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Acceptability of Electrical Installation and Maintenance Instructional Trainer

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Abstract. The study aimed to evaluate the acceptability of the instructional trainer in teaching Electrical Installation and Maintenance National Certificate Level Two at Dalipuga National High School-Senior High School Department during the first semester of 2018-2019. Grade Twelve electrical installation and maintenance students and licensed electrical practitioners-experts from the academe and the industry served as evaluators of the instructional trainer. The researcher used an adopted and modified questionnaire to determine the acceptability of the instructional trainer concerning its effectiveness, workmanship, functionality, safety, and user-friendly. The level of acceptability of the developed trainer as evaluated by students and professionals is determined using descriptive statistics such as frequency count, percentages, weighted mean, and standard deviation. Based on the result of the study, the instructional trainer was very good in terms of effectiveness, workmanship, functionality, safety, and user-friendly. In terms of ranking, the effectiveness and user-friendly rank the highest, followed by safety, workmanship, and functionality. All of these are very good, so the results implied that the instructional trainer is helpful in the training and learning the required electrical installation and maintenance competencies.

Keywords: acceptability; electrical installation and maintenance; instructional trainer; competencies

1. Introduction

Quality education is one of the 17 Global Goals that comprise the 2030 Agenda for Sustainable Development. Realizing universal access to high-quality education reinforces the view that education is one of the most potent and proven drivers for long-term development. It also aspires to give equal access to cheap vocational training and remove gender and wealth inequalities to achieve universal access to a high-quality higher education that is inclusive and equitable and promotes lifelong learning opportunities for all (Goal 4: Quality Education,2018).

In the Philippines, the Senior High School Program is one of the salient features of the K to 12 Program. This feature is otherwise known as "GEARING UP FOR THE FUTURE. “Senior High School is two years of specialized upper secondary education where students may choose a specialization based on aptitude, interests, and school capacity. The choice of career track will define the content of the subjects a student will take in Grades 11 and

12. Senior High School subjects fall under the Core Curriculum or specific Tracks (GOVPH, n.d.)

The K to 12 program graduates, especially the Senior High School, will be ready to go into different paths – whether further education in college, employment, or entrepreneurship. Moreover, the SHS graduate will be equipped with information, media, and technology skills, learning and innovation skills, practical communication skills, and life and career skills.

One of the tracks of SHS is the Technical Vocational and Livelihood Track, which focuses on the technical vocational education and training that will develop and enhance the students' knowledge, skills, attitudes, and values. Electrical Installation and Maintenance National Certificate Two (EIM NC II) is one of the specializations of the TVL Track-Industrial Arts Strand. This specialization in most public senior high schools will enable the students to be certified skilled electricians if they are competent in the National Assessment of TESDA. In addition, this will make the students employable since most industries locally and globally require at least National Certificate Two holders.

Further, the TESDA Policy brief stated that graduates of the tech-voc track under K to 12 are expected to be equipped with employable competencies when they exit Grades 10 and 12 through National Certification II (TESDA, 2013).

Based on the 2015 TESDA Amended Training Regulations ofthe Electrical Installation and Maintenance National Certificate (EIM NC II) consists of competencies that a person must attain to install and maintain electrical wiring, lighting, and related equipment and systems in residential houses/buildings the voltage does not exceed 600 volts. This qualification qualifies a person to work as a Building-Wiring Electrician, Residential/Commercial-Wiring Electrician, and Maintenance Electrician (TESDA, 2015).

That is why UNESCO-UNEVOC (2004) paid particular attention to promoting best practices and innovations in technical and vocational education and training (TVET) and education for the world of work. For the SHS student graduates to be skillful and competitive, technological innovations in instructional materials are necessary. In this context, the teachers'/trainers' attitude about technological innovation considerably affects the curriculum and its handling mechanism.

