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Research Article

THE EFFECT OF VIDEO TUTORIAL MEDIA ON STUDENTS' PRACTICAL UNDERSTANDING OF TUNE-UP PROCEDURES FOR THE 2010 TOYOTA AVANZA ENGINE

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Abstract
As a vocational automotive teacher from SMK Muhammadiyah Larangan, the authors often find chapter trials of Grade XI students (TKR) they have had trouble memorizing the correct sequence of stages tuning motors for eg 2010 Toyota Avanza EFI engine, especially in determining the function TPS, MAP and IACV. A single live example from the teacher is often not enough: students might miss some crucial part of it while taking notes, or be too shy to ask questions when they don't understand something. To address this problem, the researcher used a classroom action research with 12 minute video instructional media using smartphone creations and Avanza engine 2010 in school. Sixty Grade XI TKR students were selected for this study, divided into an Experimental Group (video learning method) and a Control Group (traditional demonstration method). The results showed: Mean of Experimental group: 85.0, average of the control group : 67.3. A total of 83.3% of the experimental group received marks for the category of Excellent, while the control group received 0%. The result of the independent t-test showed that there is a significant difference between the means of the two groups, since t(58) = 8.21 The aforementioned findings prove the effect of the use of cheap instructional videos prepared by lecturers to address the issue of resource equality for better access to independent learning for the students, which lies squarely within the principle of autonomy of the students under the Merdeka Curriculum of Indonesia.

Keywords: video tutorial, tune-up, EFI engine, vocational education, multimedia learning, automotive learning outcomes

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INTRODUCTION

In the past ten years, automotive technology has advanced quickly, changing the skills needed for vocational high school graduates, especially those studying Automotive Engineering (Caterino et al., 2025). Modern cars like the 2010 Toyota Avanza have complex electronic systems, fuel injection controls, and sensor-based features that require a deeper understanding of how to diagnose and maintain them (Liang et al., 2024). Because of this, traditional teaching methods that are often used in many Indonesian vocational schools-like giving lectures and showing a demonstration once are not enough to help students gain the skills needed in today's workshop (Rana & Khatri, 2024). These old methods don't give students enough visual support, a clear order for doing tasks, or the chance to practice according to their own needs (Ali et al., 2024). So, there's a big need for new teaching tools that help vocational students meet industry standards and handle the complicated systems in today's cars.

The writer found that when students were instructed on how to remove an idle air control valve (IACV), approximately 70 percent of the students improperly used the wrench (some turned the tube fixture in the opposite direction and some disconnected the wiring harness prior to removing the bolts). Despite two demonstrations of IACV removal, students continued to make the same mistake (Omarov & Kulambayev, 2024). After the second demonstration, 68 percent of students said they forgot quickly what they had seen because they did not have time to go back to it and 22 percent said they were afraid to ask questions, for fear it would interfere with the progress of the demonstration. The average practical test scores before the intervention were 62.5 with a strong mode, meaning a majority of students scored below average. Only five students (8.3%) achieved scores greater than or equal to eighty, while eighteen students (thirty percent of students) scored less than sixty-five on the practical test (Chinnasamy et al., 2025). These results suggest that, in general, a single experience of live demonstrations will not develop a student's complete understanding of the entire process - especially when there are a combination of mechanical elements (such as adjusting valve clearances) as well as electronic elements (verifying sensor signals).

Educational resources highlight that vocational students often learn best through visual and hands-on methods (Amaira & Zarai, 2025). These learners gain the most from materials that show real actions, clear examples, and step-by-step processes that they can watch over and over again. Research on multimedia learning, like Mayer's work from 2005, says that combining clear visuals with spoken explanations helps form better mental models, makes ideas easier to understand, and improves memory of skills (Hou et al., 2025). Traditional teaching methods don't meet these needs because once a teacher shows a process, students can't review it again (Gligorić et al., 2024). This makes it harder for students to remember all the steps, leading to confusion. Because of this, using technology especially video tutorials has become an important solution to help students connect theory with real-world application.

