

Development of an E-Jobsheet for Clutch System Overhaul Based on Flip PDF Corporate Software for Grade XI Students of SMK Negeri 3 Semarang

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Abstract

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This study aims to develop an e-jobsheet for manual clutch system overhaul based on Flip PDF Corporate software for Grade XI students at SMK Negeri 3 Semarang. The e-jobsheet is a digital worksheet designed to replace conventional jobsheets and was created in HTML5 format using Flip PDF Corporate software. It can be accessed via electronic devices such as smartphones or computers connected to the internet. This research follows a Research and Development approach using the ADDIE model (Analyze, Design, Development, Implementation, and Evaluation). This study used a pre-experimental design with a one-group pretest-posttest model involving one class of students. The feasibility of the product was evaluated by media and material experts, resulting in scores of 96.87% and 89.95%, respectively, categorized as “very feasible.” The average pretest score was 60.4, while the posttest average was 86.5, with a gain of 43.21%. A paired-samples t-test showed $p < 0.001$, and the N-Gain score reached 0.6532, indicating a significant and effective improvement. Additionally, student response questionnaires yielded a satisfaction score of 93%, also classified as very positive student response. These findings confirm that the developed e-jobsheet is feasible and moderately effective in supporting learning outcomes.



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1. INTRODUCTION

Education plays a vital role in shaping intelligent, skilled, and morally upright human resources. In today's digital era, vocational education faces increasingly complex challenges, particularly in ensuring that practicum-based learning remains effective and relevant to technological developments (Afriyadi, 2020). Vocational High Schools (SMK)

are required to produce graduates who are competitive in the workforce by mastering competencies in their respective areas of expertise (Komara & Iskandar, 2025; Rohani, 2020).

One of the programs offered at SMK Negeri 3 Semarang is Light Vehicle Engineering (Teknik Kendaraan Ringan), which includes learning materials on manual clutch system

overhaul. This material is delivered through hands-on practice, guided by a jobsheet. However, the use of conventional printed jobsheets presents several limitations, such as a lack of interactivity, inflexibility, and unequal distribution among students (Putri & Hidayati, 2023). These issues hinder some students from fully understanding the material and participating optimally in the practicum process. E-jobsheets have emerged as a digital innovation to improve the effectiveness of practical learning (Yahya et al., 2023).

The Merdeka Curriculum is an educational initiative that aligns with national standards, wherein teachers function as facilitators and mediators rather than as the sole source of knowledge, as was the case in previous curricula. This curriculum empowers teachers to act as motivators, fostering student engagement and learning, since it is fundamentally student-centered (Lince, 2022).

As a Center of Excellence vocational school, SMK Negeri 3 Semarang is not only committed to implementing the Merdeka Curriculum but also to ensuring the relevance of departmental competencies with the advancements in modern technology. This reflects a concrete effort to prepare competent, high-quality, and competitive graduates for the era of globalization and digital transformation (Tim P5 SMK N 3 Semarang, 2023).

Etymologically, the term jobsheet is derived from the English words job (work) and sheet (page). Therefore, a jobsheet refers to a work or activity sheet that includes procedures and instructional materials (Primastuti & Nayono, 2023; Iskandar et al., 2020)). An e-jobsheet, on the other hand, is a learning medium that originated from the printed jobsheet format and has been transformed into a digital format (Sya'adah et al., 2023).

The implementation of manual clutch system overhaul practice at SMK Negeri 3 Semarang presents specific challenges regarding the use of jobsheets, particularly due to their limited availability. Interviews with the teacher responsible for the chassis and power transmission subject revealed that conventional

jobsheets, preliminary interviews indicated that the existing jobsheets were compiled from various online sources and had not been systematically designed as structured practicum guides. These are still used to guide practicum activities. Furthermore, student interviews indicated persistent difficulties during practical sessions, caused by conventional jobsheets that are perceived as unengaging and poorly structured. Moreover, not all students receive printed jobsheets, resulting in unequal access to knowledge on manual clutch system overhaul procedures.

In response to technological advancements in education, jobsheets have evolved. While conventional jobsheets are limited to printed formats containing only text and static images, newer versions incorporate interactive features. One such innovation is the e-jobsheet, which allows the integration of multimedia elements such as video and dynamic images into the content (Wardani, 2023).

