

The Effect of Preventive Maintenance Excavator Videos on Mastery and Practical Skills in Heavy Equipment

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ABSTRACT

This study investigates the impact of using instructional videos on improving students' knowledge and practical skills in daily inspection and preventive maintenance of heavy equipment. The research aims to: (1) examine the increase in students' knowledge of the daily inspection program, (2) analyze the improvement of practical skills in executing the preventive maintenance program, and (3) compare the differences in knowledge mastery and practical skills between students using instructional videos and those who do not. A quasi-experimental design was employed, involving eleventh-grade students from a heavy equipment engineering program. Data were collected using a questionnaire administered to both control and experimental groups. The results show that the control group had an average pretest score of 62.67 and a post-test score of 73.50, while the experimental group improved from 63.00 to 84.17. The experimental group showed a greater score increase (21.17) compared to the control group (10.83). Hypothesis testing revealed a significant improvement in the experimental group, with a t-value exceeding the t-table value at a 5% significance level ($9.050 > 1.69726$) and a p-value of less than 0.05 ($0.000 < 0.05$). The findings confirm that instructional videos significantly enhance students' mastery of the daily inspection program and their practical skills in preventive maintenance.

Keywords: Daily inspection, Heavy equipment, Instructional video, Practical skills.

INTRODUCTION

The education system in Indonesia is fundamentally designed to prepare the younger generation to meet future challenges and contribute positively to society, the nation, and the state. As stipulated in the National Education System Law No. 20 of 2003, education is a conscious and planned effort aimed at fostering an environment conducive to active learning and personal potential development. Despite these efforts, there are significant challenges within the educational framework, particularly in vocational schools (SMK), where students often struggle to master essential skills needed for the job market.

Government initiatives, such as Presidential Instruction No. 9 of 2016 and Presidential Regulation No. 68 of 2022, demonstrate a commitment to enhancing vocational education quality. However, there remains a notable gap in the effective absorption of vocational school graduates into the workforce, with recent data from Badan Pusat Statistik (BPS) indicating that SMK graduates account for 8,380 unemployed individuals, or 58.88% of total unemployment in 2023.

Research reveals that students in vocational schools still exhibit low mastery of critical skills such as preventive maintenance, with observations from SMK Negeri 3 Tanjung Selor showing inadequate student engagement and motivation. Many students rely on traditional, lecture-based teaching methods that fail to promote an interactive learning atmosphere, leading to a lack of understanding of complex topics. Effective use of educational media, particularly instructional videos, is crucial in enhancing student engagement and comprehension of intricate concepts like preventive maintenance. According to Santosa and Wulandari (2020), video-based learning significantly improves students' understanding and practical skills in vocational education.

This study aims to investigate the impact of using instructional videos on students' mastery of daily inspection

programs and practical skills in vocational education, specifically within the Heavy Equipment Engineering program. By addressing the gaps in current teaching methods and leveraging innovative tools, this research seeks to contribute to the improvement of vocational education quality in Indonesia, equipping students with the necessary competencies to thrive in the workforce.

RESEARCH METHODS

The study employed a quasi-experimental design with a Nonequivalent Control Group Design to evaluate the effectiveness of video-based learning media on students' understanding and practical skills related to preventive maintenance for excavators. Conducted at *SMK Negeri 3 Tanjung Selor*, this research involved two classes, with the experimental group of 30 students utilizing video media in their learning process, while the control group of another 30 students engaged in traditional teaching methods, such as lectures and PowerPoint presentations.

The primary aim of the research was to determine whether the use of video learning media could significantly enhance students' comprehension of daily inspection programs and their practical skills in maintenance techniques. Data was collected through pre-test and post-test, measuring the changes in students' knowledge and practical abilities before and after the implementation of the respective teaching methods.

The findings revealed that the students who were exposed to video-based learning exhibited a marked improvement in both understanding and practical competencies compared to their peers in the control group. This significant enhancement can be attributed to the engaging and interactive nature of video media, which provides clear visualizations of complex concepts and procedures, making it easier for students to grasp essential information.

Despite the inherent limitations of quasi-experimental designs, such as the lack of randomization and potential confounding variables, the study effectively demonstrates the positive impact of video as an instructional tool in a real classroom environment. The results suggest that incorporating video media into technical education not only fosters better comprehension but also encourages active participation among students, ultimately leading to improved learning outcomes. Therefore, this study highlights the importance of integrating innovative teaching methods, like video learning, to enrich students' educational experiences in vocational training settings.