According to SEAMEO INNOTECH (2014), one of the creative outputs in Senior High School is encouraging teachers to develop their instructional materials to help enrich existing instructional materials. This creative output will help the teachers enhance their knowledge, skills, attitude, and values for an outcome. It is a fact that the effectiveness and efficiency of the teachers in imparting knowledge, skills, attitude, and values are not only by teaching but also by being innovative in the teaching-learning process. Therefore, in technical vocational training, the teacher must be creative since there is an essential need to develop knowledge, skills, attitude, and values.

Monitoring of the Philippine Department of Education’s model senior high school program. (2020

With this concern and challenge, the "Acceptability of Electrical Installation and Maintenance National Certificate Two Instructional Trainer" was purposely developed to accelerate the learning assimilation and acquisition of knowledge, skills, attitude, and technology of electrical installation and maintenance senior high school students. In addition, the instructional trainer caters to the needs for training and classroom instructions according to the required competencies. It is also essential for the instructor/teacher/trainer to facilitate learning situations efficiently and effectively.

The acceptability of an electrical installation and maintenance trainer will enhance the knowledge, skills, attitudes, and values of the Senior High School Electrical Installation and Maintenance National Certificate Level Two students such as discover new things, be responsible for their learning, encouraged independent study, gain mastery of the concepts

and many more. Hence, it is possible because the instructional trainer matches the promulgated training requirements and competencies of the Training Regulations and the Curriculum and, most of all, in the industries.

This instructional trainer includes both the instructional trainer and learning exercise materials that serve different activities for the students to perform. This instructional trainer aimed to accelerate the learning assimilation of knowledge, skills, attitude, and technology of electrical installation and maintenance senior high school students. Further, this instructional trainer is based on the promulgated and migrated EIM NC Training Regulations of TESDA and the curriculum guide of DepEd.

2. Objective of the study

This study aimed to see how well the electrical installation and maintenance instructional trainer worked in effectiveness, workmanship, functionality, safety, and user-friendliness.

3. Framework of the study

The Input-Process-Output (IPO) Model provides the general structure and guides the analysis. Inputs are the conditions that exist before group activity, whereas processes are the interactions among group members. Finally, outputs are the results of group activity that the team or the organization values. The input-process-output model has historically been the dominant approach to understanding and explaining team performance and continues to exert a strong influence on group research today. The framework is anchored on classic systems theory, which states that the general structure of a system is as crucial in determining how effective it will function as its components. Similarly, the IPO model has a causal structure in that outputs are a function of various group processes influenced by numerous input variables(Input-process-Output model, 2016).

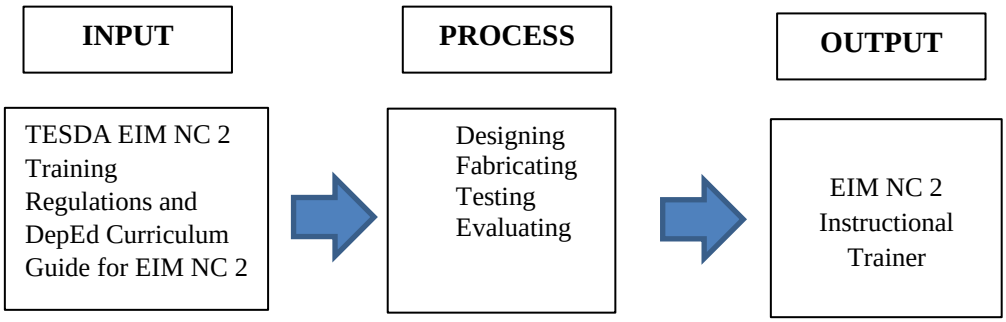

Figure 1. The IPO Model of the Study

The figure above illustrates the instructional trainer's Input-Process-Output (IPO) system.

The inputs were based both on the competencies of the TESDA Electrical Installation and Maintenance National Certificate 2 (EIM NC 2) Migrated Training Regulations and the Curriculum Guide of the Department of Education (DepEd) for senior high school.

