Development of SKKNI and Industry Based Periodic Maintenance Modules for Class XI Light Vehicle Engineering Expertise at SMK Negeri 5 Serang City

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ABSTRACT

Along with the development of the automotive industry, the education curriculum at SMK must be able to follow market demands. Therefore, the development of modules based on the Indonesian National Work Competency Standards (SKKNI) which are aligned with the needs of the automotive industry is needed. This study aims to determine the needs in learning at SMKN 5 Serang City, identify the development of periodic maintenance modules that are relevant to SKKNI and industry and determine the effectiveness of student learning outcomes using periodic maintenance modules. This research uses the ADDIE development model, including Analysis, Design, Development, Implementation and Evaluation. Using data collection techniques of interviews, observation, documentation, and expert assessment questionnaires.

The results showed that the SKKNI and Industry-based periodic maintenance module obtained validation results with a module score of 80% (feasible criteria) and a jobsheet score of 88% (very feasible criteria). Based on the effectiveness test, the N-gain value of class XI TKR 1 was 0.7 (high criteria) and class XI TKR 2 was 0.4 (medium criteria). Based on these data, it is concluded that the use of periodic maintenance modules based on SKKNI and Industry is effective in improving student learning outcomes.

Keywords: *Module, SKKNI, industry, periodic maintenance.*

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I. INTRODUCTION

The 21st century marked by the industrial revolution 4.0 is also known as the century of globalization. Compared to the previous century, human life has

undergone a significant transformation. With the rapid advancement of technology can bring major changes to the field of life, including the world of education. technological advances also affect the education system(Ambarwati et al., 2022). Improving human quality can be improved by the field of education which is the key to keeping up with the development of the revolution in industry 4.0(Lase, 2019). Education is an effort to create an environment and learning process that allows students to develop their potential with all intelligence, personality and skills (Aspi, 2022). Vocational High School (SMK) is a formal education that provides vocational education and skills to students. The profile of Vocational High School graduates is to master the competencies of the expertise program, entrepreneurship, meet the demands of industry, follow higher education and build or produce graduates who have special skills and are ready for employment in sync with market demands (Irfan et al., 2022).

Based on data released by GAIKINDO in Indonesia, the automotive sector continues to show significant growth. This development presents both challenges and opportunities for vocational education institutions, including Vocational High Schools (SMK), in preparing graduates who are ready to work according to industry standards. One of the steps taken is to implement the concept of "teaching factory," which integrates theoretical learning with real work practices to produce products or services on demand (Dea Anissa & Latief, 2019). With this approach, SMK graduates are expected to have competencies and skills that are in line with the needs of the industrial world.

SMK graduates in the Indonesian National Qualifications Framework (KKNI) are equivalent to level II or called operators. In the KKNI level II standard, the Automotive Light Vehicle Engineering expertise competency consists of 10 core competency units and 5 optional competency units. Competency achievement is achieved in competency groupings and achieved within 3 years. Indonesian National Work Competency Standards (SKKNI), according to SKKNI KEP.45 / MEN / II / 2009, is a formulation of work ability that includes knowledge, skills, and work attitudes that are relevant to carrying out the duties and requirements of positions stipulated by applicable regulations. To match the quality of the workforce with

industry needs, SKKNI is also used to develop competency-based training programs and curricula.

In order for the implementation of education to be organized and have a good and systematic goal direction, it is necessary to manage the curriculum in order to achieve the expected educational goals. The curriculum plays an important role in advancing education in Indonesia. In an independent curriculum, the use of learning tools can be tailored to its characteristics and needs. Learning tools in an independent curriculum can be in the form of teaching materials, teaching modules and project modules. Along with the development of the automotive industry, the education curriculum at SMK must be able to follow market demands. Modules can be used as reading material that is systematically organized and written in easy-to-understand language so that students can learn independently without the help of educators. The purpose of making modules also helps students more easily understand the material being taught so that they can improve their skills.

The use of learning tools that are in accordance with industry needs is important to prepare students to know what skills are needed when working in industry. State Vocational High School 5 Kota Serang is located on Jl. Raya Gunungsari, Cilowong, Kec. Taktakan, Kota Serang, Banten. Based on the results of initial observations when conducting the Introduction to the School Environment (PLP) activities that have been carried out at SMKN 5 Kota Serang, there are several obstacles in learning, including a less conducive learning atmosphere and also too much practical learning so that students do not understand the theoretical learning.

