



Effectiveness Level of Electrical Fixture Trainer Board in Electrical Technology Student

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Abstract

A significant aspect of modern life is electricity. The world would be substantially different without it. Electricity has become a necessity for humanity. This trainer board was designed in order to assist electrical technology teachers effectively teach the fundamentals of building wiring installation. It is anticipated to be simple to utilize, appropriate for students at their educational level, and responsive to current demands in building wiring installation. The respondents used in the evaluation of the trainer were 20 first-year Electrical Technology students of Bohol Island State University's Calape Campus. For the functionality of trainer board, researcher created a self-made observation guide that was validated by experts in the field of electrical, which includes registered electrical practitioners, instructors, and professors of Bohol Island State University Main Campus, Calape Campus, and Balilihan Campus. Moreover, standard deviation (*SD*) describes the variability of the pre-skill test and post skill-test of the students using the Electrical Fixture Trainer Board. On the other hand, independent samples *t*-test applying bootstrapping with 95% Bias corrected accelerated was used to test if there is significant difference on the difference between the pre-skill test and post-skill tests scores of the students who have used the Electrical Fixture Trainer Board. Bootstrapping is robust estimation method for reducing bias associated with normality, homogeneity of variance, and sampling. Probability values (*p*) are compared at 0.05 level of significance. IBM SPSS Statistics Trial Version was used in all the analysis. Results shows that the pre-skill test scores ($M = 1.825$, $SD = .157$) is significantly lower than the post-skill test scores ($M = 1.825$, $SD = .157$) of students, $t(38) = -16.935$, $p = .000$. This implies that the Electrical Fixture Trainer Board is an effective tool to train the students in the field of building wiring at the same time learn additional knowledge in electrical instrumentation.

Keywords: Effectiveness, Sensor, Electrical Fixture, Skill Test, Trainer Board

Introduction

A significant aspect of modern life is electricity. The world would be substantially different without it. Electricity has become a necessity for humanity. As more and more products are created to make life easier, the demand for power keeps rising. Lighting our homes and streets is one of electricity's primary uses. It provides safety and comfort during the night by turning on the lights. The use of candles and oil lamps has been replaced by electricity, increasing accessibility to illumination and lowering the risk of accidents and fire hazards.

Skilled professionals are essential to the efficient operation, safety, and effectiveness of electrical systems in the vast and complex world of electricity. These highly skilled people, often known as electricians or electrical technicians, have the knowledge and skills necessary to handle the complexities of electricity, which makes such an essential component of contemporary society.

To produce skilled professionals' universities must be able to adapt to technological advancements in order to generate graduates who are competent in cognitive, psychomotor, and affective domains. To ensure that students are prepared for the difficulties of the world in the technological era, new technology must be introduced during lectures. Learning outcomes for students will be impacted by the quality of the learning process. (Muskhir et.,al. 2019)

Bohol Island State University as a science and technology university that serves as a training ground of competent engineers and technologists. As a technology school, skills and knowledge are top priority. The university vision is to provide quality higher education in the arts and sciences, as well as in the professional and technological fields; undertake research and development and extension services for the sustainable development of Bohol and the country.

The goal of technology education is to assist students with technology by giving them the knowledge and abilities they need to comprehend and use it. By enabling all learners, a broad variety of information and abilities, or "technological literacy," to engage in the quickly evolving technologies, technology education makes a special contribution to their growth.

The methods that technology can be used in the field of instruction is by integrating it to instruction by using it as instructional materials or as trainer. Learning occurs in a variety of ways: some learning occurs from what students hear; more learning occurs from what students see; and still more learning occurs from what students do. Instructional materials are used to improve students' knowledge, abilities, and skills; to track their assimilation of information; and to contribute to their overall development and upbringing. (Calderon 2022)

Trainer boards also offer a secure setting where students can explore and make mistakes without suffering serious repercussions. These boards frequently have built-in safety features and protective procedures, which lower the possibility of harming expensive equipment or oneself. Before moving on to more difficult or complex tasks, learners can build confidence and proficiency by experimenting with various concepts and strategies on the trainer board.

