

## Industry practice platform based on work-based learning: Solutions to improve student competence

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### ABSTRACT

This study aims to (1) Develop a work-based learning-based industrial practicum platform; (2) Know the feasibility of a work-based learning-based industrial practicum platform; and (3) Know whether there is an effectiveness of student learning with a work-based learning-based industrial practicum platform. This type of research is Research and Development (R&D) with the Four-D model, and the research subjects are class C students as an experimental class with a total of 21 students and class B students as a control class with a total of 22 students. Data collection uses a questionnaire method to determine the feasibility of the media used for research and written test questions in the form of multiple choice with a total of 20 questions. The data analysis test used a normality test, homogeneity test, and t-test. The research data showed that: (1) The procedure for developing practical learning media based on work-based learning includes the defining stage, planning stage, development stage, and dissemination stage; (2) Work-based learning media is feasible to use as a learning media in light vehicle electrical maintenance subjects. This can be proven from the validation results of media expert lecturers who showed 82.50% of the score indicating valid criteria. Validation by material expert lecturers showed 78.75% of the score obtained, indicating quite valid criteria; and (3) The t-test results ( $t$ -count = 6.021 and  $p = 0.000$ ) prove that the work-based learning-based practicum platform made is effective for improving student learning outcomes. This is shown through the response of trial students, which includes small group trials, obtaining 77%, which includes five students, and large group trials, obtaining 80.50%, which includes 15 students. The normality test obtained  $p = 0.059$  in the control class and  $p = 0.115$  in the experimental class because  $p > 0.05$  indicates that both groups are normally distributed. Through the homogeneity test,  $F$  count = 0.762 with  $p = 0.388$  because  $p > 0.05$ , the two groups have homogeneous variants. Thus, the industrial platform practice based on work-based learning can improve student learning outcomes.



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## INTRODUCTION

The rapid development of technology has had much influence on human life. Technological development aligns with its goal to facilitate human work, starting from economic, social, and educational aspects (Alfarsi et al., 2020; Bagila et al., 2019; Banjongprasert et al., 2019). This convenience should be addressed, even though this technological advancement should also be balanced with an increase in the quality of its human resources. Efforts to improve human capabilities can be made in various ways, including courses (training) or education (schools).

Both training and education have similarities in their implementation, namely, using a learning process (Agustina et al., 2017; Billett, 2011; Sarwandi et al., 2019). From this process, learning outcomes will be obtained, which are used as a benchmark for the success of a learning process. Media is an intermediary or message delivery from the sender to the message's recipient. Implicit learning media includes tools that are physically used to convey the contents of teaching material, including books, tape recorders, video cameras, video recorders, films, slides (picture frames), photos, pictures, graphics, television, and computers (Fatah & Sudiyanto, 2018; Fathia et al., 2018; Haryanto et al., 2021; Suyitno et al., 2018, 2019). Work-based industry practice platform learning is an electronic-based learning tool that can be accessed with electronic media designed to be learned by students or users who can be used and studied independently (Agustina et al., 2017; Sarwandi et al., 2019; Sofyan et al., 2020). Learning outcomes are related to processes within students, such as remembering and strengthening, both specific to students. According to Gagne (1970) in Suprihatiningrum (2016), learning outcomes are abilities possessed by students as a result of learning actions and can be observed through student performance (learner's performance).

So far, one of the ways to train the professional competence of automotive students is by having training somewhere (Allan, 2014; Fjellström, 2014). However, most of the training conducted so far has only been theoretical. This platform offers a work-based industry practice platform-based learning (PI-WBL) for Automotive Engineering students. Work-based learning is a learning approach that utilizes the workplace (in the business/industry world) to structure experiences gained in the workplace to contribute to social, academic, and student career development (Allan, 2014; Ariyanti et al., 2018; Suyitno et al., 2022; Suyitno & Pardjono, 2018). In addition, the PI-WBL platform also integrates training in higher education institutions with those in the industry (Agaveleyan et al., 2020; Cuendet et al., 2014; Hof & Leiser, 2014). For students, integrating on campus and in the industry will make understanding more quickly regarding professional abilities.

Observation results show that students' learning outcomes are less than optimal due to the limited memory and minimal material possessed by students, especially those who do not have conventional modules, as well as the lack of enthusiasm for student learning due to distance learning (Agustina et al., 2017; Kholifah et al., 2020; Mubarak et al., 2020; Nurtanto et al., 2020). This problem can be overcome with work-based industry practice platform-based learning.

