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Needs Analysis for The Development of Teaching Materials in High School

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ABSTRACT

Teachers facilitate students in understanding the material taught to achieve competence optimally. Making digital teaching materials is needed to achieve the objectives of the 2013 curriculum. The purpose of this study is to analyze the needs of students and teachers for teaching materials needed in schools. This research is descriptive research with the research subjects of X1.4 and X1.9 class students and 3 teachers of SMA 11 Palembang. The research data were obtained from filling out a questionnaire to analyze the initial needs of the type of teaching materials used. The results of the questionnaire analysis stated that the critical thinking skills of students were still low. The teaching materials used so far are textbooks and are considered not to support the learning process. The learning method applied by the teacher is still in the form of assignments, so it has not directed students to problem-solving. In addition to not using a learning model, teachers also have not used learning approaches such as STEAM, which emphasizes learning in aspects of science, technology, engineering, art, and mathematics.

INTRODUCTION

Education serves as a fundamental pillar for a nation's advancement and development. It empowers individuals by enhancing their intellectual abilities, competencies, and knowledge, enabling them to adapt to the ever-changing demands of the modern era. However, the current educational landscape is confronted with numerous intricate challenges. One of the main problems faced is inadequate educational infrastructure. Many schools suffer from a lack of facilities and infrastructure, such as damaged school buildings, a lack of sports facilities, minimal libraries, and limited internet access. Consequently, both the effectiveness of the learning process and students' comfort during instruction are adversely affected (Isma et al., 2023).

As facilitators, teachers guide students in mastering learning content to reach targeted competencies. To support this, they should be able to select relevant resources such as books, journals, or other printed media that align with learning goals. Utilizing teaching materials is one effective approach to improve students' comprehension (Syafei, 2019). Mastery of concepts is a crucial element that underpins effective learning and fosters the development of students' competencies across different scientific disciplines (Jannah et al., 2024).

Teaching materials are systematically developed instructional resources that encompass content, methodology, limitations, and assessment approaches, aimed at facilitating the achievement of complex competencies and sub-competencies (Lestari, 2013). The development of teaching materials must adhere to instructional guidelines, considering their role in supporting teachers throughout the learning process (Nuryasana & Desiningrum, 2020). Various forms of teaching materials have been utilized by educators, including printed resources such as textbooks, modules, and student worksheets (LKPD). In addition, non-printed materials such as films and PowerPoint presentations are also commonly employed to support the learning process (Sati & Mutmainnah, 2023). Making digital teaching materials is necessary for the needs to achieve the objectives of the 2013 curriculum. The elements of teaching materials consist of learning instructions, this

component include instructions for educators and students, competencies to be achieved, supporting information, exercises, work instructions or worksheets, and evaluation, which is one part of the assessment process (Nuryasana & Desiningrum, 2020).

The development of teaching materials involves several benchmark aspects, including concepts (as foundational ideas), principles (fundamental truths that guide thought and action), facts (actual events or experiences), processes (sequences of changes or developments), values (as patterns, measures, or models), and skills (the capability to perform tasks effectively) (Magdalena et al., 2020). The development of teaching materials is needed because teaching materials help teachers to present learning materials that meet the needs and learning objectives, of course, determined and adjusted to the model that is the reference for learning (Dwi Ummu & Herlina Usman, 2023). Analysis of teaching material needs is the main step to find out the development of teaching materials (Nurhayati & Langlang Handayani, 2020).

Needs analysis serves as a means to recognize existing problems to formulate appropriate solution steps (Sujarwo & Kusumawardani, 2020). This stage is the initial foundation in the process of preparing scientific work, because the results of the analysis become a reference in designing, developing, and implementing the planned solution. The purpose of the needs analysis is to ensure that the solution designed is truly by the needs and expectations of users, and can realize the desired goals, such as improving the quality of education. Based on the description above, the author intends to analyze teaching materials to improve critical thinking skills at SMA Negeri 11 Palembang. This article aims to analyze the needs of Biology teaching materials at SMA Negeri 11 Palembang because the teaching materials used so far are textbooks and are considered not to support the learning process, it is evident that the development of teaching materials is essential to enhance and support the effectiveness of the learning process.