RESEARCH RESULTS AND DISCUSSIONS

After presenting the results of the pretest and post-test evaluations of the control class, the next section will discuss the results of the descriptive tests assisted by SPSS version 25.00, as shown in the following results:

Table 1. Descriptive Test Results for the Control Class

Statistics	Pretest Control	Post Test Control
N	Valid	30
Missing	0	0
Mean	62.67	73.50
Median	65.00	75.00
Mode	65a	75

Based on Table above, using SPSS version 25.00 for the data before the treatment (pretest) in the control class, there are 30 valid samples, with a mean pretest score of 62.67 and a mean posttest score of 73.50 for the control class.

The data in this research pertains to experimental research. The data consists of initial tests and final tests concerning the material that has been delivered using Video Learning for Preventive Maintenance of Excavators.

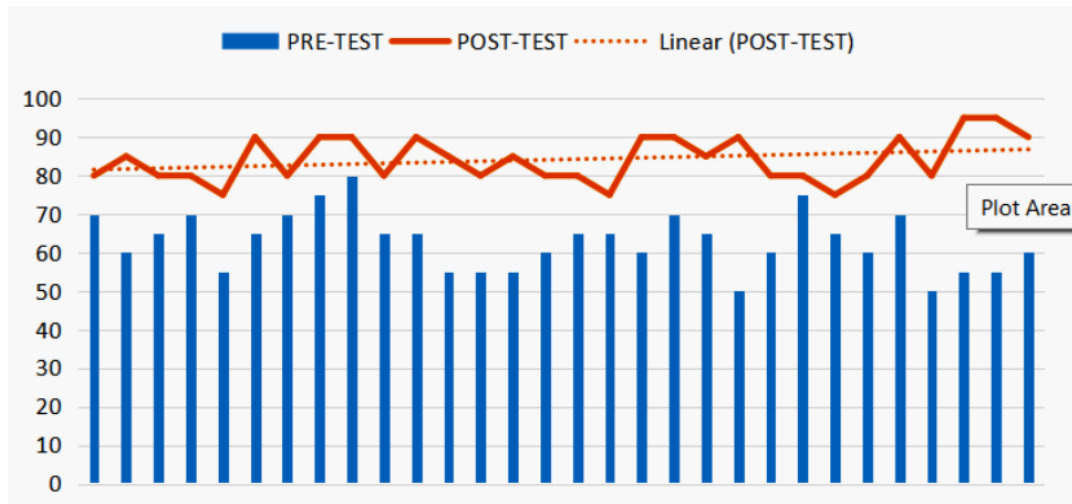
Below is the presentation of the pretest and posttest scores for the experimental class:

Table 2. Average Scores for the Experimental Class

No	Student Name	Pre-Test	Post-Test
1	Andi Syawal	70	80
2	Arun Junfiansyah	60	85
3	Fatur Karim Hamsah	65	80
4	Giverson Jayandri Tonapa	70	80
5	Hamzan Rifai	55	75
6	Indra Argi Nugraha	65	90
7	Irfan Nopem	70	80
8	Jendry Markus	75	90
9	Kosminski Mangu	80	90
10	M.Khairil Jamil	65	80
11	Mahruf Alfarizi	65	90
12	Maulana	55	85
13	Melsandi Rafel	55	80
14	Muhamad Risdi	55	85
15	Muhammad Arman	60	80
16	Muhammad Ghofi	65	80
17	Muhammad Haikal	65	75
18	Muhammad Rizki	60	90
19	Nehemia Rakinaung	70	90
20	Putrasius Rejang	65	85
21	Rafael Vepianus	50	90
22	Ramadhan Wira	60	80
23	Rasta Farian	75	80
24	Ridwan A	65	75
25	Ridwan	60	80
26	Roby	70	90
27	Ronal Din Ho	50	80
28	Sainuddin	55	95
29	Yusuf Rinus	55	95
30	Joel Piter	60	90

Based on Table 2, the Average Scores for the Experimental Class are displayed in the form of a histogram (bar chart) as shown in the figure:

Figure 1. Experimental Class Graph



After the presentation of the pretest and posttest scores for the experimental class above, the results of the descriptive test, assisted by SPSS 25.00, will be presented as follows:

Table 3. Descriptive Test Results for the Experimental Class

Statistics	Pretest Experiment	Post Test Experiment
N	Valid	30
Missing	0	0
Mean	63.00	84.17
Median	65.00	82.50
Mode	65	80

Based on Table above, using SPSS version 25.00 for the data before treatment (pretest) in the experimental class, there are 30 valid samples, with a mean pretest score of 63.00 and a mean post test score of 84.17 for the experimental class. Results of Normality Tests for the Control Class.

