ASSESSING ELECTRICAL HAZARD AWARENESS AND SAFETY MEASURES AMONG GRADE 12 STUDENTS AT LETRAN-BATAAN: GENDER AND TRACK-BASED DIFFERENCES AND COMMUNITY LITERACY IMPLICATIONS

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ABSTRACT

Understanding electrical hazards and safety measures among Grade 12 students from Letran is crucial for enhancing safety and preventing accidents. This study investigates the levels of awareness regarding electrical hazards and safety measures among 92 Grade 12 students at Letran-Bataan, divided equally into 46 males and females, focusing on gender, academic tracks, and their implications for community and literacy development. Using a quantitative approach, a mixed-mode survey was conducted with a purposive sample of participants. The analysis included descriptive statistics, parametric, and non-parametric tests. Results indicate a high overall awareness level among Grade 12 students regarding electrical hazards and safety measures. While gender-based differences were observed, with males exhibiting higher awareness levels in safety measures, there was no significant difference in hazard awareness between genders, suggesting similar levels of hazard awareness among male and female students. Tailored educational interventions are recommended, especially across diverse tracks, to effectively enhance awareness. The study advocates institutional policies integrating safety education, contributing to community literacy development, and improving safety standards. These findings underscore the importance of targeted interventions for enhancing electrical safety awareness among Grade 12 students at Letran-Bataan, offering valuable insights for educational and community safety initiatives.

Keywords: Electrical hazards, Safety measures, Grade 12 students, Awareness levels, Gender differences, Academic track, Technical- track, Community development, Literacy initiatives.

INTRODUCTION

Electricity, an intangible phenomenon inherent in the natural world, has been widely recognized as a substantial danger in many environments, encompassing domestic spaces, business enterprises, educational facilities, and other sites [12]. Electricity poses a substantial danger due to its potential to cause harm. However, when effectively regulated and controlled, the possibility of damage occurring is significantly reduced [9]. Electrical hazards provide a significant and common occupational risk, as individuals across numerous job roles are routinely exposed to electrical energy while carrying out their everyday tasks [47]. Electricity is often described as a "silent killer" due to its invisible nature, as it cannot be detected through our senses of taste, sight, hearing, or smell [25]. The phenomenon under investigation is characterized by its innate invisibility. The improper handling of this object can lead to significant damage to properties.

This is particularly relevant for grade 12 students, who are increasingly exposed to electrical devices both in their academic pursuits and personal lives. The Commission on Higher Education's research indicated that currently, students aged 16 to 18 are enrolled in Grades 11 and 12, part of the Senior High School program.

Therefore, adolescents between 16 and 18 years old are in a crucial period of development where they are considering various career options and becoming more independent, putting them at risk of electrical hazards if they are not properly informed about safety precautions related to electricity (Johnson et al., 2019). Starting from young students, everyone must learn about the significance of electrical safety. Developing positive habits at a young age can continue into later years [8]. Therefore, this timeframe offers a chance to provide them with knowledge on electrical safety to avoid accidents and injuries.

An electrical hazard is a situation with potential danger involving contact with live electrical components or objects that have been energized by a malfunction [14]. Electrical contact can be dangerous and may result in injuries such as shock or burns.

Electrical appliances are ubiquitous, and we engage with them regularly daily. Many individuals frequently overlook the potential hazards of these goods, yet it is crucial to consider electrical safety protocols when engaging with electrical apparatus. Around 1.2 million individuals annually suffer injuries caused by electrical accidents [34]. This considerable statistic demonstrates the widespread occurrence of electrical injuries. As previously stated, our daily interaction with electrical equipment heightens the likelihood of electrical injury. Given this statistic, individuals must acquire and adhere to electrical safety protocols. Electrical accidents can occur among individuals of any demographic; however, adolescents and vulnerable adults are more prone to experiencing enduring harm as a result of such injuries. Electrical accidents have the potential to propagate and escalate into more injuries; thus, individuals must acquire and adhere to electrical safety protocols.

Additionally, ESFI has gathered occupational electrical injury and fatality data from sources such as the U.S. Bureau of Labor Statistics (BLS) and the U.S. Census Bureau. According to these statistics, there were a total of 32,790 non-fatal injuries related to electrical accidents for individuals aged 16-19 in 2020, encompassing all types of conditions.

