



Development of Continuous Variable Transmission (CVT) E-Jobsheet on Motorcycle Chassis Maintenance for Class XII TBSM Students SMK N 11 Malang

Syarif Suhartadi, Erwin Komara Mindarta*, Yudha Rian Pratama, Taupik Yuhana,
Dwi Bayu Handayani, Muhammad Sultan Daffa Nugroho

Department of Mechanical and Industrial Engineering, State University of Malang, Malang, Indonesia

*Corresponding author. E-mail: erwin.komara.ft@um.ac.id

ABSTRACT

This study's objectives were to create a Continuous Variable Transmission (CVT) E-Jobsheet, determine its viability, assess the improvement in learning outcomes, and ascertain the reactions of the students to the CVT E-Jobsheet. Research and Development (R&D) is the research paradigm. The one group pretest-posttest design paradigm was employed in this study's pre-experimental designs. 32 students from class XI TBSM made up the research sample. Results of the trial by media experts showed that 91.67% of participants were eligible, while 91.80% of participants were material experts. Both groups came up with excellent workable criteria. The average value of the pretest and posttest increased by 27.00%. The t-test analysis produced a t count of 47,177 and a t table of 2,040 (t count > ttable), indicating that the learning outcomes differ significantly. As can be observed from the wind test average of 0.63, which falls into the "medium" category, there is a considerable and effective contribution made by the usage of Continuous Variable Transmission (CVT) E-Jobsheet. A 91% percentage of the students' responses met the very good standard.

Keywords: *E-Jobsheet, maintenance, motorcycle CVT, R&D.*

1. INTRODUCTION

The constitution of Indonesia, drafted in 1945, lists education as one of the country's objectives. Since the success and future of the country entirely depend on students' capacity to keep up with advancements in knowledge and technology, education is the most appropriate strategy for achieving this aim. The Indonesian nation must develop high-quality education that will enable it to compete with other nations in terms of attitudes, knowledge, and skills if it is to meet the difficulties of the contemporary Southeast Asian free trade era. One of the education providers is Vocational High School (SMK), which has the competence, abilities, and attitudes relevant to each of its majors. to produce graduates of vocational high schools who are competitive.

Motorcycle Engineering and Business (TBSM) is a specialty program at SMK N 11 Malang. Motorcycle Chassis Maintenance is one of the competences that are

taught to pupils. Students learn how to repair a motorcycle's CVT, or popularly known as an automatic gearbox system. Checking the V-belt, inspecting and cleaning the weight roller, cleaning the clutch and lining on the driver's face, and inspecting and cleaning the kick starter are all tasks that are performed during CVT inspection practice. The synchronization skeleton of program meeting the specification can be read from this model [1]. SMK gives students the opportunity to develop their talents through real-world experiences. Jobsheets are crucial in a practice since they show how the practice is conducted. There aren't many job seekers in the TBSM department, which is shown in the CVT examination practice at SMK N 11 Malang. Based on discussions with eye teachers.

The use of engaging learning resources can foster enthusiasm and student motivation, according to 63% of students who "strongly agreed" and 37% of students who "agreed" in a needs analysis questionnaire for 30 student

respondents at SMK N 11 Malang in the TBSM expertise program that was distributed on January 24, 2023. Learning via media that can depict actual procedures in more detail or in real life is highly engaging, according to 27% of students who "strongly agree" 60% of students who "agree" and 13% of students who "quite agree". Additionally, according to observations made during the CVT test practice exam by class XII students at TBSM for the 2022–2023 academic year, a total of 30 students, 5 of the students failed to finish the CVT examination task and were required to participate in remedial. Based on observations made of TBSM students in class XII at SMK N 11 Malang, and in accordance with Permen No. 65 of 2013 at point 13 about the use of information and communication technologies to improve the efficiency and effectiveness of learning. The author of this thesis chooses the title "Development of Continuous Variable Transmission (CVT) E-Jobsheet on Motorcycle Chassis Maintenance for Class XII TBSM Students SMK N 11 Malang" because she believes that an engaging and simple jobsheet is crucial for students' preparation practice in order to support the greatest practice value.

