DEVELOPMENT AND ACCEPTABILITY OF FIRE DETECTION AND ALARM SYSTEM (FDAS) TRAINER

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ABSTRACT

The Fire Detection and Alarm System (FDAS) is a newly incorporated competency in the Electrical Installation and Maintenance NC II curriculum following the updated TESDA training regulations. It is now part of the standard training for the Electrical Installation and Maintenance NC II qualification, requiring trainees to learn about installation and maintenance of FDAS systems. This study intended to develop a Fire Detection and Alarm System Trainer as an instructional material for Technical-Vocational Livelihood Track, Industrial Arts Strand specializing in Electrical Installation and Maintenance. The developed product was conceptualized to provide students with hands-on learning experiences in operating and troubleshooting fire detection and alarm systems and to address the learning difficulties experienced by the students, particularly due to the lack of school laboratories because of its shifting to academic classrooms and the scarcity of instructional materials to facilitate the teaching and learning process.

The study aimed to evaluate and determine the acceptability of the developed Fire Detection and Alarm System Trainer and sought answers to the following: (1) What fire detection and alarm system trainer may be developed?; (2) What are the steps involved in the development of Fire Detection and Alarm System Trainer?; (3) What is the level of acceptability of the developed Fire Detection and Alarm System Trainer as assessed by the teacher and student along: (a) Functionality, (b) Durability, (c) Portability, (d) Usability, and (e) Safety?; (4) Is there a significant difference on the level of acceptability of the developed Fire Detection and Alarm System Trainer as assessed by two (2) groups of respondents?.

This inquiry used the developmental-descriptive research method in the development and evaluation of the developed product. This method involves procedures and steps such as planning, designing, construction, testing, and evaluation to develop the trainer. The product development was aided using the widely used structured framework known as ADDIE model to ensure that the instructional product meet learners' needs and achieve the desired outcomes. The acronym ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation, which are the five phases of the process. Each phase of the framework played an important role in ensuring the success of the developed fire detection and alarm system trainer. In the evaluation of the acceptability of the finished product, a group of respondents composed of TVL - Electrical Installation and Maintenance teachers and students were selected using the purposive sampling method. The product was presented and assessed by the respondents through the use of survey questionnaires as the primary data gathering tool. The acceptability of the Fire Detection and Alarm System Trainer was determined in terms of functionality, durability, portability, usability, and safety.

The findings of the study showed that the developed Fire Detection and Alarm System Trainer was constructed with lightweight and durable materials, including aluminum angle bars and acrylic sheets. It incorporates actual fire detection and alarm components, such as a smoke detector, sounder strobe, manual call point, and fire alarm control panel, to provide realistic hands-on experience to the end-user of the product. Banana plugs and jack were used to make the system ideal for quick assembly and reconfiguration. The trainer is also equipped with a small compartment intended for organizing cables, connectors, and additional components, providing a tidy and accessible learning setup. The application of the ADDIE model outlined the development of the Fire Detection and Alarm System Trainer.

Furthermore, the product was evaluated as highly acceptable in terms of functionality, with average weighted means of 5.00 and 4.96, respectively. Likewise, the trainer achieved average weighted means of 4.90 and 4.77 in terms

of durability, earning a rating of highly acceptable. Similarly, the product obtained an average weighted means of 4.96 and 4.89 for portability, 4.92 and 4.86 for usability, and 5.00 and 4.92 for safety. These three variables were rated as highly acceptable. In addition, there is no significant difference between the level of perception of teachers and students along the identified variables.

In conclusion, incorporating the actual components of fire detection and alarm system can provide realistic hands-on experience and helps learners develop skills in installation, troubleshooting, and maintenance of fire alarm systems. The application of the ADDIE model made the development of the product effective and efficient. There are also seven identified steps or procedures needed for the development. Moreover, the developed trainer was deemed highly acceptable across its identified variables and the agreement between the two key user groups reinforces the idea that the product was well-designed and suitable for its intended purpose, making it a reliable and acceptable instructional tool for use.

Keywords: - *Development, Acceptability, Fire Detection, Alarm System, FDAS, Trainer*

1. INTRODUCTION

Effective teaching is when a teacher is capable of improving student's achievement, promote active participation, and mastering the subject through numerous factors. One of these factors is the effective use of instructional materials that the teachers used to make learning more interesting and memorable. Delivering lessons trough theoretical explanation is certainly essential for building a foundational understanding of a subject and may sometimes be enough, however it is a known fact that educators cannot teach effectively without proper teaching materials. Hands-on experiences and practical application of skills play a crucial role in reinforcing learning and fostering a deeper understanding. To facilitate this, creating an appropriate instructional material that can provide congruent learning experience is one way to help with this.

According to Sale (2016), the use of instructional materials is an indispensable tool that enhances qualitative teaching and learning. He further expounds that instructional materials are used to facilitate comprehension of ideas and ensure long term retention of ideas and topics taught to the learners. The insight from Sale tells the importance and the critical role of instructional resources to the teaching and learning process. A well-designed instructional material can help students grasp complex concepts more easily, foster student engagement and encourage active participation in the learning process.