MATERIALS AND METHODS

1. Time and Place of Research

This research was conducted on November 2024 at 11 High School Palembang, in coordination with the biology class schedule for grade XI students.

2. Research Methods

This study employs a descriptive approach to examine the use of teaching materials within the learning process. It represents the initial phase of the 4D development model, specifically the define stage (Thiagarajan, 1974). In the define stage, five analytical steps are carried out: front end analysis, learner analysis, task analysis, concept analysis, and the determination of learning objectives. A visual representation of this stage is provided in Figure 1.

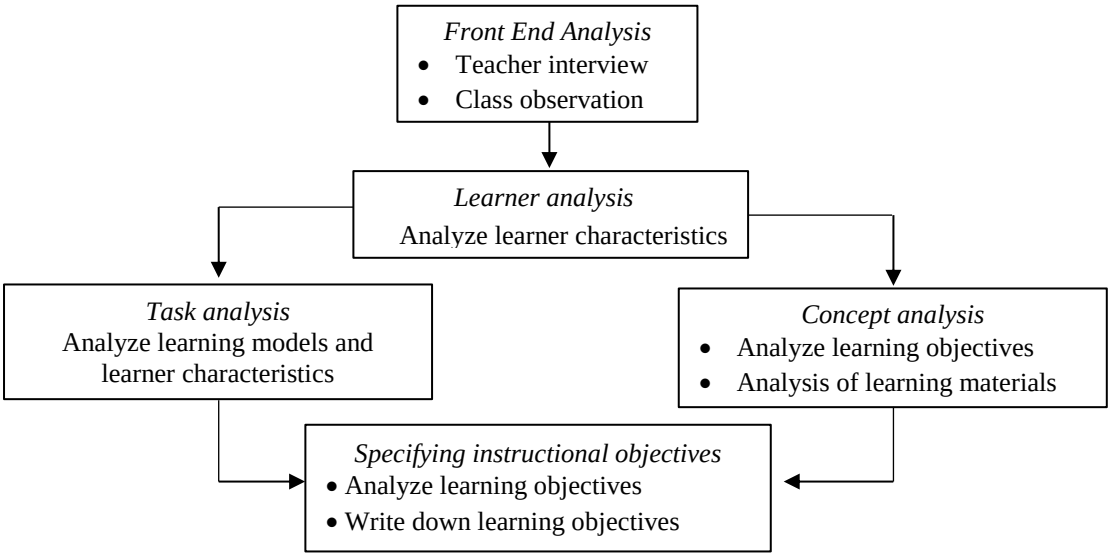

Figure 1. *Define* the stage of the 4D model

3. Population and Sample

The participants in this study consisted of both teachers and students. The subjects in this study were biology teachers and 64 total students in class XI.4 and XI.9 and 3 teachers at 11 High School Palembang. Respondent characteristics are detailed in Tables 1 and 2.

Table 1. Teacher Characteristics

No.	Respondent Characteristics	Number of Respondents
1	Science teacher	3
2	Gender	
	Female	3
	Male	-
3	Education level	
	Bachelor's degree	2
	Master's degree	1

Table 2. Characteristics of Learners

No.	Respondent Characteristics	Number of Respondents
1	Class	
	XI. 4	29
	XI. 9	35
2	Gender	
	Female	37
	Male	27

4. Data Collection

Data collection was conducted through questionnaires and interviews. Prior to distribution, the questionnaire underwent validation by the supervisor and was subsequently revised. During the implementation phase, the questionnaire was administered to 3 science teachers and 64 students. The teacher questionnaire sheet, totaling 19 questions, has 5 aspects, namely: teaching materials, teaching materials, measured abilities, learning models, and learning approaches. The learners' questionnaire, totaling 20 questions, has 5 aspects, namely: teaching materials, measured abilities, teaching materials, learning approaches, and facilities and infrastructure. The teacher and learner questionnaire grids can be seen in Tables 3 and 4 below.

