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OUTCOME-BASED EDUCATION SCORING SYSTEM UTILIZING MODULAR OBJECT-ORIENTED DYNAMIC LEARNING ENVIRONMENT

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Abstract

The dynamic nature of education necessitates inventive approaches to assessment and evaluation. This study concentrates on formulating a Scoring System aligned with Outcome-Based Education (OBE) principles, utilizing the Modular Object-Oriented Dynamic Learning Environment (MOODLE) platform. OBE prioritizes showcasing specific learning outcomes, cultivating a student-centric approach. The proposed system seeks to improve assessments through a flexible framework accommodating diverse learning objectives, employing a modular and object-oriented design. Integration with MOODLE, a widely-used e-learning platform, explores the seamless implementation and user-friendly interaction. The Scoring System aids educators in efficiently evaluating student performance against predefined outcomes, fostering transparency and accountability. Key features include customizable assessments, progress tracking, and timely feedback. The study also examines the system's impact on student engagement, motivation, and overall learning outcomes, contributing valuable insights to innovative assessment methodologies in contemporary education. In conclusion, the research introduces a Scoring System harmonizing OBE principles with MOODLE's flexibility, benefiting educators, students, and institutions. The study's outcomes provide valuable implications for educators and technologists aiming to enhance assessments in the evolving education landscape.

Keywords: *Blended Learning, Educational Impact, Learning Management Systems (LMS), Learning Platform, Outcome-Based Education (OBE)*

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INTRODUCTION

Outcome-Based Education (OBE) has become a foundational element in shaping curricula across various higher education institutions. This concept places a primary emphasis on the anticipated learning outcomes of students, marking a shift from traditional teaching methods. To ensure the efficacy of implementing outcome-based curricula, especially amid the dynamic development of educational technology, computer-based learning through Learning Management Systems (LMS) has emerged as a crucial element in supporting the learning process (1).

In tandem with advancements in information technology, LMS has proven to be an effective means of integrating the principles of Outcome-Based Education into the learning process (2). This article explores the implementation of outcome-based curricula through a blended learning approach within Learning Management Systems. Blended learning, which combines online and face-to-face learning, is considered a method that enhances interactivity and student engagement (3).

Previous research (4) highlights the crucial role of Big Data analysis in understanding student behaviours within LMS, providing in-depth insights into student needs and preferences. In the specific field of study, research (5) explores how LMS data can be used to predict student success in specific courses.

The impact of technology in education is considered through research (6), where a cloud-based Learning Management System offers opportunities for flexible and integrated learning (7). Additionally, the integration of computer-based concept mapping with LMS use in the study (8) provides an overview of enriching student learning experiences, exploring the potential of collaborative and independent learning (9).

A longitudinal study (10) offers a time-related perspective on the sustainability of students' LMS usage, providing insights into factors influencing usage sustainability (11). Students' and teachers' perceptions of Learning Management Systems are also explored in research (12), offering valuable insights for system development and improvement (13).

The concept of automatic control in learning is introduced through research (14), presenting an integrated approach to learning management using web services and the semantic web (15). Technology acceptance by instructors is considered in (16), providing insights into factors influencing instructors' intentions to use specific tools in LMS (17).

The use of a mobile Learning Management System (m-LMS) is noted in (18), investigating the relationship between m-LMS usage and the academic achievement of online students (19). Furthermore, research titled (20) explores the interplay between individual learning styles and the overall success of an LMS, examining how different learning styles can moderate the effectiveness and user satisfaction with LMS (21).

Understanding the diversity of learning styles is crucial in optimizing the design and functionality of an LMS to accommodate a broad spectrum of learners (22). The study investigates how factors such as visual, auditory, reading/writing, and kinesthetic learning preferences influence the user experience within the LMS environment (23). The research aims to provide valuable insights into tailoring LMS features and content presentation to align with individual learning styles (24).

This investigation recognizes that a one-size-fits-all approach may not be optimal in the context of learning management systems (25). The article seeks to contribute to the ongoing discourse on personalized learning experiences and how adapting LMS components to individual learning styles can enhance engagement, comprehension, and overall satisfaction (26).

In summary, the research on the moderating effect of learning styles on the success of a learning management system strives to uncover the intricate connections between individual learning preferences and the efficacy of LMS implementation. This knowledge can inform educators, instructional designers, and LMS developers on crafting more inclusive and adaptable digital learning environments that cater to the diverse needs of learners in secondary education.

Building upon these findings, the article aims to explain and analyze the implementation of outcome-based curricula through a blended learning approach within Learning Management Systems. By detailing significant contributions from previous research, this article provides in-depth insights into the potential and challenges of implementing this learning model in secondary education.