Several influential thinkers and educators have contributed to the discourse on learning styles, emphasizing the importance of understanding individual learning preferences and tailoring educational approaches to accommodate diverse student needs. Taking into account the diverse learning styles and preferences of students is essential in the development of instructional materials because it allows educators to create personalized and effective learning experiences that cater to the specific needs, strengths, and preferences of each student. Instructional materials can be tailored to optimize engagement, comprehension, and retention, leading to improve learning outcomes.

21st century learners on the other hand continue to challenge teacher's creativity and resourcefulness. In this period of time where individual difference and multiple intelligence were recognized, innovative instructional materials are essential tool in improving students' understanding of concept, abilities and skills which can led to a high academic achievement and meaningful learning. According to Loveless (2025) the Learning Pyramid, or the "Cone of Learning", developed by the National Training Laboratory, suggests that most students only remember about 5% from lecture, 10% from reading, 20% from audio-visual, 30% from demonstration, 50% from discussion, 75% from practice and nearly 90% from teaching others. These strongly suggest that students better understand a concept when they practiced and experienced it directly rather than being told about it.

Moreover, John Dewey thought "In contrast to traditional classrooms, the school and classrooms should represent the real-life situations, allowing children to participate in learning activities interchangeably and flexibly in a variety of social settings (Dewey, 1938; Gutek, 2014)". Dewey implies that learners must be exposed on different hands-on activities in order to attain life-long learning. This also means that active involvement in the learning process is a powerful factor in understanding and retaining information.

Furthermore, the Philippine education system implemented the Republic Act 10533 otherwise known as The Enhance Basic Education Act of 2013 which aims to meet international standard and produce globally competitive graduates equipped with the 21st century skills and life-long learning. One of the main objectives of the K-12 program is the development of the technical and vocational skill of the learners. The Technical-Vocational Track (TVL) is designed to provide learners with practical skills and knowledge that are directly applicable to the workplace or to

further studies in technical and vocational education. This objective can only be realized if an appropriate, adequate and well-designed instructional material is utilized by educators in the teaching and learning process.

A decade after the implementation of the K–12 program, the lack of classrooms, laboratory facilities, and instructional resources are still some of the unsolved problems that needs to be address in the field of Education. In the report of Macasero (2023), The Department of Education (DepEd) stated that the country was short of 159,000 classrooms this coming school year. Accordingly, the lack of physical classrooms can have various consequences impacting students, teachers and the overall educational experience. These consequences were also experienced by the schools in the province of Sorsogon specifically, in the municipality of Castilla due to the shortage of physical facility.

Moreover, School laboratories where important equipment, resources and training materials intended for experiential learning and to facilitate teaching and learning process were now used as regular classroom resulting to the limited hands-on and practical activities. Furthermore, many educational institutions, particularly technical-vocational schools and training centers, lack the appropriate equipment or trainer boards specifically designed for FDAS training. Most training programs of these schools rely heavily on theoretical learning through the use of textbooks, presentations, and online resources to explain FDAS principles. Some schools use generic electrical training setups that do not provide the specialized experience needed for FDAS-specific competencies, while others rely on industry-based training during work immersion or apprenticeships.

In addition, standard wiring boards where system components of fire detection and alarm system were installed are not designed for portability and are mounted on walls or in fixed position. Students could interact with these components but only in a stationary setting. In the study of Olayinka (2016), he concluded that students taught with instructional materials have excellent achievement scores compared with those taught without any material. This clearly shows that the use of instructional materials in the teaching and learning process cannot be overemphasized.

On this premise, the researcher decided to develop a Fire Detection and Alarm System trainer. The device is designed to allow learning to take place in different location where the trainer can carry the device in various environment for practical or hands-on activities. It is also customized to meet the needs of the learners and also a cost-effective alternative by providing a portable solution without the need for extensive structure. Lastly, it can address one of the core competencies in Electrical Installation and Maintenance NC II (EIM NC II): Perform roughing-in activities, wiring and cabling works for single-phase distribution, power, lighting and auxiliary systems.

OBJECTIVES

This study aimed to develop and determine the level of acceptability of Fire Detection and Alarm System Trainer for Technical Vocational-Livelihood track, Industrial Arts strand and Specialized in Electrical Installation and Maintenance.

Specifically, it sought answer to the following:

1. What fire detection and alarm system trainer maybe be developed?
2. What are the steps involved in the development of Fire Detection and Alarm System Trainer?
3. What is the level of acceptability of the developed Fire Detection and Alarm System Trainer as assessed by the teachers and students along:
    a. Functionality;
    b. Durability;
    c. Portability;
    d. Usability; and,
    e. Safety?
4. Is there a significant difference on the level of acceptability of the developed Fire Detection and Alarm System Trainer as assessed by two (2) groups of respondents?

