Development of Learning Management System-Based Teaching Materials to Increase Students' Learning Independence

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Abstract

This research aims to develop appropriate teaching materials for the Vocational Fundamentals subject in Class X using the Learning Management System (LMS), with the primary goal of enhancing students' learning independence. Additionally, the effectiveness of using LMS-based teaching materials in promoting learning independence within the Computer Network and Telecommunications Engineering (TJKT) competency program is examined. The research follows a Research and Development (R&D) approach, utilizing the ADDIE development model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. These stages provide a systematic and effective framework for developing LMS-based teaching materials. The participants in this study include teachers and students from SMKN 1, SMKN 3, and SMKN 6 in Bengkulu City. Data collection methods include expert assessments, learner independence questionnaires, and tests. The collected data will be analyzed using statistical techniques such as mean and t-tests, while expert validation will employ a Likert scale. The research findings indicate that the teaching materials developed in this study are suitable for students, and the utilization of LMS-based teaching materials has proven to enhance learner independence.

Keywords: *Learning Achievement, Learning Independence, Learning Management System, Teaching Materials*

A. Introduction

Advances in Information and Communication Technology (ICT) have had a significant impact on the progress of education in Indonesia. One important aspect is the integration of ICT into the learning process, which involves the utilization of interactive teaching materials. This approach allows learners to effectively communicate complex and abstract concepts in a simplified manner, thus facilitating easier comprehension and understanding. Widodo and Jasmadi, as cited in Lestari (2013: 1), explain that teaching materials include a collection of educational resources or instruments that include learning materials, methods, guidelines, and evaluation approaches. These teaching materials are designed systematically and attractively with the aim of achieving certain educational goals. This interpretation emphasizes the importance of following instructional principles when developing and compiling teaching materials, as they serve as valuable tools for teachers to facilitate and improve the learning process [1].

According to Dick and Carey (1996), teaching materials can be defined as an organized collection of materials that present a comprehensive overview of the content or subject matter to be learned by learners. These materials are arranged systematically to provide a coherent and structured approach to mastering targeted competencies [2].

As stated by Prastowo (2012: 17), teaching materials include a variety of information, tools, and texts arranged in a sequence. The purpose of this arrangement is to ensure that these materials can be understood by learners and used effectively during the learning process. By organizing content in a logical and progressive manner, teaching materials aim to facilitate learners' understanding and active engagement in their education [3]. Majid (2008: 174) defines teaching materials as various types of materials, both written and unwritten, used by educators during classroom teaching and learning activities. These materials serve as important resources used by teachers to facilitate and enhance the teaching and learning process [4]. Based on the previous point of view, it can be concluded that teaching materials function as instruments or

media to achieve educational goals, thus simplifying students' understanding of learning materials. Among visually oriented teaching materials, an example is the LMS (Learning Management System).

As stated by Ellis (2009), LMS (Learning Management System) refers to software used for the purpose of managing administration, documentation, activity reports, as well as facilitating online teaching, learning, and related activities [5]. According to Riyadi (2010), LMS is software designed to deliver online learning materials through a web-based platform, as well as to supervise and monitor learning activities and results [6]. According to Riad and El-Ghareeb (2008: 2), a Learning Management System (LMS) can be described as a software that offers comprehensive integration of various features aimed at course delivery and management. The LMS is responsible for managing the course catalog, facilitating course delivery, and handling assessment and quiz functionalities [7]. According to Amiroh (2012:1), Learning Management System (LMS) which is also called Course Management System (CMS) or Virtual Learning Environment (VLE) is a software application used by educators, universities, and schools as an internet-based online learning media, commonly known as e-learning [8].

