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Building a Functional Mock-up of a Motorcycle Electrical System: Assessment and Evaluation of the Interplay of Lighting, Starting, Ignition and Charging Systems

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Abstract

Aim: The study on the improvised mock-up motorcycle Electrical system aims to empower students and institution with valuable insights into the optimization of practical learning tools, ultimately benefiting the next generation of automotive engineers and technicians.

Methodology: The descriptive-evaluative design was employed in the study. In order to achieve the objectives of the study, which included assessing the functional and reliable aspects of the Functional Improvised Mock-up Motorcycle Electrical System and figuring out the degree of use and user satisfaction with the Improvised Mock-up Motorcycle Electrical System, this design made use of survey questionnaires that were given to the participants. To help determine a project's improvement needs, numerical values ranging from 1 to 5 were assigned. The matching classes in the table that followed represented the assessors' descriptive assessment of the project. The respondents' responses were explained, examined, and reported by the researchers themselves. The innovative design, material selection and identification, assemblage production, and testing procedure were all part of the experimental research method used in this work.

Results: With a mean score of 4.67 for functionality, 4.61 for instructional applicability, 4.69 for aesthetic value, 4.69 for durability, and 4.70 for safety, the evaluation's findings showed that all five domains were praised for their excellence. According to the evaluation results, the trainer that was created was the most appropriate educational resource to guarantee that lessons—especially the fundamental ideas of the motorbike system—were delivered effectively and efficiently.

Conclusion: The motorcycle electrical system trainer that was created successfully met important educational needs, offering a useful instrument for improving hands-on learning and preparing students for prosperous jobs in the rapidly changing automotive sector. This revolutionary training tool's ability to fill skill gaps in vocational education through new and useful solutions was proven by its successful development and evaluation. The thorough research design and the favorable comments from knowledgeable assessors offered a solid basis for the future application and broader acceptance of comparable strategies in technical training programs.

Keywords: improvised mock-up, Assessment and evaluation, descriptive-evaluative research, Experimental research

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INTRODUCTION

In the realm of technical education and vocational training, the development of effective teaching aids and practical learning tools is essential to equip students with real world skills. As technology continues to advance rapidly, it becomes essential for individuals and organizations to keep up with the latest developments and acquire the necessary skills to work with new technologies. One of the challenges in technology training is the need for practical, hands-on experience, which can be difficult to provide without access to complex equipment (Bosch, 2019).

As stated in the work of Kober (2015) It only shows that, as a teacher, it is necessary to take into consideration that not all of the students can immediately understand the lesson, especially about a topic that they are not familiar with which also goes with the study of Akhter (2018). As stated by Akhter (2018), a lot of students find studying mathematics challenging and unsatisfying, which is why they often decide to stop as soon as possible. This kind of scenario is not limited to mathematics subjects only but even to some learning areas because some students do not pay attention to the subject areas that they have difficulty understanding just as learning the basic concept of electricity.

In the context of automotive technology education, global gaps exist that hinder effective learning and skill development. A significant issue is the lack of standardization in curricula across different countries, leading to varying levels of proficiency among trainers and students (Hafeez, 2021). Additionally, there is often limited access to modern equipment and training resources, which can impede hands-on learning experiences (Gul, 2014). Insufficient collaboration between educational institutions and the automotive industry further exacerbates these challenges, resulting in outdated training practices that do not reflect current technological advancements. Resource deficiencies also pose challenges, as trainers often struggle to access updated training materials and equipment necessary for teaching automotive technology effectively (Chen et al., 2020).

The role of trainers in lesson demonstration and hands-on activities is crucial for facilitating learning and skill development. They guide students through practical applications of theoretical concepts, ensuring that students acquire essential technical skills needed for careers in the automotive industry (Boyd et al., 2022). Additionally, trainers are responsible for assessing student performance during practical activities and providing constructive feedback to enhance learning. By serving as a bridge between educational content and industry requirements, trainers ensure that students are equipped with relevant skills and knowledge applicable in real-world scenarios.

