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Pilot Sensing Device Simulator

IRVIN B. DUMAPIAS
https://orcid.org/0000-0001-6744-6451
dumapiasirvin17@gmail.com
Bohol Island State University – Balilihan Campus
Philippines

JHONMAR S. AVERGONZADO
https://orcid.org/0000-0002-2383-0969
jhonmar.avergonzado@bisu.edu.ph
Bohol Island State University – Balilihan Campus
Philippines

ABSTRACT

The main intention of this study was to design and assemble the Pilot Sensing Device Simulator and assess further its effectiveness as an instructional device. The researcher observed no actual sensing device (or mock-up) that the instructor could use during discussions related to automation studies. The study employed the experimental design, particularly one group pre skilltest- post skilltest design. This was design used to measure the change in the outcome before and after an intercession was implemented. The efficiency in imparting the knowledge and skills to the students being evaluated. The researcher utilized a questionnaire for the students and experts. To acquire the necessary information on the acceptability level of the device, the researcher conducted observations on the device. When gathering of data was finished, the researcher analyzed and interpreted the data. Based on the findings of this study, the proponent highly recommended that the instructional device can be employed by the instructors that are related to automation studies. It helps the students to understand the uses and functions of different sensors. Indeed, the researcher came up with the conclusion that it is a useful instructional tool. It was recommended that the administration might utilize the research output for instructional purposes.

KEYWORDS

Automation, sensors, instructional device, experimental research design, Philippines

INTRODUCTION

One of the components of technology is electricity. Electricity has made tremendous advancement during the last few decades, and our day-to-day life involves the use of electronic devices. Electricity has played a major role in every sphere of our lives. Electronic inventions are still coming at a very fast rate in the fields of transportation, communication, entertainment, manufacturing, home appliances, and even in the arts. Today's inventors are working on some very exciting uses of electrically powered gadgets for tomorrow's users. Advances in various technologies have helped a range of industries to move forward and embrace the Fourth Industrial Revolution (Grein, 2010). According to Marr (2018), industry 4.0 fosters what has been called a "smart factory." Within modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world, and make decentralized decisions. Over the Industrial Internet of Things (IIoT), cyber-physical systems communicate and cooperate with each other and with humans in real-time both internally and across organizational services offered and used by participants of the value chain.

Prior to the Industrial Internet of Things (IIoT), machine data went to a screen for an operator to take action. The operator might see a list of alarms, for example, and react. The goal now is to shift reactionary responses, and move to predictive responses. The result will be better machine performance, less equipment downtime and lesser inefficiencies (Hossain & Muhammad, 2016). Through the rapid evolution of electrical devices, sensing devices emerged. A sensing device is an electronic component, module or subsystem whose purpose is to detect events or changes in its environment and send information to other electronic devices. A sensing device detects and responds to some type of input from the physical environment. The specific input could be light, heat, motion, moisture, pressure, and the absence of any other environmental phenomena. The output is generally a signal converted to a human-readable display at the sensor location or transmitted electronically over a network for reading or further processing. Automata Theory lies at the foundation of computer science and is vital to a theoretical understanding of how computers work and automation. According to Preston and Duff (2013), the Automata Theory gave rise to the motion of deterministic computation wherein each configures of the machines has only one possible successor. For some families of automata, deterministic and non-deterministic automata are equivalent. The languages can be accepted by non-deterministic automation of that family but cannot be accepted by any deterministic automata. A computer used in Pilot Sensing Device Simulator for program design in the Programmable Logic Controller (PLC). A computer is a machine that accepts data as input, processes that data using programs, and outputs the processed data as information. Many computers can store and retrieve information using hard drives. Computers can be connected together to form networks, allowing connected computers to communicate with each other (Van Eck & Waltman, 2010).

The Bachelor of Science in Electrical Technology also has a lesson about sensing devices. As the researchers observed, there is no actual sensing device (or mock-up) that the teacher can use during the discussions. To have variation in teaching the students, the teacher must have an actual device such as a sensing device so that the students can physically manipulate the gadget. If the teacher teaches the students without the actual components, they will just imagine the flow of discussion. The students cannot easily understand the discussion given by the teacher. Due to these observations, the researchers decided to conduct a study entitled Pilot Sensing Device Simulator so that the electrical shop room of Bohol Island State University – Balilihan Campus will have a valuable tool for instruction. The researchers also believed that this study would also benefit the students to have a broader, wider, and have enough knowledge about the different parts, components, and the installation process of the Pilot Sensing Device Simulator. The researchers believed that by using this instructional tool, learning would be very convenient for the students of Bachelor of Science in Electrical Technology. Thus, this research aimed to create a Pilot Sensing Device Simulator that would help both the teacher and students in learning this certain topic in this field.