The process is the designing, constructing, testing, and evaluation of the proposed trainer. Benchmarking trainers from the internet and technical training institutes is a part of the design process. It entails preparation and consultation with electrical installation and maintenance professionals. Fabrication is creating the board according to the design and layout where the wiring devices, materials, and other parts of the structure were mounted or fixed. The testing involves checking whether the wiring devices work according to their purpose and function. This process also includes changes and revisions if there is a

problem or suggestions for improvement. Lastly, the instructional trainer was evaluated by the students' participants and expert evaluators regarding effectiveness, workmanship, functionality, safety, and user-friendly.

The acceptability of the EIM NC 2 instructional trainer is the output. Therefore, the finished project or prototype concerns the level of acceptability.

4. Methodology

The study was conducted in Dalipuga National High School-Senior High School Department, Barangay Dalipuga, Iligan City, Philippines. The participants of the study were the two sections (37 students) of grade twelve senior high school electrical installation and maintenance students under the technical-vocational-livelihood track during the first semester of the school year 2018-2019. Twenty (20) series of activities/exercises were performed by the participants based on the developed activity training materials.

A self-made instrument is used by the participants and expert evaluators using the point scale on its effectiveness, workmanship, functionality, safety, and user-friendly.

Indicators	Scale	Range
Very Good	5	4.60-5.00
Good	4	3.70-4.59
Average	3	2.80-3.69
Poor	2	1.90-2.79
Very Poor	1	1.00-1.89

5. Results and Discussion

Table 1. Distribution of Statistics Frequency, Percentage Distribution, Mean and Standard Deviation of Participants and Experts' Evaluation on Electrical Installation and Maintenance National Certificate Level Two Instructional Trainer: EFFECTIVENESS

Description	Range	Frequency	Percentage Distribution
Very good	4.60-5.00	33	82.50%
Good	3.70-4.59	5	12.50%
Average	2.80-3.69	2	5.00%
Poor	1.90-2.79	0	0.00%
Very poor	1.00-1.89	0	0.00%
	Mean 4.73		

	Descriptor/Evaluation Parameters	Score					Mean	SD
A.	**Effectiveness**	5	4	3	2	1		
1.	The instructional trainer is effective in the numerous activities it can perform.	31	8	1	0	1	4.66	0.76
2.	The instructional trainer is effective with the desired competencies.	25	13	2	1	0	4.51	0.71
3.	The instructional trainer is appropriate for training purposes and effective for teaching-learning.	30	8	3	0	0	4.66	0.62
4.	The instructional trainer is effective in terms of students' learning and performance.	33	5	3	0	0	4.73	0.59
5.	The instructional trainer is effective in terms of motivating the students.	35	6	0	0	0	4.85	0.36
								SD 0.40

The data shows that eighty-three (83%) of participants and experts evaluated the expanded instructional trainer for electrical installation and maintenance national certificate two in terms of effectiveness as very good. The overall rating is very good (mean=4.73). The standard deviation of 0.40 indicates that participants and experts evaluated the expanded instructional trainer for electrical installation and maintenance national certificate two in terms of effectiveness is close or similar to each other.

The score of the descriptors explains well that the instructional trainer is indeed very good regarding effectiveness. The result implies that the instructional trainer is effective in terms of the number of laboratory activities and exercises, the desired competencies, its appropriateness for training purpose and teaching and learning process, and is motivating the students.

Table 2. Distribution of Statistics Frequency, Percentage Distribution, Mean and Standard Deviation of Participants and Experts' Evaluation on Electrical Installation and Maintenance National Certificate Level Two Instructional Trainer: WORKMANSHIP

Description	Range	Frequency	Percentage Distribution
Very good	4.60-5.00	31	77.50%
Good	3.70-4.59	7	17.50%
Average	2.80-3.69	2	5.00%
Poor	1.90-2.79	0	0.00%
Very poor	1.00-1.89	0	0.00%
		Mean 4.73	**SD 0.38**