Flip PDF Corporate is a software application that facilitates the creation of e-jobsheets with a printed book-like appearance, supporting the integration of videos, images, and animations in an interactive manner (Sumarni & Dwitianti, 2022). The use of Flip PDF-based e-jobsheets has been shown to enhance students' learning outcomes and interest in automotive practice (Putri & Hidayati, 2023). Additionally, the Flip PDF Corporate Edition offers HTML output, a format that is more user-friendly and accessible both online and offline via smartphones or similar digital devices (Prisila et al., 2021).

Based on these considerations, this study aims to develop a Flip PDF Corporate-based e-jobsheet for teaching manual clutch system overhaul to eleventh-grade students in the Light Vehicle Engineering program at SMK Negeri 3 Semarang. Furthermore, the study seeks to evaluate the feasibility, effectiveness, and student responses to the developed digital learning media.

2. RESEARCH METHODS

This study is a type of Research and Development (R&D) aimed at producing a learning media product in the form of an e-jobsheet for manual clutch system overhaul, developed using Flip PDF Corporate software. The development model employed in this study is the ADDIE model, which consists of five stages: Analyze, Design, Development, Implementation, and Evaluation (Malik et al., 2024; Maulana et al., 2025; Raharjo et al., 2025).

The subjects of this study were eleventh-grade students from the Light Vehicle Engineering (TKR) program at SMK Negeri 3 Semarang, along with two experts who served as validators, two subject matter experts and two media experts. The sample for this study consisted of 34 Grade XI students from the Light Vehicle Engineering program.

The research utilized a pre-experimental design, specifically the One-Group Pretest-Posttest Design, involving a single group of students who were first given a pretest, then received treatment using the developed e-jobsheet, and finally completed a posttest (Khoiruddin & Iskandar, 2024).. The design of the study can be illustrated by the following formula:

$$O_1 \times O_2$$

Research Design (Sugiyono, 2023: 114)

Description:

O_1 : Cognitive and psychomotor pretest scores

O_2 : Cognitive and Psychomotor Posttest Scores

Data collection techniques in this study included media and content validation questionnaires completed by expert validators, learning outcome tests (pretest and posttest), and student response questionnaires. The data obtained were analyzed using descriptive quantitative methods. The feasibility of the media was evaluated based on expert validation results. Prior to conducting product trials, the product's feasibility must first be determined through expert judgment validated by both

media experts and content experts using a product feasibility assessment. The following formula was used to analyze product feasibility:

$$P = \frac{\sum n}{\sum N} \times 100\%$$

Description:

P = Percentage of e-jobsheet feasibility

$\sum n$ = Total score of assessment aspects given by experts

$\sum N$ = Maximum possible score (maximum score per item $\times$ number of items $\times$ number of respondents)

Once the product feasibility scores were obtained, the percentage was then converted into qualitative data. To determine the appropriateness of the e-jobsheet development aspects, data interpretation was based on the following criteria (Sugiyono, 2015): 76–100% = Very feasible; 51–75% = Feasible; 26–50% = Less feasible; 0–25% = Not feasible

The effectiveness of the e-jobsheet was determined by comparing pretest and posttest scores using the paired sample t-test, based on the following formula:

$$t = \frac{\bar{B}}{\frac{s_B}{\sqrt{n}}}$$

(Sudjana, 2005)

Description:

t = Calculated value

$\bar{B}$ = Mean of the difference between pretest and posttest scores

s_B = Standard deviation of the differences

n = Number of samples

In addition, the comparison of scores was also analyzed using the N-Gain test, based on the following formula:

$$g = \frac{(\% < S_f > \% < 100\% S_i)}{(100\% - \% < S_i >)} \\ \text{(Hake, 1998: 65)}$$

Description:

g = Gain score

S_f = Posttest score

S_i = Pretest score

S_{max} = Maximum possible score

After the gain scores for each student were obtained, the data were statistically processed. The gain scores were input into an SPSS worksheet and analyzed using the Descriptive Statistics menu to determine the minimum score, maximum score, mean, and standard deviation of the overall N-Gain (Musyono et al., 2024). Once the $\langle g \rangle$ value was calculated, it was compared to the gain interpretation criteria for learning outcomes, as shown in Table 1.