2. RESEARCH METHOD

The research and development method (Research and Development/R&D) is the one that is being used. Analyze, Design, Development, Implementation, and Evaluation are the five processes that make up the ADDIE development paradigm, which is used to create e-jobsheets [2]. The one group pretest-posttest design paradigm was employed in this study's pre-experimental designs. In this study, a single group was chosen, given a pretest to determine the baseline circumstances, and then given a posttest to determine any changes in the outcomes of the various treatments. The following diagram

illustrates the Pre-Experimental Designs research design using the One Group Pretest-Posttest Design paradigm:

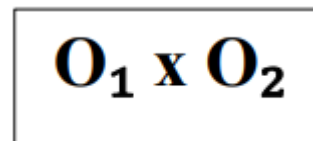


Figure 1 Research Design [3]

Information:

O₁ :Pretest the value of CVT treatment practices.

O₂ :Posttest CVT treatment practice scores.

32 pupils from SMK N 11 Malang who participated in CVT maintenance procedures on motorcycle chassis repair served as the study's test subjects. A questionnaire (questionnaire) and test instruments were employed as the data collection tools in this study. A questionnaire is a method of gathering data in which respondents are given a list of written statements or questions to respond to [4]. On the created e-jobsheet, recommendations and replies from respondents were gathered using the questionnaire instrument. The tool measures concepts such as knowledge, abilities, emotions, intelligence, or attitudes of people and groups.

3. RESULTS

The results of the evaluation, which were then assessed to establish the eligibility level of the e-jobsheet being built, were gathered from the demonstration feasibility test carried out by media experts and material experts. The table below displays the findings of media experts' and material experts' analyses of product feasibility test data on the CVT E-Jobsheet:

Table 1. Media Expert Rating Percentage.

| No | Media Expert | Total score | Total Maximum Score | Eligibility Presentation | Criteria |
|----|------------------------------|-------------|---------------------|--------------------------|---------------|
| 1 | Dr. Dani Irawan, S.Pd, M.Pd. | 85 | 96 | 88.54% | Very Worth it |
| 2 | Drs. Partono, M.Pd | 83 | 96 | 86.46% | Very Worth it |
| 3 | M. Ihwanudin, S.Pd, M.Pd | 96 | 96 | 100.00% | Very Worth it |
| | Amount | 264 | 288 | 91.67% | Very Worth it |

The evaluation of the media expert yielded an average score of 91.67% with extremely good criteria. In order to

draw the conclusion that the e-jobsheet is highly suitable for usage as a learning tool overall.

Table 2. Percentage of Material Expert Rating.

| No | Material Expert | Total score | Total Maximum Score | Eligibility Presentation | Criteria |
|----|----------------------------------|-------------|---------------------|--------------------------|---------------|
| 1 | Dr. Amat Nyoto, M.Pd | 208 | 248 | 83.87% | Very Worth it |
| 2 | Dr. H. Syamsul Hadi, M.Pd, M.Ed. | 248 | 248 | 100.00% | Very Worth it |
| 3 | Fuad Indra Kusuma, S.Pd, M.Pd | 227 | 248 | 91.53% | Very Worth it |
| | Total | 683 | 744 | 91.80% | Very Worth it |

Based on these facts, the material expert's evaluation came up with an average score of 91.80% with extremely respectable standards. In order to draw the conclusion

that the e-jobsheet is generally extremely suitable for use as a teaching tool. Jobsheet as a tool in practice that functioned as a tool for school and utilized by the learners

[5]. This e-job sheet was designed as a source of learning in the practice of making children's clothing patterns [6]. The averaged pretest and posttest findings show an improvement in learning outcomes following the usage of the Continuous Variable Transmission (CVT) E-Jobsheet. The analysis's findings indicate that the average value has risen. Between the pretest and posttest, scores on average increased by 27.00%. Figure 1 below shows the increase in the typical pretest and posttest scores:

