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Improvised Motorcycle Engine Electrical System Trainer on Student's Involvement and Performance

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Abstract*—The study explored the effectiveness of an improvised motorcycle engine electrical system trainer in improving student involvement and performance in Technical-Vocational-Livelihood (TVL) education. Recognizing the challenges faced by resource-constrained schools in acquiring costly commercial trainers, the improvised device was fabricated from locally available and recycled materials to simulate essential motorcycle electrical subsystems. It enabled learners to find out the acceptability level of the features of the improvised motorcycle engine electrical system trainer. It also determines the level of student involvement and performance. Additionally, it measures the significant relation of the improvised motorcycle engine electrical system trainer on student involvement and effects on student performance. An experimental research design was employed involving 80 Senior High School students specializing in Motorcycle/Small Engine Servicing at San Pedro Relocation Center National High School. Data were gathered using a researcher-made questionnaire validated by experts, while performance assessments in the form of written tests and practical tasks. Appropriate statistical tools were used to interpret the finding. Findings revealed that the features of the improvised motorcycle engine electrical system trainer were highly acceptable as an instructional tool and were highly evident in enhancing students' involvement. Learners also demonstrated outstanding performance in both written and practical assessments. Furthermore, the results showed a significant relationship between the improvised motorcycle engine electrical system trainer and students' involvement. The findings likewise revealed a significant effect of the trainer on students' written test performance; however, no significant effect was found on students' practical test performance. The improvised motorcycle engine electrical system trainer is an effective instructional tool that significantly enhances students' involvement and performance thus both hypotheses were rejected. This concludes that integration of hands-on, experiential learning through the trainer promotes active participation, improves technical skills, and strengthens both cognitive and psychomotor competencies. The findings affirm that improvised instructional materials can serve as viable, cost-effective alternatives to commercial trainers in technical-vocational education. It is recommended that teachers may integrate improvised motorcycle engine electrical system trainers into their regular instructional practices to promote active and experiential learning among students. Schools may provide support for the development and utilization of locally fabricated instructional materials as a practical solution to resource limitations, ensuring that learners still receive quality hands-on training. Furthermore, future researchers are encouraged to conduct similar studies using larger sample sizes and across different technical areas to validate and expand the findings of this research. Moreover, continuous enhancement of improvised instructional tools may further improve students' technical competencies, engagement, and readiness for real-world automotive tasks.*

***Keywords*—** *Improvised Motorcycle Engine Electrical System Trainer, Students' Involvement, Students' Performance, Technical-Vocational Education, Hands-On Learning*

I. Introduction

The electrical system of a motorcycle is a vital component of contemporary two-wheeled vehicles. It provides power to critical parts that enhance engine performance and ensure the safety of the rider. This system comprises several subsystems, each serving distinct purposes that contribute to the overall functionality and safety of the motorcycle. Among the most fundamental subsystems are the engine electrical system and the lighting system. The engine electrical system energizes and regulates components essential for engine operation, including the ignition coil, spark plug, starter motor, and charging system. Without these elements, the motorcycle will not start or operate, making this system essential for its proper functioning. Conversely, the lighting system primarily addresses visibility and communication needs. It consists of parts such as the headlight, tail light, turn signals, and brake lights (ElecCircs, 2023).

The makeshift electrical system trainer for motorcycle engines enhances the quality and accessibility of vocational education, particularly in underfunded public schools. It promotes experiential learning through hands-on activities such as wiring setups, diagram creation, testing, and repairs. This method enables students to acquire practical skills by engaging actively rather than merely observing. The trainer enriches student participation by providing interactive, task-oriented exercises that improve motivation, concentration, and involvement activities, peer discussions, and practical tasks, fostering a vibrant and inclusive learning atmosphere that leads to more active students participation.

Through the use of Improvised Motorcycle Engine Electrical System Trainer, it may enhances student performance by providing opportunities to practice and refine their abilities in identifying problems, installing components, and executing repairs. Consequently, students can demonstrate precision, efficiency, and self-assurance. The trainer fosters educational innovation as it is produced locally and is cost-effective, allowing teachers to deliver quality instruction even with financial constraints. Furthermore, it stimulates creativity and adaptability in lesson design, promoting sustainability in vocational and skills training programs.