Based on observations that have been carried out with productive subject teachers at SMKN 5 Kota Serang. The results of interviews with educators at SMK Negeri 5 Kota Serang together said that: So far, learning using modules has not been based on SKKNI and industry. Students do not explore in the delivery of material and the learning provided by the teacher is too far away so that students do not understand the delivery of material. Deficiencies in the use of modules at this time, where the process of delivering material is too long so that the limited learning time and lack of literacy are only about 20% of students who try to explore the material from the modules used. Furthermore, it is hoped that there will be a module to

improve students' understanding of the use of Personal Protective Equipment (PPE) and Standard Operating Procedures (SOP) according to work competencies and modules that are able to explain how to maintain vehicles in accordance with industry standards. Based on the problem shows the need for competency-based module development that adapts to the needs of SKKNI and industry. To prepare students to carry out periodic maintenance in accordance with industry standards. Based on the background of the problem restrictions that have been described, this study has the aim of how the process of developing periodic maintenance modules is the effectiveness of student learning outcomes using SKKNI and Industry-based periodic maintenance modules.

II. METHODS

This research is a research and development, the purpose is to create a periodic maintenance module that focuses on light vehicle engineering expertise at SMKN 5 Serang City class XI. This study used the ADDIE development model, which was developed by Dick and Carry. This model includes five main phases: analysis, design, development, implementation, and evaluation. The ADDIE development model was chosen in this study because it has a systematic and flexible structure for developing quality educational modules. In the ADDIE development model which is the definition of Analysis, Design, Development, Implementation, and Evaluation.

Data collection techniques are methods for determining and collecting various relevant data sources needed in research. Data collection techniques used in the development of SKKNI and Industry-based modules use pre-research interviews, observation, documentation, expert assessment questionnaires and student learning outcomes tests. The trial stage used experimental research of the one-group pretest-posttest type. The trial stage has a pretest before treatment, which allows knowing the results of the treatment accurately because it compares the situation before and after treatment (Sugiyono, 2018). Data obtained through research instruments are analyzed with statistical data. By using a Likert scale as a measurement tool, responses from quantitative questionnaires can be presented in percentage form.

No	Quantitative Analysis	Score
1	Very Feasible	4
2	Feasible	3
3	Less Feasible	2
4	Not Feasible	1

Table 1. Criteria for Assessment by Expert
Source: (Sugiyono, 2018)

Calculation of values using the formula shown below:

$$\text{Persentase jawaban responden} = \frac{jumlah\ skor\ yang\ diperoleh}{jumlah\ skor\ tertinggi} \text{ x } 100\%$$

(Sugiyono, 2015)

Furthermore, the assessment is used to calculate the average number of trial sample subjects and then converted into an assessment statement in determining the quality and level of usefulness of the product based on expert opinion.

Score Percentage	Interpretation
81% - 100%	Very feasible
61% -80%	Feasible
41% - 60%	Reasonable
21% - 40%	Less feasible
0%-20%	Not feasible

Table 2. Module feasibility criteria in percentage form (%)
Source: (Riduwan & Sunarto, 2014)

Student learning outcomes before and after the module were measured by Hake's Normalized Gain formula. To find the gain N, calculate the average gain (g) of the pretest and posttest scores. The calculated amount is as follows:

$$g = \frac{\text{S postest} - \text{S pretest}}{\text{S maks} - \text{S pretest}}$$

Description:
S post = Average Post test score
S pre = Average Pre test score
S max = Maximum value
The results of the value are interpreted into the N-gain level criteria table

Score N-Gain	Categori
g ≥ 0,7	High
0,3 < g < 0,7	Medium
g ≤ 0,3	Low

Table 3. Interpretatio of gain value
Source : Meltzer, 2002 in Lestari et al., 2021

III. RESULTS

This development research produces products in the form of SKKNI and Industry-based periodic maintenance modules. The periodic maintenance module developed consists of teaching materials and jobsheets based on SKKNI and Industry. The development process on the product can be seen as follows:

The development procedure in this study used the ADDIE development model. The following are the results of the ADDIE model development procedure that has been carried out:

1. Stages of Periodic Maintenance Module Development

a) Analysis Results

This stage aims to collect information and identify problems that exist in learning both in theory and practice. The information collected in the analysis stage is an analysis of class conditions and needs analysis. Information obtained after conducting interviews is learning that only focuses on practice that is not balanced with theory, students do not explore the delivery of material, the process of delivering material is too long so that teachers have limited learning time. During the observation, information was obtained about the teaching tools used in the learning process activities. The lack of effectiveness of the modules used and the process of learning activities is still teacher-centered. So it is necessary to develop modules that are relevant to the needs of students and industry to increase student involvement in the learning process and to prepare students with relevant knowledge and skills in the industrial sector.

b) Design Results

This stage is the planning process of developing SKKNI and Industry-based periodic maintenance module products. The steps taken are: (1) determining the format;

determining the systematics developed using B5 paper size 17.6 x 25cm, the title of the module developed is "SKKNI and Industry Based Periodic Maintenance Module" and the Module consists of teaching materials and jobsheets that refer to the SKKNI and Industry standards that have been set. (2) determination of module content; This stage is to find information about components that are relevant to the previous analysis so as to produce the right periodic maintenance module. (3) preliminary design; This development stage composes the product to be developed by including modules and jobsheets. The teaching material components are made based on SKKNI and Industry according to the needs based on the background of the problem. This stage is organized as the basis of module development, as for the initial design as follows:

1. Module front cover

   The results of this product development on the front cover contain the module title, author's name, class and supporting images.
2. Description

   In the development of the module in the description section contains a summary of the contents to provide a glimpse of the periodic maintenance module.
3. Outcome diagram

   In the development of periodic maintenance modules, the achievement diagram contains a visualization of the material to be achieved through the module to help understand the flow and targets to be achieved.
4. Material

   The material in the periodic maintenance module is a collection of knowledge, concepts, and skills that are systematically organized to help students understand and perform vehicle maintenance procedures.
5. Summary

   The summary section of the module contains the essence of the material that has been learned. It aims to highlight the key points of the entire module so that students can understand the material more easily and quickly.