2. METHODOLOGY

2.1 Research Design

The study utilized a developmental-descriptive research method to systematically develop, assess, and document the effectiveness of Fire Detection and Alarm System trainer as an instructional material for Senior high school TVL track specializing in Electrical Installation and Maintenance. This research approach integrates both

developmental and descriptive research. In the developmental research aspect, the study focuses on planning, designing, and constructing the developed FDAS Trainer as an instructional tool including prototype testing to evaluate the trainer's functionality and safety. Additionally, an improvement process was conducted, incorporating feedback from experts and students to enhance the trainer's design. In the descriptive research aspect, the study assesses the effectiveness and acceptability of the developed product as perceived by teachers and students, focusing on its functionality, durability, portability, usability, and safety using a survey questionnaire as the primary data gathering instrument in determining the level of acceptability of the developed FDAS trainer. The research approach provided both the process of development and the detailed evaluation of the product.

In the development of Fire Detection and Alarm System Trainer, the researcher utilized the widely used framework for designing and developing instructional materials or product known as ADDIE model. The ADDIE model is an acronym that stands for Analysis, Design, Development, Implementation and Evaluation. The model served as the groundwork for the researcher to ensure that the product is of high quality and addressed the desired learning outcome. The process in the development of the product includes identifying the learning gap, planning, sketching, identifying tools, materials and equipment, casing assembly, installation of electrical components, and testing.

2.2 The Sample

The research sampling method used in this study in finding the significant and valid results from several respondents was purposive sampling. This sampling method is a non-probability sampling technique where the researcher deliberately selected the respondents of the study based on specific characteristics relevant to the study. The participants of this study were composed of 10 teachers teaching Technical-Vocational Livelihood Track, Industrial Arts Strand, and specialized in Electrical Installation and Maintenance, and 60 students specializing in TVL-Electrical Installation and Maintenance from the four National High Schools in the municipality of Castilla, Sorsogon.

2.3 The Instrument

This study used a survey questionnaire as the primary tool in gathering significant data to describe the level of acceptability of FDAS trainer board in terms of the criterion set by the researcher. This survey questionnaire was composed of two parts. The profile of the respondents on the first part, while the second part was the survey questionnaire for the level of acceptability of fire detection and alarm system trainer to determine its functionality, durability, portability, usability and its safety. This part also contained the rating scale known as the 5-point Likert scale to express or describe the respondent's response to the criterion set by the researcher. The indicators used in the survey questionnaire were adapted from the studies of Plazo and Escoto (2021), Oarde and Escoto (2022), and Esmeña and Escoto (2024).

To ensure that the instrument measures what it intends to measure accurately, the researcher conducted a survey questionnaire validation by seeking feedback from experts in the same field to assess the survey question's quality, relevance, and appropriateness. For more refinement of the survey questionnaire, the researcher also administered a pilot testing of the survey on November 11, 2024, involving 20 EIM students and their teacher at Cumadcad National High School to identify issues with question-wording, response options, and the overall survey flow.

2.4 Data Collection Procedures

The data collection procedures for the developed Fire Detection and Alarm System Trainer involved several steps to ensure a thorough evaluation of the acceptability of the product in terms of functionality, durability, portability, usability and safety. The initial step done by the researcher was to identify schools offering Electrical Installation and Maintenance under the Technical-Vocational Livelihood Track, Industrial Arts Strand in the municipality of Castilla.

To gather the significant data needed for this study, the researcher first secured an approval of permission letter from the Dean of SSU-SGS to conduct the survey. The letter was sent to the office of the Superintendent of DEPED Sorsogon Province for further authorization. With consent from school heads of the target schools, the researcher personally administered a face-to-face survey to the TVL-EIM teachers and students for the school year 2024-2025.

On November 15, 2024, the actual survey to determine the acceptability of the developed fire detection and alarm system trainer was conducted. During the data collection process, the researcher oriented the participants of the evaluation process and how the developed product works. Afterwards, the researcher demonstrated the trainer's

features, functions, and safety measures to the respondents of the study. Thereafter, the researcher allowed the evaluators to check and use the trainer in simulated scenarios to test its functionality, usability and safety features. In testing the functionality of the product, each component of the developed instructional material such as the smoke detectors, manual call points, strobe sounders and the fire alarm control panel were tested to ensure they work as intended. The performance of safety features like the emergency stop button and protective device were also verified.

While the participants were using the developed instructional material, the researcher observed and noted any difficulties or concern about the product. Later, the survey questionnaires were distributed to gather the participants insights about the acceptability of the product in terms of functionality, durability, portability, usability, and safety. Then, the researcher retrieved the survey questionnaires for data analysis. A 100% retrieval rate was assured after the data gathering.

2.5 Data Analysis Procedures

The gathered data was organized, tallied, tabulated, and statistically treated using statistical measures such as weighted mean and Wilcoxon-rank sum test in order to assess and interpret if the product meets the needs and expectations of its intended users and to ensure the effectiveness of the developed instructional material. The survey results were summarized using Microsoft Excel software to compute the weighted mean. The statistical measure was used to interpret numerical data in order to determine the level of acceptability of the fire detection and alarm system trainer in terms of its functionality, durability, portability, usability, and safety features.