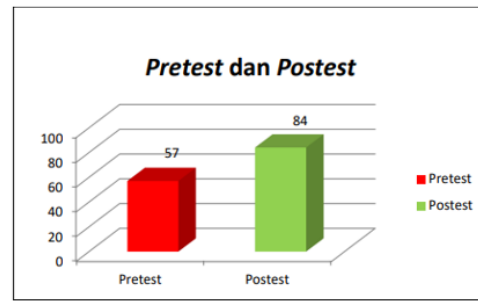


Figure 2 Graph of Average Pretest and Posttest Scores

Table 3. Results of Student Responses.

| Statement | Response | | | | | | | | Total Value |
|---------------------|-----------|------|-------|------|------------|------|-----------|------|-------------|
| | Very good | | Good | | Not enough | | Very less | | |
| | Score | Mark | Score | Mark | Score | Mark | Score | Mark | |
| Amount | 476 | 1904 | 252 | 756 | 8 | 16 | 0 | 0 | 2676 |
| Response Percentage | | | | | | | | | 91% |
| Criteria | | | | | | | | | Very good |

Students' opinions on the produced Continuous Variable Transmission (CVT) E-Jobsheet were also known, in addition to being tested for viability and recognizing the value of employing it. The findings of student replies are analyzed in table 3.

The Continuous Variable Transmission (CVT) E-Jobsheet received a percentage of 91% and was rated

"Very Good" based on the analysis of student responses. Data analysis with the t-test can be used to evaluate differences in learning outcomes across practices using traditional jobsheets and E-Jobsheet Continuous Variable Transmission (CVT) practices. The following table 4 show the outcomes of the pretest and posttest t-test:

Table 4. Pre-test and Post-test Normality Test Results.

| No | Test | χ^2_{count} | χ^2_{table} | Conclusion |
|----|-----------|------------------|------------------|-------------------------|
| 1 | Pre-test | 5.361 | 11.07 | Normal Distributed Data |
| 2 | Post test | 1921 | 11.07 | Normal Distributed Data |

The null hypothesis is accepted based on the table of normality test results pre-test and post-test, which shows that for $\alpha = 5\%$, $dk = 6 - 1 = 5$ obtained $\chi^2_{table} = 11.07$

then $\chi^2_{count} < \chi^2_{table}$, indicating that the resulting data were normally distributed in both the pre-test and post-test.

Table 5. Homogeneity Test Results.

| Sample | Fcount | Ftable | Conclusion |
|------------------------|--------|--------|------------------|
| Pre-test and Post test | 1.40 | 1.76 | Homogeneous Data |

Based on the table of pre-test and post-test homogeneity test results, it can be inferred that the samples in the pre-test and post-test have homogeneous

data because at $\alpha = 0.05$, dk numerator = 31 and dk denominator = 31 obtained $F_{table} = 1.76$ then $F_{count} < F_{table}$ ($1,400 < 1.76$).

Table 6. Paired t test results.

| tcount | ttable | Conclusion |
|--------|--------|---------------------------------------|
| 47.177 | 2040 | There is a significant skill increase |

The null hypothesis is disproved at $\alpha = 5\%$ with $dk = 32 - 1 = 31$, $t(0.975) : (32) = 2.040$ $t_{count} > t_{table}$. The

implementation of Continuous Variable Transmission (CVT) E-Jobsheets, for example, is intended to have an

impact on raising student skill levels, therefore it may be argued that there are significant changes in learning results.

Table 7. Pre-test and Post-test Normality Test Results.

| Pre-test average score | Post-test average score | Enhancement | Gain Value | Conclusion |
|------------------------|-------------------------|-------------|------------|------------------|
| 56.70 | 84.07 | 27.36 | 0.63 | Moderate Upgrade |

Gain test analysis yielded a value of 0.63 as a result. The increase in learning outcomes is classified as modest based on the gain testing criterion, with a value of 0.63.