Table 1. N-Gain Interpretation Criteria

Intervals	Criteria
$\langle g \rangle > 0.7$	High
$0.7 > \langle g \rangle > 0.3$	Medium
$\langle g \rangle < 0.3$	Low

Meanwhile, student response data were analyzed based on the percentage of questionnaire score categories, using the following formula:

$$P = \frac{\sum n}{\sum N} \times 100\%$$

Description:

P = Percentage of e-jobsheet feasibility

$\sum n$ = Total score of assessment aspects provided by respondents (students)

$\sum N$ = Maximum possible score (maximum score per item $\times$ number of items $\times$ number of respondents)

After the product evaluation percentages were obtained, they were converted into qualitative data. To measure the feasibility level of the e-jobsheet development, the results were interpreted based on the following scale (Sugiyono, 2015: 144): 76–100% = Very feasible; 51–75% = Feasible; 26–50% = Less feasible; 0–25% = Not feasible.

3. RESULTS AND DISCUSSION RESULTS

After the development of the Flip PDF Corporate-based e-jobsheet for manual clutch

system overhaul, a series of tests and validations were conducted to determine the feasibility and effectiveness of the product. The validation process involved two experts: one media expert and one subject matter expert. Tables 2 and 3 present the average assessment results from both validators.

Table 2. Results of media expert assessments

No.	Assessed Aspect	Assessment Results		Average
		Validator 1	Validator 2	
1.	Presentation Components	31	32	31,5
2.	Pedagogy Component	20	20	20
3.	Linguistic component	29	31	30
4.	Benefit	11	12	11.5
Total Score		91	95	
Maximum Score		96	96	
Percentage (%)		94.79	98.95	96.87
Criteria		Very Feasible	Very Feasible	Very Feasible

Table 3. Results of material expert assessments

No	Assessed Aspect	Assessment Results		Average
		Validator 1	Validator 2	
1	Title	6	8	7
2	Learning Objectives	6	8	7
3	Tools and Materials	10	12	11
4	Work Procedures	85	107	96
5	Component Inspection and Measurement	31	32	31.5
6	Evaluation and Assignments	10	12	11
7	Content Feasibility	6	8	7
8	Language	6	7	6,5
9	Presentation	12	16	14
10	Graphics	9	12	10.5
Total Score		181	222	
Maximum Score		224	224	
Percentage %		80.80	99.10	89.95
Criteria		Very Feasible	Very Feasible	Very Feasible

Based on the tables above, the results of the media expert validation showed a score of 96.87%, which falls under the "Very Feasible" category. The evaluated aspects included visual

appearance, navigation clarity, multimedia integration, and ease of use. The media expert noted that the e-jobsheet excels in its interactive design and book-like layout, while being presented in a responsive digital format. Meanwhile, validation by the subject matter expert yielded a score of 89.95%, also classified as "Very Feasible." The assessed aspects included content alignment with the curriculum, accuracy of technical information, and the systematic structure of practicum procedures. The subject matter expert concluded that the e-jobsheet meets the standards of practical learning at vocational schools and is appropriate for the characteristics of vocational school students.

Following the validation phase, the product was tested on Grade XI students of the Light Vehicle Engineering program at SMK Negeri 3 Semarang. Prior to using the e-jobsheet, students were given a pretest to assess their initial understanding of the manual clutch system overhaul material. The average scores of the students' pretest and posttest results are presented in the following Table 4.

Table 4. Pretest and Posttest Scores of Students

	Score	
	Pretest	Posttest
Total Score	2054.6	2942
Mean	60.4	86.5
N	34	34
S	6.0	4.0
Maximum Score	70.82	92.1
Minimum Score	46.44	78.9

Based on the table above, there is a noticeable difference between the average pretest and posttest scores. The posttest average shows a significant increase compared to the pretest average. The increase in the average score reaches 43.21%, indicating an improvement in students' understanding of the material after using the developed learning media. This improvement is illustrated more clearly in Figure 1.

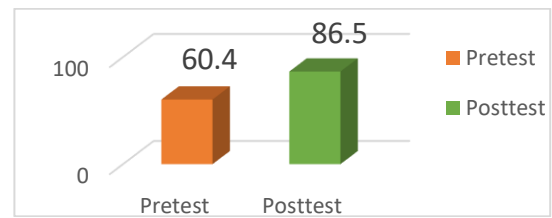


Figure 1. Average Pretest and Posttest Scores

To quantitatively measure the effectiveness of the media, a statistical analysis was conducted using a paired sample t-test. The results showed p value < 0.001 , indicating a significant difference between the pretest and posttest scores. Therefore, the use of the e-jobsheet has a statistically significant effect on improving student learning outcomes.