Students during the study got not only theoretical knowledge, but they were able to solve practical problems like installing, programming, and troubleshooting the device. Therefore, the device will be proposed and create practical problems in order to verify the theory in practice. For these laboratory tasks, we use the most advanced technology from companies operating in industrial automation. Effective learning requires training both in theory, practice, and in thinking about doing. John Dewey's "Learning by Doing" theory states that the actual and practical approach contributes much to the development of a student's skills and ideas. Learning is enhanced and memory retention is enriched when both physical and mental capacities are used. The theory is further affirmed by Brent M. Egan, who said, "Knowing is not enough, we must apply; willing is not enough, we must do" (Egan, 2017). Article XIV, Section 10 of the 1987 Philippine Constitution states that: Science and Technology are essential for national development and progress. The state shall give priority to science and technology, education, training, and services. It shall support indigenous, appropriate, and self-reliant scientific and technological capabilities and their application to the country's productive system and national life (Abinales & Amoroso, 2017). This law inspired the researcher to develop a device that would benefit the economy and train people to be more useful and progressive. Additionally, Executive Order 226, otherwise known as the Omnibus Investment Code, was enacted in 1987 to develop the country's industries, establish a competitive investment environment, and discourage monopolies. Under this law, qualified projects, depending on their category, are granted a host of incentives including tax holidays, tax credits, and tax and duty exemptions for imported raw materials. Safety is a vital and important aspect of everyone's actions, whether on the job or in a private capacity. Accident prevention in the electrical trade is a matter of education. The Analog–Digital Input Simulator for Programmable Logic Controller is provided with safety devices in order to protect the PLC and the electrical devices from the excessive flow of current. Furthermore, the study is supported by Article 430, Section 1 of the 1985 Philippine Electrical Code, which states that: Systems and circuit conductors are grounded to limit voltages due to lightning, line surges, or unintentional contact with higher voltage lines, and to stabilize the voltage to the ground during normal operation. Systems and circuit conductors are solidly grounded to facilitate over-current device operation in case of ground faults. Furthermore, the Technical Education and Skills Development Authority (TESDA), established through Republic Act No. 7796, otherwise known as the "Technical Education and Skills Development Act of 1994" by President Fidel V. Ramos on August 25, 1994, is mandated to integrate, coordinate, and monitor skills development in its programs. Thus, it restructures efforts, promotes, and develops middle-level manpower through accreditation and training, and approve of skills standards and tests. TESDA also funds programs and projects for technical education and skills development and assists trainers in training programs. The establishment of TESDA aimed to encourage the full participation of all sectors, mobilizing the industry, labor, local government units, and technical-vocational institutions in the skills development of the country's human resources.

Creating Pilot Sensing Device Simulator is slightly expensive. However, the above statements drive the researcher to pursue the study. Technically, it needs enough ability and knowledge to solve problems that will come up during the process. This study enables the researchers and respondents to practically apply their theoretical knowledge and skills. The more the students are exposed to installing and troubleshooting the said instructional apparatus, the better he/she can analyze problems and successfully solve them. It is very important to stir students' minds for their understanding and with the close supervision of instructors.