4. DISCUSSION

21st century learning, leads to the achievement of Higher Order Thinking Skills (HOTS). These skills can be achieved with various efforts, both the application of learning models and the use of appropriate learning materials [7].

E-jobsheet, as one type of digital resources, have been moving slowly into library collection [8]. The end output of product development consists of three main sections, namely the initial section, the contents portion, and the final section, and displays an e-jobsheet in an interactive format with automatic transmission (CVT) maintenance information. Basic competency, K3, tools and materials, and brief information make up the first section. Preparation, work steps, the conclusion of practice, and testing make up the content part. Report sheets and reports make up the final section. A digital book/e-book is how the Continuous Variable Transmission (CVT) e-Jobsheet is presented. The process used by the Ministry of National Education to create the jobsheet is referred to as "e-jobsheet preparation".

According to the e-jobsheet's average level of eligibility for media experts, which is 91.67%, and for material experts, which is 91.80%, according to the feasibility evaluation of material and media experts, it is deemed to be "very feasible" according to the percentage scale table for expert judgment. According to the material expert's evaluation, the generated e-jobsheet satisfies the requirements for a valid e-jobsheet and is acceptable for use based on the criteria for evaluating the title, fundamental competences, tools and materials, work steps, as well as inspection and measurement. The generated e-jobsheet is seen from the perspectives of software, visual design, and benefits that meet the e-jobsheet criteria that are legitimate and suitable for usage, according to media experts' assessments.

The e-jobsheet's final version, which was evaluated by 32 respondents who were TBSM SMK N 11 Malang students, revealed that there was a difference between the average pretest and posttest scores: the pretest was 57 and the posttest was 84, representing an increase of 27% on average. On the basis of the n-gain test, the participants'

learning outcomes improved in the "moderate" category with an increase of 0.63. In light of these findings, it can be said that the proposed e-jobsheet is successfully applied and evaluated to enhance student learning results.

The findings of the aforementioned discussion are consistent with earlier research done by Septianingsih [4], who created interactive job sheets using computer-based applications on PC maintenance content in Class X TKJ SMK NEGERI 1 SAWIT. According to the research, interactive job sheets are extremely practicable according to material experts' opinion (88%), and very possible according to media experts' assessment (83%). Additionally, a brief user evaluation at SMK NEGERI 1 SAWIT with one automotive teacher and three class X TKJ students yielded results with an average score of 97% in the very decent category. TKJ's user trials (extended) with all of the class X pupils yielded findings that, on average, scored 83% in the "very feasible" category. These findings indicate that the interactive job sheets developed are practical for use in education. Who used interactive job sheets to increase students' skills, the outcomes of the due diligence jobsheet on average had 83.62% candidates who qualified well. The pretest-posttest results showed an average gain of 0.47, demonstrating the effectiveness of learning. Additionally, this study demonstrated the effectiveness of learning with a level of media achievement based on the student questionnaire of 83% belonging to the good category and based on the teacher questionnaire of 91% belonging to the good category. Mulyana's subsequent research in 2017 led to the creation of an interactive work sheet for engine overhaul competencies in an effort to raise the proficiency of Semarang Vocational Training Development Center (BBPLK) trainees [9]. According to the study's findings, the media expert trial's results achieved a feasibility percentage of 77.5% included in the very practicable category, while the results of the trial by material experts obtained a feasibility percentage of 81.3% included in the extremely feasible category. With n-gain calculations, improving learning outcomes yields an average gain of 0.57%, meeting the criterion for moderate improvement. Based on the study's findings, it can be said that the experimental class's use of interactive jobsheets increased significantly. In contrast to the findings of the trial by media experts, which got a feasibility percentage of 77.5% included in the extremely feasible group, 3% is included in the very feasible category. With n-gain calculations, improving learning

outcomes yields an average gain of 0.57%, meeting the criterion for moderate improvement. Based on the study's findings, it can be said that the experimental class's use of interactive jobsheets increased significantly. In contrast to the results of the media expert trial, which received a feasibility percentage of 77.5% included in the extremely feasible group, 3% is included in the very feasible category. With n-gain calculations, improving learning outcomes yields an average gain of 0.57%, meeting the criterion for moderate improvement. Based on the study's findings, it can be said that the experimental class's use of interactive jobsheets increased significantly.