In the realm of products, appliances were responsible for causing 71% of electrical fires [21]. Each household possesses multiple electrical items that have the potential to cause accidents. Regardless of size, both small and large electrical appliances can inflict harm. Frequently, these injuries might result in severe outcomes. Irrespective of the frequency of your use of an electrical device, it is imperative to adhere to safety protocols to mitigate the risk of any untoward occurrences. Manufacturers frequently provide advice for the safe handling of appliances. Ensure strict adherence to these guidelines as a safety measure.

Additionally, studies and reports have emphasized that electrical accidents involving adolescents is common, prompting a closer examination of the causes and preventive measures. An example of this is a tragic event with a 16-year-old from Uttar Pradesh, as recounted in the Times of India, which emphasized the hazards of using smartphones while being plugged in. Likewise, The Sun News, UK also reported on the tragic death of a 17-year-old girl who passed away while using her phone in the bath, leading to conversations about electricity safety. Additionally, Sun Star stated that an 18-year-old boy in Barangay Agus, Lapu-Lapu City was electrocuted after coming into contact with a live electrical wire, highlighting the need for adolescents to be aware of electrical hazards and safety measures. These occurrences emphasize the importance of fully understanding and being aware of electrical hazards and safety measures, particularly among adolescents [36].

The concept of living without electricity is inconceivable to us. Electricity is essential in our everyday life since it supplies energy to our urban areas, residences, electrical equipment, gadgets, and other technical items. Electricity is an intangible kind of energy that does not possess auditory, visual, or smell characteristics. Although it is a crucial element of our daily lives, we must be mindful of the possible hazards it poses to ourselves and our loved ones. Therefore, it is important to have a thorough understanding, especially adolescents since most individuals in this age bracket tend to ignore the potential electrical hazards of their equipment. Hence, it is vital to possess a comprehensive comprehension of the present condition of awareness regarding electrical hazards and electrical safety measures among individuals in this age bracket, in order to effectively and securely utilize electrical power.

Electrical safety is of utmost importance in every household, regardless of whether one is a homeowner or a renter [15]. The awareness of electrical hazards plays a crucial role in mitigating the significant number of home fires, injuries, and fatalities that result from electrical incidents annually [15]. Individuals' increasing reliance on electricity has led to a growing need for heightened awareness of electrical safety among users. The importance of learning to use electricity safely from a young age cannot be overstated [2].

The Electrical Safety Foundation (ESFI) is an organization that is recognized as an authority on electrical safety. The mission of ESFI is to educate the public and raise awareness about the prevention of electrically related injuries, deaths, and fires. By doing so, ESFI aims to save lives and protect property through its outreach efforts. The use of electric technology is becoming more prevalent in the future. As electrification expands, there is a possibility of encountering more electrical products. Thus, safety is crucial for the electrical industry's success and growth in meeting society's needs [15].

Electrical injuries, which can be caused by lightning, low-voltage, or high-voltage incidents, are a common form of mechanical trauma that can result in severe harm or even death. Electrical injuries are typically accidental and can often be prevented [34]. Electrical injuries have the potential to cause harm to various tissues and organs and, in some cases, can be fatal. Approximately 1,000 Americans lose their lives each year due to electrical injuries. Around 400 injuries occur because of high-voltage electrical accidents. Approximately 30,000 nonfatal shock episodes happen each year. Electrical accidents account for 5% of the admissions to burn units in the United States. Around 20% of electrical injuries happen to adolescents, with a higher occurrence among adolescents [34]. Thus, electrical accidents at home commonly injure adolescents, while adults tend to experience these injuries at work, making them a significant cause of workplace-related deaths .

Recognizing workforce diversity, including gender differences, is essential for ensuring the safety and health of all workers as stated by the International Labour Organization [18]. When looking at workplace safety, it is crucial to acknowledge that men and women could face different dangers depending on their tasks and duties. This requires putting in place unique electrical safety measures to deal with these particular hazards. Moreover, prior studies, like Johnson and Smith's (2019) examination of universal electrical safety education and Rozanski and Cichowicz's (2020) research on adolescents' developmental stage and career path exploration, emphasize the significance of specific educational interventions. These actions are essential for targeting particular requirements and deficiencies based on the grade 12 students' understanding of electrical hazards and safety measures.

