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Development of Problem-Based Learning E-Module for Grade X High School Students : Preliminary Research

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Abstract: This study aims to determine the initial needs related to teaching materials and the learning models used in the learning process. The research method employed is quantitative descriptive research. This study represents the preliminary stage of development research. The data collection instruments for this research include interview sheets, teacher-needs questionnaires and student-needs questionnaires. The developed learning materials take the form of e-modules, which may consist of text, images, and instructional videos as a structured approach to independent learning. A needs analysis is conducted to identify the learning resources teachers utilize, learning obstacles, and the learning resources students require. The population for this study comprises Grade X students, with a sample size of 42 students and one biology teacher. The data obtained are analyzed using descriptive statistical analysis. The needs analysis results indicate that 79.66% of the 42 Grade X students require e-modules to support the learning process. Therefore, it is necessary to develop teaching materials like e-modules integrated with the Problem-Based Learning (PBL) model to enhance the learning experience.

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Introduction

Education is a conscious and planned effort to create an environment and learning process that enables students to actively develop their potential to achieve noble character, good personality, self-control, intelligence, religiosity, and the skills necessary for themselves and society (Pristiwanti et al., 2022). Education is not merely understood as the transfer of knowledge and skills but also as a comprehensive effort to realize individuals' desires, needs, and abilities in achieving a personally and socially satisfying lifestyle. The learning process experienced by each individual is known as education, which aims to provide opportunities for individuals to understand, develop emotionally, and think critically (Rahman et al., 2022). In the context of education, the presence of teaching materials becomes essential.

Teaching materials are a set of learning tools or aids systematically arranged, encompassing learning materials and methods teachers and students use to guide learning activities towards achieving the desired objectives (Magdalena et al., 2020). Teaching materials, often referred to as lesson materials, are fundamental elements in the learning process, as they are the core of the activity. The materials can be in the form of written or non-written content. Teaching materials are systematically arranged in written or non-written forms, creating a conducive environment for students to learn (Herawati & Muhtadi, 2018). One form of teaching material is the module.

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A module is a book written with the aim that students can learn independently, either with or without teacher guidance. A module at least contains learning instructions, skills, content material, supporting information, exercises, and work instructions that may include worksheets, assessments, and feedback on assessment results (Putro et al., 2018). Modules can also be developed in electronic format, known as e-modules. An e-module is a systematically arranged teaching material presented in electronic format, including text, images, audio, animations, and videos (Seruni et al., 2019). E-modules can be accessed via computers or mobile devices, facilitating students to learn anytime and anywhere (Lastri, 2023). E-modules can be integrated with problem-based learning models.

Previous studies have shown that using e-modules can improve student learning outcomes (Rahayu et al., 2024; Nizaar et al., 2021; Widiastutik & Rudyatmi, 2021). Furthermore, problem-based learning models can encourage students to enhance their critical thinking skills (Azura & Selaras, 2023; Nugraha, 2018; Pertiwi & Masugiono, 2019). Therefore, using teaching materials like e-modules based on problem-based learning models can make learning more active. Based on the identified issues, this study aims to analyze the need to develop teaching materials in e-modules based on problem-based learning models for Grade X students at SMAN 5 Pekanbaru.

Research Method

This study employs a quantitative descriptive approach to describe, examine, and explain phenomena comprehensively by utilizing numerical data to draw conclusions regarding the observed issues (Rahmayani & Asrizal, 2023). The subjects of this research include one biology teacher who teaches classes X.5 to X.10, as well as 42 students from class X.10 at SMAN 5 Pekanbaru. Data collection was conducted through several instruments, namely Interview Sheets. Interview Sheets are used to identify the initial conditions of the problems. The interview sheet for the teacher consists of 12 questions, while the one for students comprises seven questions. Needs Analysis Questionnaire: This questionnaire contains a list of questions or statements that teachers and students must answer regarding their needs in the learning process. The indicators for the teacher needs questionnaire include the quality of the learning process, the use of teaching materials, and the use of e-modules. Meanwhile, the indicators for the student needs questionnaire encompass student interest and responses, teaching materials, and e-modules, with a total of 10 question items.

Data analysis in this study is conducted using descriptive data analysis techniques. The data from the questionnaires are converted into percentages using the established formula (Malik & Chusni, 2018).

$$P = \frac{F}{N} \times 100\%$$

Description:

P= Percentage

F= Frequency of answer score

N= Number of respondents

The results of the research calculations are then classified in percentage form according to the level criteria.

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Table 1. Interpretation values

Percentage	Category
81%-100%	Very high
61%-80%	High
41%-60%	Medium
21%-40%	Low
0%-20%	Very low

Source : Riduwan (2016)

Result and Discussion

Based on the interviews conducted by the researcher with the biology teacher and Grade X students at SMAN 5 Pekanbaru, several issues were identified in the classroom learning process, including: (1) Both the teacher and students only utilize teaching materials in the form of textbooks and Student Worksheets (LKPD); (2) The teacher has not yet employed teaching materials in the form of e-modules in the learning process; (3) The teacher tends to rely on lecture and discussion methods. The interview results indicate that the teaching materials used to support the learning process are still insufficiently varied, and the lecture-based learning model frequently employed by the teacher can lead to student boredom. Therefore, a different learning model is necessary to enhance student participation.

