EFFICACY OF PORTABLE MOTORCYCLE BRAKE SYSTEM TRAINER FOR AUTOMOTIVE TECHNOLOGY STUDENTS' PERFORMANCE

Charlie B. Samarca, Annie Y. Samarca, John Manuel C. Buniel

North Eastern Mindanao State University, North Eastern Mindanao State University, North Eastern Mindanao State University, Philippine.

charliesamarca2022@gmail.com; aysamarca@nemsu.edu.ph; johncotaresbuniel@gmail.com

ABSTRACT: *This research evaluates the effectiveness of a Portable Device in Teaching Motorcycle Brake Systems for enhancing the performance of Automotive Technology students. Fifty (50) respondents were considered from students of the Small Engine Repair and Motorcycle Servicing course under BSITmajor in Automotive program, equally divided into the conventional and the experimental groups. Comparative analysis between conventional and experimental groups showed initially similar skill levels in pretest assessments, but significant improvements in brake system proficiency were observed post-intervention, particularly in the experimental group using the portable trainer. Clear labeling of components further enhanced instructional clarity and learner engagement, highlighting the device's potential to significantly enhance motorcycle riders' understanding and practical skills in brake system operations.*

Keywords: Motorcycle Brake Systems, Portable Device, Trainer Efficacy, Comparative Study, Skill Enhancement

INTRODUCTION

The portable motorcycle brake system trainer enables hands-on learning with adjustable settings for experimenting with braking techniques. Its user-friendly interface and comprehensive manual support diverse learning styles, ideal for classroom demonstrations and workshops in motorcycle brake system education.

Balbin & Abrigo [1], emphasize that effective instructional materials enhance student skills through multiple representations and improved visualization, fostering higher-order thinking and problem-solving abilities crucial for automotive technology proficiency. Likewise, Exenwafor *et al*. [2] also argue that effective instructional methods in technical colleges can significantly improve student achievement. According to him, teaching and learning resources in classrooms help teachers present educational content effectively, aiding students in acquiring knowledge, skills, abilities, and values to achieve educational objectives.

In industrial technology, particularly automotive majors, the effectiveness of teaching hinges on the teacher's dedication to delivering lessons that cater to diverse learning abilities. However, challenges persist due to the scarcity of specialized laboratory equipment and customized teaching aids. This shortage often leads to students struggling to grasp complex concepts like steering systems and hydraulic brakes, underscoring the need for more interactive and practical teaching methods.

Educational interventions have been defined as efforts to implement and improve educational programs within a specific context, and are based on research. Ramdi [3],. argues that integrating advanced instructional tools, such as trainers in shop laboratories, significantly enhances student performance in understanding automotive systems.

This integration is crucial for preparing graduates to meet industry standards and excel in their careers by applying state-of-the-art techniques and technologies. The ultimate aim is to foster competence in handling modern industrial tools and processes while upholding safety and health standards in business and industry settings.

The study is anchored in Bruner's Instructional Conceptualism theory, emphasizing the construction of knowledge through imaginative processes and the use of visual presentations to enhance student engagement and motivation.

Additionally, the study draws on Piaget's constructivism, which posits that learners actively construct knowledge by integrating new information with existing experiences and interactions. This approach informs the design of an interactive learning tool that accommodates diverse learning styles and encourages active engagement through collaborative features, interactive quizzes, and multimedia content, thereby enhancing comprehension of brake systems (WGU [4].

Study applies Kolb's Experiential Learning Theory to design an instructional tool that caters to diverse learner needs and enhances learning outcomes in motorcycle brake system education, integrating flexible learning and safety awareness principles.

In response to the presented above, this study aims to develop and evaluate a portable motorcycle brake systemtrainer. To attain this objective, the following problems will be answered:

1. What is the mean score of the pretest and posttest of the conventional andthe experimental group?
2. Is there a significant difference of the mean score between the pretest andposttest of the sample of the conventional and the experimental group?

Hypothesis

The following hypotheses were tested at a 0.05 level of significance:

Ho_1:There is nosignificant difference between the pretest and posttest mean performance of the control and experimental group.

MATERIALS AND METHODS

A structured Experimental Design was used in the conduct of the study with pre-test and post-test involving two groups: anexperimental group that will be exposed to the portable device during the teaching sessions, anda control/conventional group that will receive traditional teaching methods without the portable device.

Groups	Pre-test	Treatment	Post-test
Experimental	O_1	T_1	O_2
Conventional	O_1		O_2

This study was conducted atNorth Eastern Mindanao State University – Cantilan Campus, specifically in the Department of Industrial Technology. Fifty (50) participants from the Small Engine Repair and Motorcycle Servicing course within the BSIT major in automotive program was selected using systematic random sampling method to ensure representation of the broader population. Ethical considerations, including obtaining informed consent, ensuring confidentiality, and protecting privacy through anonymizing data, are crucial to uphold participants' rights and trust in the study.

Table 1. Distribution of the Subjects of the Study

Classes/ Section	No. of Subjects
BSIT (Conventional)	25
BSIT (Experimental)	25
TOTAL	**50**

The pre-test and post-test are comprised of the same set of 30 items multiple choice questionnaire, under the subject motorcycle brake systems.

