zendrato et al. (2022), Gulo & Waruwu (2022), and Hulu et al. (2023) shows that problem-based learning modules improve students' classical learning proficiency. Research (Maryam et al., 2020) shows that the problem-based learning model strongly impacts 4C skills. Based on the research findings and previous research, the problem-based learning module may help students grasp classical learning. Thus, problem-based learning can assist pupils master traditional learning.

4. CONCLUSION

The Problem-Based Learning model-based learning module improves students' 4C skills (valid). This learning module is valid at 4.6. The created learning module meets validity indicators. Problem-Based Learning model-based learning module improves students' 4C skills with an average learning implementation score of 4.6, or 90.55%, indicating practicality. The average positive reaction score is 87.31%, very positive. Problem-Based Learning improved students' 4C skills by an average score above 80%.

Problem-Based Learning model-based learning module passes efficacy criteria: (1) Over 75% of learning objectives were met, averaging 84.06%. (2) Over 85% of pupils scored 75 or higher, with 96% completed classically. (3) The produced module received over 85% positive replies, with 87.31% highly positive. (4) Problem-based learning does not exceed regular learning hours.

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