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Development of Student Worksheets based on the Discovery Learning Approach in the Automotive Light Vehicle Engineering Program at Vocational High Schools

Andi Irfandi ✉**,** Universitas Malikussaleh, Indonesia
Siraj, Universitas Malikussaleh, Indonesia
Nuraina, Universitas Malikussaleh, Indonesia

✉ *andi.180750045@mhs.unimal.ac.id*

Abstract: This research aims to develop student worksheets based on the discovery learning approach. Designing Student Worksheets based on the discovery learning approach for class x automotive light vehicle engineering at state vocational high school 1 Seunuddon. Vocational Education Study Program in Mechanical Engineering fakultas keguruan dan ilmu pendidikan Malikussaleh University, 2024. This research aims to describe the design, feasibility and learning outcomes of class automotive. This research uses a mix methods approach. This research used a sample consisting of 8 class X students majoring in automotive engineering. Data collection uses questionnaires, documentation, interviews and observations, data analysis techniques use percentage qualitative analysis through data collection and drawing conclusions. The research results show student learning outcomes. The media I results gave an overall score with a percentage of 89.28% and media experts II gave an overall score with a percentage of 89.28%. The average percentage of the two validators shows the "very feasible" category. Thus, this student worksheet is very suitable for usefor learning by teachers and students. Where the value obtained has passed the learning objective achievement criteria value which has been determined as a reference for the success of the learning process at 75 with a percentage of 78.75%, thus it can be concluded that the value obtained by the students is categorized as complete. Thus, this student worksheet is suitable for use by teachers and students for a more effective learning process.

Keywords: student worksheet, vocational high school, discovery learning approach.

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INTRODUCTION

Education can be interpreted as the result of a nation's civilization which is developed on the basis of the nation's own view of life in the form of community values and norms (Dasopang et al., 2023; Lubis, 2019; Putra et al., 2023; Schunk, 2012). Education functions as ideals and a statement of educational tests. Based on the views of Santrock (2011), it is said that education is an environmental influence on individuals to produce permanent changes in their behavioral habits, thoughts and attitudes. According to Law Number 20 of 2003, it is stated that education is a conscious and planned effort to create a learning

atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble morals and skills. that is needed by himself, society, nation and state. Learning resources that are manifested in teaching materials are also a vital component in the learning process.

Furthermore, Ningsih et al. (2023) stated that the existence of teaching materials in learning can make it easier for students to learn and understand material content that is based on systematic competencies, so that students can achieve the specified or desired competency standards. Teaching materials are all materials (both information, tools and texts) that are arranged systematically, which display a complete figure of the competencies that students will master and use in the learning process with the aim of planning and reviewing learning implementation (Arsyad, 2011; Lubis, 2023 ; Nurliza et al., 2024; Sinaga et al., 2024). Therefore, the content of teaching materials includes knowledge (facts, concepts, principles and procedures), skills and attitudes (values) (Prastowo, 2015).

According to Prastowo (2014) explains that Student Activity Sheets are sheets containing tasks that must be carried out by students. Student activity sheets usually consist of instructions or steps to complete a task. The task must be clear about the basic competencies to be achieved. Making teaching materials must be adapted to student needs. Elements that must be present in preparing teaching materials include study instructions, competencies to be achieved, supporting information, exercises or assignments, work instructions or worksheets and evaluation.

Based on the results of observations at State Vocational High School 1 Seunuddon, it is known that the learning process in basic automotive engineering work subjects in class With an approach, learning objectives can be planned clearly so that we can set directions and targets effectively. Apart from that, the teaching materials used in the learning process only contain material and questions so they are not able to encourage students to discover their own concepts and train students' critical thinking skills so that student learning outcomes are still low. Therefore, we need a technique for designing learning tools that can be accessed by students wherever and whenever they learn so that they can support the learning process to be more effective and not passive. One of the learning tools in question is a student worksheet based on a discovery learning approach.

METHODS

The approach to this research uses a mix methods approach with the type of research and development developed by Borg and Gall in 2003 which has ten stages with the aim of producing student worksheets with valid, appropriate criteria and responses from students and teachers. The data collection techniques used to determine the feasibility of the design product are: 1) observation, 2) interviews, 3) questionnaires, 4) documentation, and 5) tests. A good instrument for obtaining information about the validity and effectiveness of the student worksheet produced is that researchers use the following instruments: 1) media expert feasibility test sheet, 2) material expert feasibility test sheet, 3) small group validation sheet, 4) results Study. As for Data Analysis Techniques. 1) Media and material validation analysis: questionnaire data from each used in this category can be shown in the previous table.