The researcher devised a modified 5-point Likert scale to evaluate the adjectival interpretation of the results, aiming to assess the level of acceptability of the fire detection and alarm system trainer. The scale is as follows:

Range-Value	*Description*
4.50 – 500	Highly Acceptable
3.50 – 4.49	Acceptable
2.50 – 3.49	Moderately Acceptable
1.50 – 2.49	Fairly Acceptable
1.00 – 1.49	Not Acceptable

On the other hand, the Wilcoxon rank-sum test was used to analyze the differences in the perceptions of teachers and students regarding the acceptability of the developed product across the following variables: functionality, durability, portability, usability, and safety.

3. RESULTS AND DISCUSSION

3.1 Development of Fire Detection and Alarm System Trainer.

The Fire Detection and Alarm System Trainer was developed using aluminum angle bars and acrylic sheets as the primary materials. These materials are generally considered as lightweight and durable. The electrical components of the system include actual fire detection and alarm system components such as smoke detector, sounder strobe, manual call point and fire alarm control panel, providing students with real-world exposure to system parts and behavior. The Fire Detection and Alarm System components were installed to the two sides of the housing. The audible alarm and the automatic initiating devices were installed on the upper side of the mock-up box, while control panel and manual initiating devices were installed on the bottom part. The trainer's size and shape could fit through standard doors and does not require excessive space when storing the product. A caster wheels were installed for smooth and easy movement of the product in various directions, making it simpler to transport. For the safety of the end user, safety features such as a power indicator lamp, safety protective device, and an emergency stop button were installed to halt the operation of the trainer in an event of electrical fault. Banana plugs and jacks were used as well to make the system ideal for quick assembly and reconfiguration. Lastly, the trainer is equipped with an internal compartment for storing the accessories of the innovated product.

Figure 1: The developed Fire Detection and Alarm System Trainer in a Close Position

Figure 2: The developed Fire Detection and Alarm System Trainer in an Open Position

3.2 Steps involved in the development of Fire Detection and Alarm System Trainer

The Fire Detection and Alarm System Trainer was developed using the widely used framework known as ADDIE model. ADDIE stands for Analyze, Design, Develop, Implement, and Evaluate, representing each phase of the model. The steps in the development of the product includes the following: identifying learning gap, planning, sketching, identifying tools, materials and equipment, casing assembly, installation of electrical components, and testing. The structured process of the developed trainer ensures its effectiveness as an instructional material. The first process focused on identifying learning gap by recognizing cognitive limitations, gathering feedback from the learners and the need for an enhanced instructional material to facilitate the teaching and learning process. The planning phase defined the trainer's purpose, skills to develop, and specifications, with expert consultations guiding the development of the product. A detailed blueprint was then created using computer software to visualize the trainer's features and functionality. On the fourth step, materials and tools were identified, with a total cost of ₱25,349.00. The trainer's casing was assembled on the fifth step, using aluminum angle bars and acrylic sheets, designed as a portable suitcase with wheels for easy transport. Electrical installation was carried out in two phases: top shell and bottom shell installation. Finally, comprehensive testing was conducted to ensure compliance with design, safety, and functionality standards.

3.3 Level of acceptability of the developed Fire Detection and Alarm System Trainer

Functionality

The result of the evaluation of the product's functionality between two groups of respondents were presented using the table below.

Table 1: Functionality of FDAS Trainer

Indicators	Teachers		Students	
	WM	**DM**	**WM**	**DM**
1. Automatic initiating devices are all operational.	5.00	SA	4.95	SA
2. Manual initiating devices are all operational.	5.00	SA	4.95	SA
3. Audible and visual alarms are all operational	5.00	SA	4.97	SA
4. The control panel instantly activates the alarm system when triggered by the initiating devices.	5.00	SA	5.00	SA
5. The product as a whole is fully operational.	5.00	SA	4.92	SA
Overall	**5.00**	**SA**	**4.96**	**SA**

Legend: ***WM*** – Weighted Mean ***DM*** – Descriptive Meaning
SA – Strongly Agree

Table 1 shows the interpreted results of the consolidated and calculated data to determine the acceptability of the product in terms of functionality. On the first indicator, respondents strongly agree that all automatic initiating devices are fully operational with a weighted mean 5.00 and 4.95 respectively. This indicates that the smoke detectors of the trainer function reliably and accurately in response to appropriate trigger. Respondents also confirmed based from the result of indicator 2 that all manual initiating devices such as the manual call point are fully operational. This indicator received a weighted mean of 5.00 and 4.95, which shows that the respondents can manually trigger the alarm system effectively by pushing the button of the manual call point.

Furthermore, a "Strongly Agree" descriptive meaning was recorded on indicator 3, suggesting that audible and visual alarm activate consistently. What's more, the fire alarm control panel instantly activates the alarm system when triggered by the initiating devices as evidenced by the overwhelmingly positive response. Lastly, the product as a whole received a "Strongly Agree" rating for being fully operational, which means that all components work together seamlessly to simulate a complete fire detection and alarm system. The overwhelmingly positive response of the respondents across all functionality indicators strongly suggests that the components of Fire Detection and Alarm System Trainer are fully operational. With overall weighted means of 5.00 and 4.95, respectively, this implies that the functionality of the innovated product is highly acceptable.