Video tutorials are seen as one of the best tools for teaching vocational skills because they show detailed, consistent, and repeatable procedures (Zhou et al., 2025). In automotive training, these videos let students watch real processes like cleaning the mass airflow sensor, removing the idle air control valve, checking fuel pressure, and verifying ignition timing in a clear, high-quality format (Charpentier et al., 2025). Unlike live lessons, where the instructor sets the pace, videos let students stop, replay, or review key parts as much as they need (Arregi et al., 2025). This helps them build a better mental picture and feel more confident when practicing. Studies show that using video instruction improves both the accuracy of the work and the understanding of the concepts in automotive classes (Nan et al., 2025). However, even though video tutorials are effective, there is not much research on using them specifically for the 1NR-FE engine in vocational schools in Indonesia.

The current study focuses on filling a gap by closely looking at how video tutorials affect students' understanding of tune-up procedures for the Toyota Avanza 2010 (Gardner et al., 2025). A 12-minute instructional video was created specifically for this study, designed to match the real-world conditions and tools found at SMK Muhammadiyah Larangan (Ullah et al., 2025). It uses local diagnostic tools, hand tools, and actual engine parts that students are familiar with. The goal is to not only check how well students learn but also to see if using video-based learning can work in schools with few resources (He et al., 2025). This study supports the Merdeka Curriculum's focus on new ideas, student independence, and teaching materials that fit local needs. It also adds to discussions in education by showing how low-cost digital tools can improve skill-based learning, even in areas with little infrastructure.

Overall, this research aims to show that video tutorials can be a useful, easy-to-use, and effective way to help vocational automotive students master tune-up skills (Sáenz et al., 2024). The study includes detailed analyses like comparing results, tracking how involved students were, and gathering in-depth feedback. These findings are meant to help teachers, school leaders, and education planners understand the benefits of using multimedia tools in teaching (Pataro et al., 2025). In the long run, the results should help create better teaching methods that prepare students for today's automotive industry and help schools with limited resources start using technology in their classrooms.

RESEARCH METHOD

Research Design

This study used a quasi-experimental approach called the Posttest-Only Control Group Design to check how well video tutorials help students learn. This method was picked because the students were already in fixed groups, so it wasn't possible to randomly assign them to different groups. There were two groups: one group watched a 12-minute video tutorial, while the other group learned through regular lectures and demonstrations. Both groups had the same learning goals and the same amount of time to learn. At the end, they all took the same test to see how much they had learned. This way, the researcher could see if the video tutorial made a real difference in their test scores.

Research Target/Subject

The research included 60 students from Grade XI in the Light Vehicle Engineering program at SMK Muhammadiyah Larangan during the 2024/2025 school year. These students were from two classes that were carefully chosen because they were easy to access and relevant to the tune-up skills being studied. The students were split into two groups: one group of 30 students used video tutorials as part of their learning, while the other group of 30 students learned through traditional lectures and demonstrations. These students were selected because they were already involved in learning about automotive engine maintenance, making them a good choice for testing how effective video-based teaching is in improving understanding and performance in tune-up lessons.

Research Procedure

The research process had four main steps done carefully to make sure the experiment was accurate. In the first step, the researcher made a video tutorial, created lesson plans for both groups, checked the 25-question test to make sure it was good, and made sure all needed tools were ready. In the second step, the group that was being tested watched a 12-minute video to learn, while the other group learned through regular lessons and showing examples. After learning, both groups took the same 25-question test under supervision, which was the main way to collect data. Later, the test scores were looked at using simple stats, checked to see if they followed a normal pattern and if they were the same between groups, and then a special test called an Independent-Samples t-test was used along with a calculation to see how much the video helped with learning.

Instruments, and Data Collection Techniques

The main tool used in this study was a 25-question multiple-choice test meant to check how well students understood the steps and ideas behind fixing the 2010 Toyota Avanza EFI engine. Experts in automotive education checked the test to make sure it was accurate, and it had a reliability score of 0.86, which shows it is very consistent. The test was given after the teaching sessions, and both the group that had the new teaching method and the group that had the usual method took the same test under supervision. This test was the main way to collect numbers to compare how well each teaching method worked. All the answers were collected right away, graded by hand, and then analyzed using both basic and more complex statistical methods.