Table 3. Grid of questionnaire sheet for teachers

No.	Aspects	Indicator	Item Number
1	Teaching materials	a. Use of teaching materials b. Types of teaching materials used c. Use of electronic teaching materials	1,12,13
2	Teaching material	a. Material that is considered difficult b. Material that is considered easy	2,3,4,5
3	Measured ability	a. Critical thinking skills	6,7,8
4	Learning model	a. The use of learning models b. Constraints of the learning model	9,10,11,
5	Learning approach	a. Learning approach model b. STEAM learning c. Readiness to use the learning model	14,15,16,17,8,19

Table 4. Grid of questionnaire sheet for teachers

No.	Aspects	Indicator	Item Number
1	Teaching material	a. Preferred material b. Difficulty specifications on the material	1,2,3,4,5
2	Measured ability	a. Critical thinking skills	6,7
3	Teaching materials	a. Use of teaching materials b. Type of teaching materials used	8,9,10,11,12,13

No.	Aspects	Indicator	Item Number
		c. Use of electronic teaching materials	
4	Learning approach	a. Use of the STEAM learning model	14,15,16,17,18
5	Facilities and infrastructure	a. Internet connection facilities b. Availability of gadgets	19,20

5. Data Analysis

Once the data has been gathered, the next step involves analyzing the quantitative data through thematic analysis or content analysis of the interview and observation findings. In quantitative methods, it starts from the descriptive statistics stage and is followed up with more specific analysis to gain more insight. Through quantitative research, it is possible to collect and analyze large amounts of data (Sofwatillah et al., 2024).

RESULTS AND DISCUSSION

The results of the questionnaire analysis show that the learning that takes place at SMA Negeri 11 Palembang does not optimally support the development of students' critical thinking skills. 83% of learners rated learning as not supporting critical thinking (Figure 2). This is reinforced by the statements of several teachers who revealed that the thinking ability of students, especially in the aspect of critical thinking, is still relatively low (Figure 3). Teachers stated that students tend to be passive and less able to express opinions during the learning process related to learning interests. Teachers are one of the important components in the world of education, even when the learning process is taking place. The role of teachers in the teaching and learning process greatly influences students' learning interests (Sobron et al., 2020). Interest in learning is a feeling of pleasure that arises within oneself when the learning process is carried out to achieve learning achievements (Putri et al., 2017). Factors that influence interest in learning, namely, motivation, attitude towards teachers and lessons, family, school facilities, and friends, interest in learning is influenced by factors that are closely related and cannot stand alone (Korompot et al., 2020).

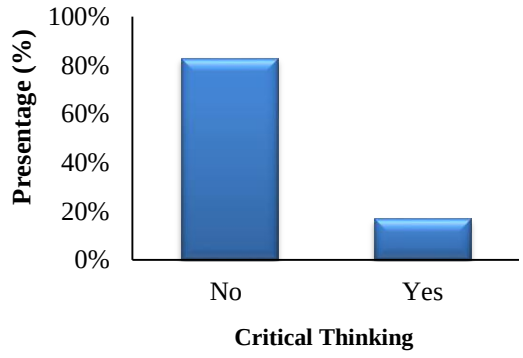

Figure 2. Learning Analysis What Supports Learners' Critical Thinking

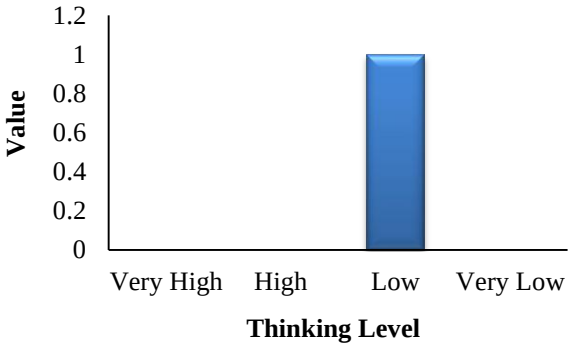

Figure 3. Thinking Level Analysis Learners

The cause of low critical thinking skills is that teachers still use conventional learning, and students are not allowed to explore problem-solving independently. Development efforts need to be continuously carried out. Steps that can be taken in developing students' critical thinking skills are leaving conventional patterns in learning and replacing them with new student-centered patterns (Suatini, 2019). Students' critical thinking skills are related to many aspects, one of which is teaching materials and learning methods. The results of the analysis of teaching materials at SMA Negeri 11 Palembang showed that textbooks were the most dominant teaching materials given in the learning process, which amounted to 67% (Figure 4). Teachers tend to use textbooks as the main teaching material for students (Figure 5). The lack of innovative teaching materials has a major effect on the decline in student learning outcomes, which starts from students who feel bored in learning activities. Innovation in teaching materials is very important to increase students' insight (Nuryasana & Desiningrum, 2020).