Descriptor/Evaluation Parameters		Score					Mean	SD
B.	**Workmanship**	**5**	**4**	**3**	**2**	**1**		
1.	The instructional trainer is made of quality materials and devices.	33	6	1	0	1	4.71	0.75
2.	The instructional trainer is presentable in appearance.	32	7	1	1	0	4.71	0.64
3.	The instructional trainer represents the standards and concepts of competency-based training and competencies	30	10	1	0	0	4.71	0.51
4.	The instructional trainer is competitive with the other instructional trainers and has a unique design.	28	11	2	0	0	4.63	0.58
5	The instructional trainer devices, components, and accessories are well-placed	30	9	2	0	0	4.68	0.57

The data shows that majority seventy-eight percent (78%) of participants and experts evaluated the expanded instructional trainer for electrical installation and maintenance NC 2 in terms of workmanship as very good. The overall rating is very good (mean=4.73). The standard deviation of 0.38 indicates that participants and experts evaluated the expanded instructional trainer for electrical installation and maintenance national certificate two in terms of workmanship is close or similar to each other.

The score of the descriptors or evaluation parameters explains well that the instructional trainer is very good at workmanship. Furthermore, it implies that the developed instructional trainer uses quality materials and devices, and the components are installed and laid out correctly.

Table 3. Distribution of Statistics Frequency, Percentage Distribution, Mean and Standard Deviation of Participants and Experts' Evaluation on Electrical Installation and Maintenance National Certificate Level Two Instructional Trainer: FUNCTIONALITY

Description	Range	Frequency	Percentage Distribution
Very good	4.60-5.00	28	70.00%
Good	3.70-4.59	10	25.00%
Average	2.80-3.69	2	5.00%
Poor	1.90-2.79	0	0.00%
Very poor	1.00-1.89	0	0.00%
	Mean 4.66 SD 0.57		

Descriptor/Evaluation Parameters		Score					Mean	SD
C.	**Functionality**	**5**	**4**	**3**	**2**	**1**		
1.	The instructional trainer is practically helpful and multifunctional concerning its purpose.	30	8	2	0	1	4.62	0.52
2.	The instructional trainer allows the user to simulate and troubleshoot the system.	29	8	3	1	0	4.63	0.80
3.	The instructional trainer operation processes clearly describe and explain the required competencies.	25	12	4	0	0	4.63	0.73
4.	The instructional trainer provides training with fundamental concepts and principles of electrical installation and maintenance	30	10	1	0	0	4.76	0.49
5.	The instructional trainer fits the desired outcome of the competencies and standards	30	9	2	0	0	4.66	0.57

The data shows that seventy percent (70%) of participants and experts evaluated the expanded instructional trainer for electrical installation and maintenance national certificate two in terms of functionality as very good. The overall rating is very good (mean=4.66). The standard deviation of 0.57 indicates that participants and experts evaluated the expanded instructional trainer for electrical installation and maintenance NC 2 in terms of functionality is close or similar to each other.

The score of the descriptors or evaluation parameters explains well that the instructional trainer is indeed very good regarding its functionality.

The result also implies that the instructional trainer is multifunctional and is very useful. It also provides the user to simulate, troubleshoot, and provides the desired competencies for electrical installation and maintenance national certificate level two.

Table 4. Distribution of Statistics Frequency, Percentage Distribution, Mean and Standard Deviation of Participants and Experts' Evaluation on Electrical Installation and Maintenance National Certificate Level Two Instructional Trainer: SAFETY

Description	Range	Frequency	Percentage Distribution
Very good	4.60-5.00	31	77.50%
Good	3.70-4.59	7	17.50%
Average	2.80-3.69	2	5.00%
Poor	1.90-2.79	0	0.00%
Very poor	1.00-1.89	0	0.00%
Mean 4.72 SD 0.42			