In conclusion, an LMS can be described as an e-learning system that provides comprehensive support for learning. It includes features such as quizzes, assignments, material downloads, and allows learning to be accessed conveniently anytime and anywhere. In addition, it facilitates interaction and discussion between teachers and learners. LMS-based teaching materials, which stands for Learning Management System, represent a type of teaching resource that utilizes Information and Communication Technology (ICT). These materials are designed to be web-based and hosted on a web server, accessible to learners through a web browser. The content of these materials may incorporate various media elements, including text, images, audio and video. The LMS serves the purpose of managing the delivery of learning in an e-learning model. E-learning offers several benefits, including the ability for learners to share information among themselves and access learning materials or information at any time and from anywhere. This accessibility empowers learners to foster independence and develop self-learning skills. Learning independence refers to the active involvement of individuals in a learning environment, where they effectively organize and utilize their abilities while maintaining positive motivation towards learning. As explained by Siti Pratini, learning achievement relates to the results achieved by an individual as a direct result of their involvement in various learning activities [9].

Learning independence, or self-directed learning, entails learners' ability to engage in learning without relying heavily on others. It emphasizes the importance of learners taking initiative, being proactive and showing a sense of responsibility in their learning journey. This approach not only covers academic aspects but also fosters desirable attitudes towards the nation and state [10]. Stephen Brookfield (2000: 130-133) proposes that self-directed learning can be described as self-aware and self-motivated to acquire knowledge and skills to achieve personal goals [11].

In conclusion, learning independence refers to the ability to engage in self-directed learning activities without relying on others, take responsibility for one's own learning, and effectively cope with learning challenges. Learning independence is achieved when learners can demonstrate self-control in their actions, evaluate their progress, and plan further progress in their learning endeavors. In addition, active participation and a desire to engage in the learning process are important aspects in fostering learning independence. Vocational education is an educational program that focuses on equipping learners with the skills and knowledge necessary to enter and excel in a specific field of work. Its main objective is to prepare graduates for productive and independent careers in their chosen field. Vocational High School (SMK) is one form of vocational education at the secondary education level, providing a continuation of education for students who have completed their studies at junior high school (SMP), Islamic junior high school (MTs), or other equivalent institutions.

SMK Negeri 3 Kota Bengkulu is an educational institution that offers vocational education, specifically focusing on the Computer Network & Telecommunication Engineering (TJKT) Expertise Study Program. In this program, learners are encouraged to have a personal laptop as their learning and practical activities rely heavily on its use. It is worth noting that most students already have cell phones (HP) as a common device. Therefore, this provides an excellent opportunity to develop learning materials that can be accessed by learners via laptops and mobile phones. These resources can play an important role in facilitating learners' understanding of concepts, especially when it comes to independently performing practical exercises.

The Vocational Basics subject is included in the curriculum of the Computer & Telecommunication Network Engineering (TJKT) Expertise Program at SMK Negeri 3 Bengkulu City. However, the process

of teaching and learning activities (KBM) of Vocational Fundamentals subjects in Class X at SMK Negeri 3 Bengkulu City has experienced obstacles in terms of its effectiveness. This is mainly due to the large amount of material presented, resulting in limited time for practice. As a result, students find it difficult to understand the material presented by the teacher. In addition, limited lesson hours further hinder optimal practice, making it difficult for learners to develop independence in learning. In addition, learners may show reluctance in expressing their opinions, hesitation in asking questions, and dependence on peers when completing tasks. These factors contribute to a lack of independence in the learning process, resulting in substandard academic performance.

Vocational Fundamentals is one of the important components of the Productive Subjects in the Computer and Network Engineering Expertise Program at SMK. In grade ten, this subject studies the understanding of TJKT Technology Development, 5G technology development, and IPV6 Development. The learning objective is for students to be able to understand technological developments in the field of computer network engineering and telecommunications, including 5G and IPV6. However, several challenges arose during the learning process. Insufficient and inadequate teaching materials and limited time allocated for practice hinder the learners' ability to understand the concepts effectively. As a result, learning outcomes cannot be achieved optimally.

To overcome these problems, the development of LMS-based teaching materials is very important. This teaching material aims to increase students' independence and learning achievement. The purpose of this research is to analyze students' needs for the development of e-learning teaching materials in Vocational Fundamentals subjects at SMK.

B.   Research Methods

This research was conducted at SMKN 3, SMKN 1, and SMKN 6 in Bengkulu City, with the research time taking place from January 11-17, 2022. The sample of this study consisted of 96 students of class X of TJKT (Computer Network and Telecommunication Engineering) Expertise Competency at SMKN 3, SMKN 1, and SMKN 6 in Bengkulu City. In addition, two Vocational Fundamentals subject teachers from SMKN 3 and SMKN 6 in Bengkulu City were also included in this study. The data collection techniques used in this study included observation, interviews, and questionnaires.