## METHODS

This research is Research and Development (R&D). The research and development used is a 4D model. The research researchers use is the Four-D Model suggested by Thiagarajan et al. (1974) in Suyitno et al. (2018). This model consists of 4 stages of development, namely define, design, develop, and disseminate or adapted into a 4-D model, namely defining, designing, developing, and deploying. This research was conducted at Universitas Muhammadiyah Purworejo and several industries in the Yogyakarta area, Java Central, and Greater Jakarta. The time of this research is August-November 2022. The subject of this research uses students from class C and class B, with a total of 43 students as experimental and control classes.

Data collection used in this research included media expert responses, material expert responses, and student responses (Purnamawati et al., 2021; Sakulviriyakitkul et al., 2020; Sukardi et al., 2020; Syahril et al., 2020). The data collection instrument uses a questionnaire and test instruments. This social phenomenon has explicitly been determined by researchers, now referred to as research variables (Sugiyono, 2017). Data analysis prerequisite test using normality, homogeneity, and t-test. Then, the data were analyzed using quantitative descriptive analysis to find out the research

data statistics and analysis prerequisite tests (Coghlan, 2011; Walpole et al., 2012). The tests carried out are: (1) The normality test aims to determine whether the dependent variable and independent variable regression model has a normal data distribution or not; (2) Homogeneity test is conducted to determine the similarity of the variants of two data groups; and (3) The t-test is used to compare the average learning outcomes of the experimental group and the control group.

## RESULTS AND DISCUSSION

This research involved automotive engineering education students at Universitas Muhammadiyah Purworejo as respondents. Work-based industry practice platform-based learning that has been developed is validated in advance by material experts and media experts, for this research, the validators are from academic lecturers, vocational education experts, and practitioners of the automotive industry.



Figure 1. Practice Platform Industry based on Work-Based Learning

Figure 1 illustrates the initial interface of the work-based learning platform. This platform was developed as a tool to assist the implementation of industrial practice and as a learning medium for students. There are several menus on this platform, including a menu for login, a menu for searching industrial practice locations, a menu for filling out logbooks, a menu for writing daily reports, a menu for writing weekly reports, a menu for writing final reports and a menu for entering grades. The media expert's assessment of the learning media scored 66. Thus, the validation results by media experts show that the learning media for industrial practice based on work-based learning is included in the valid category.

Based on data analysis of the ten aspects validated by media experts, the assessment criteria are as follows: The total score obtained from the media expert validation is 66 out of a maximum score of 80. With this score, the percentage of the results of the data is 82.5% and is included in the "valid" classification. The media expert's note on the platform lies in testing the pretest and post-test questions to students before this platform is used for research. The conclusion is that the platform developed is suitable for use. The value of validation results from media experts can be seen in Figure 2.

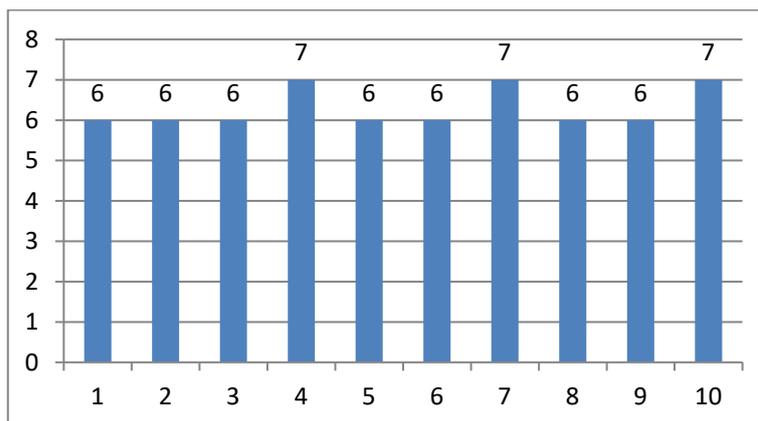


Figure 2. Histogram of Media Expert Validation Score

The score of the material expert's assessment of the material made is shown in Figure 2, which shows the score data of 63; thus, it can be said that the results of validation by material experts show that the work-based learning-based industrial practice platform is included in the valid category (Abdullah et al., 2020). Based on the data analysis of the ten aspects validated by the material expert, the assessment criteria are as follows: the total score obtained from the theoretical expert validation is 63 from the maximum score of 80. With this score, the percentage result of the data is 78.75% and is included in the "valid" classification. The results of the theorist validation can be seen in Figure 3.