A Continuous Variable Transmission (CVT) E-Jobsheet has the benefit of minimizing the usage of the lecture approach for learning prior to or during practice. The content of the e-jobsheet differs from the printed jobsheet in a way that should inspire students to learn more and achieve better learning outcomes. The information is presented in the form of images and videos of actual practices that can provide students a general idea of how to maintain the CVT on a motorcycle before they actually perform the practice. The simplicity of choosing materials from menus allows pupils to study in accordance with the demands of the practice being done. Instructors and students can easily access jobs/jobs in motorcycle CVT maintenance practices thanks to the e-jobsheet since, upon clicking the needed job, the steps and procedures are immediately presented. Unlike print media, where one must turn the pages to find the desired information. This obviously makes it simpler for teachers and students to access the jobs required in practice. In addition, adopting e-jobsheets has the benefit of allowing students to use them as independent learning resources at home.

The e-jobsheet makes it simple for instructors and students to access jobs/jobs in motorcycle CVT maintenance practices because, when clicking the required job, the steps and procedures are immediately presented. As opposed to print media, where the necessary information must be found by turning the pages. It is clear that this makes it easier for educators and students to attain the positions needed in the real world. Learning is generally classical in nature, which runs according to the completion time of the school year period [10]. The worksheet is a learning medium that can be adjusted according to each student's level of learning speed [11]. Adopting e-jobsheets also has the advantage of enabling students to use them as independent study tools at home. Classroom teachers will be both liberated and challenged as they abandon pre-packaged workbooks or purchased curricula in favor of creative activities [12].

In-class worksheets and discussion were effective at providing feedback and improving student

performance at the end of an course [13]. In an understanding of teaching that students are responsible for their own learning; it is important for the teachers to not to leave the students alone but to provide instructional environments that will give students the chance to test their experiences so that they can create their own knowledge and the guidance materials that they can use in these environments. In this direction, teachers need guidance materials prepared by researchers or experts [14]. The worksheets helped to easily cover the course material while students recorded all key information [15].

5. CONCLUSIONS AND SUGGESTIONS

Based on the findings of the study and conversation that were covered in the preceding chapter, it can be said that:

The created Continuous Variable Transmission (CVT) E-Jobsheet satisfies the "very feasible" usage requirements. 91.80% for the average percentage of material expert exam results and 91.67% for the average percentage of media expert test results are the results that can be shown. According to the research, using CVT E-Jobsheets improved learning outcomes, as evidenced by the average pretest result of 57 and the average posttest result of 84, both of which showed an average increase of 27%. After students begin learning with Continuous Variable Transmission (CVT) E-Jobsheet on the competency of maintaining motorcycle automatic transmissions, there is an effective contribution to its use that is significant, as can be seen from the n-gain test's average of 0.63, which is included in the "moderate" category.

Following the completion of the research, the following recommendations should be made:

It was determined to be valid after assessing the reliability of the material expert and the CVT E-Jobsheet media, and the results showed a difference between the pretest and posttest values. The e-jobsheet is thus recommended as a learning resource for the subject's tutor in motorcycle engine maintenance. According to the growth of these skills, the Continuous Variable Transmission (CVT) E-Jobsheet on the competency of maintaining motorcycle automatic transmissions in this study can be further enhanced. Students must be able to use this electronic task sheet on their own so they may learn about and practice maintaining a motorbike CVT.