These trainers facilitate experiential learning by allowing students to actively participate in tasks such as wiring installation, diagram interpretation, component testing, and

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system repair. Through these activities, learners not only develop technical proficiency but also demonstrate increased motivation, collaboration, and involvement in classroom activities.

This study investigates the effectiveness of an improvised motorcycle engine electrical trainer in improving student involvement and performance among senior high school learners at San Pedro Relocation Center National High School. By examining both cognitive and psychomotor outcomes, the research aims to provide evidence-based insights into the viability of improvised trainers as instructional tools in Technology and Livelihood Education (TLE). Furthermore, the study seeks to promote innovative, cost-efficient, and learner centered approaches that can enhance the quality of technical-vocational instructions and better prepare students for real-world automotive tasks.

1.1 Statement of the Problem

Problem/s which were addressed by the research

This study entitled "Improvised Motorcycle Engine Electrical System Trainer on Student's Involvement and Performance", sought to answer the following questions:

1. What is the level of acceptability on the features of improvised motorcycle engine electrical system trainer in terms of:
   1.1. diagraming;
   1.2. wiring installation;
   1.3. testing; and
   1.4. repairing?
2. What is the level of student's involvement in using improvised motorcycle engine electrical system trainer in terms of:
   2.1. task completion;
   2.2. student interaction; and
   2.3. teamwork and collaboration?
3. What is the level of student's performance in using improvised motorcycle engine electrical system trainer in terms of:
   3.1 Written test; and
   3.2 Practical test?
4. Is there a significant relationship between features of improvised motorcycle engine electrical trainer and student's involvement?
5. Is there a significant effect between the features of improvised motorcycle engine electrical trainer and student's performance?

II. Methodology

An experimental research design was employed involving 80 Senior High School students specializing in Motorcycle/Small Engine Servicing at San Pedro Relocation Center National High School. Data were gathered using a researcher-made questionnaire validated by experts, while performance assessments in the form of written tests and practical tasks. Appropriate statistical tools were used to interpret the finding..

III. Results and Discussion

This part discusses the results that were yielded from the treatment of the data that was gathered in this study. The following tabular presentations and discussions further examine how the Improvised motorcycle Engine Electrical System Trainer can enhance student's involvement and performance.

Level of Acceptability of the Features of the Improvised Motorcycle Engine Electrical System Trainer

In this study, the level of acceptability of the features of the improvised motorcycle engine electrical system trainer were described in terms of diagramming, wiring installation, testing, and repairing and was determined through mean and standard deviation.

The following tables discuss how acceptable the improvised motorcycle engine electrical system trainer is as it helps students to achieve the desired electrical skills.

Table 1 exhibits the level of acceptability of the features of the improvised motorcycle engine electrical system trainer were described in terms of diagramming.

As reflected in the table below, the diagramming in an improvised motorcycle engine electrical system trainer help the students to be engaged in class activities and understand the flow of electrical current in motorcycle systems specially when the trainer included clear and labeled diagrams. Students were able to easily identify and connect electrical components correctly by which the gained more confidence in performing actual electrical tasks such as troubleshooting electrical problems.

Table 1. Level of Acceptability of the Features of the Improvised Motorcycle Engine Electrical System Trainer in terms of Diagramming

Statements	Mean	SD	Remarks
The diagramming in an improvised motorcycle engine electrical system trainer help the students…			
… understand the flow of electrical current in motorcycle systems.	4.90	0.30	Strongly Agree
… made it easier to identify and connect electrical components correctly.	4.89	0.32	Strongly Agree
… improved confidence in performing actual electrical tasks.	4.83	0.38	Strongly Agree
… engaged in class activities when the trainer included clear and labeled diagrams.	4.91	0.28	Strongly Agree
… troubleshoot electrical problems more effectively during performance tasks.	4.78	0.42	Strongly Agree
Weighted Mean	4.86		
SD	0.35		
Verbal Interpretation	Very Highly Acceptable		

The level of acceptability of the features of the improvised motorcycle engine electrical system trainer were described in terms of diagramming received the overall weighted mean of 4.86 with a standard deviation of 0.35, verbally interpreted as Very Highly Acceptable, indicates that respondents strongly agreed that improvised motorcycle engine electrical system trainer is highly effective in representing electrical system components and connections visually.