This study used various instruments, including observation sheets, interview sheets, and questionnaires to analyze learners' needs for the development of LMS teaching materials. These instruments were filled out offline in printed form. This study used a Research and Development (R&D) research approach, following the ADDIE development model, which consists of Analysis, Design, Development, Implementation, and Evaluation. The research subjects were students from various vocational schools in Bengkulu City.

The purpose of this study is to describe the product through feasibility testing, with the aim of increasing students' independence and learning achievement. The research focused on the Vocational Basics subject taught in class X of the TJKT expertise program at SMKN 3, SMKN 1, and SMKN 6 in Bengkulu City, with a special emphasis on material related to technological advances in the field of Computer Network and Telecommunication Engineering (TJKT).
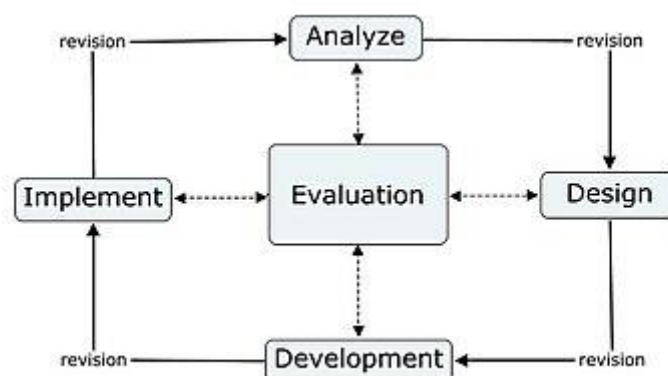
Figure 1. ADDIE Model Steps

C.   Result and Discussion

After conducting an initial investigation, the researchers proceeded to design Learning Management System (LMS)-based teaching materials. This teaching material aims to assist learners in understanding and improving their knowledge, attitudes, and skills. After the development stage was completed, the design underwent feasibility testing by experts and was then tested on students in class X TJKT.

The developed teaching materials consist of several components, including the home page, log in section, home page, home page bottom, dashboard page, subject page, and question page. The following section will explain in detail the results obtained from the development of LMS-based teaching materials.
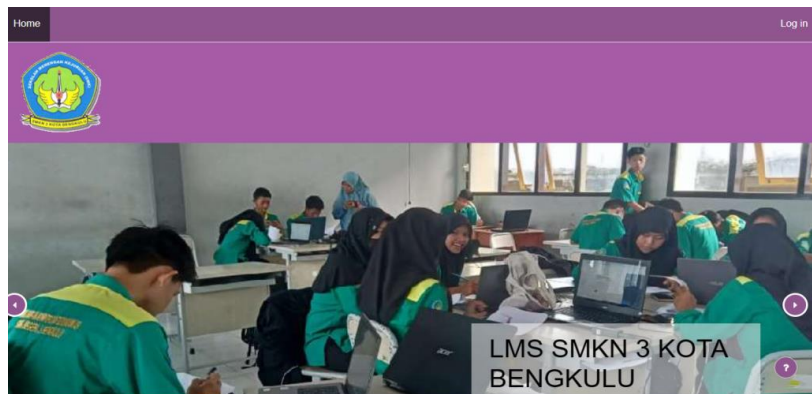
Figure 2. Homepage

When the LMS link is entered, the initial appearance of the Learning Management System teaching materials in this study can be seen in Figure 2. The LMS (Learning Management System) display in the upper corner has a log in.
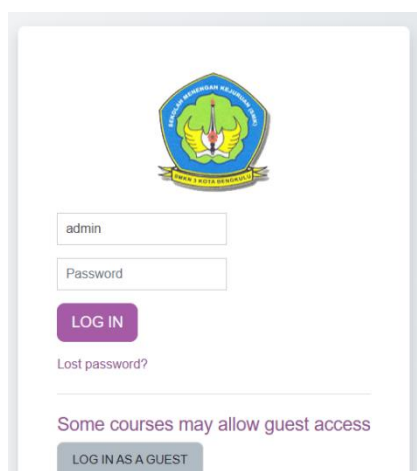

Figure 3. Login Page

Figure 3 shows the log in page, which serves as a log in to the designated LMS. Registered users, as set up by the researcher, can access this page. Teachers have provided learners with usernames and passwords for authentication purposes.