REFERENCES

- [1] EM Clarke, EA Emerson, Design and synthesis of synchronization frameworks using branching time temporal logic, in: D. Kozen (Eds.), Workshop on Logics of Programs, Lecture Notes in Computer Science, vol. 131, Springer, Berlin, Heidelberg,

- 1981, pp. 52–71. DOI: <https://doi.org/10.1007/BFb0025774>
- [2] Putra, KWB et al. Development of e-modules based on discovery learning learning models in the subject "computer systems" for class x multimedia students at SMK Negeri 3 Singaraja. *education journal*, 2017.
- [3] Sugiyono, *Metode Penelitian Pendidikan: Pendekatan Kuantitatif, Kualitatif, dan R&D*, Alfabeta, Bandung, 2015.
- [4] S. Dwi. Development of interactive job sheets using computer-based applications on PC maintenance material in Class X TKJ SMK Negeri 1 Sawit. *Informatics and computer engineering education study program*. Surakarta, 2016.
- [5] E.K.Mindarta, W. Irdianto, F.I.Kusuma, A.B.N.R. Putra, M. Ihwanudin, The effectiveness of using e-jobsheet in teaching machine control system practice, *Journal of Educational Innovation*, 5(2), December 2018, pp 65-69.
- [6] M.P.Ningsih, C. Ruhidayati, The analysis of needs for e-job sheet development on children's attire based on tutorial model, *Proceedings of the 5th upi international conference on technical and vocational education and training (ICTVET 2018)*, DOI: [10.2991/ictvet-18.2019.88](https://doi.org/10.2991/ictvet-18.2019.88)
- [7] S. Y. Sari, M. N. Sari, Y. Darvina, R. Afrizon, Validity of guided inquiry-based student worksheets in mechanical waves and thermodynamics, *Journal of Physics: Conference Series* 2582, 2023, 5th International Conference on Research and Learning of Physics (ICRLP 2022), DOI:10.1088/1742-6596/2582/1/012044
- [8] Heting Chu, *Electronic book: viewpoints from users and potential users*, *Library Hi Tech* vol. 21 (3), 2003, pp 340-346. DOI: 10.1108/7378830310494526
- [9] Mulyana, Khoerul, Development of overhaul engine competency interactive job sheets to improve competence of training participants at the Semarang Vocational Training Development Center (BBPLK), Thesis, Automotive engineering education study program Semarang, *JIPTEK*, 13 (2) 2020 DOI: <https://dx.doi.org/10.20961/jiptek.v13i2.21888> 104
- [10] H. Setiawati, A. Setiawati, N. Ismirawati, A. Syam, Nurhasanah, Development of student worksheets (LKDP) based on critical thinking skills environmental change and waste recycling materials, *Journal of Education and Instruction*, Vol. 13, No. 4, 2023, pp. 1-12, DOI: 10.47750/pegegog.13.04.01
- [11] D. Sulisworo, I. Safitri, Online student-worksheets based on toulmin argumentation pattern in physics learning, *Journal of Physics: Conference Series*, 2394, 2022. DOI: 10.1088/1742-6596/2394/1/012033
- [12] M. Ransom, M. Manning, Teaching Strategies: Worksheets, worksheets, worksheets, *Journal of Childhood Education*, Vol. 89 Issue 3, 2013. <https://doi.org/10.1080/00094056.2013.792707>
- [13] K.M. Steele, S. R. Brunhaver, S. D. Sheppard, Feedback from in-class worksheets and discussion improves performance on the statics concept inventory, *International Journal of Engineering Education* Vol. 30, No. 4, 2014, pp. 992–999.
- [14] C. İnan, S. Erkuş, The effect of mathematical worksheets based on multiple intelligences theory on the academic achievement of the students in the 4th grade primary school, *Universal Journal of Educational Research* 5(8), 2017, pp. 1372-1377. DOI: 10.13189/ujer.2017.050810
- [15] G. Gyanwali, In-class worksheet for student engagement and success, *journal of chemical education*, ACS Symposium Series Vol. 1280. DOI: 10.1021/bk-2018-1280.ch007

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