In conclusion, the overarching goal of the research titled "Implementation of Outcome-Based Education Curriculum through Blended Learning in Learning Management Systems" is to contribute valuable insights and understanding to the realm of educational practices. Through an exploration of the implementation of outcome-based curricula using a blended learning approach within Learning Management Systems, this study aims to unravel the intricacies, potentials, and challenges associated with such a pedagogical model in higher education. By building upon prior research foundations, the objective is to shed light on the effectiveness of the outcome-based education paradigm and how the integration of blended learning further enhances its application. The investigation into the moderating effect of learning styles on the success of Learning Management Systems adds a nuanced layer to the research, offering a comprehensive understanding of the diverse needs and preferences of learners. Ultimately, this research endeavours to inform educators, instructional designers, and educational technologists, providing them with valuable insights to optimize digital learning environments and contribute to the ongoing discourse on advancing educational methodologies for an inclusive, adaptive, and effective learning environment in secondary education.

RESEARCH METHODS

To comprehend, address, and foresee issues, precise data is essential. Therefore, individuals engage in research to acquire accurate information. Securing precise data necessitates an appropriate research approach. A research method is a systematic and scientifically organized way to observe with meticulous thinking, progressing through stages of searching, compiling, analyzing, and drawing conclusions from data. This enables the discovery, development, and testing of the validity of knowledge.

1. Research Design

This study employs a quantitative research approach, specifically adopting a hypothetico-deductive logic. The process commences with deductive reasoning to formulate hypotheses, followed by the verification of empirical data and hypothesis

testing based on empirical data. This ultimately leads to concluding the results of hypothesis testing, underscoring the pivotal role of statistics in this undertaking.

The research utilizes a descriptive quantitative research method, with an experimental research type. The experiment is a method employed to explore potential cause-and-effect relationships by applying treatment conditions to one or more experimental groups and comparing them to a control group not subjected to the treatment.

Within this research, the researcher employs the True Experimental Design research design, specifically the pretest-posttest control group design. This design allows the researcher to control all external variables affecting the experiment, ensuring high validity. It involves randomly selecting samples for both the experimental and control groups from a specific population. This design's hallmark is the inclusion of a control group, with the sample chosen randomly. The True Experimental Design takes two forms: posttest-only control design and pretest-posttest control group design.

In this study, the pretest-posttest control group design research pattern is used. This design involves placing subjects into an experimental group (E) and a control group (K). The experimental group undergoes a specific treatment variable, while the control group does not. Subsequently, both groups undergo the same measurement, and their results are compared.

The research process includes the following steps:

- Determining the population of all twelfth-grade students at SMK Negeri 1 Kwanyar Bangkalan and SMK Al Asya'ari Bangkalan.
- Selecting the sample using cluster sampling and applying treatments to both the experimental and control groups.
- Developing research instruments.
- Conducting a trial test for the questions in selected classes designated as the experimental and control groups, with XII TKJ A class at SMK Negeri 1 Kwanyar chosen for this research.
- Analyzing trial test results to determine validity, reliability, discriminant power, and difficulty level.
- Identifying test items for the final test based on criteria identified through trial instrument analysis.
- Conducting matching and pretests for normality and homogeneity testing. After confirming similar abilities in both classes, treatments are applied to both.
- Implementing the Learning Management System in active learning for the experimental group and non-intervention learning for the control group.
- Observing activities during the learning process for both groups.
- Analyzing test results and observation sheets, and compiling the research report.

2. Research Population and Sample

a. Population: The population is a broad category that includes entities or individuals possessing particular attributes and features specified by the researcher for examination and eventual conclusions. In this research, the population consists of twelfth-grade students from TKJ A and B classes at SMK Negeri 1 Kwanyar Bangkalan and Multimedia

A and B classes at SMK Al Asy'ari Kwanyar Bangkalan. The overall student count is 100.

b. Sample: A sample is a portion of the total population, sharing characteristics with the larger population. When the population is extensive, a sample is selected for examination to facilitate the research process. Conclusions drawn from studying the sample can then be extrapolated to the entire population. Therefore, the sample chosen from the population must be genuinely representative.

The sampling method utilized in this research is Simple Random Sampling. It is termed "simple" because the selection of sample members from the population is conducted randomly without taking into account their status within that population. This technique holds a high probability of yielding a representative sample.

In employing the simple random sampling technique for this research, the researcher randomly selects a sample of students from SMK AL Asy'ari Kwanyar, specifically from Multimedia A and Multimedia B classes in the twelfth grade, and from SMK Negeri 1 Kwanyar, specifically from TKJ A and TKJ B classes in the twelfth grade. The selection of these twelfth-grade classes is carried out randomly from various classes in the two schools.