Durability

During the evaluation, respondents assessed the quality and durability of the enclosure materials and FDAS components. They also checked if the wiring and components were securely mounted. The researcher ensured that the system followed industry standards. The table below presents the durability evaluation results from two respondent groups.

Table 2: Durability of FDAS Trainer

Indicators	Teachers		Students	
	WM	**DM**	**WM**	**DM**
1. The components used in the system meet the industry standard.	5.00	SA	4.85	SA
2. The materials used in the construction of the trainer board are sturdy.	4.90	SA	4.75	SA
3. The Trainer shows resilience to environmental factors, including temperature variations, humidity, and exposure to potential contaminants.	4.80	SA	4.70	SA
4. The trainer can withstand vibrations, shocks, and potential impacts.	4.80	SA	4.67	SA
5. The trainer assembly and components are properly secured.	5.00	SA	4.87	SA
Overall	**4.9**	**SA**	**4.77**	**SA**

Legend: ***WM*** – Weighted Mean ***DM*** – Descriptive Meaning
SA – Strongly Agree

Table 2 shows the interpreted results of the consolidated and calculated data to determine the acceptability of the product in terms of durability. Respondents strongly agreed that the first indicator of durability indicates that the components in the system meet the industry standard. This indicator received a weighted mean of 5.00 and 4.85 from the teachers and students who acted as the evaluator of the product. The result clearly implies that the components of the system are durable and aligned with the predetermined set of standards. Likewise, the second indicator having a weighted mean of 4.90 and 4.75 respectively, received a descriptive meaning of strongly agree for sturdiness. This suggest that the trainer is built from durable materials and can last a long time without becoming damaged.

Similarly, indicators 3 and 4 both received a high score and descriptive meaning of "Strongly Agree", which implies that the trainer can withstand varying conditions in different environments and is stable and resilient during handling or transportation, making it suitable for frequent use in an educational setting. Finally, the trainer's assembly and components are properly secured as attested by the "Strongly Agree" rating received by the indicator. The overall high rating of this variable suggested that the acceptability of the trainer in terms of product durability is highly acceptable.

Portability

In determining the acceptability of the fire detection and alarm system trainer in terms of portability, the overall size and shape of the trainer were evaluated. The result of the evaluation of the product's portability between two groups of respondents were presented using the table below.

Table 3: Portability of FDAS Trainer

Indicators	Teachers		Students	
	WM	**DM**	**WM**	**DM**
1. The trainer is compact and lightweight enough to be easily transported by one or two people.	4.90	SA	4.85	SA
2. Easy to store and transport without requiring excessive space.	5.00	SA	4.88	SA
3. The trainer is equipped with wheels or rollers for easy movement.	4.90	SA	4.93	SA
4. The trainer can be moved without breaking the electrical components.	5.00	SA	4.97	SA
5. The product can be moved or transported with ease.	5.00	SA	4.80	SA
Overall	**4.96**	**SA**	**4.89**	**SA**

Legend: ***WM*** – Weighted Mean ***DM*** – Descriptive Meaning
SA – Strongly Agree

Table 3 shows the interpreted results of the consolidated and calculated data to determine the acceptability of the product in terms of portability. The high rating in indicator 1 shows that the product's size and weight make it possible for convenient transportation. This indicator received a weighted mean of 4.90 and 4.85 and both received a descriptive meaning of "Strongly Agree". This proves that the trainer is compact and lightweight enough to be easily transported by one or two people. The product's design indicates that it can be stored and transported without requiring excessive space and suitable for storage in limited spaces. This claim is supported by the result of the evaluation of this indicator achieving a "Strongly Agree" descriptive meaning from the respondents and with a weighted mean of 5.00 and 4.88 respectively.

Moreover, indicators 3, 4 and 5 received the same positive response as indicators 1 and 2. The respondents weighted mean score were 4.90 and 4.93 for indicator 3, 5.00 and 4.97 for indicator 4, and 5.00 and 4.80 for indicator 5. This favorable feedback suggested that the trainer can effectively supports frequent handling and relocation without complication. This variable received an overall rating of 4.96 and 4.89, which implies that the acceptability of the product in terms of portability is highly acceptable.

Usability

The trainer's usability was evaluated on how the respondents or the users of the developed product can easily operate the trainer without extensive guidance from the developer. The result of the evaluation of the product's usability between two groups of respondents were presented using the table below.

Table 4: Usability of FDAS Trainer

Indicators	Teachers		Students	
	WM	**DM**	**WM**	**DM**
1. The trainer is designed in a way that is easy to understand and operate.	4.90	SA	4.88	SA
2. The controls, buttons, and switches are clearly labeled.	5.00	SA	4.97	SA
3. The controls, buttons, and switches are positioned orderly, making it easy for users to operate the trainer.	4.90	SA	4.82	SA
4. The replacement parts can be purchased locally.	4.80	SA	4.68	SA
5. The on and off of the product can be done with ease.	5.00	SA	4.95	SA
Overall	**4.92**	**SA**	**4.86**	**SA**

Legend: ***WM*** – Weighted Mean ***DM*** – Descriptive Meaning
SA – Strongly Agree

Portability received a surprisingly notable evaluation across all of its indicators. Respondents strongly agreed that the trainer is designed to be user-friendly and easy to understand, as reflected in indicator 1. This indicator with a

weighted mean of 4.90 and 4.98 from the respondents, suggested that the trainer can be operated intuitively. The clear labeling of controls, buttons, and switches, was also highly rated, as shown in indicator 2. This clearly indicates that the users can easily identify and operate each component.