This research aims to evaluate the knowledge of electrical hazards and safety measures among senior high school students at Letran-Bataan, examining potential variations according to gender, academic, and technical tracks. Moreover, there is an emphasis on the importance of incorporating electrical safety instruction in academic coursework [37]. Educational institutions have a vital role in getting students ready for practicing electrical safety in work settings [37]. Blending academic knowledge and workshops with hands-on experience may encourage a safety-conscious environment.

The research is also looking into what factors affect students' comprehension of electrical hazards, such as their past experience with electrical safety training, their occupation as a student and availability of educational resources. This data is crucial for suggesting appropriate suggestions and actions derived from the survey results that will greatly aid in advancing a safer environment and responsible utilization of electrical systems for grade 12 students at Letran-Bataan.

Research Rationale

The society continues to grow its dependency on electricity, so does the risk of encountering electrical hazards [39]. This increasing dependency involves a corresponding prominence on awareness of electrical hazards and safety measures [39]. Awareness of electrical hazards among twelfth-grade students is crucial due to several reasons. Adolescents at this age often gain more independence and may start using electrical appliances and devices without adult supervision, increasing the risk of accidents or mishaps involving electricity [18]. Moreover, as these students are preparing to enter higher education or the workforce, knowledge of electrical safety becomes essential. For instance, a study emphasizes that the lack of preparedness in facilities/equipment in the Technical-Vocational Livelihood Track underscores the need to evaluate electrical hazard awareness and enforce safety measures prior to implementation [22]. Additionally, instilling good safety habits early on can have long-term benefits, reducing the likelihood of electrical accidents or injuries in adulthood [24]. Therefore, supplementary education in electrical safety is crucial to mitigate hazards associated with electricity consumption.

The purpose of this study is to assess the level of awareness of electrical hazards and safety measures among twelfth-grade students at Letran-Bataan, considering their gender differences and academic track, including the Technical-Vocational-Livelihood track. By focusing on this demographic age group, the study aims to fill a gap in existing research, which often overlooks younger populations in favor of working-age respondents. The findings will be used to develop appropriate recommendations and interventions to promote electrical safety among Grade 12 students of Letran- Bataan.

Statement of the Problem

The study aims to assess the awareness levels regarding electrical hazards and safety measures among grade 12 students at Letran- Bataan: Examining Gender and Academic Track-including the Technical-Vocational-Livelihood track based.

Specifically, the purpose of this study is to address the following questions:

1. Determine the level of awareness among Grade 12 students at Letran- Bataan regarding electrical hazards and safety measures.

2. What is the level of awareness among Grade 12 students at Letran- Bataan regarding electrical hazards and safety measures when grouped according to gender?

3. Are there significant differences in the level of awareness and understanding of electrical hazards and safety measures among grade 12 students across different strands under academic and Technical-Vocational-Livelihood track?

4. Investigate factors that may impact students' understanding of electrical hazards and safety measures, such as prior exposure to electrical safety education and access to learning tools.

5. What recommendations can be suggested to enhance safety education and promote community literacy development at Letran-Bataan?

Objectives

The research aims to collect baseline data for community and literacy development at Letran-Bataan. To understand the community's status quo leading to a more effective community

development initiatives and skills training for the three- year proposal that will improve electrical safety education in the Colegio encompassing curriculum enhancements, practical training seminars, and awareness campaigns.

The primary objective of this investigation is to determine:

1. Assess the level of awareness of electrical hazards and safety measures among grade 12 students at Letran-Bataan, with a focus on gender differences.

2. Evaluate Grade 12 students at Letran-Bataan on their awareness of electrical hazards and safety measures, particularly examining gender-based differences or similarities.

3. Examine potential differences in the awareness levels of grade 12 students across different academic track, including technical track, regarding electrical hazards and their adherence to electrical safety measures.

4. Investigate factors influencing students' understanding of electrical hazards and safety measures, including prior exposure to electrical safety education and access to learning tools.

5. Develop a three- year proposal, recommendations, and measures based on the survey results to enhance safety education and promote community literacy development at Letran- Bataan.