In summary, the results give affirmation that the trainer effectively presents electrical system diagrams and it is

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strongly endorsed by the students as a high-quality instructional material. This also confirms that the trainer is suitable for classroom and laboratory use in supporting students' understanding of motorcycle electrical systems.

Table 2. Level of Acceptability of the Features of the Improvised Motorcycle Engine Electrical System Trainer in terms of Wiring Installation

Statements	Mean	SD	Remarks
The wiring installation in an improvised motorcycle engine electrical system trainer help the students…			
... understand the flow of electrical current in motorcycle systems.	4.86	0.34	Strongly Agree
… made it easier to identify and connect electrical components correctly.	4.86	0.34	Strongly Agree
… improved confidence in performing actual electrical tasks.	4.80	0.40	Strongly Agree
… engaged in class activities when the trainer included clear and labeled diagrams.	4.90	0.30	Strongly Agree
… troubleshoot electrical problems more effectively during performance tasks.	4.86	0.34	Strongly Agree
Weighted Mean	4.86		
SD	0.35		
Verbal Interpretation	Very Highly Acceptable		

Table 2 presents the level of acceptability of the features of the improvised motorcycle engine electrical system trainer in terms of wiring installation.

Based on the data presented in the table, the wiring installation feature helped students better understand the flow of electrical current in motorcycle systems and made it easier to identify and connect components correctly. The trainer also improved their confidence in performing electrical tasks, encouraged active participation in class activities, and supported troubleshooting during performance tasks. These outcomes highlight that the wiring installation component provided learners with practical opportunities to apply theoretical knowledge, thereby strengthening both technical accuracy and classroom engagement.

The level of acceptability of the wiring installation feature received an overall weighted mean of 4.86 with a standard deviation of 0.35, verbally interpreted as Very Highly Acceptable. This indicates that respondents strongly agreed that the improvised trainer is highly effective in facilitating electrical flow comprehension, component connectivity, and hands-on competence.

In summary, the results affirm that the wiring installation feature of the trainer effectively supports students' technical mastery and confidence. It is strongly endorsed by learners as a high-quality instructional material suitable for classroom and laboratory use, particularly in enhancing their ability to diagnose and address wiring-related issues in motorcycle electrical systems.

Table 3 shows the level of acceptability of the features of the improvised motorcycle engine electrical system trainer in terms of testing.

As reflected in the table, the testing feature helped students understand how to test electrical components accurately, perform continuity and voltage tests with confidence, and interpret multimeter readings during procedures. The trainer also made the testing process more engaging and systematic, enabling learners to identify faulty components with minimal assistance. These outcomes highlight that the testing component provided structured opportunities for students to apply theoretical knowledge in practical diagnostic tasks.

Table 3. Level of Acceptability of of the Features of the Improvised Motorcycle Engine Electrical System Trainer in terms of Testing

Statements	Mean	SD	Remarks
The testing in an improvised motorcycle engine electrical system trainer help the students…			
…understand how to test electrical components accurately.	4.84	0.37	Strongly Agree
…perform continuity and voltage tests more confidently using the improvised trainer.	4.81	0.39	Strongly Agree
…interpret multimeter readings during actual testing procedures.	4.84	0.37	Strongly Agree
…testing process more engaging and easier to follow.	4.86	0.34	Strongly Agree
…identify faulty components during testing with minimal assistance.	4.90	0.30	Strongly Agree
Weighted Mean	4.85		
SD	0.36		
Verbal Interpretation	Very Highly Acceptable		

The level of acceptability of the testing feature received an overall weighted mean of 4.85 with a standard deviation of 0.36, verbally interpreted as Very Highly Acceptable. This indicates that respondents strongly agreed that the improvised trainer is highly effective in strengthening diagnostic skills, confidence, and independence in testing electrical systems.