Furthermore, the orderly positioning of controls, buttons, and switches, as highlighted in indicator 3 captured a strong agreement as well. The 4.90 and 4.82 weighted means of this indicator further implies that the positioning of the components can make the end user operate the product with ease. On the hand, indicator 4 received the lowest ratings out of the 5 indicators from both respondents. Nonetheless, the indicator received a "Strongly Agree" descriptive rating, indicating that the replacement parts can be purchased locally. Lastly, indicator 5 with a weighted mean of 5.00 from teachers and 4.95 from the students affirmed the simplicity of turning the trainer on and off.

The overall weighted mean of the product suggested that the acceptability of fire detection and alarm system trainer in terms of usability is deemed highly acceptable. The result of evaluating is similar to the findings of Bermundo (2021), Cardino, et. al. (2016), and Plazo (2021). Their products user-friendliness or usability were evaluated and determined to be highly acceptable.

Safety

The trainer's safety was evaluated by the respondents by assessing the materials and components used in the trainer. All the components of the system were checked and complied to the provisions of the Philippine Electrical Code (PEC) and other standards. The result of the evaluation of the product's safety between two groups of respondents were presented using the table below.

Table 5: Safety of FDAS Trainer

Indicators	Teachers		Students	
	WM	**DM**	**WM**	**DM**
1. The electrical materials used comply with the provisions of the Philippine Electrical Code (PEC) and other standards.	5.00	SA	4.93	SA
2. The trainer is equipped with an emergency stop button that allows users to quickly stop simulations or training scenarios in case of unexpected situations.	5.00	SA	5.00	SA
3. The trainer is incorporated with an overcurrent protective device to prevent electrical overload and reduce the risk of damage to its components.	5.00	SA	4.92	SA
4. The trainer is equipped with a fast-acting circuit breaker designed to shut off electric power in the event of a ground fault and circuit troubles.	5.00	SA	4.85	SA
5. all simulations and scenarios conducted on the trainer board are non-hazardous and pose no risk to users or the training environment.	5.00	SA	4.90	SA
Overall	**5.00**	**SA**	**4.92**	**SA**

Legend: ***WM*** – Weighted Mean ***DM*** – Descriptive Meaning
SA – Strongly Agree

Table 5 shows the interpreted results of the consolidated and calculated data to determine the acceptability of the product in terms of safety. Indicator 1 received a weighted mean of 5.00 from the teacher and 4.93 from the students. The result reflects that the product complied with the Philippine Electrical Code (PEC) and other relevant standards. The availability of the emergency stop button received a very favorable reaction from the respondents as reflected in indicator 2. This suggest that the button provides users with an immediate way to halt simulations, ensuring control and safety during unexpected situations.

It is noted in indicator 3 a weighted mean of 5.00 from the teachers and 4.92 weighted mean from the students. This indicates that the incorporation of an overcurrent protective device can safely engage users in training activities without risk of electrical overload or component damage. Additionally, indicator 4 received strong agreement, affirming that the trainer's fast-acting circuit breaker is effective in preventing electrical faults by shutting off power during ground faults or circuit problems. Lastly, indicator 5 received a high rating, which confirmed that all simulations on the trainer are non-hazardous, ensures a safe learning environment where users can engage in practical training without worry of potential harm.

The strong agreement across all indicators with an overall rating of 5.00 and 4.92 implies that the acceptability of the product in terms of safety is highly acceptable. This result is similar to the finding of the studies

of Oliquino (2019), Carandang (2014), Pimentel, et. al. (2016) and Bajet, et. al. (2015). They deemed the safety of their product as highly acceptable based from the evaluation of the respondents.

3.4 Difference on the level of acceptability of the developed Fire Detection and Alarm System Trainer

The developed Fire Detection and Alarm System Trainer was evaluated across its five different variables. These variables were assessed and deemed highly acceptable by both teachers and students, who served as respondents in the study. The two groups of respondents may have differing perceptions regarding the trainer's functionality, durability, portability, usability, and safety. The table below presents the assessed variations between the two groups of respondents across the given variables.

Table 6: Difference on the level of acceptability of the developed Fire Detection and Alarm System Trainer

Statistical Bases	Functionality	Durability	Portability	Usability	Safety
Computed Value	0.92	0.95	0.85	0.87	0.95
Decision on Null	Do not reject	Do not reject	Do not reject	Do not reject	Do not reject
Conclusion	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

Legend: $\alpha = 0.05$ critical value = ±1.64

As shown in table 6, all the computed values in the five areas are less than the critical value of -1.64 at a 0.05 level of significance. Therefore, the null hypothesis in not rejected. This means that there is no significant difference in the respondents' perceptions of the level of acceptability of the developed Fire Detection and Alarm System Trainer. The teachers and students agreed on the degree of acceptability in the identified areas.