Significance of the Study

The significance of this study extends beyond its immediate scope to potentially influence institutional policies at Letran-Bataan. Currently, the Colegio lacks a specific structure for literacy training, focusing primarily on computer education. By highlighting the importance of electrical safety education among Grade 12 students, this study advocates for a broader educational framework that includes critical topics like electrical hazards and safety measures. Integrating these insights into the Colegio's policy can pave the way for a more comprehensive and holistic approach to education, addressing not just computer literacy but also crucial life skills such as electrical safety. Ultimately, this initiative contributes not only to individual student development but also to the overall literacy and safety standards within the Letran- Bataan community at large.

This study is significant to:

1. Stakeholders- This study's significance to stakeholders at Letran-Bataan lies in its potential to influence institutional policies by advocating for a broader educational framework that includes critical topics like electrical hazards and safety measures. Integrating these insights into the Colegio's policy can lead to a more comprehensive approach to education, contributing to individual student development and overall safety standards within the community.

2. Non- Personnel Staff- This study is valuable to non-teaching personnel at the Colegio as it advocates for integrating electrical safety education into the institution's policies. By emphasizing this crucial topic for Grade 12 students, it promotes a more comprehensive educational framework that enhances overall safety standards within the Letran-Bataan community.

3. Students- Through this study, students will be able to assess their level of awareness regarding electrical hazards and safety precautions with the aid of this research and take appropriate action following the findings.

4. Parents- Through this study, the parents will be able to determine whether or not their child has an average understanding of electrical hazards and safety measures through this research.

5. Teachers- Through this study, teachers can evaluate the degree of consciousness regarding electrical hazards and safety protocols among the senior high school pupils residing in Letran-Bataan means of this research endeavor. This research may provide educators insight into whether they should integrate concise information into their discussions.

6. Letran- Bataan Community- This study is significant to the Letran-Bataan community by improving overall safety standards through increased awareness of electrical hazards and safety measures among Grade 12 students.

7. Future Researchers- The study's findings are advantageous for subsequent researchers. This research may serve as a foundation for a forthcoming learning theory.

Scope and Delimitation

This study focuses on Grade 12 students at Letran-Bataan and aims to assess their awareness levels regarding electrical hazards and safety measures during the academic year 2023- 2024. The investigation includes examining potential differences in awareness between male and female students, as well as across different academic track including the Technical-Vocational-Livelihood track. Additionally, the study delves into factors that may impact students' understanding of electrical hazards and safety measures. The proposed recommendations for improving the effectiveness of electrical safety educational programs will be specific to Grade 12 students at Letran-Bataan

and may not be generalize to other educational institutions or age groups.

Moreover, recognizing workforce diversity, including gender differences, is crucial for ensuring the safety and health of all workers. A gender sensitive approach acknowledges that men and women may face distinct hazards at work due to their different roles and responsibilities, requiring different safety measures. Gender identities include male, female, transgender, other, or none. This research paper focuses on the meaning of gender in terms of societal roles, expectations, and responsibilities as male and female.

Definition of Terms

Adolescents- According to World Health Organization, adolescence is the phase of life between childhood and adulthood, from ages 10 to 19. It is a unique stage of human development and an important time for laying the foundations of good health.

Awareness - refers to the state or ability to be aware of and perceive events, objects, or sensory patterns. In this state of awareness, an observer can verify sensory information without necessarily implying comprehension.

Electrical Hazards- A dangerous situation was coming into contact with electricity or when equipment stops working correctly can lead to getting shocked, burned by an electrical arc, burned by heat, or even an explosion (according to the 2004 NFPA 70E).

Electrical Safety - Understanding the dangers of using electricity and taking necessary steps to prevent accidents and harm (2004 NFPA 70E).

Gender- According to Collins Dictionary, gender refers to being male or female with the societal and cultural expectations and norms associated with individuals of each sex.

Academic Track- According to the Commission on Higher Education the Academic track includes three strands: Accountancy, Business and Management (ABM); Humanities and Social Sciences (HUMSS); and Science, Technology, Engineering, Mathematics (STEM)

Technical-Vocational-Livelihood track- According to Department of Education, the TVL Track is among the four tracks provided in SHS. There are four strands available: Agri-Fishery Arts (AFA), Home Economics (HE), Industrial Arts (IA), and Information and Communications Technology (ICT).