FRAMEWORK OF THE STUDY

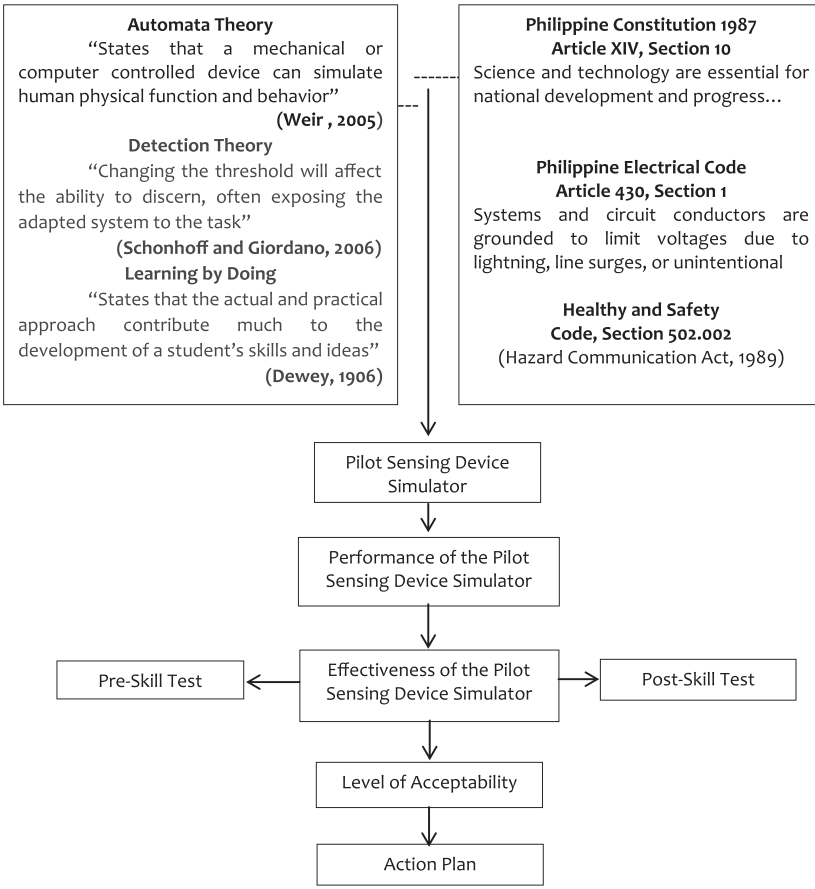


Figure 1. Theoretical and Conceptual Framework

OBJECTIVES OF THE STUDY

The main purpose of the study was to design and assemble the Pilot Sensing Device Simulator and assess further its effectiveness as an instructional apparatus. The study was conducted at Bohol Island State University (BISU) - Balilihan Campus, Magsija, Balilihan, Bohol in the Academic Year 2017-2018.

Particularly, this sought to answer the following questions: (1) What is the profile of the Pilot Sensing Device Simulator in terms of: (1.1) preparations, (1.2) designs, (1.3) cost of materials, (1.4) tools and equipments use, (1.5) procedures, (1.6) parts and functions and (1.7) Instructional Guide; (2)What is the performance of the Pilot Sensing Device Simulator in terms of: (2.1) overload protection and (2.2) functionality of sensing devices; (3) What is the effectiveness level of students taking pre-skill test and post-skill test of the Pilot Sensing Device Simulator; (4) Is there a significant difference exist between the effectiveness level of students taking pre-skill test and post-skill test of the Pilot Sensing Device Simulator; (5) What is the acceptability level of the instructional Pilot Sensing Device Simulator in terms of: (5.1) educational value, (5.2) functionality, (5.3) safety and (5.4) convenience; (6) What action plan shall be proposed based on the result of the study.

METHODOLOGY

Research Design

The study employed the experimental design, particularly the one-group pretest-posttest design. This design s the change in an outcome before and after an intercession is implemented. The efficiency in imparting the knowledge and skills to the students was being evaluated by this design.

The researchers utilized a questionnaire for the students and experts. To acquire the necessary information on the acceptability level of the product, the researchers shall conduct observations for the Pilot Sensing Device Simulator.

After gathering the data, the researchers collected, analyzed, and interpreted the data.

Research Environment and Participants

The study was conducted at Bohol Island State University- Balilihan Campus, Magsija, Balilihan, Bohol in the Academic Year 2017-2018. This institution has technology programs which, include the degree program of Bachelor of Science in Electrical Technology.

The respondents of the study are fifteen (15) students from Bachelor of Science in Electrical Technology third year. The researchers selected them since they are knowledgeable in electricity, including sensing devices operations.

The randomly selected students from the Bachelor of Science in Electrical Technology will undergo the pilot testing to determine the effectiveness of the instructional model in terms of pre skill test and post skill test of the students in the experimental group.

Research Instrument

The researchers made a questionnaire as a tool for gathering the data. The questionnaire will serve as the main tool in gathering data to evaluate the level of effectiveness of the instructional apparatus. The reflected data was checked and had undergone computation and analysis and was finally interpreted after the results were gathered.

Research Procedure

I. Permission to Conduct the Study

A letter asking permission to conduct the study noted by the adviser was submitted to the dean of the College of Technology and Allied Sciences and the Campus Director of Bohol Island State University- Balilihan Campus, Magsija, Balilihan, Bohol upon written approval and appointment of the thesis committee to conduct the study in the campus the researchers started the preparation of the materials/equipment.

II. Planning and Preparing of the Materials/Tools needed

The researchers created a ladder diagram of different operations for different sensing devices. The researchers gathered the resources necessary to make the gadget. Then, the researchers acquired affordable but quality-guaranteed materials. After preparing all the materials, the researchers have secured all the supplies to be used in the making of the instructional model.

III. Procedure of Assembly

The projected layout plan was followed by the researchers in constructing the Pilot Sensing Device Simulator. Ladder diagrams were used as an opening guide for the students for the connection of sensing devices.

IV. Functionality of the Gadget

When the assembly was done, the functionality of the gadget was tested to check if the parts are installed properly and functioned according to the desired operation.

V. Administration of the Skill Tests

The researchers conducted a skill test during the test administration. Fifteen (15) electrical students have undergone the said tests to check the validity of the effectiveness of the instructional model.

VI. Gathering Data

Pre-skill test and Post-skill test were administered to the students before and after the demonstration teaching. After showing the device and conducting the lesson, the students applied the ideas and information being formulated through assembling and installing the instructional model.