Therefore, the researcher wants to find out the effectiveness of the Electrical Fixture Trainer Board. This trainer was designed in order to assist electrical technology teachers effectively teach the fundamentals of building wiring installation. It is anticipated to be simple to utilize, appropriate for students at their educational level, and responsive to current demands in building wiring installation. The main objective of the study was to assist the effectiveness of the trainer use for instruction. The trainer is composed of electrical switches, the single switch, 3-way switch and 4-way switch, infrared sensor, motion sensor, photo switch and light bulb attach in a trainer board. It has safety feature that will protect the students and devices when there are troubles and error occur.

The study specifically aims to seek answers to the following questions: a) What is the functionality of Electrical Fixture Trainer Board b) What is the level of effectiveness of the Electrical Fixture Trainer Board in terms of pre-skill test and post-skill test; and c) Is there a significant difference between the pre-skill test and post-skill tests scores of the students;

Methods

During the academic year 2021–2022, this study was carried out on the Calape Campus of Bohol Island State University. The university uses instructional techniques that include actual demonstrations and installations. For the purpose of effectively delivering the lessons in the Electrical Technology Course, the Electrical Fixture Trainer Board was demonstrated.

The respondents used in the evaluation of the trainer were 20 first-year Electrical Technology students of Bohol Island State University's Calape Campus. The student tested the effectiveness of the trainer by having one group of pre-skill tests and one post-skill test. The experimental design was used to measure changes in outcomes before and after an intervention was implemented.

A pre-skill test was given to the students before the presentation in order to evaluate if their performance had changed as a result of their interaction with the trainer board. Following the pre-skill test, a discussion on building wiring installation and electrical instrumentation was held while the Electrical Fixture Trainer Board was actually operated. After that, the respondents took the post-skill test. The result of the skill test was graded according to the self-made rubrics.

For the functionality the trainer board, the researcher created a self-made observation guide that was validated by experts in the field of electrical, which included registered electrical practitioners, instructors, and professors of Bohol Island State University Main Campus, Calape Campus, and Balilihan Campus.

Results and Discussion

Functionality of Electrical Fixture Trainer Board

Table 1 shows the result for the functionality of the trainer board. The researcher prepared the tools and multimeter and installed four (4) electrical wiring connections on the trainer board. The first wiring connection was light-controlled in a single location. The researcher connects the wiring to a single light bulb and a single switch, and after three trials, it is found functional.

Table 1

Wiring Connection	Operation	Trial	Result	Interpretation
Light controlled in Single Location	Install single switch and one light bulb	1	the light bulb switches on when the switch is on and turns off when the switch is off	Functional
		2	the light bulb switches on when the switch is on and turns of when the switch is off	Functional
		3	the light bulb switches on when the switch is on and turns of when the switch is off	Functional
Light controlled in Two different location	Install two 3-way switch and one light bulbs	1	the light bulb turns on when either switch 1 of switch 2 is on and off when either of the two switches is switch off	Functional
		2	the light bulb turns on when either switch 1 of switch 2 is on and off when either of the two switches is switch off	Functional
		3	the light bulb turns on when either switch 1 of switch 2 is on and off when either of the two switches is switch off	Functional
Light Controlled in 3 different locations	Install two 3-way switch and one 4-way switch with one light bulbs	1	the light bulb turns on when either switch 1, switch 2 or switch 3 is on and off when either of the three switches is switch off	Functional
		2	the light bulb turns on when either switch 1, switch 2 or switch 3 is on and off when either of the three switches is switch off	Functional
		3	the light bulb turns on when either switch 1, switch 2 or switch 3 is on and off when either of the three switches is switch off	Functional
Automatic Switching of light bulb	Install photo switch, motion sensor and infrared sensor	1	Light bulb turns on when there is an object detected by the infrared sensor and switch off when there was no object detected	Functional
		2	Light bulb turns on when the photo switch detected absence of light and turns off when detected presence of light	Functional
		3	Light bulb turns on when the motion sensor detected movement and turns off when there is no movement detected	Functional

The second connection was light-controlled in two different locations. For this connection, the researcher used two 3-way switches and one light bulb. Switching on either switch 1 or switch 2, the bulb will turn on, and switching off either switch 1 or 2, the light bulb will switch off. It was done in three trials and was found functional. The third connection was light controlled in three different locations; the researcher used two 3-way switches and one 4-way switch and connected them to one light bulb. By switching on either switch 1, 2, or 3, the light bulb will turn on, and by switching off either of the three switches, the light bulb will turn off. Three trials were conducted, and no fault or error occurred during the trials, and it was found to be functional.