This research will be conducted at state vocational high school 1 Seunuddon, Aceh Province. Implementation will be carried out in the odd semester of the 2023/2024 academic year. The research and design procedures used in this research include 6 stages, namely: 1) potential and problems, 2) collecting data, 3) product design, 4) design validation, 5) design improvement, and 6) product testing. Percentage qualitative analysis: data in the form of descriptive verbal data is analyzed qualitatively. Meanwhile, to analyze data in the form of expert tests, practical and field tests are carried out quantitatively. Descriptive verbal data obtained from observations, interviews and documentation were analyzed using the following techniques: a) collecting data, b) transcribing verbal verbal

data, c) collecting, selecting and classifying data, d) analyzing data and formulating conclusions from the analysis.

RESULTS

The design of teaching materials in the form of student worksheets on hand tools material was carried out based on observations in the Automotive Engineering department of State Vocational High School 1 Seunuddon. The process of designing student worksheets on hand tools material was carried out because of problems obtained in the preliminary study. The design of student worksheets on hand tools material goes through a validation stage, namely material validation, media validation and small group validation, in order to obtain comprehensive input for the validity of student worksheets on mechanical measuring tools material when tested. After the student's worksheet receives a recommendation from the validator, the student's worksheet is tested at the school.

Designing Student Worksheets

In this section, there is an explanation of the results of the stages carried out in the process of designing student worksheets on hand tools material, namely the discovery of potential and problems. At this stage the potential is to design student hand tools worksheets as interesting, interactive and innovative learning materials. Meanwhile, the problem that was found during the observation was that there were still many students who did not understand the material on using hand tools. This can be seen from the learning process in basic automotive engineering work subjects in class also in the form of conventional learning methods without an approach.

Next is Collecting Data. Information based on interviews, researchers found the problem that teachers had not provided student worksheets on hand tools materials that were in accordance with the 2013 curriculum, conventional learning methods without an approach. Next is the process of designing the product. The design of this research was made based on the need for more interactive and innovative learning teaching materials in the form of student worksheets on hand tools at State Vocational High School 1 Seunuddon.

FIGURE 1. *Product Design*

The Discovery Learning Learning Model includes 1) Stimulus; 2) Identify the problem; 3) Data collection; 4) Data description; 5) Proof; 6) Generalization; and 7) Providing stimulus questions. The first step is stimulus. At this stage the instructor will ask several questions to provoke students' curiosity and interest. In the first activity, the teacher shows pictures of hand tools to students and students find out the name and function of the hand tools. After that, the teacher explains the functions and workings of various hand tools. Next, students continued the second activity by observing automotive

workshops and filling in the names and functions of hand tools in automotive workshops in the second activity.

Next, identify the problem. At this stage the instructor will provide the opportunity to identify problems that will become learning material. Where students write down things they did not understand during the stimulus stage. After that is data collection. At this stage, if the hypothesis has been prepared, then participants can start collecting data and information related to answering the hypothesis. Where the instructor shows a video on how to disassemble the machine and after that the students are required to identify what is being taught in the video.

After data collection is complete, the next step is data description. Data and information have been collected, then participants then begin to analyze and describe the data. Students are given several questions to describe data that has been studied previously. Next is proof. The results of data processing are then checked and examined carefully. Then participants can connect to the initial hypothesis. Is the hypothesis in accordance with the finding data? Or vice versa, another answer is found. Students present what they have observed and learned during the learning process.

The next step is the generalization process. Participants draw conclusions that can be used as general principles for all similar events or problems. And students provide conclusions about what they have learned during the learning process. Lastly, as a closing, we provide stimulation questions. This question is given to determine whether or not students have completed their learning outcomes in the learning process.

Feasibility Test Results

Material Expert Validation Results. Validation of student worksheets in this research was obtained from material expert lecturers as validator one (M1) and State Vocational High School 1 Seunuddon teachers, as validator two (M2). The results of the material expert feasibility validation test from validators I and II show the "Very Eligible" category in the form of a diagram which can be seen in full in Figure 4.3 below, as follows.

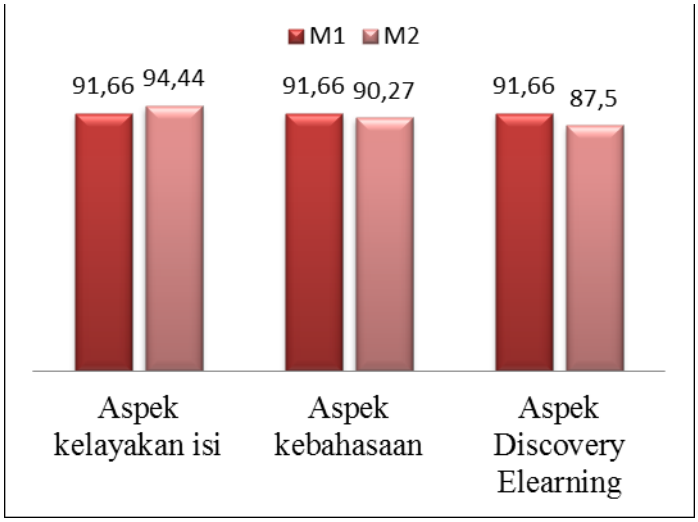

FIGURE 2. *Material Expert Validity Test Results*

Media Expert Validation Results. Validation of student worksheets in this research was obtained from media expert lecturers as validator one (M1) and State Vocational High School 1 Seunuddon teachers as validator two (M2). The media expert feasibility validation test results from validators I and II show the "Very Eligible" category in the form of a diagram which can be seen in full in Figure 4.4 below, as follows,