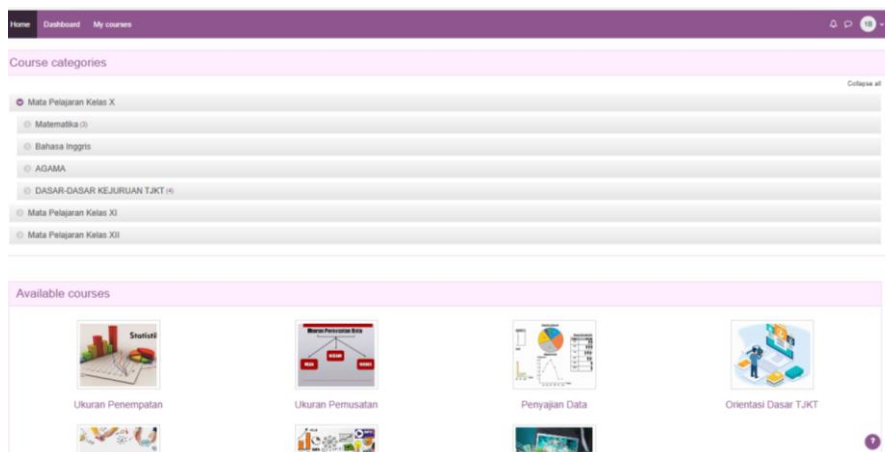The home page of the learning content can be seen in Figure 4 below.

Figure 4. Homepage

This page contains the names of subjects and classes. In this research, we only focus on class X subjects.
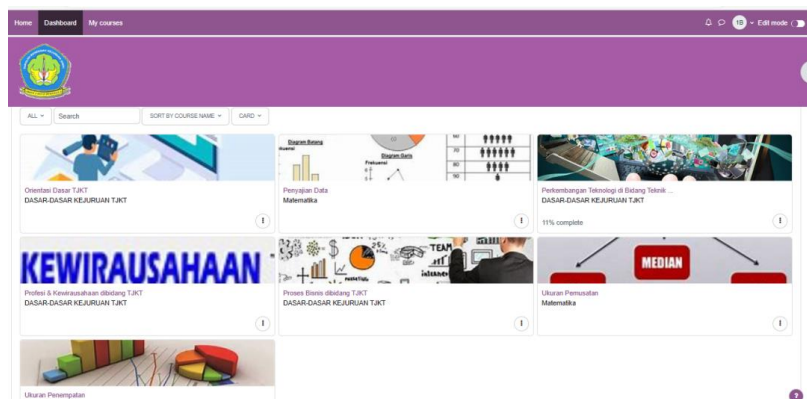