Lastly, the fourth wiring connection includes a common sensor used in automatic switching lights. The first sensor was an infrared sensor. IR sensors act as proximity sensors, and they are commonly used in obstacle detection systems (Jost 2019). When there is an object detected by the sensor, the light bulb will turn on; in the absence of an object, the light bulb will turn off. Another was the photo switch. A photo switch is a kind of sensor that detects the presence of light, generally at a certain wavelength. They are also commonly used in residential areas to turn lights on and off based on the time of day. When there is an absence of light, the photo switch will trigger and switch on the bulb, and when there is a presence of light, the light bulb will turn off. For the third sensor, the researcher used a motion sensor. It is an electronic device that is designed to detect and measure movement. According to Riyanto et al. (2018), the simple installation of commercially available motion sensors can reduce the electricity bill through increased energy efficiency. The researcher installs a motion sensor to switch on the light bulb when it detects any movement and turn it off when no more motion is detected.

There were no faults or errors observed during the trial after the electrical connections had been installed and tested, its indicates that the installation had been done correctly and was working as intended.

Level Of Effectiveness of The Electrical Fixture Trainer Board Based on The Pre-Skill Test And Post-Skill Test Of The Students Who Used The Trainer Board, As Well As, The Inferential Test Results Comparing The Test Scores Was Also Given.

Statistical Treatment

Mean (M) was computed to determine the level of effectiveness of the Electrical Fixture Trainer Board with the interpretations namely, 1.00-1.74 = needs improvement, 1.75-2.49 = satisfactory, 2.50-3.24 = very good, and 3.25-4.00 = excellent. Is also used summarize the pre-skill test and post skill-test of the students using the Electrical Fixture Trainer Board. Moreover, standard deviation (SD) describes the variability of the pre-skill test and post skill-test of the students using the Electrical Fixture Trainer Board. On the other hand, independent samples t -test applying bootstrapping with 95% Bias corrected accelerated was used to test if there is significant difference on the difference between the pre-skill test and post-skill tests scores of the students who have used the Electrical Fixture Trainer Board. Bootstrapping is robust estimation method for reducing bias associated with normality, homogeneity of variance, and sampling. Probability values (p) are compared at 0.05 level of significance. IBM SPSS Statistics Trial Version was used in all the analysis (Field, 2020; Denis, 2021; IBM Corp, 2023).

Table 2

Descriptive and inferential analysis on effectiveness of Electrical Fixture Trainer Board

Skill Test	M	SD	$t(38)$	p
Pre	1.825	.157	-16.935	.000
Post	3.675	.082		

Results shows that the pre-skill test scores ($M = 1.825$, $SD = .157$) is significantly lower than the post-skill test scores ($M = 1.825$, $SD = .157$) of students, $t(38) = -16.935$, $p = .000$. This implies that the Electrical Fixture Trainer Board is an effective tool to train the students in the field of building wiring at the same time learn additional knowledge in electrical instrumentation. The various cognitive and higher-order thinking abilities were developed when applied to real-world situations. Practical learning and the hands-on nature of the trainer help students conceptualize technological knowledge and develop intellectual processes.

Conclusion

The Electrical Fixture Trainer Board was an instructional trainer used by first year electrical technology student of Bohol Island State University, Calape Campus. The university offer bachelor of science in industrial technology (BSIT) major in electrical technology. The trainer was found functional in all the wiring connection installed. The trainer was also found to be an effective tool used in delivering instruction to the student. It helps the student to acquire knowledge and skill needed in building wiring installation.

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