In this study, the TKJ A and B classes in the twelfth grade serve as the control group, while the Multimedia A and B classes in the twelfth-grade function as the experimental group. To assess the homogeneity of the control group (K) and the experimental group (E), both groups undergo a pretest to determine if there are any initial differences between the control group (K) and the experimental group (E).

3. Data Collection Techniques and Tools

Information forms the basis for addressing research issues. To gather data that supports the research hypotheses, specific methods and tools must be employed, adhering to defined procedures. Data collection methods refer to the techniques or steps used to acquire data or evidence supporting the research hypotheses. Subsequently, this gathered data is processed to assess the validity of the predetermined theory.

a. Observation and Testing: Observation is an intricate process involving various biological and psychological components, with two of the most significant being the processes of observation and memory. Data collection through observation is employed in research focusing on human behaviour, work processes, natural phenomena, or when the number of observed respondents is not excessively large. Before commencing observation, the researcher must establish a reference, termed observation notes or guidelines, outlining the elements to be observed in alignment with the research objectives. These guidelines should specify, at the very least, the object of observation, the issues to be explored, and the requirements. Once formulated, the next step is to determine how the observation and recording process will be executed. In this study, on-site observation was conducted by the researcher to gather preliminary data, such as the class schedule and the condition of the students in the field. The objective was to comprehend the learning activities transpiring in the classroom. During this activity, the researcher also identified the groups to be studied, designating twelfth-grade TKJ A and B students as the control group (K) and twelfth-grade Multimedia A and B students as the experimental group (E). A test comprises a series of questions, exercises, or other tools used to evaluate the skills, knowledge, intelligence, abilities, or talents of individuals

or groups. In this research, the researcher will administer pretests and posttests to both the experimental and control groups to assess their abilities, and whether they receive treatment or not. The pretest is given to both groups to ascertain the initial abilities of the subjects under study, while the posttest is conducted to evaluate the abilities of both groups after the intervention. The data collection method involving tests is employed to discern the differences between the control group and the experimental group after the pretest and posttest. An objective test format, featuring multiple-choice questions, is chosen for its broad and targeted coverage, objective nature, and ease of result correction.

b. Validation and Reliability Testing of Instruments: The primary objective in any research is to acquire valid data, signifying data that precisely represents the intended reality. By employing instruments for data collection that are both valid and reliable, there is an expectation that the research outcomes will be dependable and accurate. Therefore, possessing instruments that are both valid and reliable is a fundamental prerequisite for achieving research results that are similarly valid and reliable. Moreover, the conditions of the objects under study and the proficiency of individuals utilizing the instruments to collect data also impact the validity of the research findings. Consequently, researchers must have the capacity to control the objects under study and enhance the skills of individuals using instruments to measure the variables being investigated. A measurement tool is deemed valid when it exhibits precision and accuracy in its measuring function, yielding measurement results that align with the intended purpose of the measurement.

c. Validity: Validity refers to the extent to which an instrument accurately measures what it is intended to measure. It is an indicator that gauges the levels of accuracy or validity of a given instrument. A valid instrument implies that the measurement tool utilized to gather data is, indeed, valid. When the obtained data is valid, it signifies that the data possesses high validity. In this study, the researcher assesses the validity of individual item questions to ascertain the overall validity of the instrument. This approach ensures that the instrument can be utilized effectively and efficiently as a learning test, measuring cognitive aspects related to students' interests and learning outcomes. To examine the validity of this research, the product-moment correlation formula is applied, assisted by Microsoft Office Excel.

d. Reliability: Reliability serves as a metric to evaluate the degree of consistency exhibited by an instrument, indicating that if the instrument is repetitively employed to measure the same entity, it will yield consistent data. Reliability pertains to the extent of trustworthiness or dependability in something. A reliable instrument can be deemed trustworthy and dependable. The reliability of an instrument is a prerequisite for evaluating the instrument's validity. Thus, even though a valid instrument is generally reliable, conducting reliability testing is essential. In this study, internal instrument reliability testing is utilized to assess the reliability of individual item questions. Internally, instrument reliability can be examined by scrutinizing the coherence of the items in the instrument through a specific technique. In this instance, the researcher employs the internal consistency technique, wherein the testing involves administering the instrument once, and subsequently analyzing the obtained data using a specific technique. The outcomes of the analysis can then be used to make predictions regarding the reliability of the instrument.

RESULT AND DISCUSSION

In general, these students represent a 1:3 ratio of the entire student population in each school. They have undergone conventional learning methods previously and later participated in the implementation of the Outcome-Based Education (OBE) scoring system using the Modular Object-Oriented Dynamic Learning Environment (MOODLE). Further characteristics of the respondents include educational background, interests, and previous experiences with learning technology, which were gathered through data collection methods such as questionnaires and surveys filled out by the students.