The researchers prepared the questionnaire and observation guide for the gathering of data. The feedback on the questionnaires was recorded.

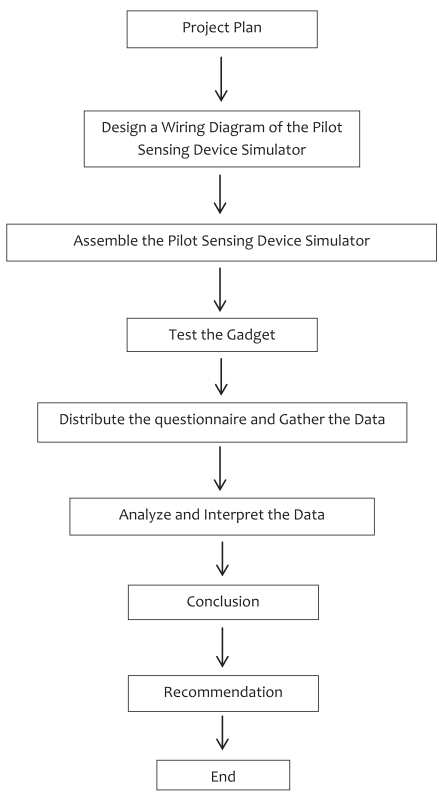


Figure 2. Flow Chart

VII. Analyzing and Interpreting the Test Results

The researchers gathered the data, tallied and tabulated it using appropriate statistical treatment to arrive at proper analysis and interpretation.

VIII. Conclusion and Recommendation;

Based on the analysis and interpretation of the data gathered, the researchers formulated the conclusions and recommendations.

IX. Action Plan

An action plan was formulated for the utilization of the results of the study.

Statistical Treatment

The researcher will use weighted arithmetic mean formula to determine the acceptability level of the Pilot Sensing Device Simulator and utilize the following scale in order to arrive at the correct interpretation of the students and experts' perceptions.

Acceptability level is qualitatively interpreted using the following scale:

Scale		Range	Acceptability Level
4	=	3.41-4.00	Very High (VH)
3	=	2.61-3.40	High (H)
2	=	1.81-2.60	Average(A)
1	=	1.00-1.80	Low(L)

A t-test computation is employed to determine whether there is a significant difference between the pre skill test and post skill test of the students using the Pilot Sensing Device Simulator.

RESULTS AND DISCUSSION

The researchers finalized the design for the schematic diagram as the reference in making the perspective view of the gadget, which was the basis in securing the needed tools, equipment, and materials in creating the gadget.

Design

The design of the Pilot Sensing Device Simulator was the basis for assembling the gadget.