Teacher Needs Analysis

The teacher needs analysis was conducted to determine the extent of the teacher's requirements in developing problem-based learning e-modules to improve students' problem-solving abilities. The results of the teacher needs analysis are presented in Table 2.

Table 2. Results of the Teacher Needs Questionnaire

No	Indicator	Percentage	Category
1	Quality of Learning Process	100%	Very high
2	Use of Teaching Materials	67%	High
3	Use of e-modules	75%	High
Total		**242%**	
Average		**80,66%**	
Category		**High**	

From the analysis of the teacher needs questionnaire presented in Table 2, it is evident that the quality of the learning process conducted by the teacher is rated at 100%. However, regarding teaching materials, the teacher has not yet utilized electronic teaching materials in the learning process, resulting in a percentage of 67%. Furthermore, concerning the use of e-modules, the teacher has not incorporated e-modules into the learning process, leading to a percentage of 75%. When aggregated, the average score obtained is 80.66%, which falls into a high category.

Using teaching materials can enhance students' understanding of the subject matter and encourage active engagement, increasing their enthusiasm for comprehending the material. Additionally, with the aid of teaching materials, the burden on teachers in presenting the content is reduced, allowing them more time to guide students during the learning process (Magdalena et al., 2020).

However, teachers often encounter difficulties developing teaching materials that meet students' needs. As a result, students may lack confidence when faced with questions requiring specific skills. Therefore, teachers require more varied and innovative teaching

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materials that can be utilized in the learning process, such as e-modules. E-modules can be employed inside and outside the classroom, making them highly beneficial for teachers' instruction and assisting students in developing independent learning skills. Moreover, the use of e-modules can enhance the learning experience for students. In this context, electronic modules also support teachers' professional development, particularly in integrating technology into teaching (Istiqoma et al., 2023).

E-modules designed to enhance critical thinking skills, particularly through integrating problem-based learning models, can assist students in understanding the material while simultaneously honing their problem-solving skills (Malina et al., 2021). The required e-modules should also be systematically organized, encompassing text, images, instructional videos, and simulations. This approach enables students to study biology material easily and independently (Laraphaty et al., 2021). Thus, teachers require teaching materials that can support the learning process and certainly favour the development of e-modules utilizing the problem-based learning model.

Results of student needs analysis

The student needs analysis was conducted to determine students' requirements for problem-based learning e-modules as a handbook or learning resource in educational activities. Based on the preliminary study data obtained from 42 students at SMAN 5 Pekanbaru through distributing a questionnaire consisting of 10 questions, the scores obtained from the questionnaire were calculated to derive percentages and aligned with the criteria established based on existing sources. The following are the results of the student needs analysis presented in Table 3.

Table 3. Results of student needs questionnaire

No	Indicator	Percentage	Category
1	Learner Interest and Response	79%	High
2	Use of Teaching Materials	77%	High
3	Use of E-modules	83%	Very high
	Total		**239%**
	Average		**79,66%**
	Category		**High**

The analysis of the student needs questionnaire presented in Table 3 shows that students possess a handbook useful for studying biology. Systematically organized learning resources that can be understood independently are an essential part of the learning materials required by students to support their educational activities. These teaching materials take the form of e-modules, which can include text, images, and videos, differing from printed modules, requiring students to learn to solve problems independently (Malina et al., 2021).

A potential solution to address these issues is to employ a learning model that aligns with the conditions to enhance students' understanding. Problem-Based Learning (PBL) is a learning model emphasizing problem-solving in education. PBL encourages students to think critically and solve problems. This approach is suitable for use in teaching materials such as e-modules. PBL in problem-solving can assist students in understanding real-life issues, taking responsibility for their learning, and enhancing their knowledge (Malina et al., 2021). Based on this needs analysis, there is a necessity for teaching materials for students to learn, specifically in the form of problem-based learning e-modules.

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Conclusion

Based on the research conducted through interviews and needs questionnaires at SMAN 5 Pekanbaru, it can be concluded that both teachers and students currently only utilize printed books and Student Worksheets (LKPD). Students have expressed difficulties in understanding the material presented in printed books. Therefore, there is a need for teaching materials in the form of e-modules that can support learning in schools. Other findings indicate that the implementation of electronic-based teaching materials as a learning medium has not yet been realized in the school. Consequently, developing teaching materials such as Project-Based Learning (PBL) e-modules is essential, considering that students cannot always rely on conventional teaching materials. It is hoped that engaging teaching materials such as PBL-based electronic modules will enhance students' understanding and critical thinking skills.

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