The data collected from the responses of these 100 students consist of interest in learning assessment questionnaires. The surveys were conducted twice, both before and after the testing of the Modular Object-Oriented Dynamic Learning Environment, and the data will be presented in the following table.

• Results of the Survey at SMK Negeri 1 Kwanyar

The questions presented to the students consist of 20 items, covering the material taught in class, specifically on the subject of Creative Products and Entrepreneurship. The completion of the questionnaire involves calculating the overall average using the following formula:

$$\text{The average score} = \frac{A1+A2+A3+\cdots+An}{\sum An}$$

The average scores obtained from the completion of Pretest and post-test values by 61 students at SMK Negeri 1 Kwanyar are 59.91803279 and 87.37704918, respectively. The researcher visualized these results in a graph to observe the changes for each student who participated in the study.

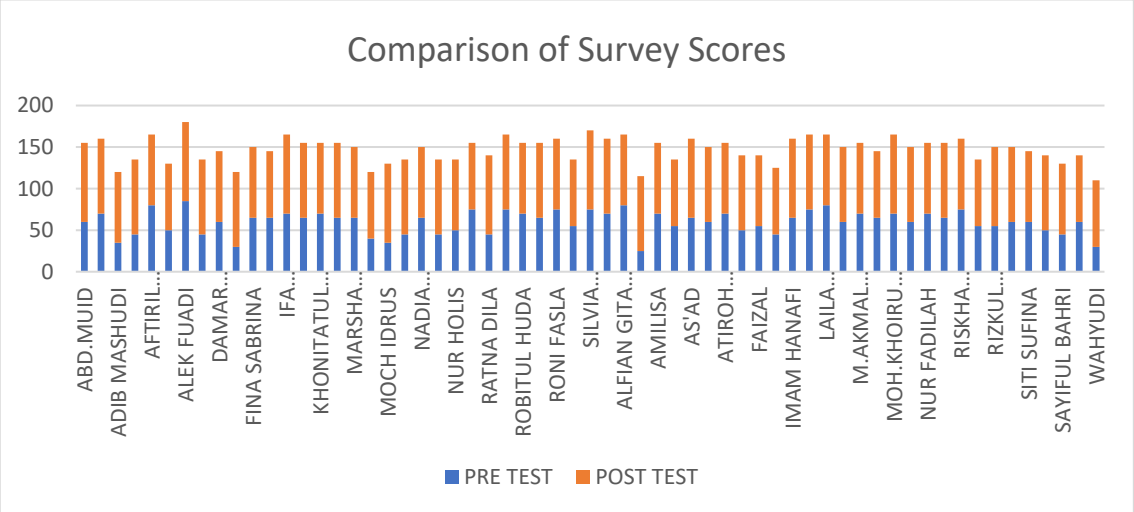

Figure 1. Comparison of Survey Scores

Figure 1 illustrates that the vertical lines represent the score range used for grading in multiples of 20, and the horizontal lines represent the names of students who participated in the study at SMK Negeri 1 Kwanyar, totalling 61 students from 2 TKJ classes. In the bar chart, the blue colour is assumed to represent the Pre-Test results, while the red colour is assumed to represent the Post-Test results.

• Results of the Student Interest Questionnaire at SMK Negeri 1 Kwanyar

In the context of this research, the previous learning interest assessment questionnaire was used to measure the extent of students' learning interests before the implementation of the Project-Based Learning-based scoring system using the Modular Object-Oriented Dynamic Learning Environment (MOODLE). This questionnaire aims to gain an understanding of students' initial learning interest in the learning material. The information is presented in points that outline the data processing process, and the following steps lead us to a deeper analysis stage, particularly in evaluating data from the questionnaire. With the following steps:

- The filled questionnaires from respondents are checked for completeness of their answers and then organized according to the response codes.
- Quantifying the answers to each question by assigning scores according to predetermined weights.
- Creating data tabulations.
- Calculating the percentage for each sub-variable using the formula specified in the checklist score percentage calculation.

Next, determine the distribution of learning interest interval criteria using the following provisions:

Determine the Maximum Score (x)

X = Total Questions x Highest Score

X = 30 x 4

X = 120

X (%) = $\frac{120}{120} x 100\%$

X(%) = 100%

Determine the Minimum Score (x)

X = Total Questions x Lowest Score

X = 30 x 1

X = 30

X (%) = $\frac{30}{120} x 100\%$

X(%) = 25%

Based on the calculations above, the range and qualitative criteria, as well as the test question criteria, can be determined as shown in the following table, based on the Likert scale proposed by Sugiono.