The automotive sector, in particular, has witnessed a remarkable shift towards electrification, with electric motorcycles gaining popularity as eco-friendly and efficient transportation options. As a result, educational institutions and training centers face the challenge of keeping their curricula and resources up-to- date to prepare the workforce for the future.

The comprehensive training and understanding of these systems are paramount for ensuring the safety and reliability of electric motorcycles, and thus, the education and training provided must reflect the complexities of these modern machines. To address this challenge, our study examines three essential components of this educational tool: functionality testing, economic valuation, and the assessment of an improvised mock-up motorcycle electrical system. It allows users to gain hands-on experience with electronic components and circuits. By manipulating the various components and observing how the system responds, users can learn about the principles of electronics and gain valuable practical skills that can be applied to a wide range of technology-related fields. The combination, these elements provide a comprehensive strategy for raising the standard of technical instruction and training in the area of motorcycle electrical systems.

Overall, the study on the improvised mock-up motorcycle Electrical system aims to empower students and institution with valuable insights into the optimization of practical learning tools, ultimately benefiting the next generation of automotive engineers and technicians.

Objectives

This study aimed to build a Functional Mock-Up of a Motorcycle Electrical System.

Specifically, the study aimed to:

1. assess the features of the Improvised Mock – up Motorcycle Electrical System in terms of its:
   - 1.1 Functionality
   - 1.2 Instructional applicability
   - 1.3 Aesthetic value
   - 1.4 Durability

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1.5 Safety

2. estimate the cost involved in terms of its components, installation, and possible savings.
3. evaluate the economic feasibility of implementing the Improvised Mock- up Motorcycle Electrical System.
4. appreciate and determine the ease of use and user satisfaction with the Improvised Mock– up Motorcycle Electrical System

METHODS

Research Design

The descriptive-evaluative design was used in the study. In order to achieve the objectives of the study, which included assessing the basic functionality and dependability of the Functional Improvised Mock-up Motorcycle Electrical System and figuring out the degree of use and user satisfaction with the Improvised Mock-up Motorcycle Electrical Systems, this design made use of survey questionnaires that were given to the respondents.

Numerical values ranging from 1 to 5 were assigned to help identify the project's upgrade needs. Corresponding categories expressed the assessors' descriptive assessment of the project. The respondents' responses were explained, examined, and interpreted by the investigators themselves.

Population and Sampling

The total respondents of the study were thirty (30) Motorcycle Small Engine Trainers, Motorcycle Small Engine Assessors, Automotive Trainers, and Automotive Trainees of the Technical Education and Skills Development Authority (TESDA) Sultan Kudarat. They evaluated the acceptability of the electric circuit trainer in terms of functionality, instructional applicability, aesthetic value, durability, and safety.

Instrument

In this study, two (2) sets of research tools were employed. The profile of the respondents, including their name, course, age, and sex, was the main focus of the first section of the questionnaire. The second set of questionnaire was adopted to the stuidy of (Sumaoang, 2024) and was confirmed by six (6) experts from the study's site. The questionnaire focused on the Functionality, instructional usefulness, aesthetic value, durability, and safety in the use of this study were the main topics of the second section of the questionnaire. Respondents checked the response that best matched their selection. Respondents were asked to rank the variables as Excellent, Very Satisfactory, Satisfactory, Fair, or Needs Improvement in the questionnaire.

Data Collection

The researchers obtained all required correspondence from Sultan Kudarat State University's Graduate School. Following the completion of the research instruments, permission was sought from Sultan Kudarat, the Provincial Director of the Technical Education and Skills Development Authority (TESDA), to distribute the survey questionnaire to the automotive trainers, automotive trainees, motorcycle small engine assessors, and motorcycle small engine trainers. Following the collection of all survey questions, the data was compiled for analysis.

Treatment of Data

To interpret the result of the evaluation, descriptive statistical tools such as percentages, computed mean, and standard deviation were used.