To determine whether the data follow a normal distribution, a normality test was conducted. The pretest and posttest scores were used to assess students' achievement. Conducting a normality test is essential to ensure that the data are normally distributed, making the findings representative and suitable for further analysis using either parametric or non-parametric tests. Table 5 presents the results of the normality test conducted using SPSS version 25.

Table 5. Normality Test Results

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.093	34	.200*	.972	34	.515
Posttest	.128	34	.176	.949	34	.113

Based on the normality test results presented in Table 5, it can be concluded that the Shapiro-Wilk test statistics indicate that the data are normally distributed. A value closer to 1 suggests a higher degree of normality. The df (degree of freedom) represents the number of respondents, which is 34 in this case. The significance value (Sig.) is used to determine the distribution, and it is compared to an alpha level (α) of 0.05. Since the significance values for the pretest and posttest are 0.515 and 0.113, respectively, which are both greater than 0.05, it

can be concluded that the data follow a normal distribution.

In addition to the normality test, a homogeneity test was conducted on the pretest and posttest scores to determine whether the data variances are equal. In this study, the Levene's Test was used with a significance level of 0.05. Table 6 presents the results of the homogeneity test using SPSS version 25.

Table 6. Homogeneity Test Results

		Levene			
		Statistic	df1	df2	Sig.
Learning Outcomes	Based on Mean	3.888	1	66	0.053
	Based on Median	3.744	1	66	0.057
	Based on Median and with adjusted df	3.744	1	54.568	0.058

Based on the results in Table 6, the obtained significance values are all greater than 0.05, indicating that there is no significant difference in variance between the pretest and posttest data. In other words, the data exhibit homogeneous variance. This result confirms that the assumption of homogeneity has been met, allowing the use of parametric statistical tests in further analysis.

To quantitatively measure the effectiveness of the learning media, a paired sample t-test was conducted. The results are presented in Table 7, using SPSS version 25.

Table 7. Paired Sample t-Test Results

Sig. (2-tailed)		
Pair 1	Pretest - Posttest	0.000

The test result shows a significance value (p) of 0.000, which is less than 0.05, indicating a statistically significant difference between pretest and posttest scores. Thus, it can be concluded that The use of the e-jobsheet was associated with a significant improvement in students' learning outcomes.

In addition, an N-Gain analysis was conducted to further determine the level of learning improvement. Table 8 presents the results of the paired N-Gain test using SPSS version 25.

Table 8. N-Gain Test Results

	N	Min	Max	Mean	STD
N_Gain	34	.45	0.82	0.6532	0.10574
Valid N	34				

The N-Gain test result shows a score of 0.6532. According to the N-Gain interpretation criteria, this value falls under the "moderate" category, indicating that the use of the developed e-jobsheet is moderately effective in improving student learning outcomes on the topic of manual clutch system overhaul. This implies that the e-jobsheet contributed significantly to enhancing students' understanding compared to their prior knowledge.

In addition, student responses to the e-jobsheet were overwhelmingly positive. The results of the student response analysis are presented in Table 9.

Table 9. Student Response Results

Table 3: Student Response Results									
Statement	Response								Total Value
	Very Good		Good		Poor		Very Poor		
	Score	Mark	Score	Mark	Score	Mark	Score	Mark	
Total	600	2400	157	471	22	44	0	0	2915
Maximum value of response questionnaire									3128
Response percentage									93%
Criteria									Very Feasible

Based on the distributed questionnaires, the average student response score was 93%, which falls under the "Very Feasible" category. Students reported that the developed media was easy to use, visually engaging, and helped them understand the clutch overhaul steps in a more structured manner.

DISCUSSION

This study is a research and development (R&D) project that produced an e-jobsheet for manual clutch system overhaul based on Flip PDF Corporate. The product was developed using the ADDIE model (Analyze, Design, Development, Implementation, Evaluation). The e-jobsheet was designed as a digital learning medium accessible via an internet-connected device through a provided link.

The structure of the e-jobsheet consists of three sections: the introductory part (learning objectives, occupational health and safety, tools and materials, and brief information), the main content (preparation, working procedures, post-practicum steps, and testing), and the final part (practicum report). The product was validated as "very feasible" by media experts (96.87%) and content experts (89.95%) based on criteria such as presentation, language, content, graphics, and usability.