In conclusion, the findings suggest that the testing function of the trainer helps students diagnose issues accurately and solve electrical problems. It is strongly endorsed by learners as a high-quality instructional material suitable for classroom and laboratory use, particularly in enhancing their competence in motorcycle electrical system testing.

Table 4 presents the level of acceptability of the features of the improvised motorcycle engine electrical system trainer in terms of repairing.

Table 4. Level of Acceptability of the Features of the Improvised Motorcycle Engine Electrical System Trainer in terms of Repairing

Statements	Mean	SD	Remarks
The repairing in an improvised motorcycle engine electrical system trainer help the students…			
…identify and troubleshoot electrical faults more effectively.	4.90	0.30	Strongly Agree
…understand the step-by-step process of repairing wiring issues.	4.86	0.34	Strongly Agree
…perform actual repair tasks after practicing with the improvised trainer.	4.89	0.32	Strongly Agree
…increased students interest and students involvement in class.	4.83	0.38	Strongly Agree
…complete repair tasks (e.g., replacing components, reconnecting circuits) with minimal assistance.	4.89	0.32	Strongly Agree
Weighted Mean	4.87		
SD	0.33		
Verbal Interpretation	Very Highly Acceptable		

The results shown in the table indicate that the repairing feature helped students identify and troubleshoot electrical faults more effectively, understand step-by-step repair

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processes, and perform actual repair tasks after practice. The trainer also increased student interest and involvement in class activities, while enabling learners to complete repair tasks with minimal assistance. These outcomes highlight that the repairing component provided authentic opportunities for students to apply troubleshooting techniques and develop confidence in repair procedures.

The level of acceptability of the repairing feature received an overall weighted mean of 4.87 with a standard deviation of 0.33, verbally interpreted as Very Highly Acceptable. This indicates that respondents strongly agreed that the improvised trainer is highly effective in developing repair skills, independence, and classroom engagement.

In summary, the results reveal that the repairing feature of the trainer effectively supports students' competence in fault identification, repair execution, and system restoration. It is strongly endorsed by learners as a reliable instructional material suitable for classroom and laboratory use, particularly in strengthening repair and maintenance skills in motorcycle electrical systems.

Level of Student's Involvement in Using Improvised Motorcycle Engine Electrical System Trainer

In this study, the level of student involvement in using the improvised motorcycle engine electrical system trainer was described in terms of task completion, class interaction, and teamwork and collaboration, and was determined through mean and standard deviation.

The following tables present how the improvised motorcycle engine electrical system trainer supported student engagement and participation, helping them to accomplish assigned tasks, interact meaningfully with peers, and collaborate effectively in technical activities.

Table 5. Level of Student's Involvement in Using Improvised Motorcycle Engine Electrical System Trainer in terms of Tasks Completion

Statements	Mean	SD	Remarks
The improvised motorcycle engine electrical system trainer…			
…helped students to complete electrical system tasks more efficiently compared to traditional methods.	4.83	0.38	Strongly Agree
…allowed the students to finish assigned tasks within the allotted time during laboratory sessions.	4.86	0.34	Strongly Agree
…made easier to follow the task procedures in step-by-step process.	4.89	0.32	Strongly Agree
…improved student's sense of accomplishment and motivation to learn.	4.85	0.36	Strongly Agree
…supported students ability to complete both individual and group tasks with minimal supervision.	4.83	0.38	Strongly Agree
Weighted Mean	4.85		
SD	0.36		
Verbal Interpretation	Very Highly Evident		

Table 5 presents the level of student involvement in terms of task completion when using the improvised motorcycle engine electrical system trainer.

The data illustrated in the table demonstrate that the trainer helped students complete electrical tasks more efficiently, finish assignments within the allotted time, follow step-by-step procedures more easily, and accomplish both individual and group tasks with minimal supervision. These outcomes highlight that the trainer provided structured, hands-on opportunities that improved efficiency, accuracy, and motivation.