Figure 5. Dashboard Page

The dashboard page consists of a selection of menu icons that represent the various subjects and materials available within the LMS.
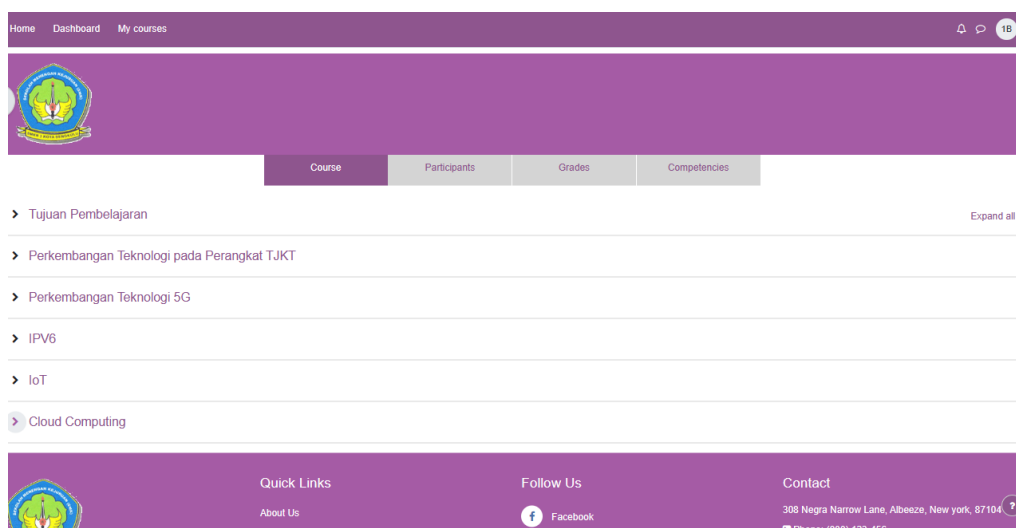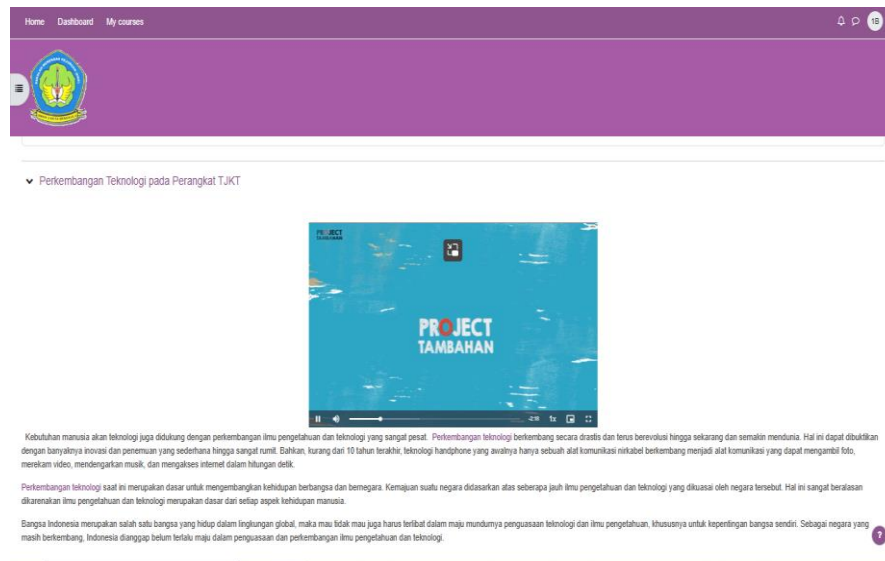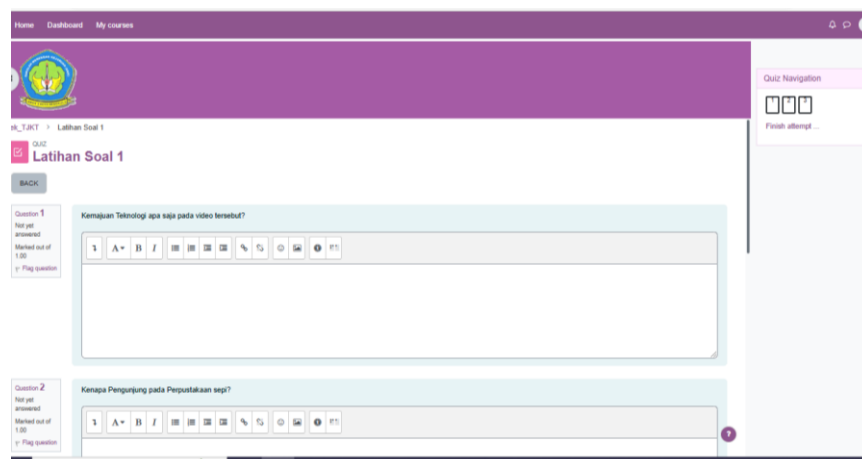

Figure 6. Subject Display

The subject menu contains materials on the LMS.

Figure 7. Material Display

The material display contains material on the LMS, in the material there is content in the form of text or images and videos so that students can be interested and better understand the subject matter.


Figure 8. Question View

On the question display page contains questions that must be filled in, if not filled in, students cannot proceed to the next material.