The teaching materials used in the learning process are still conventional, namely textbooks (Figure 4). Conventional media in its operation does not use applications or other digital programs. Conventional media is a traditional learning media known as lecture learning, this method has been used since long ago as a medium of oral and written communication between educators and students in the learning and teaching process (Yuniarti et al., 2023). These teaching materials tend to emphasize providing information in a one-way manner without encouraging learners to explore, analyze, or critically evaluate information. As a result, learners focus more on memorizing concepts rather than developing critical thinking skills. Teachers tend to prefer using textbooks as the main source of learning because they are considered practical (Figure 5).

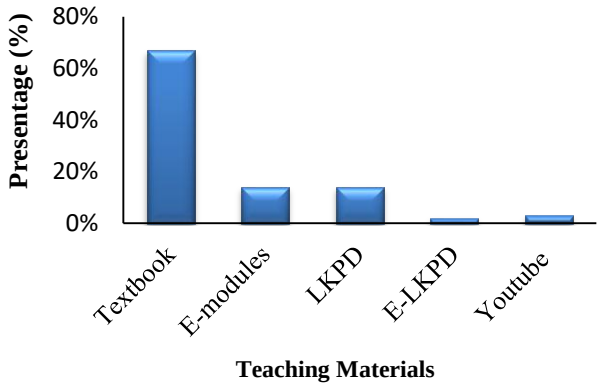

Figure 4. Needs Analysis Teaching Materials for Learners

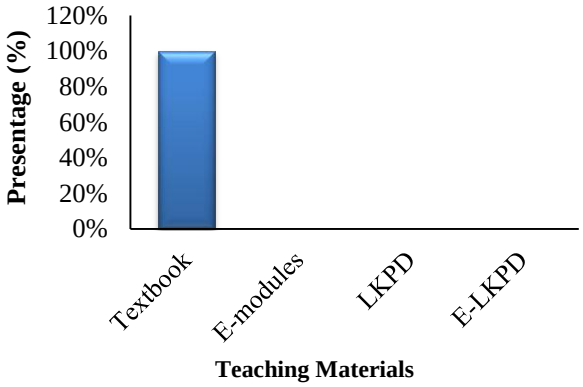

Figure 5. Material Usage Analysis Teaching Materials for Learners

Teaching materials have a very important role in the 21st century because they are the main means to support the learning process that is relevant to the demands of the times. In an era characterized by technological advances, abundant information, and rapid social change, teaching materials must not only contain basic knowledge but also encourage critical thinking skills, collaboration, creativity, and digital literacy. Teachers and educators are required to develop teaching materials that are contextual, interactive, and easily accessible to learners through various platforms, including digital. Select teaching materials that suit the needs of learners and integrate them effectively into the learning process to target the achievement of learner competencies (Wahyudi, 2022).

The diverse demands in education necessitate the use of media that can assist students in comprehensively and systematically understanding the material, enabling the integration and accumulation of various competencies. Teachers can develop LKPD as a tool in learning activities to increase motivation and achieve learning objectives. LKPD development can be prepared by adjusting the conditions and characteristics of students so that the learning process takes place effectively and well. The rapid advancement of science and technology demands that teachers modify their instructional strategies. Rather than serving solely as the primary source of knowledge, teachers need to adapt their classroom teaching approaches to stay aligned with the fast-paced developments in science and technology (Ramadani et al., 2024).