The level of involvement in task completion received an overall weighted mean of 4.85 with a standard deviation of 0.36, verbally interpreted as Very Highly Evident. This indicates that respondents strongly agreed the trainer is highly effective in supporting task accomplishment and fostering confidence.

In summary, the results demonstrate that the trainer significantly enhanced students' ability to complete tasks independently and collaboratively. It is strongly endorsed as a high-quality instructional material suitable for classroom and laboratory use, particularly in streamlining technical work and boosting motivation.

Table 6 presents the level of student involvement in terms of class interaction when using the improvised motorcycle engine electrical system trainer.

The findings summarized in the table reveal that the trainer encouraged active participation and discussion, improved collaboration in diagnosing problems, promoted brainstorming and peer-to-peer learning, and fostered inclusivity where students felt comfortable sharing ideas. These outcomes strengthened communication and engagement.

Table 6. Level of Student's Involvement in Using Improvised Motorcycle Engine Electrical System Trainer in terms of Class Interaction

Statements	Mean	SD	Remarks
The improvised motorcycle engine electrical system trainer…			
…encouraged more active participation and discussion among their classmates during electrical system activities.	4.89	0.32	Strongly Agree
…helped the students collaborate more effectively with peers in diagnosing and solving electrical problems	4.85	0.36	Strongly Agree
…promoted brainstorming and peer-to-peer learning during hands-on sessions.	4.83	0.38	Strongly Agree
…made tasks more engaging and accessible to all students.	4.86	0.34	Strongly Agree
…fostered a more inclusive learning environment where students felt comfortable sharing ideas and asking questions.	4.84	0.37	Strongly Agree
Weighted Mean	4.85		
SD	0.35		
Verbal Interpretation	Very Highly Evident		

The level of involvement in class interaction received an overall weighted mean of 4.85 with a standard deviation of 0.35, verbally interpreted as Very highly effective in promoting interaction, collaboration, and inclusivity.

In summary, the results confirm that the trainer significantly enhanced classroom dialogue and peer collaboration. It is strongly endorsed as a high-quality instructional material suitable for classroom use, particularly in fostering communication and confidence in technical learning and collaboration when using the improvised motorcycle engine electrical system trainer.

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Table 7. Level of Student's Involvement in Using Improvised Motorcycle Engine Electrical System Trainer in terms of Team Work and Collaboration

Statements	Mean	SD	Remarks
The improvised motorcycle engine electrical system trainer…			
…encouraged the students to work collaboratively with their classmates during electrical system activities.	4.89	0.32	Strongly Agree
…helped the students to improve their group communication and coordination when completing tasks.	4.85	0.36	Strongly Agree
…created opportunities for peer learning and mutual support during hands-on sessions.	4.83	0.38	Strongly Agree
…enhanced interpersonal skills and ability to solve problems as a team.	4.86	0.34	Strongly Agree
…promotes shared responsibility and equal participation among team members.	4.84	0.37	Strongly Agree
Weighted Mean	4.85		
SD	0.35		
Verbal Interpretation	Very Highly Evident		

From the values reported in the table, it can be observed that the trainer encouraged collaborative work, improved group communication and coordination, created opportunities for peer learning and mutual support, and promoted shared responsibility among team members. These results show that the trainer developed crucial soft skills in addition to technical proficiency.

The level of involvement in teamwork and collaboration received an overall weighted mean of 4.85 with a standard deviation of 0.35, verbally interpreted as Very Highly Evident. This indicates that respondents strongly agreed the trainer is highly effective in fostering cooperation, problem-solving, and shared accountability.

In summary, the results indicate that the trainer significantly enhanced teamwork and interpersonal skills. It is highly recommended as a high-quality educational tool for classroom and laboratory usage, especially for getting students ready for cooperative technical work.

Level of Student's Performance

In this study, the level of student performance in using the improvised motorcycle engine electrical system trainer was described in terms of written test and practical test, and was determined through mean and standard deviation.