When choosing teaching materials, teachers must follow relevant principles, one of which is the selection of media that can be used effectively in the learning process. Thus, the quality of learning can be improved and improved. [12]. Teachers choose to use learning media in order to promote active learning, which encourages learners to actively participate and engage in the learning process, both physically and mentally. Active learning methods aim to stimulate learners' cognitive and emotional engagement, fostering a more dynamic and engaging educational experience [13].

The research findings of the development of Learning Management System (LMS) teaching materials show that this device can effectively be used in the learning process to increase students' learning independence. The validation conducted by experts resulted in an overall average score in the "excellent" category, which indicates the effectiveness of the LMS in encouraging learners' independence and facilitating their academic progress. This can be seen from table 1 below.

Table 1. Results of Validation of Teaching Material Development from Both Teachers

| Aspect	Sub-Aspect	Indicator	Total Score	Average	Category
Material	Content Eligibility	Suitability of material with Learning Outcomes	4		Very good
		Depth of material	3	3.3	
		The accuracy of the material	3		
		Completeness of teaching materials	4		
		The usefulness of teaching materials	3		
	Presentation	Clarity of learning objectives in teaching materials	4		Very good
		Presentation of material logically and systematically	3	3.4	
		Presentation of practicum	4		
		Appropriateness of illustrations with material	4		
		Evaluation ability	3		
Media	Display and Content of Teaching Materials	Readability of text	4		Very good
		Display color composition	3		
		Layout	3		
		Illustration display quality	4	3.4	
		Sound/audio quality	4		
		Consistency	4		
		Smoothness of operation	3		
		Instructions for use	4		
		User control	3		
	Characteristics of	Interactivity	4		Very good
		Motivates independence in learning	3		
		Effectiveness of learner learning activities	4	3.6	
		Feedback on learning evaluation results	4		
Linguistic	Conformity With the Rules	Conformity with Indonesian EYD	4		Very good
		Use of precise and clear sentences	4		
		Effectiveness and efficiency of language	3	3.5	
		Writing systematics	3		
		Bibliography writing	4		
Score				**3.45**	**Very good**
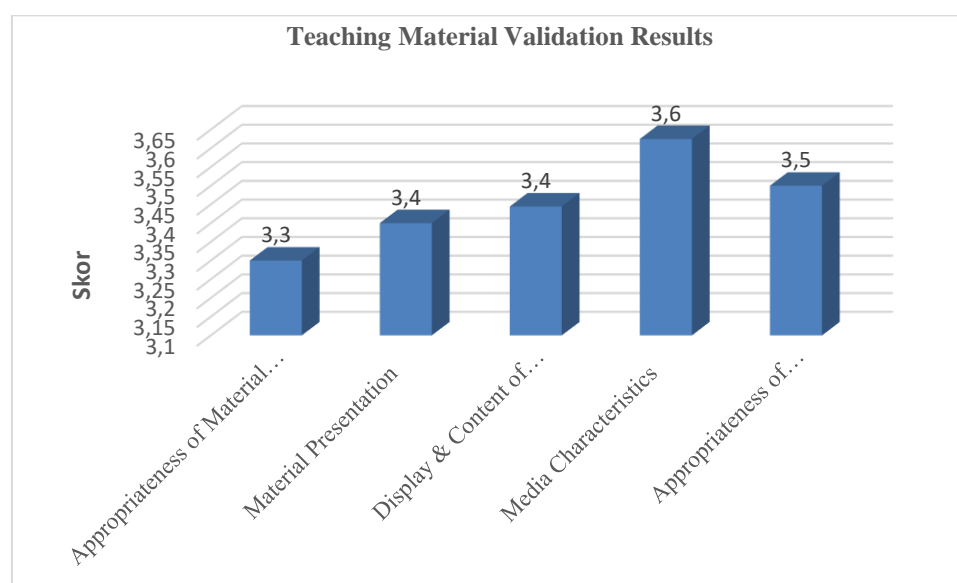
Figure 9. Graph of Teaching Materials Validation Results