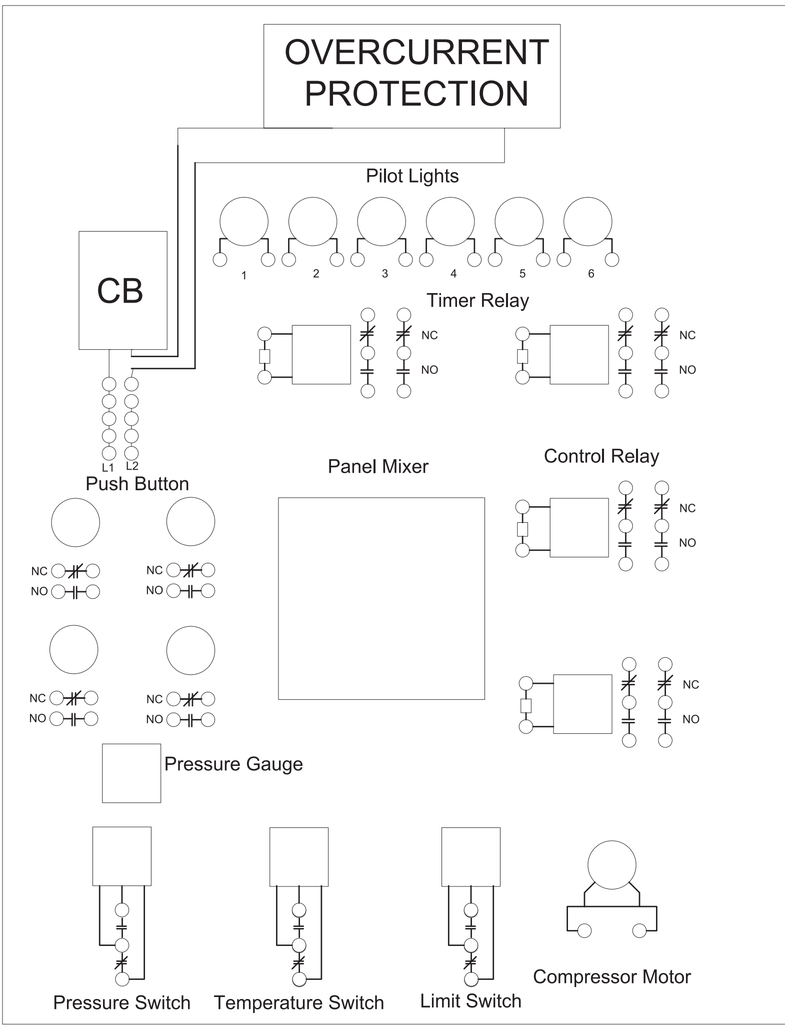


Figure 3. Wiring Design

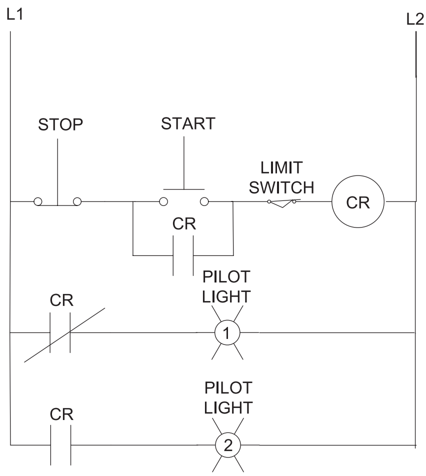


Figure 4. Limit Switch Ladder Diagram

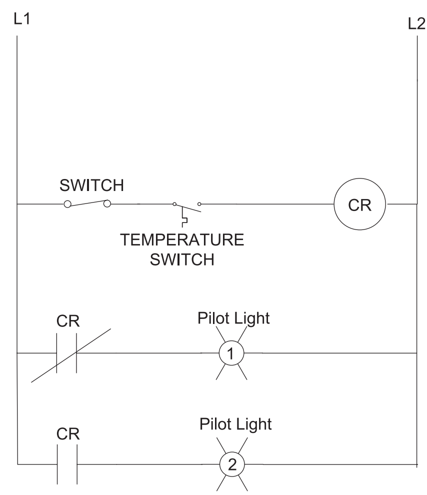


Figure 5. Temperature Switch Ladder Diagram

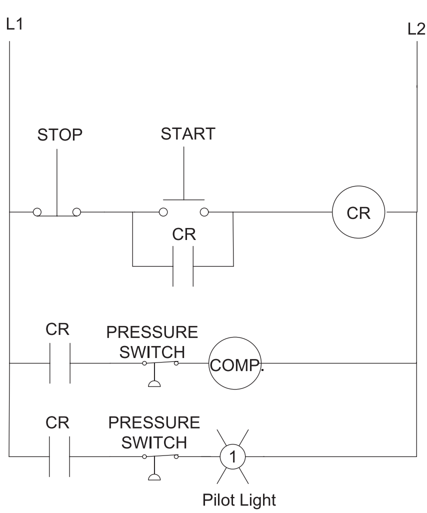


Figure 6. Pressure Switch Ladder Diagram

Table 1. Cost of Materials used in Assembling the Gadget

Item No.	Qty.	Unit	Description	Unit Cost in Peso	Total Cost in Peso
1	1	Sheet	2'x3', Fiber Glass	P1600.00	P1600.00
2	2	Pieces	Push Button, Red, 220VAC	P180.00	P360.00
3	2	Pieces	Push Button, Green, 220VAC	P180.00	P360.00
4	1	Piece	Gas Tank (Small)	P800.00	P800.00
5	6	Pieces	Pilot Light, Amber, 220 VAC	P150.00	P900.00
6	2	Pieces	Teflon Tape, ½"	P7.00	P14.00
7	1	Piece	Paint, Enamel, Blue, 500ml	P145.00	P145.00
8	1	Piece	Brush, 1 ½"	P10.00	P10.00
9	1	Piece	Bronze Rod	P35.00	P35.00
10	1	Piece	Variable Temperature Switch, 220VAC	P2500.00	P2500.00
11	1	Piece	Circuit Breaker, 220v, 30 amps	P250.00	P250.00
12	1	Piece	Pressure Switch, 220 VAC	P550.00	P550.00
13	1	Piece	Ball Valve, ½"	P250.00	P250.00
14	1	Set	Halogen Lamp, 1000w	P569.00	P569.00
15	1	Piece	Stainless Nipple, 1/2" x 6"	P89.00	P89.00
16	2	Pieces	Stainless Nipple, 1/4" x 6"	P66.00	P132.00
17	1	Piece	Spray Paint, Blue, 100ml	P110.00	P110.00
18	1	Pack	Tox With Metal Screws, 1"	P29.75	P29.75
19	2	Packs	Screw Bolt, 1/8"x 1"	P2.00	P4.00
20	2	Packs	Nut, 1/8"	P2.00	P4.00
21	2	Packs	Flat Washer, Tin Washer, 1/8"	P2.50	P5.00
22	10	Meters	Soldering Lead, 60/40	P10.00	P100.00
23	72	Pieces	Binding Post, Red	P13.00	P936.00
24	79	Pieces	Binding Post, Black	P13.00	P1027.00
25	1	Piece	Limit Switch,220VAC	P350.00	P350.00
26	2	Sets	Control Relay, 220 VAC/5A	P850.00	P1700.00
27	2	Sets	Timer Delay Relay, 220 VAC/5A	P675.00	P1350.00
28	4	Pieces	Plastic Roller Wheels	P40.00	P160.00
29	1	Pack	Self-Tapping Screw, 1"	P25.75	P25.75
30	15	Meters	Wire, THN, #14	P12.00	P180.00
31	5	Meters	Duplex Wire, #12	P18.00	P90.00
32	1	Piece	Male Plug	P15.00	P15.00
			Total Cost of Materials		P14,650.50
			30% Labor Cost		P4,395.35
			Total Cost of the Gadget		P19,045.85