The researcher observed consistency between the results and the previously presented data. Teachers and students unanimously perceived the developed Fire Detection and Alarm System Trainer as highly acceptable, citing its functionality, durability, portability, usability and safety. Furthermore, the agreement in their perceptions indicate that the use of the said instructional material may facilitate the attainment of the most essential learning competencies in teaching electrical installation and maintenance. Moreover, the respondents' unanimous perception of the level of acceptability of the developed Fire Detection and Alarm System (FDAS) Trainer in terms of functionality, durability, portability, and usability aligns with the findings of Esmeña (2024) and Oarde (2022). The respondents of their studies unanimously perceived the developed product as highly acceptable in the identified areas.

4. CONCLUSIONS AND RECOMMENDATION

Conclusions:

Based on the established findings of this study. the researcher concluded the following:

1. The FDAS Trainer was developed following the ADDIE Model to enhance the learning exposure of TVL EIM students.
2. The developed FDAS trainer followed a structured process to ensure safety, efficiency, reliability and effectiveness as an instructional material.
3. The developed fire detection and alarm system trainer was rated highly acceptable by the respondents along: functionality, durability, portability, usability and safety.
4. Teachers and students have the same perceptions on the acceptability of the developed FDAS Trainer.

Recommendations:

Based on the findings and conclusions generated in this study, the followings are highly recommended:

1. Teacher may be encouraged to develop other instructional materials for Technical-Vocational Livelihood Track, Electrical Installation and Maintenance students.
2. The steps used in the development of the Fire Detection and Alarm System (FDAS) Trainer may be improved to ensure a more effective and efficient process.

3. The developed FDAS trainer may be submitted to experts for further review and evaluation before adaptation and implementation.
4. The developed Fire Detection and Alarm System (FDAS) trainer may be further evaluated by a different group of respondents of similar characteristics.
5. Further studies on the impact and applications of the developed fire detection and alarm system trainer may be conducted.

5. REFERENCES

Published Journals Articles

[1] Antonio, W. (2020). Development and Acceptability of Multi-Purpose Electrical Circuit Demonstration Trainer. International Journal of Advanced Trends in Computer Science and Engineering, 9(1), 208-214. https://doi.org/10.30534/ijatcse/2020/3191.32020

[2] Aranaz, F. (2023). Construction and evaluation of continuously variable transmission on a Four-Stroke engine simulator. https://ejournals.ph/article.php?id=21500

[3] Bajet, M., Hidalgo, R., & Bajet, N. (2015). Design and Development of Electric Motor Controller Trainer: An Instructional Device. JPAIR Multidisciplinary Research. http://dx.doi.org/10.7719/jpair.v20i1.319

[4] Bartolome, E. (2020). Development and Acceptability of an Industrial Motor Control System Trainer. International Journal of Advanced Trends in Computer Science and Engineering, 9(1), 435-439. https://doi.org/10.30534/ijatcse/2020/6891.32020

[5] Bermundo, D. (2022). Effectiveness And Acceptability Of Audio Amplifier Trainer. International Journal of Educational Management and Innovation, 3(3), 279-287. https://journal2.uad.ac.id/index.php/ijemi/article/view/4867/3097

[6] Cardino, P., & Namoco, C. (2016). Development and Evaluation of Schematic Simulation Board for Automotive EFI System Trainer. Indian Journal of Science and Technology,9(47). https://www.researchgate.net/publication/312517933_Development_and_Evaluation_of_Schematic_Simulation_Board_for_Automotive_EFI_System_Trainer#full-text

[7] Cayaco, P. D. R. P. (2019, February 28). The acceptability of a developed Fire Detection and Alarm System (FDAS) trainer. Cayaco | Aloha International Journal of Management Advancement (AIJMA). http://journal.aloha.academy/index.php/aijma/article/view/aijma10202/10202

[8] Chukwuma, R. (2015). The use of Instructional Materials in Teaching and Learning. www.academia.edu. https://www.academia.edu/19619952/THE_USE_OF_INSTRUCTIONAL_MATERIALS_IN_TEACHING_AND_LEARNING.

[9] Electrician Philippines. (2023, July 17). Fire detection and alarm system | Electrician Philippines. https://electricianphilippines.com/fire-detection-and-alarm-system

[10] Evans, A. (2021). Fire alarm System Basics: The 4 purposes of your system. Vanguard. https://vanguard-fire.com/fire-alarm-system-basics-the-4-purposes-of-your-system/

[11] Jain, N. (2023). What is Innovation? Definition, Types, Examples and Process. IdeaScale. https://ideascale.com/blog/what-is-innovation/#toc_What_is_Innovation

[12] Lane, S. (2023, July 19). The role of instructional materials in teaching and learning. EduEdify. https://eduedify.com/role-of-instructional-materials/#google_vignette

[13] Loveless, B. (2025, January 4). Understanding the learning pyramid. Education Corner. https://www.educationcorner.com/the-learning-pyramid/

[14] Lukman, D. (2022, January 4). Instructional materials, teaching methods and students' performance. Medium. https://imperialwriters7.medium.com/instructional-materials-teaching-methods-and-students-performance-754e38d8709c