Descriptor/Evaluation Parameters		Score					Mean	SD
D.	**Safety**	**5**	**4**	**3**	**2**	**1**		
1.	The instructional trainer has safety features and protection.	31	7	2	0	1	4.67	0.50
2.	The instructional trainer connections are correctly connected and insulated.	31	6	3	1	0	4.68	0.76
3.	The instructional trainer shows the appropriate labels and symbols for electrical circuits and devices	32	8	1	0	0	4.71	0.68
4.	The instructional trainer connection of devices is made in a safe manner and condition to eliminate electrical shocks and hazards	29	10	2	0	0	4.68	0.57
5.	The instructional trainer does not pose a serious risk of injuries to the users.	30	9	2	0	0	4.71	0.60

The data shows that majority seventy-eight percent (78%) of participants and experts evaluated the expanded instructional trainer for electrical installation and maintenance NC 2 in terms of safety as very good. The overall rating is very good (mean=4.72). The standard deviation of 0.42 indicates that participants and experts evaluated the expanded instructional trainer for electrical installation and maintenance national certificate two in terms of safety is close or similar to each other.

The score of the descriptors or evaluation parameters explains well that the instructional trainer is indeed very good regarding safety. Thus, this promotes that safety feature is essential when dealing with electrical installation since electricity can kill if not dealt with according to safety and standards. Moreover, it implies that the instructional trainer is safe because the connections are correctly terminated and insulated with proper labeling. Electric circuits and devices were presented using the standard symbols. Thus, using the instructional trainer proves no severe risks to electrical-related injuries.

Table 5. Distribution of Statistics Frequency, Percentage Distribution, Mean and Standard Deviation of Participants and Experts' Evaluation on Electrical Installation and Maintenance National Certificate Level Two Instructional Trainer: USER-FRIENDLY

Description	Range	Frequency	Percentage Distribution
Very good	4.60-5.00	33	82.50%
Good	3.70-4.59	4	10.00%
Average	2.80-3.69	3	7.50%
Poor	1.90-2.79	0	0.00%
Very poor	1.00-1.89	0	0.00%
Mean 4.75 SD 0.43			

Descriptor/Evaluation Parameters		Score					Mean	SD
E.	**User-Friendly**	**5**	**4**	**3**	**2**	**1**		
1.	The instructional trainer is easy to use and transportable to the training place.	32	7	1	0	1	4.70	0.51
2.	The instructional trainer provides real-life tasks applicable to the student's actual work.	33	5	2	1	0	4.67	0.45
3.	The instructional trainer is practically helpful at any particular learning time frame	30	9	2	0	0	4.68	0.57
4.	The instructional trainer is compatible with the user's ability to learn.	32	6	3	0	0	4.71	0.60
5.	The instructional trainer is designed for everybody and adapts to any training group size.	32	7	2	0	0	4.73	0.55

The data shows that eighty-three (83%) of participants and experts evaluated the expanded instructional trainer for electrical installation and maintenance national certificate two in terms of user-friendly as very good. Therefore, the overall rating is very good (mean=4.75). Furthermore, the standard deviation of 0.43 indicates that participants and experts evaluated the expanded instructional trainer for electrical installation and maintenance national certificate two in terms of user-friendly is close or similar to each other.

The score of the descriptors or evaluation parameters explains well that the instructional trainer is indeed very good when it comes to being user-friendly where the students won't encounter and experience difficulty when using the devices of the instructional trainer. This further implies that the instructional trainer was designed for everybody with an electrical installation and maintenance background and adapts to any training group size.

Table 6. Distribution of Statistics Frequency, Percentage Distribution, Mean and Standard Deviation of Participants and Experts' Evaluation on the INSTRUCTIONAL TRAINER FOR ELECTRICAL INSTALLATION AND MAINTENANCE NC 2: Overall

Description	Range	Frequency	Percentage Distribution
Very good	4.60-5.00	31	77.50%
Good	3.70-4.59	7	17.50%
Average	2.80-3.69	2	5.00%
Poor	1.90-2.79	0	0.00%
Very poor	1.00-1.89	0	0.00%
	Mean 4.72 SD 0.36		

The data shows that the majority seventy-eight percent (78%) of participants and experts evaluated the overall expanded instructional trainer for electrical installation and maintenance NC 2 as very good. The overall rating is very good (mean=4.72). The standard deviation of 0.36 indicates that participants and experts evaluated the overall expanded instructional trainer for electrical installation and maintenance NC 2 s close or similar to each other.