Ethical Considerations

This study complied with ethical standards. The respondents were free to leave the study at any moment if they felt uncomfortable, and their participation was completely optional. Their involvement did not result in any kind of injury, whether it be psychological, social, physical, or otherwise. Consistent protection was given to the well-being and dignity of the responding trainers and trainees. In order to preserve academic and scientific integrity, the respondents' rights were respected and the research data was kept private throughout the study. Furthermore, there was no plagiarism or other type of research misconduct in the study.

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RESULTS and DISCUSSION

The information acquired during the course of the study served as the foundation for the findings, analysis, and interpretation of the data. The statistical tools utilized to shed light on the study's findings served as the foundation for the numerical data's analysis and interpretation. The collected data, along with the accompanying interpretations and explanations, are shown in the following tables.

Table 1. Result of the Evaluation on the Functional Mock - Up of a Motorcycle Electrical System: Assessment and Evaluation the Interplay of Lighting, Starting, Ignition and Charging System in terms of Functionality

Functionality	Mean	SD	Description
Consistency in operation	4.57	0.63	Excellent
Effectiveness of the design	4.63	0.56	Excellent
Operational performance of the trainer	4.73	0.52	Excellent
Easy to handle/manageable to use	4.73	0.52	Excellent
Overall	4.67	0.34	Meets 96-100% expectations

The table shows the functionality of the Functional Mock - Up of a Motorcycle System Trainer is excellent with a mean value of 4.67 and a standard deviation of 0.34 which is highly acceptable. This only proves that the trainer is efficient to use. The evaluators rated the trainer excellent remark which resulted in a mean of 4.57 and a standard deviation of 0.57 in terms of its operational consistency. This implies that even though the trainer was used several times it still maintains its functionality.

With regards to the effectiveness of the design of the trainer with a mean of 4.73 and standard deviation of 0.56, the evaluators find the trainer to be excellent. It only mean that they find the trainer beneficial in doing competencies, particularly in explaining the basic concept of the motorcycle which was also emphasized in the study of Dela Cruz (2018) which implies that instructional materials just like the trainer can be an effective intervention to enhance students' proficiency.

Relative to the operational performance of the mock-up trainer, the trainer can be operated in any systems. Based on the result of the evaluation, a mean of 4.50 and a standard deviation of 0.53 in terms of its operational performance. It only implies that the trainer is suitable for all systems.

Based on the study of Che Kob, et. al. (2019) it is important to consider that the trainer should be easy to handle and manageable to use. In line with that, the respondents rated the trainer excellent gained a mean of 4.73 and standard deviation of 0.52. This only suggest that they find the trainer to be user-friendly.

Another domain of the Motorcycle System Trainer that was included and highlighted in the study is instructional applicability. The result of the evaluation of the acceptability of the Motorcycle System Trainer in terms of instructional applicability is shown below.

Table 2. Result of the Evaluation on the Functional Mock - Up of a Motorcycle Electrical System: Assessment and Evaluation the Interplay of Lighting, Starting, Ignition and Charging System in terms of Instructional Applicability

Instructional Applicability	Mean	SD	Description
Provide hands-on exercises for skills development	4.53	0.63	Excellent

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Enhance and upgrade student's knowledge	4.70	0.65	Excellent
Provide exercise that instills desirable habits and values for work.	4.60	0.56	Excellent
Overall	4.61	0.43	Meets 96-100% expectations

The table reveals that the instructional applicability of the trainer is excellent with a mean value of 4.61 and a standard deviation of 0.43 which is also highly acceptable just like functionality. It indicates that the mock-up trainer helps to improve the teaching-learning process, particularly in enhancing students' understanding of the basic concept of motorcycle which was also emphasized in the study of Dahar and Faize (2011). Dahar and Faize pointed out that excellent instructional materials will have a big impact on students' learning like the motorcycle mock-up trainer when used properly.