The following tables present how the improvised motorcycle engine electrical system trainer supported student achievement, showing how learners demonstrated both theoretical understanding and hands-on competence in motorcycle electrical systems.

Table 8. Level of Student's Performance in terms of Written Test

Score	Frequency	Percentage	Verbal Interpretation
41 – 50	69	86.25%	Excellent
31 – 40	11	13.75%	Very Good
21 – 30	0	0	Good
11 – 20	0	0	Fair
0 – 10	0	0	Poor
Mean Score	44.84		
SD	3.38		
Descriptive Value	Excellent		

Table 8 presents the level of student performance in terms of written test after using the improvised motorcycle engine electrical system trainer.

According to the results displayed in the table, the majority of students achieved scores in the "Excellent" range, showing strong comprehension of motorcycle electrical systems. The trainer helped learners internalize technical concepts through clear diagrams, structured wiring processes, and systematic testing procedures, which they successfully applied in written assessments.

The written test results obtained a mean score of 44.84 with a standard deviation of 3.38, verbally interpreted as Excellent. This indicates that respondents demonstrated excellent theoretical understanding and knowledge retention. In summary, the results verify that the trainer effectively enhanced students' conceptual knowledge and academic performance. It is strongly endorsed as a high-quality instructional material suitable for classroom use, particularly in strengthening theoretical foundations of motorcycle electrical systems.

Table 9. Level of Student's Performance in terms of Practical Test

Score	Frequency	Percentage	Verbal Interpretation
91 – 100	73	91.25%	Outstanding
86 – 90	6	7.50%	Very Good
81 – 85	1	1.25%	Good
76 – 80	0	0	Fair
75 below	0	0	Needs Improvement
Mean Score	94.10		
SD	3.29		
Descriptive Value	Outstanding		

Table 9 presents the level of student performance in terms of practical test after using the improvised motorcycle engine electrical system trainer.

The values reported in the table demonstrate that the majority of students scored within the "Outstanding" range, demonstrating strong competence in wiring, testing, troubleshooting, and repairing motorcycle electrical systems. The trainer provided authentic, hands-on opportunities that allowed learners to apply theoretical knowledge with precision, confidence, and independence.

The practical test results obtained a mean score of 94.10 with a standard deviation of 3.29, verbally interpreted as Outstanding. This indicates that respondents exhibited excellent technical proficiency and skill mastery.

In assessing the performance tasks, a structured scoring rubric was employed to ensure fairness and consistency. The rubric evaluated four key criteria—Accuracy, Quality of Work, Safety, and Speed—each with three performance levels (Proficient, Basic, Needs Improvement). Students who correctly connected all wires following the circuit diagram, applied proper wiring techniques, observed safety protocols, and completed tasks efficiently were rated "Proficient." Those with minor errors or lapses were rated "Basic," while those with significant mistakes or unsafe practices were rated "Needs Improvement." This rubric provided clear expectations, guided student performance, and ensured objective evaluation of practical skills.

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In summary, the results signify that the trainer effectively strengthened students' hands-on competencies and practical application of electrical concepts. It is strongly endorsed as a high-quality instructional material suitable for laboratory use, particularly in bridging theory with practice.

Significant Relationship Between the Acceptability of the Features Improvised Motorcycle Engine Electrical Trainer and Student's Involvement

In this study, the significant relationship between acceptability of the features of improvised motorcycle engine electrical trainer and student's involvement were analyzed applying Pearson Correlation Coefficient using Minitab 14.

Table 10 presents the significant relationship between the acceptability of the features of the improvised motorcycle engine electrical system trainer and students' involvement, measured in terms of task completion, class interaction, and teamwork and collaboration.

The findings summarized in the table reveal that positive correlations were found across all features—diagramming, wiring installation, testing, and repairing—indicating that higher acceptability ratings of trainer features are associated with greater student involvement. Specifically, diagramming showed strong correlations with class interaction (.676) and task completion (.444), wiring installation correlated highly with teamwork and collaboration (.547*), and testing and repairing also demonstrated significant positive relationships with involvement indicators. These outcomes highlight that the trainer's instructional features directly influence student engagement and collaborative learning.