Ensuring the relevance of basic competencies and learning indicators is an important factor in evaluating the feasibility of learning media. This consideration ensures that the products produced are in accordance with the required learning outcomes. In addition, the validation process of the developed teaching materials is carried out carefully, following the guidelines outlined in the interactive learning multimedia book. This validation process further increases the credibility and effectiveness of the product [14]. According to Surjono's book, interactive multimedia used in learning should fulfill three criteria: content, instruction, and display. These aspects are crucial to ensure that the multimedia effectively delivers relevant and interesting content, provides clear and effective instructions, and presents information in an attractive and easy-to-use way. By fulfilling these criteria, interactive multimedia can enhance the learning experience and facilitate better understanding and retention of information [15]. The average learner response to the LMS-based teaching materials as a whole was 91.23%, which showed a category rating of "very good". Based on this finding, it can be concluded that the teaching materials are highly effective for facilitating the learning of vocational fundamentals. The positive response from learners reflects the effectiveness and suitability of the LMS-based approach in enhancing the learning experience and promoting better understanding of the subject matter. Learners' responses to the tool are illustrated in the Table below

Tabel 2. Validation Results of Teaching Material Development from Both Teachers

Number	Aspect	Total score	Achievement Score (%)	Category
1	Materi	1192	93.13 %	Very good
2	Media	1486	89.30%	Very good
3	Linguistic	584	91.25%	Very good
Score		3262	91.23 %	Very good
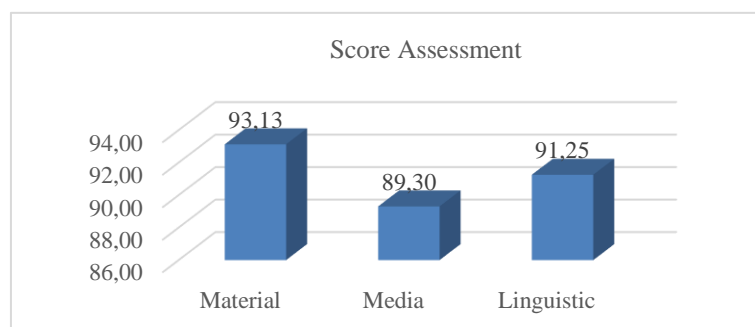
Figure 10. Learners' response to teaching materials

To assess the effectiveness of using Learning Management System (LMS)-based teaching materials in increasing students' learning independence, this study conducted a limited trial and a large-scale trial. The limited trial involved 32 participants, while the large-scale trial involved 64 participants using the PTK (Pedagogical Content Knowledge) learning approach. The results showed a significant difference between the two groups, with a Sig (2-tailed) value of 0.005. The average post-test score is higher than the pre-test score, indicating that LMS-based teaching materials are more effective in fostering learning independence. This finding supports the conclusion that the utilization of LMS-based teaching materials contributes positively to increasing students' learning independence in the learning process.

In conclusion, the development of LMS teaching materials is proven to increase students' independence and learning achievement compared to the previous method. This finding is in line with Sudana's research (2022) on the development of interactive virtual laboratories integrated with MOODLE LMS in learning high school physics, where the virtual laboratory is proven effective in improving the learning outcomes of class XI students [16]. This is also in line with previous research by Clark et al. (2014), who evaluated learners who had difficulty in understanding thermodynamic concepts through a series of questions and observations before and during learning [17]. These studies collectively support the effectiveness of LMS-based approaches in promoting self-directed learning and improving academic performance.

D. Conclusion

Based on the findings and discussion presented in the previous chapter, the following conclusions can be drawn: (1) Learning Management System (LMS) based teaching materials provide a visual and sequential

presentation of lessons, making it easier for students to understand the subject matter. (2) The development of LMS-based teaching materials for vocational basics lessons that focus on technological developments in the TJKT field has produced a final product that has been evaluated by experts and meets the criteria for effective use in learning to increase students' learning independence. Positive responses from students, with an average score of 91.23, further support the suitability and effectiveness of this teaching material in encouraging students' learning independence. (3) The results show that the use of LMS-based teaching materials is more effective in improving students' learning outcomes compared to the learning methods used previously. This conclusion highlights the importance of LMS-based teaching materials in facilitating learners' understanding, promoting independent learning in vocational education.

E. Acknowledgement

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