According to the study of Dizon, et. al. (2019), it was mentioned that the purpose of the K to 12 programs is to enhance the students' abilities by giving them avenues to possess the needed skills to become competent in their chosen field which is also the purpose of the motorcycle mock-up trainer. The trainer is used primarily to provide hands-on exercises for skills development among the students, particularly about automotive technology. Based on the result of the evaluation, it attained a mean of 4.53 and standard deviation of 0.63 on the applicability of the trainer in classroom activities. It implies that the trainer can be utilized to provide students with different hands-on exercises that will help them improve their skills.

Aside from improving students' skills, another purpose of the electric circuit trainer is to help the students enhance and upgrade their knowledge specifically on the basic concept of electricity which the trainer also achieved considering that resulted to a mean of 4.70 and standard deviation of 0.65 on the applicability of the trainer in the teaching-learning process. This, only shows that an trainer is needed to enhance students' knowledge of concepts that they are not familiar with like the concept of motorcycle systems which was also confirmed in the study of Adjei, et. al (2015).

Also, with the use of an trainer, the teacher can facilitate classroom activities that will provide exercises that instill desirable habits and values for work. Evaluators rated it excellent resulting in a mean of 4.60 and a standard deviation of 0.56. It suggest that with the use of the trainer, it can be an avenue to encourage collaboration among the students. As mentioned by Cheng et. al (2021), it pointed out that collaborative learning not only improves students' engagement but also enhances students' innovative ability, and even empathy, and even promotes mutual learning. Aside from that, since the student needs to use motorcycle mock -up trainer in doing classroom activities and competencies, they have to be reminded that there are some dos and don'ts that need to be observed to maintain order in the academic environment and to avoid unforeseen events. With these, it will allow students to be more responsible for themselves, the people around them, and even their environment.

Besides functionality and instructional applicability, another factor that is being considered in designing the Motorcycle System Trainer is the aesthetic value. As defined, aesthetic value refers to the attractiveness of the design of the trainer and it is appealing to the learners. The result of the evaluation of the acceptability of the Motorcycle System Trainer in terms of aesthetic value is shown below.

Table 3. Result of the Evaluation on the Functional Mock - Up of a Motorcycle Electrical System: Assessment and Evaluation the Interplay of Lighting, Starting, Ignition and Charging System in terms of Aesthetic Value

Aesthetic Value	Mean	SD	Description
The attractiveness and overall appearance of the design	4.60	0.62	Excellent
Appropriateness of size of electrical and electronic components, and the trainer	4.80	0.48	Excellent

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The harmonious arrangement of components	4.63	0.56	Excellent
The neatness of the product.	4.73	0.45	Excellent
Overall	4.69	0.31	Meets 96-100% expectations

Based on the result of the evaluation, the aesthetic value of the Motorcycle System Trainer is considered excellent garnering a mean value of 4.69 and a standard deviation of 0.31 which is considered highly acceptable. As highlighted in the study of Sudira, et. al. (2018), it was mentioned the importance of instructional material just like the Motorcycle System Trainer to guide students and motivate them to understand the materials but the Motorcycle System Trainer should not only be limited to that purpose. It is also important to take into consideration the overall appearance of the trainer.

With regards to the attractiveness and overall appearance of the design of the trainer, derived a mean of 4.60 and standard deviation of 0.62. This only implies that overall they find the design of the Motorcycle System Trainer attractive.

For the appropriateness of the size of components, the results show a mean of 4.80 and standard deviation of 0.48. Only shows that the systems components used in the trainer are just suited to their sizes and even the design of the mounting board is appropriate considering that they don't need to occupy too much space and that goes also to the size of the trainer.

Aside from the appearance and size of the trainer, another factor that is being considered about the attractiveness of the trainer is the harmonious arrangement of its components. According to the observation of the evaluators, the calculated mean is 4.63 and a standard deviation of 0.56. This only suggest that the components of the trainer complement each other such as their color and sizes.