[15] Macasero, R. (2023, August 23). Philippine classroom shortage rises to 159,000 – DepEd. RAPPLER. https://www.rappler.com/nation/deped-report-classroom-shortage-school-year-2023

[16] Official Gazette. (2013, May 15). Republic Act No. 10533. Official Gazette. https://www.officialgazette.gov.ph/2013/05/15/republic-act-no-10533/

[17] Olayinka, A. (2016). Effects of Instructional Materials on Secondary Schools Students' Academic Achievement in Social Studies in Ekiti State, Nigeria. World Journal of Education, 6(1), 32-39. https://files.eric.ed.gov/fulltext/EJ1158251.pdf

[18] Oliquino, J. P. (2019). Development and Acceptability of the Mobile Workstation for Electronic Products Assembly

and Servicing Training Program. International Journal of Innovative Technology and Exploring Engineering (IJITEE), 9(1), 1320-1324. https://www.researchgate.net/publication/364094904_Development_and_Acceptability_of_the_Mobile_Workstation_for_Electronic_Products_Assembly_and_Servicing_Training_Program

[19] Olympia. (2021, April 12). Why is it important to have a fire detection? Olympia Electronics | Safety & Security Systems. https://www.olympia-electronics.com/en/blog/editorials/why-it-important-have-fire-detection

[20] Pimentel, R. A., & Namoco, C. S. (2016). Outcomes-Based Trainer for Tabletop Industrial Motor Control utilizing Variable Frequency Drive and Programmable Logic Controller. International Journal of Science, Engineering and Technology, 4(5), 784-790. https://www.ijset.in/wp-content/uploads/2016/11/10.2348.09160784.pdf

[21] RealPars. (2019). What is a fire alarm system? (Fire detection system). RealPars. https://www.realpars.com/blog/fire-alarm-system

[22] Rosales, V. (2022). Acceptability of Electrical Installation and Maintenance Instructional Trainer. Asia Research Network Journal of Education, 2(2), 84-101. https://www.researchgate.net/publication/363665842_Acceptability_of_Electrical_Installation_and_Maintenance_Instructional_Trainer

[23] Sabado, A. (2024). FDAS - Fire Detection and Alarm System: All you need to know. © 2024 Flameguard Fire Protection Inc. https://flameguardph.com/blogs/fdas-fire-detection-and-alarm-system

[24] Sale, M. (2016). The Place of Instructional Materials in Quality Teaching at Primary School Level in Katsina Metropolis, Katsina State, Nigeria. Retrieved from https://www.researchgate.net/publication/345897715_instructional_materials

[25] Sandefur, T. (2018). Innovation. Retrieved from https://www.econlib.org/library/Enc/Innovation.html

[26] Studocu. (n.d.). Dales Cone of Experience summary - Description. Dale's Cone of Experience is a model that - Studocu. https://www.studocu.com/en-us/document/our-lady-of-fatima-university/social-issues-and-professional-practice/dales-cone-of-experience-summary/42198637

[27] Talin, B. (2023, November 28). Innovation explained – Definition, types and meaning of innovation. MoreThanDigital. https://morethandigital.info/en/innovation-definition-innovation-types-and-meaning

[28] The Global College & By The Global College. (2023, May 26). What is innovation in education? - The Global College. The Global College. https://theglobalcollege.com/blog/what-is-innovation-in-education/

[29] Tuburan, J. E. (2024). Photovoltaic system trainer. ResearchGate. Retrieved [date], from https://www.researchgate.net/publication/387046888_Photovoltaic_System_Trainer

Unpublished Master's Thesis

[1] Andes, YRD.et al. (2018). Development and acceptability of motor control trainer. Unpublished Thesis. Sorsogon State College. Sorsogon City Campus, Sorsogon City.

[2] Carandang, F. M. (2014). Transformer trainer with phase converter: An instructional device in electrical technology. Unpublished Master's Thesis. Bicol State College of Applied Sciences and Technology, Naga City.

[3] Dogcol, J. A., et al. (2018). Effectiveness of the innovative lighted screwdriver. Unpublished Thesis. Sorsogon State University. Sorsogon City Campus, Sorsogon City.

[4] Erisare, P. G. D., et al. (2015). Mechanical transmission lifter: An innovation. Unpublished Thesis. Bicol State College of Applied Sciences and Technology, Naga City.

[5] Esmeña, J. G. (2022). Development and acceptability of mobile radio frequency identification (RFID) door access control system. Unpublished Thesis. Sorsogon State University. Sorsogon City Campus, Sorsogon City.

[6] Oarde, J. N. (2022). Development and acceptability of mobile closed-circuit television trainer. Unpublished Thesis. Sorsogon State University. Sorsogon City Campus, Sorsogon City.

[7] Plazo, G. D. (2021). Acceptability of the innovated hand tool shadow board. Unpublished Thesis. Sorsogon State University. Sorsogon City Campus, Sorsogon City.

[8] Valencia, J. B. (2016). Hydraulic lifter and transporter for engine and transmission assembly. Unpublished Master's Thesis. Bicol State College of Applied Sciences and Technology, Naga City.