Learner worksheets (LKPD) can be used as a tool to direct students to be able to work independently. The LKPD that is prepared is adjusted to the learning model and the objectives of the learning. LKPD that can be used optimally is a quality worksheet and can be understood by students (Wahyuni & Miterianifa, 2019). In line with what is expressed by Hifarianti et al (2017), quality teaching materials are teaching materials that include the completeness of the dimensions of knowledge and can train students' cognitive abilities. The use of LKPD can provide opportunities for students to be active and creative in the learning process. The use of LKPD also supports learning conditions to be *student-centered* (Khairati et al., 2022). Alternative teaching materials educators can use e-LKPD because in its use it does not use paper so it is more efficient, it can also eliminate student boredom because there are variations in the questions in its presentation and is

also equipped with animations, images and learning videos that will make students interested in learning (Nurjannah et al., 2022). The development of LKPD in electronic form, packaged in digital format, can be easily operated by students and teachers in the implementation of learning both offline and online. The existence of digital teaching materials makes the implementation of learning more effective and interactive (Yulaika et al., 2020). Student worksheets (LKPD) can be utilized as teaching materials for critical thinking skills with guidance activities and solving problem (Indriani & Sakti, 2022).

The learning methods used by teachers are still dominated by giving assignments to students, both individually and in groups (Figure 6). Suggests a strong reliance on traditional, task-oriented instructional approaches.The high frequency of these assignments shows that teachers have not optimally applied the appropriate learning model to encourage active involvement and development of critical thinking in students (Figure 7). Education is expected to build critical thinking skills for everyone, especially students, who can play an active role in life (Fiqtianisa, 2025). Curiosity arises when people have critical thinking skills and are able to solve problems by thinking actively (Tinambunan et al., 2023). Lack of variety and innovation in teaching strategies ultimately the optimal development of students' critical thinking abilities in the learning process.

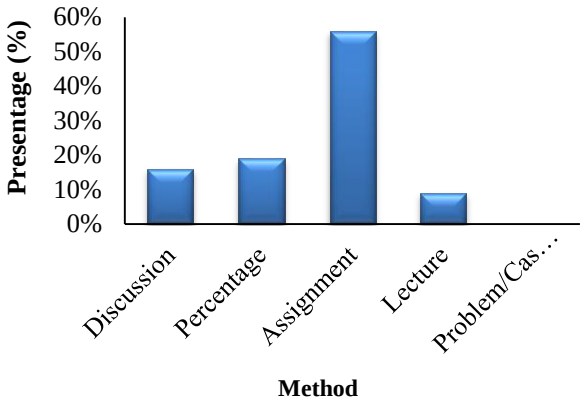

Figure 6. Student Learning Analysis Method

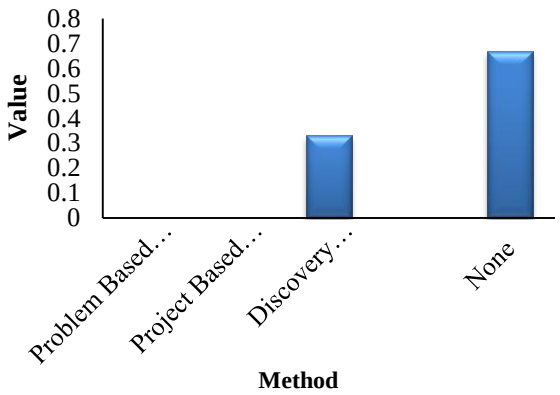

Figure 7. Learning Model Analysis

Analysis of the learning process of students at SMA Negeri 11 Palembang shows that assignment is the most frequently used learning method in the learning process which is 56% (Figure 6), this is reinforced by the results of teacher interviews which state that assignment is the most frequently used learning method especially in learning biology. The assignment method applied by the teacher has not directed students to solve problems that have an impact on critical thinking skills. Based on the questionnaire results, the learning model that has been used by the teacher is Discovery Learning (Figure 7). A suitable learning model used in the problem-solving process is PBL, which involves an open, unstructured real-world problem as a context in which students can develop problem-solving skills and build new student knowledge (Puspitasari, 2023). The PBL learning model can improve students' ability to think critically, namely by encouraging students to be more active and opening up opportunities to foster students' curiosity naturally to help develop the ability to ask questions and seek answers based on existing evidence to improve critical thinking attitudes and learning outcomes (Sukowati & Harjono, 2023).