Table 1. Likert Scale

No	Intervals	Criteria
1.	1 - 25	Not good
2.	26 - 50	Enough
3.	51 - 75	Good
4.	76 - 100	Very good

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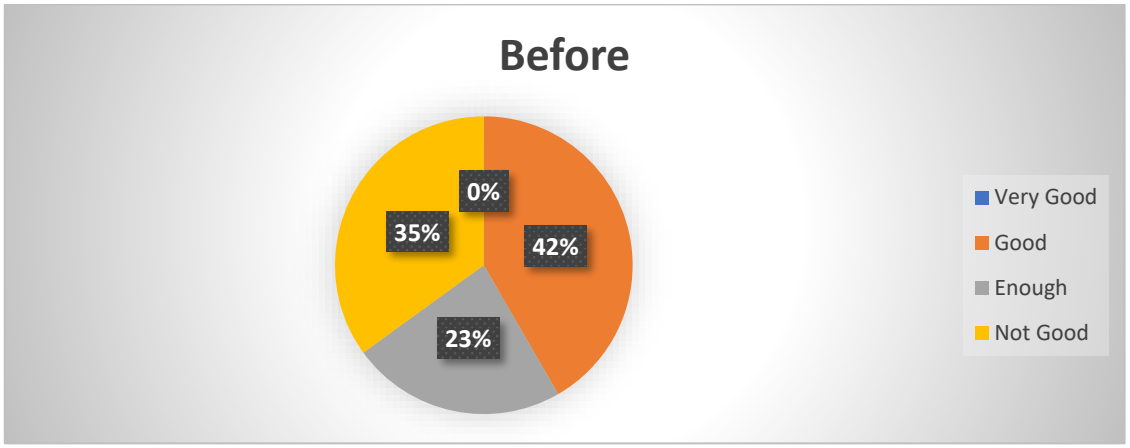

Figure 2. Students' interest in learning before LMS

The results of filling out the student learning interest questionnaire from a total of 61 students in grade 12 TKJ at SMK Negeri 1 Kwanyar before the implementation of the Modular Object-Oriented Dynamic Learning Environment (MOODLE) are known to have obtained the highest score, which is 75, and the lowest score, which is 25. It received a Good predicate with a percentage of 42% to represent a score of 75 and Not Good to represent a score of 25 with a percentage of 35%.

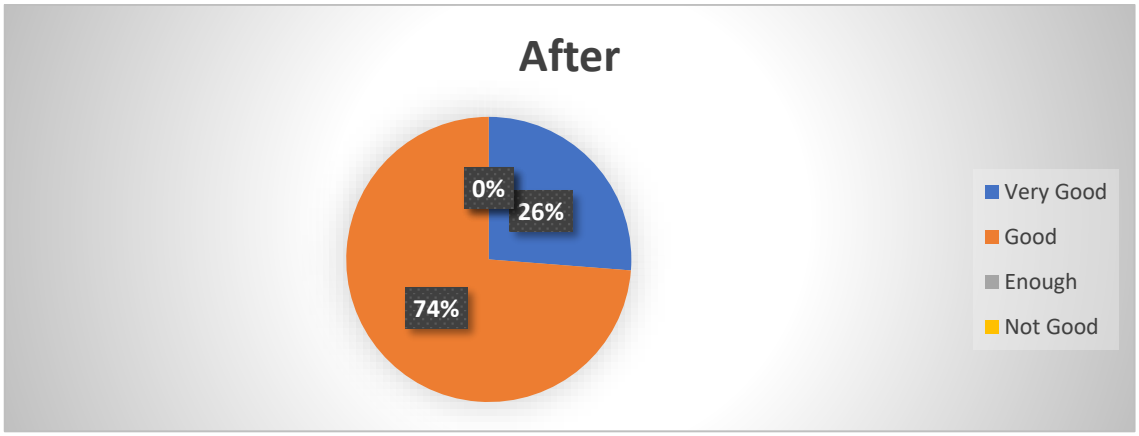

Figure 3. Students' interest in learning after LMS

Processing the student learning interest questionnaire data after the implementation of the Modular Object-Oriented Dynamic Learning Environment (MOODLE) from 61 respondents in grade 12 TKJ at SMK Negeri 1 Kwanyar obtained the highest score, which is 100, with a Very Good predicate and a percentage of 26%. The lowest score obtained from the questionnaire data is 75 with a Good predicate and a percentage of 74%, based on the Likert Scale in the Criteria for Qualitative Data Analysis.