Data Analysis Technique

The results from the posttest were studied using both simple and advanced statistical methods. First, we looked at the basic information, like the average scores, how much the scores varied, the lowest and highest scores, and how the scores were spread out in each group. Before checking if there were any differences between the groups, we made sure the data met certain conditions. We used the Shapiro–Wilk test to see if the data followed a normal pattern and Levene's Test to check if the groups had similar variation. Once these conditions were satisfied, we used an Independent-Samples t-test to compare the posttest scores between the experimental group and the control group. This helped us see if the video tutorial made a meaningful difference in how well the students learned. We also calculated Cohen's d to find out how big the effect of the video tutorial was in real-world terms.

RESULTS AND DISCUSSION

As an educator frequently witnessing students mix up the TPS and MAP sensors' diagnostic sequence, the posttest was deliberately created to evaluate not only factual memory but also procedural accuracy, as mistakes in sequence during actual workshops can lead to ECU malfunctions. Thus, the items were derived from real instances in our school workshop, such as, 'After changing the air filter, the engine runs unevenly what should be the initial action? the posttest was made to show not just how well people did overall, but also how their performance varied and stayed consistent things that show if they're building strong knowledge and getting better at skills. Table 1 compares the experimental group and the control group in a detailed way, showing average scores, how spread out the scores were, the highest and lowest scores, and the most common score levels. These numbers show how well the teaching method worked and how well it helped close the gap between students with different abilities. This is especially important in classrooms where students have different levels of skill. Also, since the Merdeka Curriculum focuses on personalized learning and student independence, these results help see if the teaching method supports all students in reaching the same level of understanding.

Table 1. Comparison of Posttest Scores

Group	N	Mean Score	SD	Min	Max	Dominant Category
Experimental	30	85.0	8.2	70	100	Excellent (83.3%)
Control	30	67.3	9.1	50	80	Fair (50%)

Table 1 shows a big difference between the two groups. The experimental group had a much higher average score of 85.0 compared to the control group's 67.3. The experimental group also had higher lowest and highest scores, which means they understood the tune-up procedures better and more consistently. The fact that most of the experimental group fell into the “Excellent” category shows that using video tutorials really helped improve students’ learning. On the other hand, the control group mostly stayed in the “Fair” category. Notably, while the experimental group demonstrated a broader range of scores (70–100), none of the students scored below 70 indicating that the video enabled all learners to exceed the minimum competency level (70 = ‘Good’, necessary for industry apprenticeship). In comparison, the control group still had students achieving a score of 50, showing they are unable to conduct simple tune-ups without direct oversight

While average scores can give a general idea, they might hide important details about how well students really understand the material-especially in vocational areas where meeting a certain level of skill (like getting a minimum "Good" to be ready for a workshop) is essential. That’s why Table 2 provides a detailed breakdown of performance categories based on the school’s standards: Excellent (80–100), Good (70–79), Fair (60–69), and Poor (below 60).

Table 2. Score Distribution by Category

Category	Score Range	Experimental (%)	Control (%)
Excellent	80–100	**83.3%**	0%
Good	70–79	10%	30%
Fair	60–69	6.7%	50%
Poor	<60	0%	20%

The results in Table 2 show a big difference between the two groups. Most of the experimental group, which is 83.3%, were rated as “Excellent.” None of the control group students reached this level. On the other hand, half of the control group were rated as “Fair,” and 20% were in the “Poor” category. This shows that using video tutorials helped students understand and perform better than traditional teaching methods.

Figure 1 shows a clustered bar chart that illustrates the distribution of categorical scores for both groups in addition to the tabular presentation in Table 2. This graphic illustrates how video-based instruction fosters uniform mastery, which is particularly important in vocational education where procedural consistency and safety depend on dependable skill acquisition. It highlights the disparity in learning outcomes, not only in terms of central tendency but also in the spread and concentration of performance levels.