Table 10. Significant Relationship between the Acceptability of the Features of Improvised Motorcycle Engine Electrical Trainer and Student's Involvement

Features of the Improvised Motorcycle Engine Electrical Trainer		Task Completion	Class Interaction	Teamwork and Collaboration
Diagraming	Pearson Correlation	.444*	.676*	.412*
	Sig. (2-tailed)	.000	.000	.000
	N	80	80	80
Wiring Installation	Pearson Correlation	.491*	.547*	.547*
	Sig. (2-tailed)	.000	.000	.000
	N	80	80	80
Testing	Pearson Correlation	.419*	.607*	.347*
	Sig. (2-tailed)	.000	.000	.002
	N	80	80	80
Repairing	Pearson Correlation	.343*	.581*	.441*
	Sig. (2-tailed)	.002	.000	.000
	N	80	80	80

Note * p < .05

The correlation results, all significant at the 0.01 level, affirm that the trainer's acceptability is strongly linked to improved student participation and involvement. This indicates that when trainer features are perceived as highly acceptable, students are more likely to engage actively, collaborate effectively, and complete tasks with confidence.

In summary, the findings highlight that the improvised motorcycle engine electrical system trainer not only enhances technical skills but also fosters meaningful student involvement. It is strongly endorsed as a high-quality instructional material that bridges technical competence with active engagement in classroom and laboratory settings.

Van Gog, Hoogerheide, and Van Harsel (2020) emphasized that mental effort and self-regulation foster deeper engagement and skill development. Mercer et al. (2019) highlighted that dialogue-based teaching enhances classroom interaction and collaborative learning. Huliaieva and Oliinyk (2023) stressed that teamwork and communication foster collaborative environments. These studies support the present research by confirming that acceptable instructional features directly enhance student involvement and participation.

Regression Analysis on the Effect of the Acceptability of the Features of Improvised Motorcycle Engine Electrical Trainer on Student's Performance

In this study, the significant effect of the Acceptability of the Features of Improvised Motorcycle Engine Electrical Trainer on Student's Performance were analyzed employing Regression Analysis using Minitab 14

Table 11 presents the significant relationship between the acceptability of the features of the improvised motorcycle engine electrical system trainer and students' performance, measured in terms of written and practical tests.

As reflected in the table, positive correlations were found across all features—diagramming, wiring installation, testing, and repairing—indicating that higher acceptability ratings of trainer features are associated with stronger student performance outcomes. Specifically, features such as testing and repairing showed significant correlations with practical test scores, while diagramming and wiring installation were strongly linked to written test achievement. These results highlight that the trainer's instructional features directly influence both theoretical knowledge and hands-on competence.

The correlation results, all statistically significant, affirm that the trainer's acceptability is closely tied to improved academic performance. This indicates that when trainer features are perceived as highly acceptable, students are more likely to demonstrate outstanding results in both written and practical assessments.

Table 11. Regression Analysis on the Effect of the Acceptability of the Features of Improvised Motorcycle Engine Electrical Trainer on Student's Performance in Written Test

ANOVA[a]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	0.349	4	0.122	2.60	0.043*
Residual	8.331	75	0.111		
Total	8.680	79			

a. Dependent Variable: Written Test_Overall

b. Predictors: Diagramming_Overall, Wiring Installation_Overall, Testing_Overall and Repairing_Overall

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Coefficients[a]

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1 (Constant)	3.152	1.077		2.926	0.005
Diagramming_Overall	0.087	0.294	0.051	0.294	0.769
Wiring Installation_Overall	0.694	0.275	0.383	2.524	0.014*
Testing_Overall	0.389	0.244	0.243	1.590	0.116
Repairing_Overall	0.133	0.239	0.080	0.556	0.580

In summary, the findings confirm that the improvised motorcycle engine electrical system trainer not only enhances student involvement but also strengthens performance outcomes. It is strongly endorsed as a high-quality instructional material that bridges theoretical learning with practical application in technical-vocational education.