Lastly, another element of the trainer taking into consideration in terms of the aesthetic value is the neatness of the product. Based on the result of the evaluation, it leads to a mean of 4.73 and a standard deviation of 0.45. It only proves that the trainer was carefully done and arranged to make sure that it looks tidy especially if the components of the Motorcycle System Trainer were combined particularly in practicing motorcycle system how it will work properly.

With these, it is undeniable that learning resources are very important to enhance curriculum delivery to meet the needs of the learners as mentioned in the study of Okongo, et. al. (2015) but it is also necessary to consider that a learning environment can also influence students' commitment towards learning. Emphasized by the study by Baafi (2020) revealed that students in a pleasant physical environment performed better compared to those with a less conducive learning environment. That's the reason why, the design of the Motorcycle System Trainer was taken into consideration because it can influence student's interest in learning.

Another component of the Motorcycle System Trainer included in the study is the durability of the product. The result of the evaluation of the acceptability of the Motorcycle System Trainer in terms of durability is shown below.

Table 4. Result of the Evaluation on the Functional Mock - Up of a Motorcycle Electrical System: Assessment and Evaluation the Interplay of Lighting, Starting, Ignition and Charging System in terms of Durability

Durability	Mean	SD	Description
Quality of materials used	4.57	0.68	Excellent
Quality of workmanship	4.73	0.45	Excellent
Can stand for rugged use	4.77	0.50	Excellent
Overall	4.69	0.34	Meets 96-100%

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	expectations

As shown, the durability of the Motorcycle System Trainer is excellent with a mean value of 4.69 and a standard deviation of 0.34 which is interpreted as highly acceptable. It proves that the materials used and workmanship applied in the construction and development of the Motorcycle System Trainer are of high quality. The evaluators also find that the Motorcycle System Trainer is strongly made and capable of withstanding even rough handling.

With regards to the quality of materials used in the Motorcycle System Trainer, the evaluators rated it excellent with a mean of 4.57 and a standard deviation of 0.68. It implies that the Motorcycle System Trainer materials are of prime quality.

The evaluators also commended the skills applied in making the trainer. No wonder, rated it good resulting in a mean of 4.73 and a standard deviation of 0.45 which is the highest among the indicators in terms of durability. It only shows that the end product matches the design of the Motorcycle System Trainer and the construction of the device is not of poor quality.

Lastly, with regards to the usage of the Motorcycle System Trainer in an actual situation, if it can stand for rugged use, the result shows that it gives a good remarks which derived a mean of 4.77 and standard deviation of 0.50. It proves that the Motorcycle System Trainer can endure situations wherein even if it is applied in different classroom activities and will be used by the students it can last over time as long as proper handling of the trainer is observed. This is so important considering that the constant use of trainers to provide a detailed explanation of concepts visually such as the basic concept of automotive is expected as pointed out by Frimpong (2021).

In a learning environment, it is undeniable that durable instructional materials can help conserve resources and reduce waste but just like durability, safety must also be given emphasis. That's why safety is one of the domains being considered in developing the Motorcycle System Trainer and included in the evaluation. The result of the evaluation of the acceptability of the Motorcycle System Trainer in terms of safety is shown below.

Table 5. Result of the Evaluation on the Functional Mock - Up of a Motorcycle Electrical System: Assessment and Evaluation the Interplay of Lighting, Starting, Ignition and Charging System in terms of Safety

Safety	Mean	SD	Description
Safe to use for hands-on exercises/activities	4.60	0.56	Excellent
No damages/defects observed	4.87	0.35	Excellent
Components are properly installed	4.77	0.43	Excellent
Mounting of Motorcycle accessories are secured	4.57	0.68	Excellent
Overall	4.70	0.27	Meets 96-100% expectations

Safety first is what others keep on emphasizing to avoid accidents and to promote a safe learning environment which is so important, particularly in learning areas such as Motorcycle Systems which some people find very dangerous. That's why safety is given priority as far as the Motorcycle System Trainer is concerned.