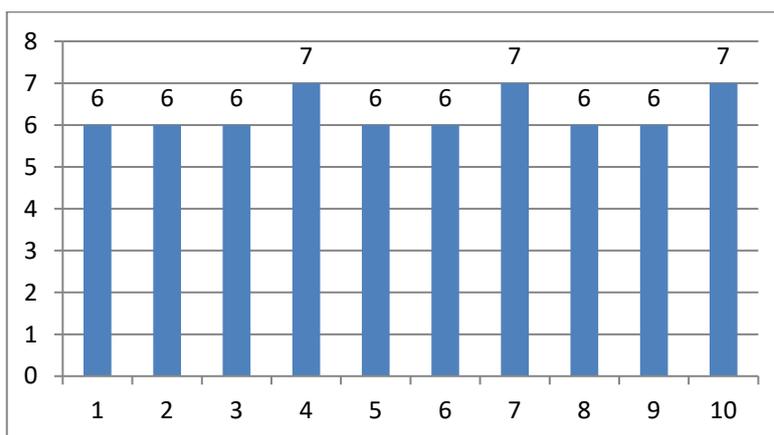


Figure 3. Histogram of Material Expert Validation Score

Based on the data on the value of the material expert validation results listed in Figure 3, the average results are above 6. The data obtained in this study is in the form of student learning outcomes data totaling 43 students. The data was then processed using the Microsoft Excel 2010 data processing program. The results of descriptive statistical analysis can be seen in Table 1.

Table 1. Comparison of Learning Outcomes of Control and Experimental Class Students

Indicator Statistics	Class Control	Class Experiment
Amount	1460	1675
Average	66,36	79.76
Highest score	80	90
Lowest score	50	70
Standard deviation	7,7	5,8
mode	70	75
Median	70	80
N	22	21

Based on Table 1, it is known that the average learning outcome of the control class is 66.36 and the average learning outcome of the experimental class is 79.76. To test the difference in the average learning outcomes of the experimental and control classes, the normality test, homogeneity test, and t test were used. The results of the normality test using SPSS software can be seen in Table 2.

Table 2. Normality Test Results Study Student Class Experiment and Class Control

	Class	Kolmogrov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df.	Sig.
Learning outcomes	Control	.260	22	.000	.915	22	.059
	Experiment	.175	21	.093	.926	21	.115

The output of the SPSS program is in accordance with Table 2, showing the significance value of Shapiro Wilk a score of 0.059 in the control class, and a score of 0.115 in the experimental class, the data is valid if the p significance is  $> 0.05$ . The data shows that both groups are normally distributed (Nghia & Duyen, 2019). The results of the homogeneity test using SPSS software can be seen in Table 3.

Table 3. Test Results T-test Study Student Class Experiment and Class Control

	Class	Levene's Test for Equality of Variances		t-test for Equality of Means			95% Confidence Interval of the Difference			
		F	Sig.	T	df	Sig.	Mean Difference	Std Error Difference	Lower	Upper
		Learning outcomes	Equal variances assumed	.762	.388	-6.02	41	.000	-12.03	1.99
Equal variances not assumed				-6.05	39.91	.000	-12.03	1.98	-16.05	-8.01

The results of the t-test in Table 3 use the paired technique samples t-test obtained t-count of 6,02 with  $p = 0.000 < 0.05$ , indicating that there are differences in the learning outcomes of the experimental class and the control class, meaning that the average learning outcomes of the experimental class are significantly higher than the control class.

The test results that researchers have carried out show a percentage difference between the control class using conventional media and the experimental class using a work-based learning industry practice platform. The learning process using a work-based industry practice platform based on work-based industry learning can improve student learning outcomes in light vehicle electrical maintenance lessons, especially car air conditioning systems. The results of this study are also similar to research by Dragicevic et al. (2019) related to the development of electronic testing systems using artificial intelligence.

In this study, the electronic testing system can be used after undergoing small-scale and large-scale trials (Dhahir et al., 2020). Based on the data obtained in this study, there is effectiveness in learning based on industrial work practices compared to learning conducted using conventional media. This can be proven by the results of data analysis calculations in the experimental class, which obtained an average value of 78.83, greater than the control class average of 69.78. With these results, an increase in student learning outcomes occurs after using industrial practice work platform-based learning.

## CONCLUSION

The research data shows that the stages in developing work-based include defining, planning, developing, and implementing. Based on the research that has been conducted, work-based industrial practice platform-based learning is feasible to use as a learning platform in automotive engineering courses. This is evidenced by the results of validation conducted by media experts, which

show that the score obtained shows valid criteria. The t-test results prove that work-based industrial practice platform-based learning effectively improves student learning outcomes. This is indicated by student responses, which include small-group trials and large-group trials that are good. The normality test shows that both groups are normally distributed, and the homogeneity test obtained homogeneous variants. Thus, work-based industrial practice platform-based learning can improve student learning outcomes.

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