Normality testing is conducted to determine whether all variables are normally distributed or not. The normality test uses the Kolmogorov Smirnov formula with calculations using SPSS version 25.00. To determine normality, if the significance level (sig) is greater than 0.05, it is considered normal, while if the significance level is less than 0.05, it is considered not normal. The results obtained from the normality test of the control class are as follows:

Table 4. Normality Test Results for the Control Class

Unstandardized Residual	
N	30
Normal Parametersa, b	Mean
	Std. Deviation
Most Extreme Differences	Absolute
	Positive

	Negative
Test Statistic	0.118
Asymp. Sig. (2-tailed)	.200c, d

Based on the table above, it can be seen that the pretest and posttest data for the control class has a significance value of 0.200, which is greater than 0.05, leading to the conclusion that this group of data is normally distributed.

Normality testing is conducted to determine whether all variables are normally distributed or not. The normality test uses the Kolmogorov-Smirnov formula with calculations using SPSS version 25.00. To determine normality, if the significance level (sig) is greater than 0.05, it is considered normal, while if the significance level is less than 0.05, it is considered not normal. The results obtained from the normality test of the experimental class are as follows:

Table 5. Normality Test Results for the Experimental Class

One-Sample Kolmogorov-Smirnov Test	
N	30
Normal Parameters ^{a, b}	Mean
	Std. Deviation
Most Extreme Differences	Absolute
	Positive
	Negative
Test Statistic	0.251
Asymp. Sig. (2-tailed)	.200c

Based on the table above, it can be seen that the pretest and posttest data for the control class has a significance value of 0.200, which is greater than 0.05, leading to the conclusion that this group of data is normally distributed.

After determining the normality of the data, the next step is to conduct a homogeneity test. The homogeneity test is used to determine the level of equality of variances to accept or reject the hypothesis by comparing the significance value of Levene’s statistic with 0.05 (significance > 0.05). The results of the homogeneity test can be seen in the table below.

CONCLUSIONS

The findings of this research demonstrate that the use of video learning significantly enhances both the mastery of the daily inspection program and the practical skills of students in the Preventive Maintenance program for excavators at SMK Negeri 3 Tanjung Selor. The study confirms the hypothesis that video-based learning is more effective than conventional methods in improving students' knowledge and skills. Students who engaged with video materials displayed a clearer understanding of theoretical concepts and improved their practical abilities more consistently. This highlights the effectiveness of video as a learning medium, allowing students to visualize critical maintenance procedures, which facilitated a deeper comprehension of daily inspections.

In terms of the research objectives, this study successfully identifies the positive impacts of video learning on students' cognitive and psychomotor development. The results illustrate a significant difference in students' knowledge and practical competencies before and after the implementation of video-based learning. The research not only contributes to understanding the role of technology in vocational education but also underscores the necessity for educational institutions to adopt more interactive and practical teaching methods.

Looking ahead, several future experiments could expand on these findings. Subsequent research could explore

a broader array of video materials, covering various types of heavy equipment beyond excavators, to enhance the learning experience. Additionally, incorporating interactive learning technologies such as augmented reality (AR) or virtual reality (VR) could provide students with immersive simulations of preventive maintenance procedures, further boosting engagement and comprehension. Comparative studies with other teaching methods, such as interactive modules or computer simulations, may yield insights into the most effective strategies for fostering both theoretical knowledge and practical skills. Longitudinal studies are also recommended to assess the sustained impact of video learning over time, providing a comprehensive understanding of its effectiveness in vocational education. By pursuing these avenues, educators can better equip students with the necessary skills for success in the workforce.