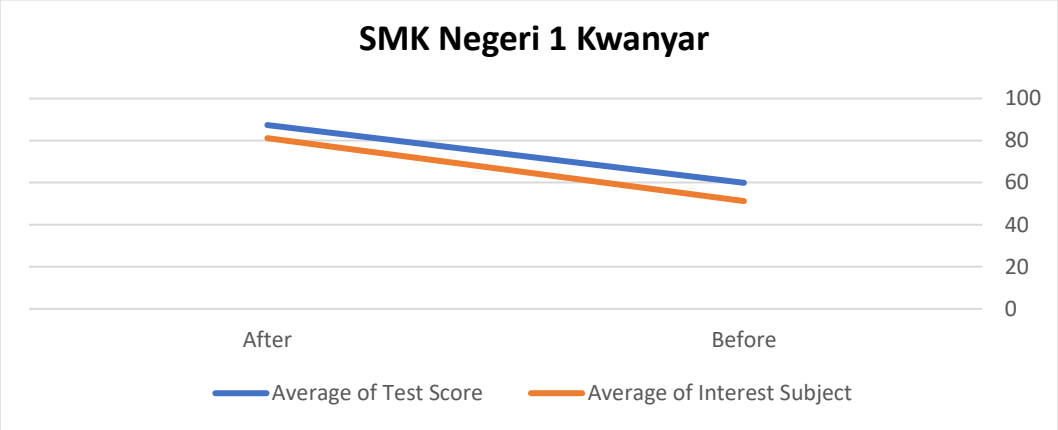

Figure 4. Before and after comparison chart

Examining the results of the above line diagram visualization indicates that there is a positive change, as evidenced by the movement of scores above 50 approaching 100. In other words, the implementation of the Modular Object-Oriented Dynamic Learning Environment (MOODLE) based on Project-Based Learning for the scoring system at SMK Negeri 1 Kwanyar has successfully brought about changes in the learning interest of grade 12 Computer Network Engineering students.

• Results of the questionnaire from SMK Al-Asy'ari Bangkalan

The questions given to students consist of 20 items, covering the material learned in class, specifically on the subject of Audio-Video Processing Techniques. The completion of the questionnaire involves calculating the overall average using the following formula:

$$\text{average value} = \frac{A1+A2+A3+\cdots+An}{\sum An}$$

The average scores obtained from the Pretest and post-test assessments of 39 students at SMK Al-Asy'ari are 64.102564 and 89.74358974, respectively. These results are visualized in a graph to observe the changes in each student who participated in the study.

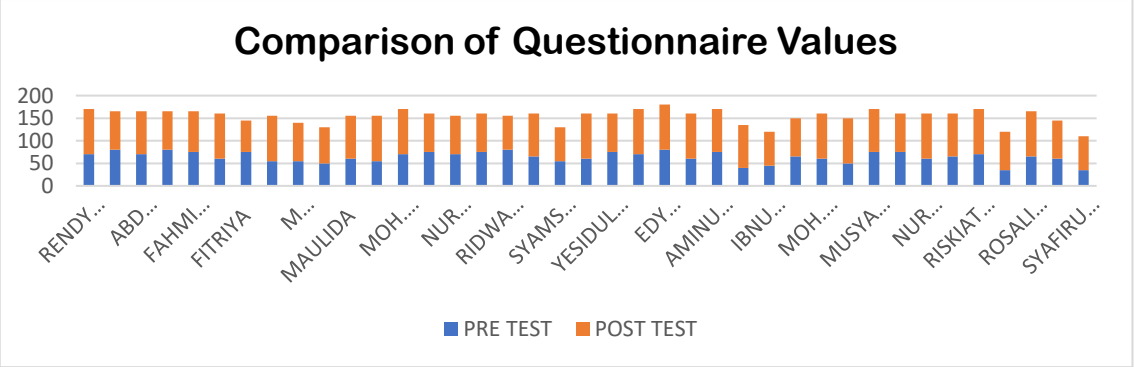

Figure 5. Comparison of Questionnaire Values

The graph above illustrates that the vertical line represents the range of values used to assign scores in multiples of 20, and the horizontal line represents the names of students participating in the study at SMK Al-Asy'ari, totalling 39 students from 2 Multimedia classes. In the bar chart, the blue colour is assumed to represent the pre-test results, while the red colour is assumed to represent the post-test results.

• Results of the Student Interest Questionnaire at SMK Al-Asy'ari Bangkalan

In the context of this research, the interest assessment questionnaire is used to measure the extent of students' interest in learning before and after the implementation of the Project Based Learning-based scoring system using the Modular Object-Oriented Dynamic Learning Environment (MOODLE). This questionnaire aims to gain an understanding of students' initial interest in the learning materials. The steps are as follows:

- The questionnaire filled out by respondents is checked for completeness of answers and then organized according to the response codes.
- Quantifying the answers to each question by assigning scores according to the predetermined weights.
- Creating data tabulation
- Calculating the percentage of each sub-variable using the formula used in calculating the checklist score percentage.