In terms of ranking the criteria or parameters, both the effectiveness and user-friendly rank the highest percentage (83%), followed by safety and workmanship (78%) and lastly is the functionality (70%). All of these are very good, so the results implied that the instructional trainer is instrumental in the training-learning process and its effectiveness, workmanship, functionality, safety, and user-friendly.

The overall results support the findings of Bajet and Bajet that the trainer, in its advancement in the teaching and learning process and the principle of operations, is easy to understand the different connections of electric circuitry in the mechanical components. Its design focuses on a skills training approach to aid the beginner student efficiently and comprehensively in learning the trade (Bajet et.al., 2015).

Another study by Bajet et al. found that the instructional device or trainer was generally assessed as very much acceptable in terms of usefulness, effectiveness, functionality, reliability, and safety (Bajet et.al., 2015).

Hernando concluded that his developed trainer is a highly acceptable instructional device for teaching Industrial Electricity in design and functionality (Hernando, 2016).

Lastly, based on the study of Rio, the developed training module was very much accepted as evaluated by the two groups of evaluators; thus, it can be used as instructional material. In addition, the developed training module is also suitable and fitted for use by the students majoring in electrical technology and can be utilized as an effective instructional material in accomplishing competency-based subjects (Rio, 2014).

6. Conclusion

The instructional trainer for Electrical Installation and Maintenance NC 2 has been an instrument and medium in developing and enhancing students' scores and performance in installing electrical protective devices for distribution, power, lighting, auxiliary, lightning protection, and grounding systems, and installing wiring devices of floor and wall-mounted outlets, lighting fixture/switches and auxiliary outlets.

This implies that the instructional trainer serves as the medium in the training and learning process of students' knowledge, skills and attitude. The instructional trainer enables the students to fully grasp, comprehend and appreciate the learning procedures that made them confident in performing electrical installation and maintenance. This was possible because they were exposed and have actual hands-on learning with the different series of exercises and activities before, they will have the actual installation activities.

The conceptualization of this instructional trainer will not be realized without benchmarking to the existing commercial instructional trainers. Since the instructional trainer is an innovation, the conceptualization is the result of the researchers' experienced and dream of developing an instructional trainer.

This instructional trainer is to be commercialized and needs to be patented so that the rights of design and development is solely for research benefit.

In terms of evaluating the instructional trainer, there are different criteria or parameters of rating it. This is due to the different approaches of developing the instructional trainer. This also depends on the competency being studied.

Though the result is very good, it is also expected that the instructional trainer needs to be enhanced in its design and features to be more effective, quality workmanship, functional, safe to use, and easy to use.