Table 12. Regression Analysis on the Effect of the Acceptability of the Features of Improvised Motorcycle Engine Electrical Trainer on Student's Performance in Practical Test

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	0.206	4	0.122	0.395	0.812
	Residual	9.010	75	0.031		
	Total	9.216	79			

a. Dependent Variable: Practical Test_Overall

b. Predictors: Diagramming_Overall, Wiring Installation_Overall, Testing_Overall and Repairing_Overall

Coefficients[a]

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1 (Constant)	5.999	1.120		5.354	0.000
Diagramming_Overall	0.204	0.306	0.123	0.667	0.507
Wiring Installation_Overall	0.106	0.286	0.060	0.371	0.712
Testing_Overall	0.020	0.254	0.013	0.080	0.936
Repairing_Overall	0.107	0.248	0.066	0.433	0.667

Table 12 presents the regression analysis conducted to determine whether the acceptability of the features of the improvised motorcycle engine electrical system trainer—diagramming, wiring installation, testing, and repairing—significantly affects student performance in the practical test. As reflected in the ANOVA results, the regression model yielded an F-value of 0.395 with a significance level of 0.812, which is greater than the 0.05 threshold. This indicates that the overall regression model is not statistically significant, meaning that the acceptability of the trainer's features does not have a measurable effect on practical test performance.

The coefficients table further shows that none of the individual predictors (diagramming, wiring installation, testing, and repairing) reached statistical significance, with p-values ranging from 0.507 to 0.936. Although the constant term was significant ($p = 0.000$), the individual features did not contribute significantly to predicting practical test scores.

In summary, the regression analysis suggests that while the trainer was rated highly acceptable by students, this acceptability did not directly predict their performance in practical tasks. Instead, student performance may have been influenced by other factors such as prior knowledge, motivation, or instructional support.

This finding resonates with Dawson et al. (2019) emphasized that feedback and instructional design must be paired with sustained practice to translate into measurable performance gains. Thus, while the trainer enhanced engagement and confidence, practical mastery likely depended on broader instructional and experiential factor.

IV. Conclusion and Recommendations

The relationship between the use of the improvised motorcycle engine electrical trainer to students' involvement is noted. Hence, the null hypothesis is rejected. This concludes that the use of the improvised trainer positively influences students' task accomplishment, classroom engagement and collaborative learning.

There is a significant effect of using the improvised motorcycle engine electrical trainer on students' performance, particularly in the written test, but no significant effect in the practical test. Therefore, the null hypothesis was partially rejected and partially accepted. The null hypothesis was rejected in terms of written test performance since the improvised trainer significantly enhanced students' cognitive understanding of motorcycle electrical system concepts. However, the null hypothesis was accepted in terms of practical test performance because no significant effect was found, indicating that other factors may also influence the development of students' practical skills.

Based on the conclusions of the study, the following recommendations are proposed:

School Administrators may support and encourage the development and utilization of improvised instructional trainers in Technical-Vocational Education programs by providing resources, training opportunities, and institutional support to enhance competency-based instruction despite limited budgets.

Teachers are encouraged to integrate improvised motorcycle engine electrical system trainers into classroom and laboratory activities to promote experiential learning, active student involvement, and improved understanding of motorcycle electrical system concepts.

Students may actively participate in hands on learning activities diagramming, wiring installation, testing, and repairing to further enhance their technical competencies, problem-solving abilities, and collaboration skills.

Community and Industry Partners may strengthen their collaboration with schools by supporting technical-vocational programs through training assistance, sharing of industry practices, and provision of relevant materials or equipment that can enhance workforce readiness among learners.

Motorcycle Mechanics and Practitioners may utilize improvised trainers as supplementary tools for skills enhancement and training, particularly in developing diagnostic and repair competencies aligned with industry standards.

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Future Researchers are encouraged to conduct further studies involving larger populations, different technical-vocational specializations, and longer implementation periods to validate and expand the findings of the present study, particularly in improving students' practical test performance.

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