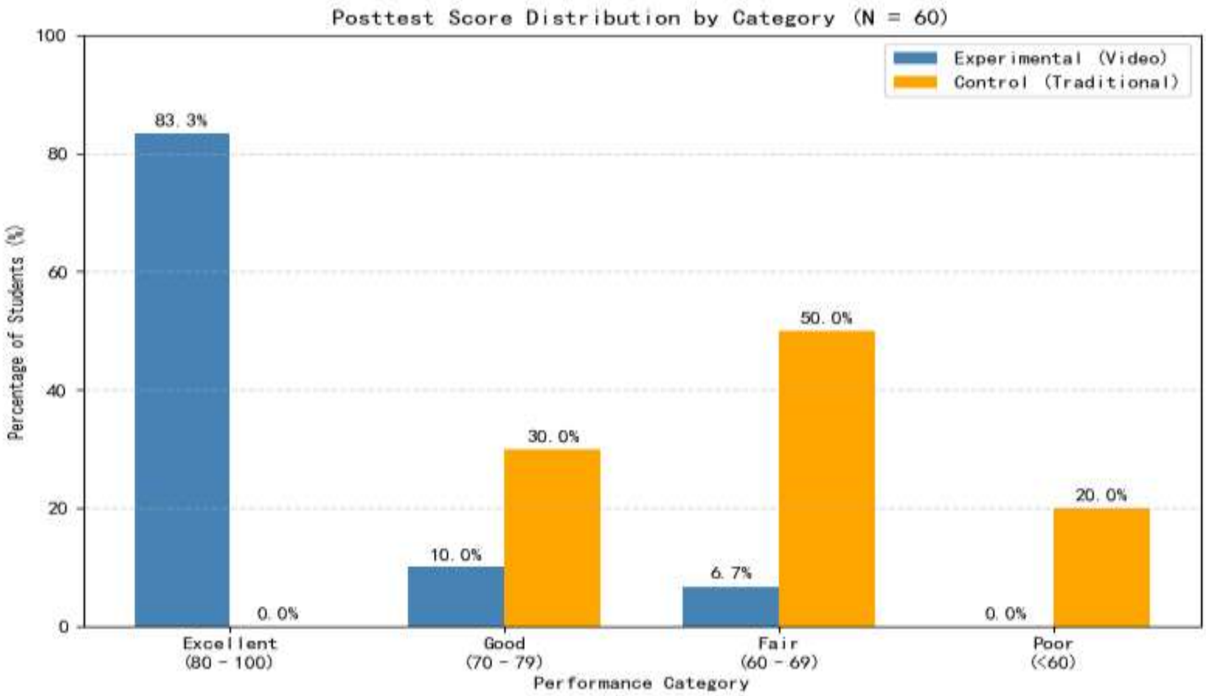

Figure 1. displays a clustered bar chart visualizing the categorical score distribution across both groups.

Figure 1, which shows that the Experimental group is mostly concentrated in the Excellent category (83.3%)The quantitative results in Table 2 are supported by Figure 1, which shows that the Experimental group is mostly concentrated in the Excellent category (83.3%), with very little representation in the Good (10%) and Fair (6.7%) categories and no students in the Poor category. In sharp contrast, there are no Excellent performers in the Control group, and 70% of them score at or below Fair, with 20% falling into the Poor category. This graphic highlights a crucial educational realization: although some students can achieve good performance with traditional training, it is unable to raise kids to high proficiency levels or stop low achievement. In line with the Merdeka Curriculum's objectives to promote equitable, student-centered learning, video tutorials help more students cross the threshold into functional and expert-level competency by offering repeated, timed, and multimodal input. As illustrated in Figure 1, the prevalence of 'Excellent' in the video category was intentional. While observing, students repeatedly reviewed the idle speed adjustment part some even discussed: 'At 8.2 seconds, why is the idle screw turned 1.5 turns instead of 2?' This type of peer evaluation exemplifies the critical thinking promoted by the Merdeka Curriculum: students don't merely watch videos—they question the methods

CONCLUSION

This study shows that using video tutorials helps students learn better when they are being taught how to service the 2010 Toyota Avanza EFI engine. Students who watched the video tutorials did much better on their tests and performed more consistently than those who were taught using traditional methods like lectures and demonstrations. The way the test scores were spread out also shows that using videos makes it easier for students to understand the ideas and do the steps correctly. These results match what is known about how people learn through multimedia. It seems that using videos helps students understand better, remember more, and create clearer mental pictures of how things work. So, video tutorials can be a great way to teach vocational automotive skills, especially when the job requires knowing detailed mechanical steps.

AUTHOR CONTRIBUTIONS

Author 1: Conceptualization, Methodology, Investigation, Data Curation, Writing-Original Draft.

Author 2: Supervision, Validation, Writing-Review & Editing.

Author 3: Supervision, Validation, Project Administration.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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