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Appendix 1

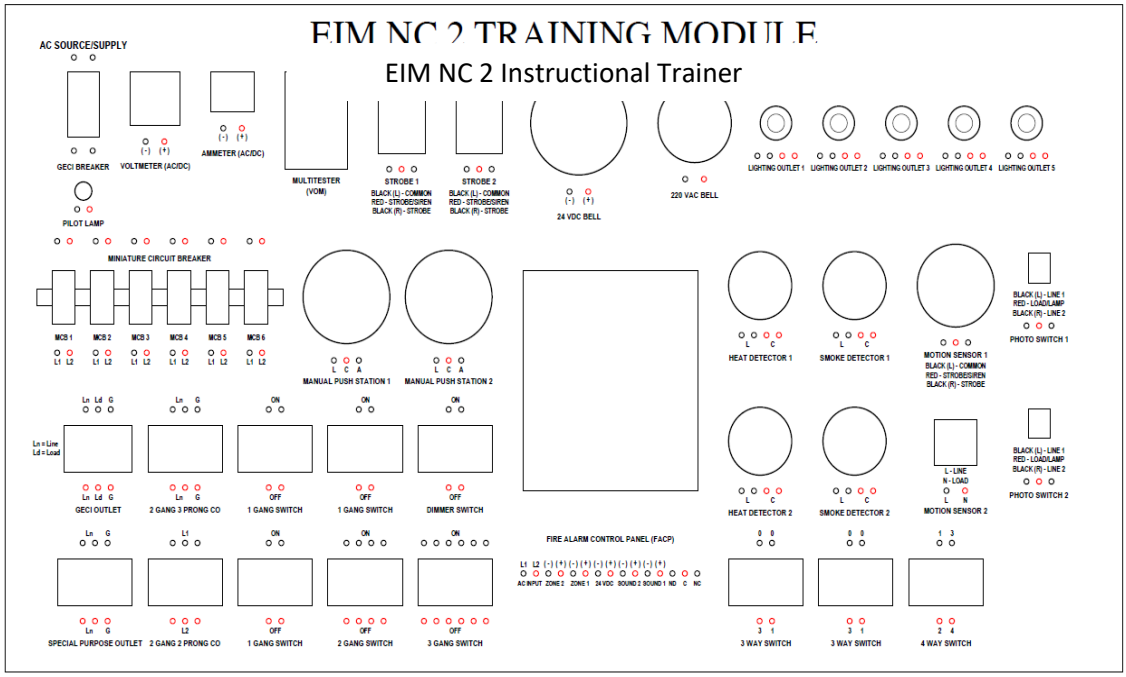


Figure 2. Instructional Trainer Devices Layout

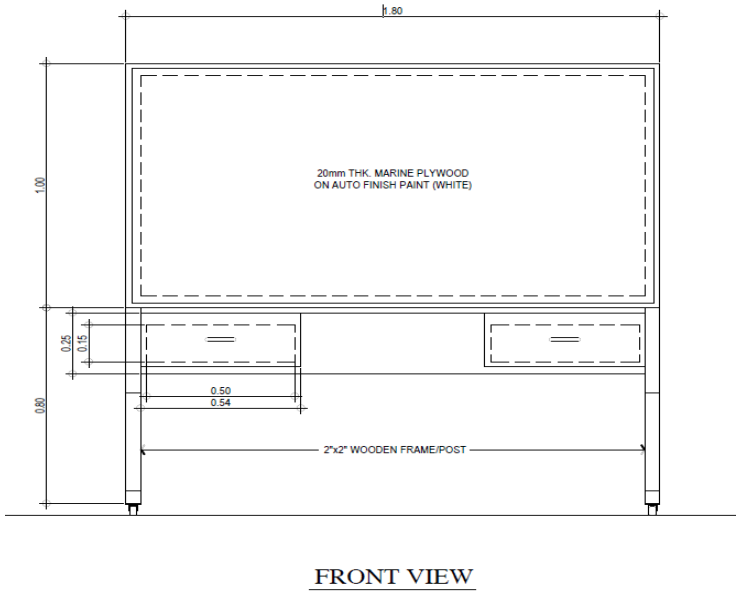


Figure 3. Front View of the Instructional Trainer Design

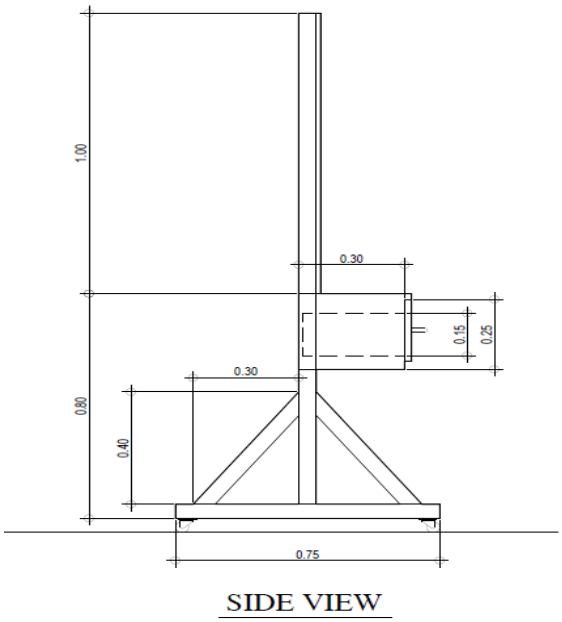


Figure 4. Side View of the Instructional Trainer Design

A B

Figure 5-A and 5-B. Construction of the board frame and stand

A B

Figure 6-A and 6-B. Drilling holes for the binding post and other devices

A B

Figure 7-A and 7-B. The board with holes (A) and ready for first painting (B)