Data Gathering Procedure

The data collection process employs a structured approach. Permission to conduct the pretest and posttest to the respondents was obtained from the Department of Industrial Technology of NEMSU – Cantilan Campus through formal communication letters. Upon approval of request, the researcher had a discussion with the teachers handling the subject and was informed with the lesson as well as the orientation of the research methodologies. Pretests were conducted for both groups before the class discussions. The control group was only exposed to traditional lecture method setup, while the experimental group was exposed to the developed portable motorcycle brake system trainer. At the end of the discussion, posttests were given to both groups. Data collected during the pretest and the posttest were statistically analyzed and interpreted.

Statistical Treatment

After the data gathering, the datawere subjected to statistical treatment. The mean and standard deviation were utilized to determine the mean performancesof the control and experimental groups in the pretest and posttest. A t-test was utilized to determine the significant difference between the pretest and posttest performance of the control and experimental groups.

RESULTS AND DISCUSSION

Table 2: The mean performance of the conventional and experimental group

Pretest			
Group	**N**	**Mean**	**Standard Deviation**
Conventional	25	17.8400	4.87066
Experimental	25	20.1600	3.26190
Posttest			
Group	**N**	**Mean**	**Standard Deviation**
Conventional	25	22.1600	4.66083
Experimental	25	27.9200	2.27156

The table 2 presents the mean scores of pretest and posttest results for both the conventional and experimental groups. Initially, both groups had similar mean scores in the pretest phase, indicating comparable proficiency levels before intervention. However, significant differences emerged in the posttest phase after the experimental group utilized the portable motorcycle brake system trainer. The experimental group showed a substantial increase in mean score to 27.92, with lower variability compared to the conventional group's mean score of 22.16.

These results suggest that the trainer ectively improved brake system skills, highlighting its ential to enhance safety and performance among motorcycle riders compared to traditional teaching methods.

Table 3: Significant values on the difference between the pro-test and post-test mean performance of the conventional and experimental group.

Pretest							
Group	**N**	**Mean**	**Standard Deviation**	**t-value**	**p-value**	**Decision**	**Interpretation**
Conventional	25	17.8400	4.87066	1.979	0.54	Failed to reject H₀	There is no significant difference
Experimental	25	20.1600	3.26190				
Posttest							
Group	**N**	**Mean**	**Standard Deviation**	**t-value**	**p-value**	**Decision**	**Interpretation**
Conventional	25	22.1600	4.66083	5.555	0.000	Reject H₀	There is significant difference
Experimental	25	27.9200	2.27156				

The study initially revealed that there was no significant difference in pretest scores between the conventional group, which had an average score of 17.84 with a standard deviation of 4.87, and the experimental group, which had an average score of 20.16 with a standard deviation of 3.26. The t-test revealed a value of 1.979, and a p-value of 0.54, indicating that both groups had similar performance before the experiment.

Results also revealed that experimental group significantly outperformed the conventional group in the posttest phase. The mean posttest score for the experimental group reached 27.92 (SD = 2.27), while the conventional group scored an average of 22.16 (SD = 4.66). The resulting t-test revealed a t-value of 5.555, and a p-value of 0.000, which led to the rejection of the null hypothesis. From these results, it can be said that the intervention was indeed effective in enhancing the performances of the students.

Febriani and Sarino [5], claimed that educational interventions are crucial to addressing concerns related to education and that these efforts are important for thelong-term development of learning. The results above, with the significant differencebetween the conventional and experimental groups of respondents, clarified the ideathat the experimental group that used the innovation gave better results thantheconventional methods.

CONCLUSIONS

The study examined how automotive students at NEMSU - Cantilan Campus improved their understanding of brake systems using a portable motorcycle brake system trainer. It also explored how the trainer contributed to their learning and skill development. Designed with intuitive features and clearly labeled components, the Enhanced Portable Motorcycle Brake System Trainer is particularly well-suited for educational contexts.

The study's findings showed that, in comparison to the control group, those who were exposed to the trainer had noticeably higher posttest scores. These results highlight the trainer's potential as a useful instrument for improving performance and safety in motorcycle braking system instruction and training courses.

RECOMMENDATIONS

Based on the conclusions, the following recommendations are given:

1. Continue the use of the Portable Device for Teaching Motorcycle Brake Systems in educational settings having proved that its significance in improving the performances of the students is commendable.
2. Improve part labeling to enhance usability and ensure clearer understanding that could maximize the learning outcomes of the students.
3. Further research opportunities should be explored to enhance the trainer's functionality, potentially integrating advanced simulation features and ensuring compatibility with a wide range of motorcycle models.

REFERENCES

[1] Balbin, N.B., & Abrigo, J.L. (2019). Development and Evaluation of Hydro- pneumatic Power Brake System Trainer. BU R&D Journal, 22(1), 17-24. Retrieved from http://journal.bicol-u.edu.ph

[2] Exenwafor, J.I., Titus I. E. & Sylvester C.O. 2020. Effect of computer- assisted instruction on students' academic achievement and retention of auto- mechanics technology in technical colleges. July 2020. The International Journal of Humanities & Social Studies 8(7):87- 93. https://www.researchgate.net/publication/349339630

[3]Ramdi, O.D. (2020). Development of Automotive Engine Electrical Systems Trainer for Automotive Technology Students. IJCIRAS Research Publication. Vol. 2Issue. 12. Retrieved from https://www.academia.edu/43221481

[4] WGU. (2005). What is Constructivism? Retrieved fromhttps://www.wgu.edu/blog/what-constructivism2005.html#close

[5] Febriani, P.S., &Sarino, A. (2017). Dampak Cara BelajardanFasilitasBelajardalamMeningkatanPrestasiBelajarSiswaSekolahMenengahKejuruan. Jurnal MANAJERIAL.