The application of the STEAM (*Science, Technology, Engineering, Arts,* and *Mathematics*) approach in the learning process has not been carried out optimally by teachers. Each aspect of the STEAM approach has not been well integrated. Teachers tend not to link the subject matter with elements of science, technology, engineering, arts, and mathematics application in an integrated manner in learning. In addition to the learning model, the STEAM approach also influences the critical thinking process of students. Based on the results of the analysis, teacher learning is more dominant in the science aspect by 33% and the lowest in the math aspect by 8% (Figure 8). The STEAM approach has never been done by teachers at SMA Negeri 11 Palembang (Figure 9).

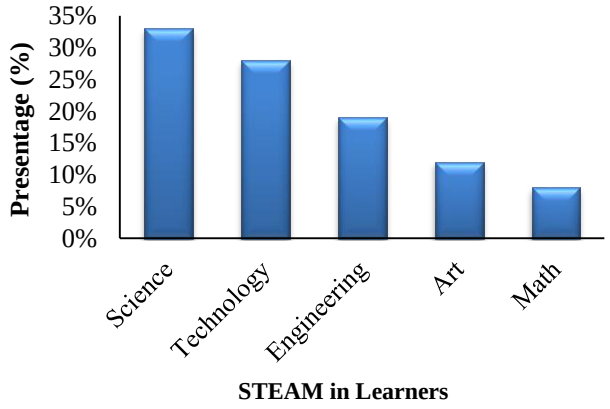

Figure 8. Analysis of Approach STEAM in Learners

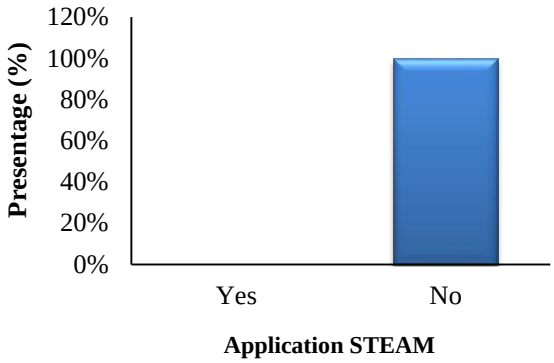

Figure 9. Analysis of Application STEAM in Learning

STEAM involves students having to think more creatively to solve problems that occur by emphasizing the relationship of *Science*, *Technology*, *Engineering*, *Arts*, and *Mathematics* skills. This STEAM-based approach can train the abilities and talents of students in dealing with problems in the 21st century, because this learning approach encourages students to think more broadly about problems by thinking critically (Rosdiana et al., 2022). The results of research conducted by Hafizhah et al. (2024) show that the use of STEAM-based learning helps teachers strengthen skills, especially in critical thinking of students, especially in solving problems and finding solutions, especially in science lessons. The application of the STEAM approach positively influences biology learning, particularly in enhancing 21st century skills such as critical thinking, creativity, and others. STEAM is applied through multidisciplinary topics, including biotechnology and ecological or environmental changes (Rahmadana & Agnesa, 2022). From the above explanation, it can be concluded that the teaching material to be developed is an electronic student worksheet (e-LKPD) integrating the Problem Based Learning model with the STEAM approach, aimed at enhancing students' critical thinking skills at SMA 11 Palembang.

CONCLUSION

The findings of the study indicate that students' critical thinking skills remain low, which is associated with the continued use of conventional teaching materials. The reliance on textbooks, which are perceived as less supportive of the learning process, highlights the need for more engaging instructional materials to enhance students' critical thinking in solving problems. The learning method applied by the teacher is still in the form of assignments, so it has not directed students to problem-solving. In addition to not using a learning model, teachers also have not used learning approaches such as STEAM which emphasizes learning in aspects of science, technology, engineering, art and mathematics, so teachers at SMA 11 Palembang need teaching materials in the form of PBL based e-LKPD with a STEAM approach to improve students' critical thinking skills.

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