Figure 8-A and 8-B. A hired painter spray-paint the board

A B

Figure 9-A and 9-B. Mounting the board frame

A B

Figure 10-A and 10-B. Papring the board for the mounting of devices and binding post.

A B

Figure 11-A and 11-B. Mounted devices and binding post

A B

Figure 12-A and 12-B. Terminating and crimping the wires to the binding post terminal

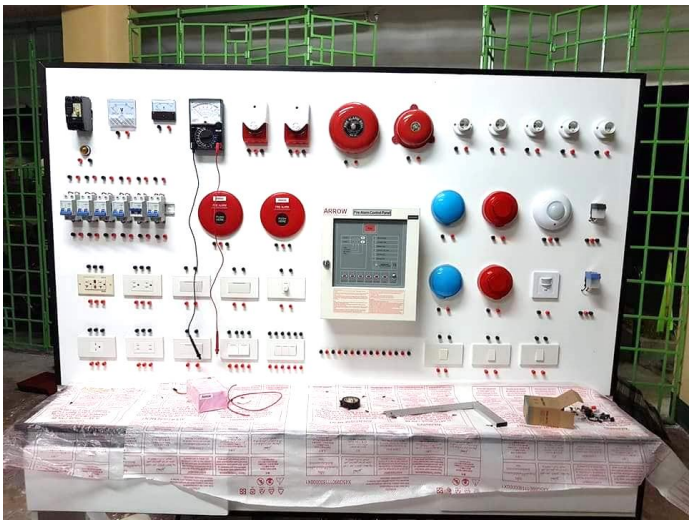
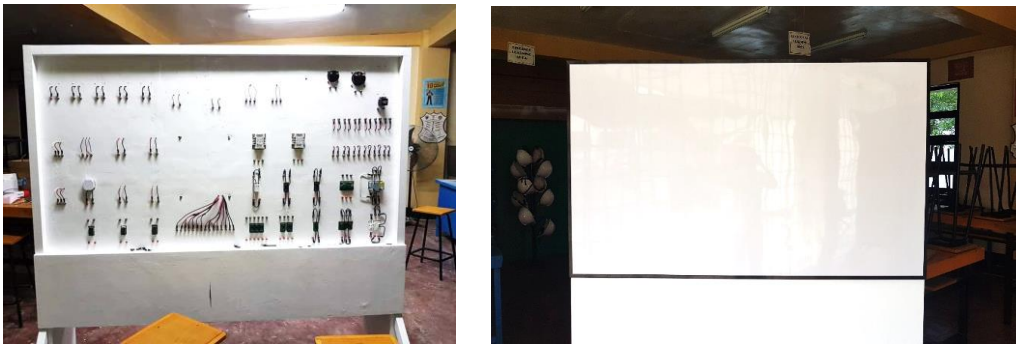


Figure 13. The almost finish Instructional Trainer (no labels yet)

A B

Figure 14. The Instructional Trainer (front- with labels or names of the devices)



A B

Figure 15-A and 15-B. Back of the Instructional Trainer: A- without cover and B – with a whiteboard as cover

A B

Figure 16-A and 16-B. Testing the instructional trainer.

A

B

C

D

E

F

Figure 17 (A, B, C, D, E and F). Different exercises/activities performed by the students

Figure 18. The experts from left to right (Prof. Overstreet, Prof. Gultia and Dr. Gonzales)

A

B

C

Figure 19 (A, B and C). Students and experts during the evaluation.