BIBLIOGRAPHY

1. Fauzi Fahmi, Nirwana Anas, Rahmi Wardah Ningsih, Rabiatal Khairiah, & Winarsih Hendi Permana. (2021). Pemanfaatan Media Pembelajaran Sederhana Sebagai Sumber Belajar. *Decode: Jurnal Pendidikan Technology Informasi*, 1(2), 57–63. <https://doi.org/10.51454/decode.v1i2.17>
2. Harling, V. N. Van. (2021). Pengaruh Penggunaan Video Pembelajaran terhadap Kemampuan Berpikir Siswa pada Mata Pelajaran Kimia. *Edukatif: Jurnal Ilmu Pendidikan*, 3(5), 3332–3338.
3. Kustandi, & Darmawan. (2020). Pengembangan Media Pembelajaran: Konsep & Aplikasi Pengembangan Media Pembelajaran bagi Pendidik di Sekolah dan Masyarakat. Prenada Media.
4. Kusum, & Akbar. (2023). Dimensi Media Pembelajaran (Teori dan Penerapan Media Pembelajaran Pada Era Revolusi Industri 4.0 Menuju Era Society 5.0). PT. Sonpedia Publishing Indonesia.
5. Kusyairi, A. (2024). Implementasi media pembelajaran terhadap keberhasilan prestasi belajar siswa di MTs Al-Hikmah Jembrana. 10(2), 110–131.
6. Magdalena, I., Fatakhatu Shodikoh, A., Pebrianti, A. R., Jannah, A. W., Susilawati, I., & Tangerang, U. M. (2021). Pentingnya Media Pembelajaran Untuk Meningkatkan Minat Belajar Siswa SDN Meruya Selatan 06 Pagi. *EDISI: Jurnal Edukasi Dan Sains*, 3(2), 312–325.
7. Nurfadhilah, S., Fadhilatul Barokah, S., Nur'alfiah, S., Umayyah, N., Yanti, A. A., & Tangerang, U. M. (2021). Pengembangan Media Audio Visual Pada Pembelajaran Matematika Di Kelas 1 MI Al Hikmah 1 Sepatan. *PENSA: Jurnal Pendidikan Dan Ilmu Sosial*, 3(1), 149–165.
8. Pradana, I., & Tacoh, Y. (2021). Pengaruh Penggunaan Video Pembelajaran Melalui Microsoft Teams Terhadap Hasil Belajar Pengolahan Audio Video. *Jurnal Education and Institute Pendidikan Tapanuli Selatan*, 9(4), 65–74.
9. Puspasari, R. (2019). Pengembangan Buku Ajar Kompilasi Teori Graf dengan Model Addie. *Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang*, 3(1), 137. <https://doi.org/10.31331/medivesveteran.v3i1.702>
10. Ramdani, & Sulastini. (2019). Pengaruh Media Video (Teman Sebaya) Terhadap Keterampilan Pemasangan Elektrokardiogram. *Jurnal Keperawatan 'Aisyiyah*, 5(2), 41–49.
11. Sari, P. (2019). Analisis terhadap kerucut pengalaman Edgar Dale dan keragaman dalam memilih media yang tepat dalam pembelajaran. *Jurnal Manajemen Pendidikan*, 1(1), 42–57.
12. Sitinjak, F. R., & Silalahi, F. T. R. (2023). Analisis Strategi Pemeliharaan Preventive Maintenance Excavator Menggunakan Pendekatan Analytical Hierarchy Process (AHP) dan Analisis Sensitivitas. *Journal of Integrated System*, 6(2), 226–242.
13. Suhardiman, S. (2022). Meta Analisis Pengaruh Media Simulasi E-Learning PhET terhadap Hasil Belajar dalam Pembelajaran Fisika. *Jurnal Pendidikan Mipa*, 12(3), 779–791. <https://doi.org/10.37630/jpm.v12i3.652>
14. Suminar, D. Y. (2022). Penerapan Video Interaktif Alur Merdeka Untuk Meningkatkan Kemampuan Bernalar Kritis Di SMAN 10 Pontianak. *Jurnal Pembelajaran Prospektif*, 7(1), 32–39.
15. Surata, I. K., Sudiana, I. M., & Sudirgayasa, I. G. (2020). Meta-Analisis Media Pembelajaran Pada Pembelajaran Biology. *Journal of Education Technology*, 4(1), 22. <https://doi.org/10.23887/jet.v4i1.24079>
16. Susanti, S., Nurdin, H., Nabawi, A., & Mesin, J. T. (2021). Pengaruh Media Pembelajaran Video Tutorial Terhadap Hasil Belajar Siswa Pada Mata Pelajaran Gambar Teknik Mesin Di SMK Negeri 5 Padang. *The Influence of Video Tutorial Learning Media on Student Learning Outcomes in Mechanical Engineering Drawing Subjects At SMK Negeri 5 Padang*, 3(3), 38–44.