Next, determine the distribution of the Interest in Learning interval criteria using the following provisions:

Determining the Maximum Score (x)

X = Number of Questions x Highest Score

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X = 120

X (%) = $\frac{120}{120} x 100\%$

X(%) = 100%

Determine the Minimum Score (x)

X = Total Questions x Lowest Score

X = 30 x 1

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X (%) = $\frac{30}{120} x 100\%$

X(%) = 25%

Based on the calculations above, the range and qualitative criteria, as well as the test question criteria, can be determined as shown in the following table, based on the Likert scale proposed by Sugiono.

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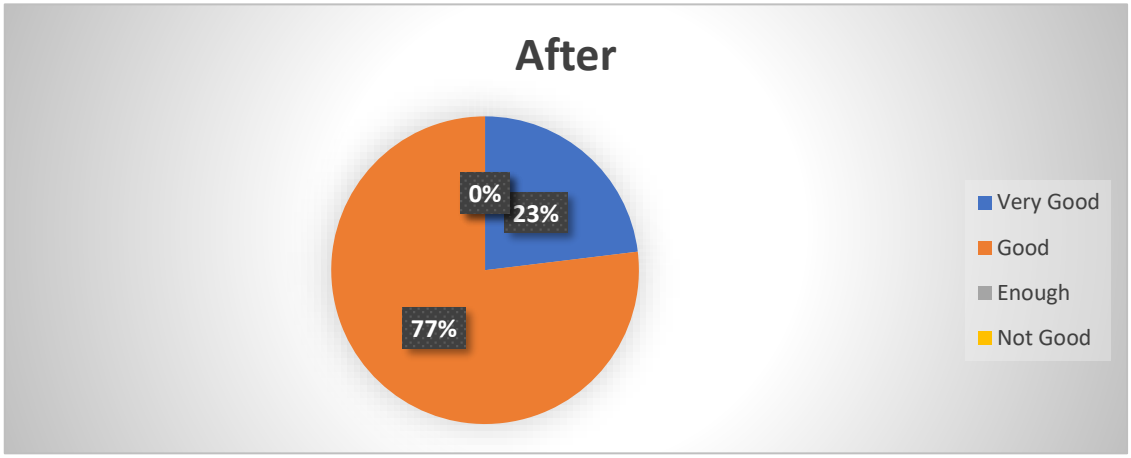

Figure 6. Students' interest in learning before LMS

The results of the questionnaire on students' learning interest from a total of 39 Multimedia students in grade 12 at SMK Al-Asy'ari before the implementation of the Modular Object-Oriented Dynamic Learning Environment (MOODLE) revealed the highest score to be 75 and the lowest score to be 25. This corresponds to a rating of "Good" for a score of 75, representing 46% of the students, and "Not Good" for a score of 25, representing 28% of the students. The average score obtained is 53.84615385. This score will be compared with the average score obtained after the implementation of the Modular Object-Oriented Dynamic Learning Environment (MOODLE) in OBE.

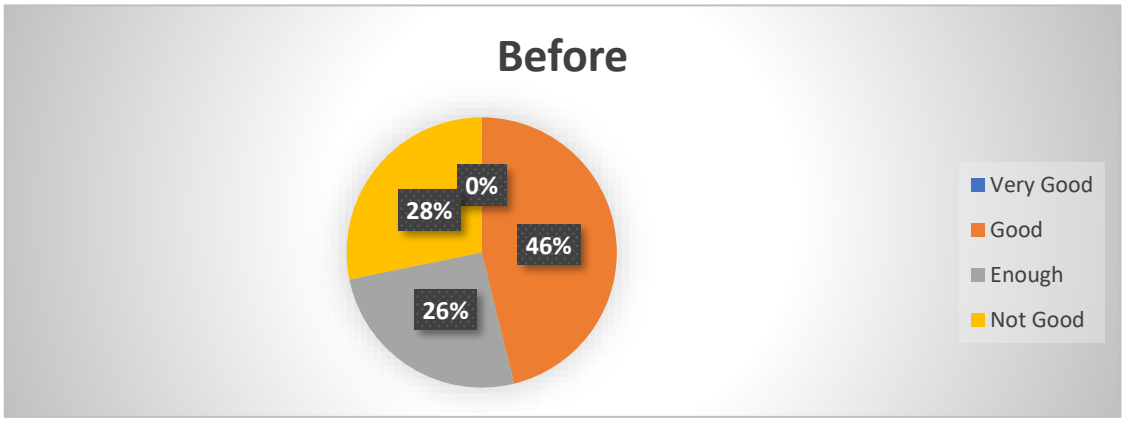

Figure 7. Students' interest in learning after LMS

The results of the data after the implementation of the Modular Object-Oriented Dynamic Learning Environment (MOODLE) in Project Learning (PjBL) from 39 Multimedia students in grade 12 at SMK Al-Asy'ari Bangkalan showed the highest score to be 100, with a rating of "Excellent" at a percentage of 21%. The lowest score obtained from the questionnaire data was 75, with a rating of "Good" at a percentage of 79%, based on the Likert Scale in the Criteria for Qualitative Data Analysis. The average score obtained is 80.12820513.