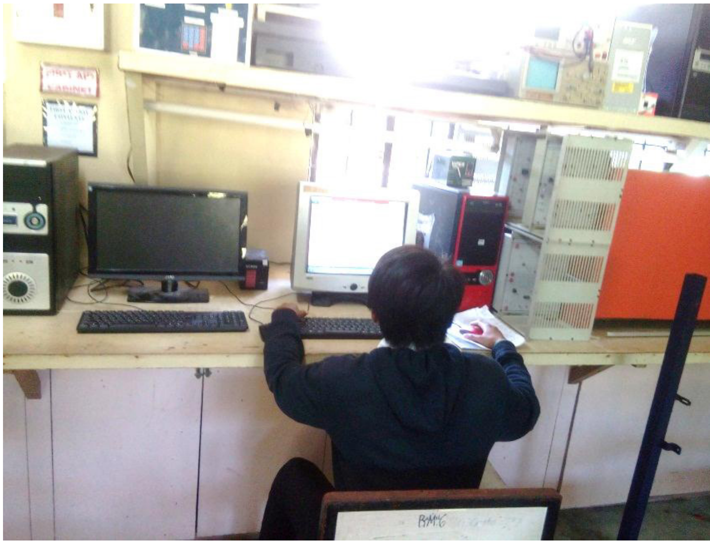
Table 2. List of Tools, Equipment, and Instruments and their Corresponding Functions

Tools, Equipment and Instrument	Purpose
1. Driving tools	
a. Flat screwdriver	Drives ordinary screws with slotted heads.
b. Philip screw driver	Drives screws with cross or star heads
c. Nut driver	Drives and tightens nuts/ lock of pilot light.
2. Equipment	
a. Multi-meter	Measures voltage, current, and resistance of the circuit.
3. Soldering tools	
a. Electric soldering iron	Solders terminals and joints of the instructional material.
4. Boring materials	
a. Electric drill press	Bores holes for the terminals of the instructional materials.
b. Electric hand drill	Bores holes on the plastic hard case.
5. Measuring tools	
a. Pull-push rule	Measures the exact dimension of the base of the instructional material were all the devices was mounted.
6. Marking tools	
a. Center punch	Marks guides for the boring of the plastic hard case of the device.
7. Holding tools	
a. Pliers (long nose, diagonal and flat)	Holds small components of the device.
8. Edge cutting tools	
Wire stripper	Used to remove insulation particularly small sizes of wires.
Knife	Used to reamed excess/dirt portion of the assembled simulator.

Procedure in Assembling the Gadget

The following shows the steps in assembling the gadget. These were supported with pictures to give complete insight into how the gadget was being formed.

1.) Make a ladder diagram that serves as a reference guide.



2.) Gather all the needed tools and equipments.

3.) Drilling the fiberglass.

4.) Mounting the components into fiberglass.

5.) Soldering all the connections of the different parts and components of the circuit.

6.) Testing the Gadget.

7.) Overview of the finished gadget.