Based on the result of the evaluation, the acceptability of the Motorcycle System Trainer in terms of safety is excellent with a overall mean result of 4.70 and a standard deviation of 0.27 which is highly acceptable.

The result proves that the Motorcycle System Trainer is safe to use particularly during the conduct of hands-on exercises. No wonder, it was rated excellent gaining a mean of 4.60 and a standard deviation of 0.56. This appear

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that the Motorcycle System Trainer is safe to use by anyone as long as safety procedures and the proper way of using the Motorcycle System Trainer are observed.

In terms of the possibility that the Motorcycle System Trainer has damages or defects that may cause harm to the user, the result of the evaluation resulting in a mean of 4.87 and a standard deviation of 0.35. It only proves that no major defects or damages observed that may put the lives of the users into risk.

With regards to the proper installation of each component of the Motorcycle System Trainer, the result shows excellent remarks which leads to a mean of 4.77 and standard deviation of 0.43. Only appears that each component of the Motorcycle System Trainer is properly installed. No wonder the trainer works well during the hands-on activities as long as the connection is correct.

Aside from the proper installation of the Motorcycle System Trainer's components, another feature of the Motorcycle System Trainer in terms of safety observed is the secureness of mounting of Motorcycle accessories. Based on the result of the evaluation and according to the strict scrutiny of the evaluators, it was rated excellently gaining a mean of 4.57 and a standard deviation of 0.68 which implies that the mounting of Motorcycle accessories are secured.

Overall, the result only proves that the Motorcycle System Trainer attained its goals aside from the fact that it can be an effective way to understand the concept of Motorcycle System which was emphasized in the study of Korganci, et. al. (2015), it is also safe to use. Considering that an unsafe instructional material could endanger the users particularly the students that could lead to a hazardous learning environment which can affect students' learning performance. Always remember as mentioned earlier, the students performed better in a pleasant and safe physical environment compared to a less conducive learning environment that's why it is so important to promote and maintain a safe space for everyone.

To sum it up, the result of the evaluation of the acceptability of the Motorcycle System Trainer about functionality, instructional applicability, aesthetic value, durability, and safety is shown below.

Generally, the acceptability of the Motorcycle System Trainer across all the specified domains received an excellent remark with a grand mean of 4.67 and a standard deviation of 0.34. It only appear that the electric circuit trainer is the best-suited instructional material for the students to understand the basic concept of Motorcycle which was emphasized by one of the evaluators. Also, it is highlighted in the study of Lumanta (2019) that the Motorcycle System Trainer is not just effective but very useful for the learners to enhance their knowledge and skills when it comes to the basic concept of Motorcycle.

Estimate the cost involved in terms of its components, installation, and possible savings

Based on the provided data from the material costs and the installation costs and possible savings here is the finalized the cost estimation.

Material Costs: ₱35,000 (as detailed in the bill of materials)
Installation Costs: ₱2,000 (based on the labor rate of ₱500/hour and an estimated installation time of 4 hours).
Total Cost (Improvised System Trainer): ₱35,000 + ₱2,000 = **₱37,000**
Cost of a Commercial System: **₱45,000**
Potential Savings: **₱45,000 - ₱37,000 = ₱8,000**

The presented savings of ₱8,000 are based on labor rates and installation time, and a cost for a commercial equivalent. Actual costs may vary significantly depending on the specific circumstances.
Uncertainties: The analysis does not account for potential additional costs, such as unforeseen expenses during installation, transportation of materials, or the cost of specialized tools.

Long-Term Costs: The analysis focuses on initial costs. Long-term maintenance and repair costs for the improvised system are not considered. A commercial system might have a warranty or be more reliable, reducing long-term expenses.

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Quality and Safety: The analysis does not account for differences in quality and safety between the improvised and commercial systems. A commercial system is likely to meet safety standards and have better quality control.