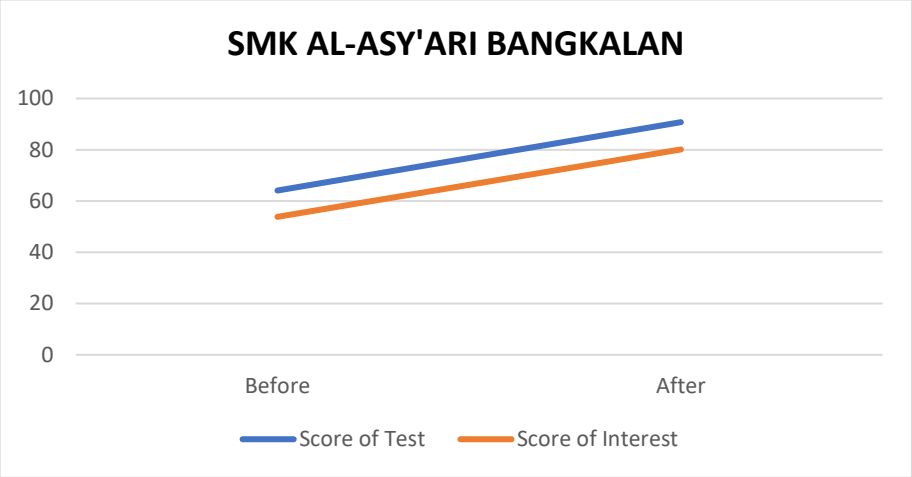

Figure 8. Before and after comparison chart

Examining the results of the line diagram visualization above shows that there is a positive change indicated by the movement of the score from above 40 approaching 100. In other words, the implementation of the Modular Object-Oriented Dynamic Learning Environment (MOODLE) based on Project Learning for the scoring system at SMK Al-Asy'ari Bangkalan has successfully brought about a positive change in the learning interest of 12th-grade Multimedia students.

CONCLUSION

This research successfully developed and implemented an Outcome-Based Education (OBE) assessment system using the Modular Object-Oriented Dynamic Learning Environment (MOODLE) to enhance the effectiveness of learning and measure student achievements. Through evaluations conducted at SMK Al-Asy'ari and SMK Negeri 1 Kwanyar, the findings indicate that the implementation of OBE with MOODLE has a significant positive impact. A notable improvement is observed in the post-test scores of students in both schools, reflecting an enhanced understanding of the learning material. The OBE scoring system with MOODLE has successfully created a more effective learning process, marked by significantly higher average posttest scores compared to pretest scores. This success extends beyond academic aspects and is also reflected in the increased interest in learning among students. Student participation in learning with this scoring system has resulted in a significant increase in interest scores, creating an indicator of more active student engagement in the learning process. Visualization of data through line diagrams proves to be an effective tool in demonstrating positive changes in students' interest in learning. The movement of scores approaching the maximum score (100) visually illustrates the success of the OBE-based scoring system in positively impacting students' interest in learning at SMK Al-Asy'ari and SMK Negeri 1 Kwanyar. The conclusions drawn from this research reinforce that MOODLE-based OBE implementation has the potential as an effective solution to enhance learning and students' interest in various schools, supporting educational progress towards a more adaptive and outcome-oriented approach. The research findings provide several strategic recommendations to improve the implementation of the Outcome-Based Education

(OBE) assessment system using MOODLE. First, there is a need for the development of more varied and relevant learning content to enhance the attractiveness of learning, stimulate interest, and optimize student engagement. In-depth teacher training on the use of OBE-based scoring systems with MOODLE is also crucial to ensure optimal utilization in the learning process. A more thorough evaluation of the development of students' soft skills, such as collaborative skills, communication, and problem-solving, needs to be emphasized using specific assessment instruments. Encouraging the implementation of the scoring system in other schools can expand the impact of the learning method by adapting it to the specific needs of each environment. Finally, further research involving more participants is expected to provide clarity regarding the consistency and sustainability of the benefits of this learning method over a broader timeframe. By implementing these recommendations, it is hoped that the MOODLE-based OBE scoring system can continue to be improved, making a greater contribution to the enhancement of learning quality, stimulating student interest, and developing soft skills as the primary focus of this learning method.

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