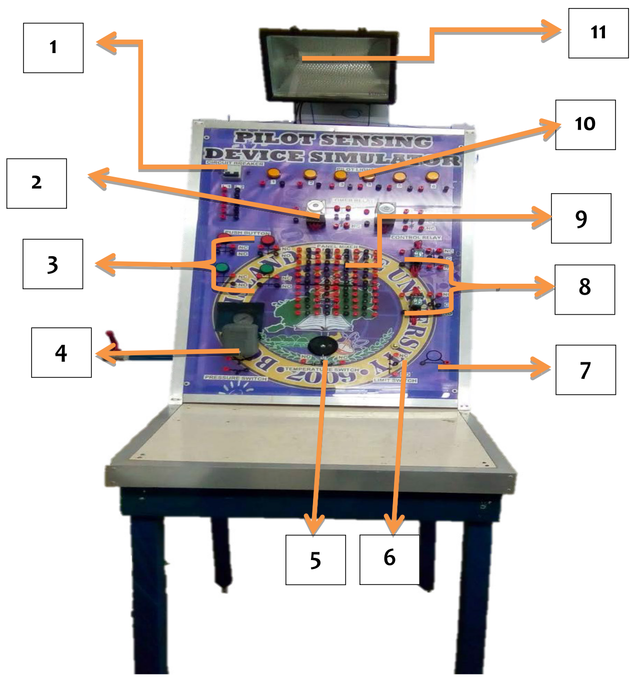


Figure 7. Parts and Function of the Gadget

Table 3. Parts and function of the Pilot Sensing Device Simulator

No.	Parts	Function
1	Circuit Breaker	An electromagnetic device that opens a circuit automatically when the current exceeds a predetermined value.
2	Timer-Delay Relay	Control one electrical circuit by opening and closing contacts in another circuit.
3	Push Button	Used as an input to control other functions according to the circuit applied.
4	Pressure Switch	Detects the pressure of the gas tank.
5	Temperature Switch	Detects the presence of excessive heat
6	Limit Switch	Detects physical contact.
7	Compressor Motor Contacts	Pumps air into the gas tank.
8	Control Relay	Control one electrical circuit by opening and closing contacts in another circuit after some time of delay.

9	Panel Mixer	Used as an extra connection if other connections exist.
10	Pilot Light	Can be used to indicate the current status of the circuit or as an output
11	Fault Indicator	Lights up when the circuit you applied has a fault or wrong connection (short circuit).

Instructional Guide in Operating the Gadget

Procedure in Operating the Gadget

1. Supply the gadget with 220-240VAC only.
2. Use the banana plugin connecting the binding posts to simulate the desired connection.
3. To test the connections turn the gadget's circuit breaker on.
4. If your connections are wrong, the Fault Indicator Lamp) will light up.
5. After using the gadget, disconnect it from the 220-240 VAC power source.

Precautions in Operating the Gadget

1. Do not touch the connecting parts of the gadget when the main circuit is on.
2. Turn off the circuit breaker when connecting.
3. Avoid interchanging the circuit of the gadget.
4. Do not expose the gadget to the rain.

Performance of the Pilot Sensing Device Simulator

Table 4. Overload Protection

Faults Actions	Output	Description
Short Circuit	Fault Indicator On	Functional
	Fault Indicator On	Functional
	Fault Indicator On	Functional
Overload	Fault Indicator On	Functional
	Fault Indicator On	Functional
	Fault Indicator On	Functional

The researcher tested the overload protection of the Pilot Sensing Device Simulator by plugging the device into a 220 VAC source.

In trial 1, the instructional apparatus was connected with a short circuit, and the fault indicator responded accordingly, described to be functional.

In trial 2, the instructional apparatus was connected in an overload causing the fault indicator to respond accordingly, described to be functional.

Table 5. Functionality of the Sensing Devices

Connections	Output	Description
	Pilot Light turned ON/OFF	Functional
Temperature Switch	Pilot Light turned ON/OFF	Functional
	Pilot Light turned ON/OFF	Functional
	Pilot Light turned OFF	Functional
Pressure Switch	Pilot Light turned OFF	Functional
	Pilot Light turned OFF	Functional
	Pilot Light turned ON/OFF	Functional
Limit Switch	Pilot Light turned ON/OFF	Functional
	Pilot Light turned ON/OFF	Functional

The researchers tested the functionality of the sensing devices in the Pilot Sensing Device Simulator. Thus, in all the trials, the researchers make different connections rendered by the instructional apparatus. The researchers observed that the different sensing devices with an output of pilot lights which turned on, showing that all sensing devices are functional.

Effectiveness Level of Students Taking Pre-Skill Test and Post-Skill Test of The Pilot Sensing Device Simulator.

The researchers got the top 15 students of their respective section to undergo pre-skill test and post-skill test. After the test, the researchers gathered, recorded, and tabulated their scores that served as data in solving for the statistical treatment.

Table 6. Pre-skill Test and Post-skill Test Result of Pilot Sensing Device Simulator

Pre-skill Test					Post-skill Test				
Score	f	%	Description	Rank	Score	f	%	Description	Rank
3.25-4.00	0	0%	Very Good		3.25-4.00	12	80%	Very Good	1
2.50-3.24	0	0%	Good		2.50-3.24	3	20%	Good	2
1.75-2.49	5	33.3%	Fair	2	1.75-2.49	0	0%	Fair	
1.00–1.74	10	66.7%	Poor	1	1.00–1.74	0	0%	Poor	
Average Rating			0.85 Poor		Average Rating			3.35 Very Good	

Table 6 shows the frequency and percentage results of students before and after the treatment of the Pilot Sensing Device Simulator. It reveals a 66.67% percentage rating of students in the pre-skill test (10 out of 15), described as "poor." Meanwhile, only 33.33% percentage rating of the students was described as "fair." On the other hand, no one is described as "good" and "very good." The average rating of pre-skill test is 0.85, describes as "poor."