REVIEW OF RELATED LITERATURE

The present chapter establishes a strong foundation for the research by thoroughly examining local and foreign-related literature and studies. Moreover, it creates the conceptual framework that is a significant foundation for the investigation.

Electrical Hazard and Safety Measures

Electricity is an essential part of modern life but also poses inherent risks that must be managed carefully [28]. OSHA, the Occupational Safety and Health Administration, is a regulatory agency in the United States responsible for ensuring workplace safety and health. Similarly, the National Fire Protection Association (NFPA) develops and publishes codes and standards for fire safety, including guidelines related to electrical hazards [27].

Electrical hazards encompass potential dangers associated with the use, installation, or maintenance of electrical systems and equipment. These hazards range from electrocution to fire hazards [28]. Household settings are common sites for electrical injuries, with hazards including overloaded circuits, faulty wiring, and misuse of electrical appliances [36]. For instance, placing electrical cords beneath carpets can lead to overheating and increase the risk of fires [16]

According to an article published by Electrician Courses 4U in the United Kingdom, it is evident that potential hazards and accidents associated with electricity can have severe consequences, resulting in harm to both humans and property. Thus, understanding the significance of electrical safety and taking preventive measures is essential to safeguard ourselves and our loved ones from such dangers.

The concept of electrical hazard is explained as encompassing both potential and actual threats that pose hazards to the physical and operational safety of individuals, equipment, machinery, and the surrounding environment [38]. Hazards can be observed as factors that can be recognized as indicators of potential sources of hazards, such as tangled wiring, electrical devices that are not switched off, installations that lack protection and uncovered convenience outlets, overloaded socket outlets, and various other examples.

Negligence can also contribute to electrical accidents, highlighting the importance of awareness and preventive measures [36]. Global statistics reveal a significant number of electrical injuries annually, with a notable portion occurring in households [16] These incidents can result in fatalities, underscoring the need for increased safety awareness [16].

Preventive measures such as proper wiring, avoiding overloaded circuits, and using electrical appliances responsibly are crucial for reducing electrical hazards [27]. Understanding the potential dangers of electricity and implementing safety measures are key to mitigating risks [28].

In the context of Grade 12 students, who are transitioning to

more independent living arrangements and potentially using electrical appliances without adult supervision, awareness of electrical hazards is particularly crucial [5]. Teaching school students about electrical safety through training models can have a significant impact on their ability to handle electricity by increasing knowledge about hazards and ways to prevent accidents [8]. These programs not only increase awareness but also equip students with practical knowledge and skills to handle electrical equipment safely.

In a study, it was found that students who attended seminars on electrical safety demonstrated improved understanding of electrical hazards and were more likely to adopt safe practices [8]. Similarly, educational interventions led to a decrease in electrical accidents among students [10].

Therefore, implementing seminars and educational programs focused on electrical safety is essential for Grade 12 students, as it empowers them to make informed decisions and reduces the risk of electrical accidents.

Electrical Safety

The safety of individuals is a topic of concern for everyone. Safety is a fundamental component of existence, implying that it should be ingrained and instinctive, requiring no conscious deliberation, much like breathing. Undoubtedly, breathing occurs instinctively from the beginning, but safety only gets ingrained in our behavior as we progressively integrate the knowledge acquired from our parents, instructors, literature, and personal experimentation [39]. Electrical safety involves identifying potential dangers of using electric current and implementing preventive measures to prevent accidents or fatalities. Electrical safety, as defined by the Cambridge Dictionary, pertains to a condition or location characterized by the absence of hazards or potential harm associated with electrical systems. Technology has advanced rapidly in the last 20 years, and individuals are increasingly exposed to it. Experts from Electrical Courses 4U warn of hazards with luxury items like phones, appliances, and laptops. A significant majority of individuals, approximately 79%, engage in risky behavior involving electricity, leading to a substantial number of injuries. Specifically, daily, approximately 1,000 individuals sustain injuries as a result of electrical accidents. Electrical safety measures, such as proper grounding, insulation, and equipment maintenance, are critical for preventing accidents and protecting individuals from electrical hazards [28]. Thus, individuals must understand electrical safety.

According to an article published by Electrician Courses 4U in the United Kingdom, it is evident that potential hazards and accidents associated with electricity can have severe consequences, resulting in harm to both humans and property. Thus, understanding the significance of electrical safety and taking preventive measures is essential to safeguard ourselves and our loved ones from any potential harm or danger from using electrical power.