6. Formative test

   Formative tests are evaluations during the learning process with the aim of measuring students' understanding and development related to periodic maintenance.

c) Development Results

This stage is to develop SKKNI and Industry-based periodic maintenance module products based on expert input. Periodic maintenance module products that have been developed are then validated by practitioner validators, namely TKRO productive teachers, a total of 3 expert validators. The assessment of learning devices includes periodic maintenance modules and jobsheets. Then the product is revised on the basis of validator comments and suggestions. On the questionnaire sheet given using a Likert scale of 1-4.

No	Quantitative Analysis	Percentage	Criteria
1	Appropriateness of the material	67%	Feasible
2	The accuracy of the material	64%	Feasible
3	Update of the material	65%	Feasible
4	Encourage curiosity	63%	Feasible
5	Presentation technique	69%	Feasible
6	Presentation of learning	100%	Very Feasible
7	Coherence and orderliness of thought	75%	Feasible
8	Contextual nature	75%	Feasible
9	Contextual components	71%	Feasible
Average		**72%**	**Feasible**

Table 4. Module Validation Result

No	Assessment items	Percentage	Criteria
1	Content	75%	Feasible
2	Display	67%	Feasible
3	Language	69%	Feasible
4	Skills	58%	Feasible

5	Usage and presentation	58%	Feasible
Avarage		**65%**	Feasible

Table 5. Jobsheet Validation Result

2) Module Revision According to Experts

Module revisions are carried out to improve and perfect the suggestions and input from material expert validators. In addition to quantitative data, qualitative data related to the manufacture of periodic maintenance modules were also collected.

No	**Aspect**	**Suggestions and Feedback**
1	The accuracy of the material	Addition of performance criteria and competency elements
2	Updating of material	Addition of questions about 5 dimensions of Competence
3	Presentation technique	Addition of a summary
4	Display	Addition of personal document images Logo and agency changes
5	Skills	Addition of performance criteria
6	Use and presentation	Addition of jobsheet standards and conclusions

Table 6. Results of Expert Suggestions and Feedback

3) Final Product Validation Results

Products that have been revised according to expert validators and get suggestions and input to make improvements. Then the product was revised to the final product on the basis of the validator's comments and suggestions.

No	**Quantitative Analysis**	**Percentage**	**Criteria**
1	Appropriateness of the material	83%	Very Feasible
2	The accuracy of the material	86%	Very Feasible
3	Update of the material	85%	Very Feasible
4	Encourage curiosity	88%	Very Feasible
5	Presentation technique	92%	Very Feasible
6	Presentation of learning	100%	Very Feasible
7	Coherence and orderliness of thought	88%	Very Feasible

8	Contextual nature	88%	Very Feasible
9	Contextual components	82%	Very Feasible
Average		88%	Very Feasible

Table 7. Module Validation Result

No	Assessment items	Percentage	Criteria
1	Content	75%	Feasible
2	Display	79%	Feasible
3	Language	81%	Very Feasible
4	Skills	83%	Feasible
5	Usage and presentation	83%	Very Feasible
Avarage		**80%**	Very Feasible

Table 8. Jobsheet Validation Result

IV. CONCLUSION AND SUGGESTION

This research produces periodic maintenance modules based on SKKNI and industry needs using the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). The Analysis stage shows the need for a module that is relevant to industry needs. The Design stage involves systematic module development including teaching materials, jobsheets, achievement diagrams, and formative tests. The Development stage showed initial validation results of modules and jobsheets in the feasible category, with revisions to improve competency elements and appearance. The Implementation stage shows a significant increase in student learning outcomes with an N-Gain of 0.7 in the high category in class XI TKR 1 and 0.4 in the medium category in class XI TKR 2. The Evaluation stage ensures the effectiveness of the module, with the final results of validation in the very feasible category of 88% for modules and 80% for jobsheets.

The use of modules carried out by the experimental method of one-group pretest-posttest shows that the SKKNI and industry-based periodic maintenance modules have effectiveness in improving student understanding. Calculations using the Normalized Gain formula by Hake showed that the XI TKR 1 class obtained an N-

gain value of 0.7 and was included in the moderate category, while the XI TKR 2 class obtained an N-gain value of 0.4 which was also in the moderate category..

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