The product trial was conducted with 34 students of the Light Vehicle Engineering program at SMK Negeri 3 Semarang. The average pretest score was 60.4, which increased to 86.5 in the posttest, reflecting a 43.21% improvement. The N-Gain score of 0.6532, which falls within the "moderate" category, indicates that the e-jobsheet was effective in improving student learning outcomes.

These findings are consistent with the research of Putri and Hidayati (2023), who developed an e-jobsheet for tunic pattern design in the industrial fashion subject. The study showed that students who previously had difficulty understanding the material using conventional jobsheets experienced a significant improvement in comprehension after using the e-jobsheet. This improvement was attributed to

the more engaging interface and interactive features of the digital format, which enhanced student motivation. In their study, the e-jobsheet led to a 100% classical learning mastery, confirming that digital learning media not only improve access to instructional content but also enhance motivation and engagement, particularly in vocational practicum settings.

A similar study was conducted by Hutami & Herlina (2024) in the development of an e-jobsheet for a clothing construction course. The findings demonstrated that a well-structured and visually appealing e-jobsheet significantly increased student enthusiasm in learning children's clothing patterns. The integration of elements such as text, images, and audio contributed to an improvement in students' conceptual understanding.

In addition, Larassari (2020), emphasized the effectiveness of interactive e-jobsheet development in improving student learning outcomes. The product trial showed a significant increase in pretest and posttest scores, with N-Gain analysis also indicating a "moderate" level of improvement in student learning.

Based on the findings of this study and supported by previous research, it can be concluded that the development of an e-jobsheet for manual clutch system overhaul has a positive impact on improving students' learning outcomes. Therefore, the clutch overhaul e-jobsheet is considered effective and validated for use in vocational practicum learning at vocational high schools.

The questionnaire results showed that 93% of student responses rated the e-jobsheet as very feasible, supporting an increase in learning motivation. The advantages of the e-jobsheet include reducing lecture-based instruction, engaging content, supportive visuals, easy navigation, and suitability for self-directed learning.

However, some limitations were identified, such as dependence on internet connectivity, potential eye strain from prolonged device use, reduced interest in

printed materials, and diminished direct interaction between teachers and students.

In summary, the clutch overhaul e-jobsheet is an effective and feasible instructional medium, as it has been proven to enhance students' learning outcomes in vocational practice settings.

4. CONCLUSION

Based on the research results and discussion on the development of the manual clutch system overhaul e-jobsheet, it can be concluded that this study successfully produced a digital learning medium in the form of an e-jobsheet for manual clutch system overhaul based on Flip PDF Corporate software. The product was categorized as "highly feasible" to be used as a practicum guide for both teachers and students. This feasibility is supported by expert validation results, where media experts gave a rating of 96.87%, and material experts gave 89.95%, both of which fall into the "highly feasible" category. The findings indicate that the Flip PDF Corporate-based e-jobsheet for manual clutch system overhaul is highly feasible and received very positive responses from students. The improvement from pretest to posttest, supported by the paired-samples t-test and moderate N-Gain score, suggests that the e-jobsheet can support practicum learning in vocational education. However, further studies involving a control group are recommended to provide stronger evidence of its effectiveness. Student responses to the developed e-jobsheet were also highly positive, with a 93% approval rate, placing it in the "highly feasible" category.

The following recommendations are proposed based on the findings of this study. Students are encouraged to ensure stable internet access or adequate data quotas, so that they can optimally access the e-jobsheet for both learning activities and practicum guidance in manual clutch system overhaul.

5. DECLARATION/STATEMENT

5.1. Acknowledgment

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5.2. Author Contributions

Muhammad Khilmi Mubarak was responsible for designing and conducting the research, developing the e-jobsheet media, analyzing the data, and preparing the initial manuscript. Angga Septiyanto supervised the research planning and implementation process, provided academic guidance, and reviewed the manuscript during the writing process. Lelu Dina Apristia contributed to the evaluation of the content, methodology, and academic significance of the study. Burhan Rubai Wijaya provided input on academic evaluation, research methodology, and data analysis. All authors contributed to the improvement of the manuscript and approved the final version for publication.

5.3. Conflict of Interest

The authors declare that there is no conflict of interest regarding the conduct of this research and the publication of this article.

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