Based on the provided data, the Motorcycle System Trainer shows a potential initial cost saving of **₱8,000**. However, a comprehensive cost-benefit analysis requires more detailed information to account for all potential costs, risks, and long-term implications. The potential savings should be interpreted cautiously due to the significant uncertainties involved.

Economic Feasibility

The economic feasibility of the improvised system hinges on a cost-benefit analysis. Here's what's needed for a thorough evaluation:

Complete Cost Analysis: A complete cost analysis requires including installation costs and a comparison to the cost of a commercial system.

Lifespan and Maintenance: The economic feasibility is significantly impacted by the lifespan and maintenance requirements of the improvised system. If the system is less durable or requires more frequent maintenance than a commercial system, the long-term cost could be higher, negating any initial savings.

Risk Assessment: Using an improvised system carries potential risks. A comprehensive economic assessment should include a risk assessment.

Market Demand: Is there a market demand for this type of improvised system? If the demand is low, the economic feasibility is questionable, even if the cost is low.

Scalability: Can the production of this system be scaled up? If not, the economic potential is limited.

The economic feasibility would involve a rigorous cost-benefit analysis, including a sensitivity analysis to account for uncertainties in cost estimates. A thorough risk assessment and an explanation of the study's limitations would also be included. The discussion would conclude with recommendations regarding the economic viability of the project, considering the potential benefits (lower initial cost) and the potential drawbacks (higher long-term cost, potential risks). Finally, a comparison with existing literature on similar projects would add context and allow for a more informed conclusion. As highlighted in the study of Perrin (2025)Physical car mock-ups are no longer necessary thanks to automotive prototyping and simulation, which results in significant time and cost savings in the R&D, design, materials, manufacturing, and warranty phases. Highlighting the opportunity cost of not implementing digital prototyping, it draws attention to cost-benefit factors such a 30% reduction in vehicle test time, fewer parts, and lower material costs.

Table6. Summary of the Ease of Use and User Satisfaction on the Functional Mock - Up of a Motorcycle Electrical System: Assessment and Evaluation the Interplay of Lighting, Starting, Ignition and Charging System

Ease of use and user satisfaction	Mean	SD	Description	Expectations
Operational performance of the trainer	4.73	0.52	Excellent	Meets 96-100% expectations
Easy to handle/manageable to use	4.73	0.52	Excellent	Meets 96-100% expectations

The table presents data on ease of use and user satisfaction, focusing on the operational performance of a trainer and its ease of handling. Both aspects received a mean score of 4.73, indicating a very high level of satisfaction. The standard deviation (SD) of 0.52 for both metrics suggests some variability in user experiences, implying that while most found the trainer easy to use and operate, individual experiences differed to some degree. Importantly, both aspects fully met expectations (96-100%), further reinforcing the positive user feedback. This high level of satisfaction and fulfillment of expectations suggests the trainer's design is effective and user-friendly.

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Conclusion

The motorcycle electrical system trainer that was created successfully met important educational needs and is a useful instrument for improving hands-on learning and preparing students for prosperous jobs in the rapidly changing automotive sector.

This revolutionary training tool's ability to fill skill gaps in vocational education through new and useful solutions was proven by its successful development and evaluation. The thorough research design and the favorable comments from knowledgeable assessors offered a solid basis for further application and wider acceptance of comparable strategies in technical training programs.

Recommendations

The following suggestions are strongly recommended in light of the foregoing findings.

1. When partnered with learning modules, the developed trainer proved to be more effective.
2. Similar trainers were recommended to be developed not only in automotive technology but also in other areas of technical education.
3. Railings were developed to secure and protect the electric circuit trainer, thereby helping to prolong its lifespan..
4. To further validate the study's findings, a comparable investigation was suggested to be carried out in a different location. Additional research could have explored the long-term impact of this training method on student learning outcomes and career success. Examining the cost-effectiveness of the trainer compared to commercially available alternatives, as well as investigating possible adaptations for different automotive technologies, would have further enhanced its potential contribution to technical education.

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