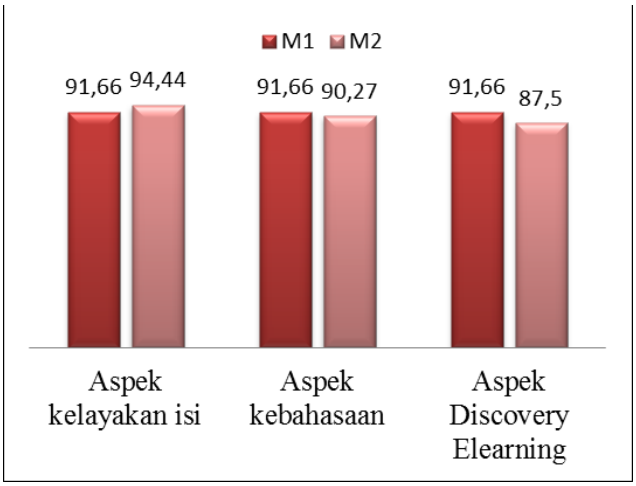

FIGURE 3. *Media Expert Validity Test Results*

Results of Small Group Validation of Student Worksheets. This section is a calculation of the results of small group validation or the results of validation carried out with several class X students in the previous year on student worksheets that have been designed. The results of the validation test with a small group showed the "Very Feasible" category. with the following results,

TABLE 1. *Small Group Validation Results*

Small Group Validation Results	
Total Score	180
Number of Scores Obtained	168
Final Score Percentage	93,33%
Categories of small group validation of student worksheets	"Very Feasible "

Student Posttest Results. The following are the results of the Posttest data obtained from the results of research in the experimental class, namely the class that uses hand tools student worksheets and the control class, namely the class that does not use student worksheets.

TABLE 2. *Student Test Result*

Class X TKRO		
No	**Initial**	**Score**
1	AN	80
2	MF	80
3	MA	70
4	MK	80
5	MI	80
6	MRM	90
7	MZ	70
8	SF	80
Σ		360
N		8
Average		78,75

Based on table 2, it can be concluded that learning using student hand tools worksheets in the experimental class is better. And the value obtained by the student has passed the criterion value. Achievement of Learning Goals that have been set as a reference or determination of the success of the learning process is 75, so the Criteria for Achievement of Learning Goals.

DISCUSSION

Student worksheets are learning teaching materials designed to facilitate students in learning, with the aim of meeting the need for teaching materials that can help and make it easier for students to understand the material independently in addition to the textbook teaching materials provided by the school. The research and design procedures adopted the Borg and Gall model Research and Development method. The design of student worksheets that have been carried out shows that student hand tools worksheets are valid for use as learning teaching materials in the "very appropriate" category.

Aspects of the appropriateness of the contents of the student worksheets, material expert I gave an overall score with a percentage of 90%, and material expert II also gave an overall score with a percentage of 85%. Based on the interpretation criteria, both data are included in the very appropriate category. In the linguistic aspect of student worksheets, material expert I gave an overall score with a percentage of 91.66%, and material expert II gave an overall score with a percentage of 88.88%. Based on the interpretation criteria, both data are included in the very feasible category.

In the discovery learning aspect of student worksheets, material expert I gave an overall score with a percentage of 91.66%, and material expert II gave an overall score with a percentage of 87.5%. Based on the interpretation criteria, both data are included in the very feasible category.

The media I results gave an overall score with a percentage of 89.28% and media experts II gave an overall score with a percentage of 89.28%. The average percentage of the two validators shows the "Very Eligible" category. Thus, this student worksheet is very suitable for use by students for learning.

CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that 1) The results of designing the student hand tools worksheet which followed seven stages starting from potential and problems, data collection, product design, design validation, design improvement, to product testing make the student worksheet Valid hand tools are used as teaching materials to train students' independent learning and understanding of learning material. 2) The feasibility level from the validation results of material experts and media experts is categorized as "very feasible" with a percentage of 89.75%. 3) Student learning outcomes using the hand tools student worksheet were 78.75%, which can be categorized as students having completed the Learning Goal Achievement Criteria. which indicates that there is a significant influence of the use of student worksheets on student learning outcomes.

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