Based on an article published by Electrician Course 4U in the United Kingdom, it has been observed that children and young adults presently possess an average of ten electronic devices within their personal spaces. This statistic represents a notable 25% increase compared to the number of gadgets their parents possessed during their childhood. The increase in electrical items in their rooms puts their lives at risk. Over 53% of adolescents leave their devices charging on their bed. Charging devices on flammable beds can cause electrical house fires due to overheating and potential battery explosions. Two in five people charge phones under a pillow while sleeping. This is dangerous because flammable objects surround the device without a way to release heat, potentially causing overheating and combustion.

Moreover, there has been a constant and upward trajectory in the proportion of individuals who have achieved access to electricity in recent decades. Ensuring the prioritization of electrical safety within any workplace is of utmost importance [19]. Moreover, it is worth noting that electrical dangers often exhibit specific characteristics compared to other forms of occupational hazards. Individuals lacking substantial familiarity with electrical hazards must acquire a fundamental understanding of electrical safety through training or awareness programs to effectively mitigate the risk of harm. Although the significance of workplace safety cannot be understated, it is imperative to use a distinct approach when addressing electrical safety to safeguard the well-being of all individuals within the facility [35].

According to an article, although electrical equipment is typically equipped with built-in safety measures, disregarding fundamental safety precautions and engaging in irresponsible behavior can override these safeguards, leading to severe electrical accidents [40]. Improper utilization of any element within an electrical system might potentially give rise to hazardous conditions, hence placing workers at risk of sustaining significant harm, including but not limited to electric shock injuries, burns, and fatality. Moreover, these devices can present a fire risk in commercial and residential settings, leading to irreparable harm. The situation does not need to be this such. The implementation of preventative measures, consistent maintenance practices, and ongoing vigilance can achieve the prevention of electrical accidents in the workplace.

Hazard identification is widely recognized as a critical component of occupational safety. According to the Occupational Safety and Health Administration (OSHA), a primary contributing factor to workplace injuries, illnesses, and accidents is the lack of identification or acknowledgment of existing or foreseeable dangers. This observation was made during the National Safety Council's National Safety Month in 2019.

Gender Differences in Electrical Safety

Numerous studies have shown that there are gender differences in the perceived risk of electrical hazards and the adoption of safety measures. For instance, a study found that males were more likely to engage in risky behaviors related to electrical hazards compared to females [41]. Similarly, it was discovered that females were more likely to report feeling uncomfortable when working near electrical equipment compared to males [41]. These findings suggest that gender may play a significant role in shaping awareness levels of electrical hazards and safety measures among students. [42] found that male students had higher awareness levels than female students regarding electrical hazards and safety measures. The study titled "Gender Differences in Electrical Safety Awareness: A Comparative Study" reveals a significant gap in awareness levels between males and females regarding electrical safety measures. It notes that males typically demonstrate greater confidence and knowledge in this area compared to females. Additionally, another research indicates that societal expectations and gender roles significantly influence individuals' perceptions and behaviors concerning electrical safety, contributing to these awareness disparities [46].

Acknowledging diversity and encompassing gender differences is vital for safeguarding the well-being and welfare of male and female employees. Although considerable advancement has been made in this domain, the International Labour Organization (ILO) asserts that further efforts are feasible and necessary [18]. This methodology recognizes and highlights the differences between males and females, aiming to identify occupational safety and health (OSH) hazards and implement efficient remedies. A gender-sensitive approach acknowledges that due to variations in occupational roles, societal expectations, and responsibilities, individuals of different genders may encounter distinct physical and psychological hazards in the workplace, necessitating diverse control and safety measures. This method also helps us understand how the division of labor between genders, biological differences, job trends, social expectations, and societal structures all create specific occupational hazards for different genders. In order to ensure the effectiveness of occupational safety and health (OSH) regulations and prevention initiatives for individuals of all genders, it is imperative to include the dimension of gender and develop policies grounded in precise information regarding the relationship between health and gender roles.