In the post-skill test, 12 out of 15 students or 80% in percentage rating of their performance got higher results and described as "very good" and rank first, while 3 or 20% percentage rating was described as "good." The students got an average rating of 3.35, described as "very good." It was found out that the post-skill test of the students who used the Pilot Sensing Device Simulator got higher scores and was shown to be effective for the improvement of the learning abilities of students.

Table 7. Difference between the Performance of the students under Pre-skill Test and Post-skill Test
N = 15

Difference	z computed value	z tabular value	Description	Interpretation
	at 0.05 level of significance, df 14			
Pre-skill test and Post-skill test	-17.53	±2.145	Significant	Reject Null Hypothesis

The table above shows the z-computed value of the pre-skill test and post-skill test of the students using the Pilot Sensing Device Simulator. It also shows the difference between the skill effectiveness of the students. Through the use of the appropriate statistical test, the researchers found out that there is a significant difference between the pre-skill test and post-skill test of the students. The computed t-test value is –17.53 which is considerably higher than the computed absolute value of ±2.145. Therefore, the researchers came up with the decision to reject the null hypothesis.

Table 8. Acceptability Level of the Pilot Sensing Device Simulator in Terms of Educational Value, Functionality, Safety, and Convenience
N=15

CRITERIA	Pilot Sensing Device Simulator	
	WM	Description
1. Educational Value		
Average Weighted Mean (AWM)	3.51	Very Good
2. Functionality		
Average Weighted Mean (AWM)	3.58	Very Good
3. Safety		
Average Weighted Mean (AWM)	3.51	Very Good
4. Convenience		
Average Weighted Mean (AWM)	3.64	Very Good
Total Average Weighted Mean	3.56	Very Good

After the calculation of data, analysis was made using their respective formulas in getting the values of the weighted mean. The descriptive rating was determining on the level of the corresponding weighted mean.

Table 8 revealed the Acceptability Level of the Pilot Sensing Device Simulator in terms of its Educational Value, Functionality, Safety, and Convenience.

In terms of Educational Value it clearly showed that items under the criteria of educational value are rated "Good" with the total average weighted mean of 2.51. This clearly shows that the respondents strongly agree to the educational value of the gadget as an instructional tool.

In terms of Functionality, the Pilot Sensing Device Simulator was rated 2.58 which is described as "Good". Table 8 revealed that the respondents strongly agree that the gadget's parts work according to their functions.

In terms of safety, the Pilot Sensing Device Simulator was rated 2.51 which is described as "Good". This indicates that it is safe to use as an instructional tool in electrical shop classes.

The gadget was rated "Good" in terms of Convenience with an average weighted mean of 2.64. This revealed that the Pilot Sensing Device Simulator can be easily transferred from one place to another because it is made from lightweight materials, and it is now easier to do discussion with the use of this instructional tool.

CONCLUSIONS

After the researchers obtain the results from using statistical treatment, the researchers concluded that there is a significant difference between the pre-skill test and post-skill test of the Pilot Sensing Device Simulator. In addition, the researchers agreed to reject the null hypothesis.

TRANSLATIONAL RESEARCH

Acceptability. It refers to measure the respondent's assessment on the trainer gadget.

Functionality. It refers to the practical or state of being function.

Safety. It is a measure used to denote that the device is not harmful to the students and instructors.

Educational Value. Characteristics of product or content that promotes the enhancement of knowledge.

Pressure Switch. A type of sensing device that changes the state of its contact when it reaches the cut in pressure.

Temperature Switch. A sensing device that senses change of the temperature then changes its state if it reaches the desired temperature.

Limit Switch. A type of sensing device that changes its state of contact when a physical force is applied to its lever/arm.

RECOMMENDATIONS

Based on the conclusions drawn from the study, the researchers have drafted these recommendations:

1. The Pilot Sensing Device Simulator can be introduced to the school to serve as guidelines on having discussions and hands on activity to the students in connecting the different types of sensors.
2. The demonstration of the gadget can be conducted for the Electrical students to be aware of the parts and connections of the Sensing Device.
3. A proposed plan can be produced to promote the use of the gadget in electrical shop.
4. Future researchers can conduct related studies to develop more its features as an instructional device in the electrical shop aside from the Pilot Sensing Device Simulator.
5. The Pilot Sensing Device Simulator must be used as an instructional device for electrical instructors during automation studies.

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