Academic Track- Based including the Technical-Vocational-Livelihood track

The track of a student can also impact their awareness levels of electrical hazards and safety measures. A study found that students in vocational programs were more likely to demonstrate knowledge and understanding of electrical safety procedures compared to those in academic programs [44]. This may be due to the fact that vocational programs often provide more practical training and hands-on experience with electrical equipment. Additionally, it was discovered that students in technical programs were more likely to report using safety measures such as wearing personal protective equipment (PPE) when working with electrical equipment [45]. These findings suggest that different strands under academic and technical track of a student may also play a significant role in shaping their awareness levels of electrical hazards and safety measures. Furthermore, results showed that technical or vocational track students have a more profound understanding of electrical risks due to specialized coursework, contrasting with lower awareness levels in non-technical tracks [22]. Similarly, it was noted that there is a higher safety consciousness among specialized technical track students compared to general academic track students [20].

The is stressed out on the necessity of comprehensive electrical safety education in technical programs, advocating for a blend of theory and practical training to instill a safety culture among future professionals [37]. Another study emphasizes the importance of universal electrical safety education across all academic backgrounds, advocating for standardized safety protocols and educational programs to reduce the risk of electrical accidents in various settings [24].

Factors Influencing Student's Understanding of Electrical Hazards and Safety Measures

According to a research entitled "Impact of Early Exposure to Electrical Safety Education on Grade 12 Students' Understanding. Safety Education Review" early exposure to electrical safety education positively impacts students' understanding and adherence to safety measures [24]. Students who have received previous education on electrical safety display greater understanding and practice safer behaviors [8]. This is in line with the overall significance of raising awareness about electrical safety among school students, highlighting the importance of beginning to teach them about electrical safety and energy conservation at a young age [8].

Moreover, a research under "Impact of Interactive Learning Tools on Grade 12 Students' Comprehension of Electrical Safety Concepts" indicates that students who can utilize interactive learning tools such as simulations and practical demonstrations exhibit improved comprehension and retention of electrical safety concepts [20]. In a similar study, having access to comprehensive educational materials and online resources greatly aids students in effectively learning about electrical hazards and safety measures [5].

Effectiveness of Electrical Safety Educational Programs

A study entitled "Impact of Structured Electrical Safety Programs on Students' Awareness and Safety Practices" focused on the impact of electrical safety education in educational institutions [6]. They found that students who participated in structured

electrical safety programs demonstrated a higher level of awareness and were more likely to adopt safe practices when dealing with electrical equipment and systems. This highlights the importance of integrating practical training and theoretical knowledge in educational curricula to enhance safety outcomes.

Moreover, a study conducted a comparative analysis of different approaches to electrical safety education, highlighting the effectiveness of interactive and hands-on training methods compared to traditional classroom lectures [9]. They observed that interactive sessions, such as simulations and practical demonstrations, not only enhanced understanding but also improved retention of safety concepts among participants.

Furthermore, a study focused on the long-term impact of electrical safety education, following up with participants of safety programs over several months and finding that sustained education and reinforcement led to a lasting change in behavior and a reduction in incidents related to electrical hazards [17].

Electrical Safety Awareness of Senior High School Students

Several studies have indicated that students frequently lack adequate preparation to address electrical hazards and safety measures [42]. Moreover, students were found most aware of the basic safety measures such as turning off unused appliances, not overloading sockets, and wearing protective gear [42]. In fact, according to a research, it indicates that students in Benin City have a generally good understanding of electrical safety. This implies that the students know electrical safety at home and in the lab. For example, in their reply to the second question, "Do you read the manufacturer's operating instructions before utilizing any electrical appliance?" A higher number of pupils (87.75%) voted 'YES' than those who responded 'NO' (12.25%). Only a few learners (3.75%) answered "YES" to the question "Do you touch electrical devices with wet hands?" contrary to the high number of students (96.25%) who answered "NO" to the identical question. This shows that students usually have a good level of understanding of electricity safety [42]

Students must know the need for preservation and safety when using electricity. The surveys aimed to assess students' knowledge of energy-conserving methods for consumer appliances, inspiration to support organizational efforts to decrease energy use, and awareness of electric shocks and catastrophes [43].

Reports of adolescents mishandling electricity

Majority of students lacked awareness about electrical hazards and safety measures [38]. According to Indiana Electric Cooperatives, identifying electrical hazards raises awareness of hazards and the harm electricity can cause. Teens do not see the morning rush before school as life-threatening. Using hair dryers, straighteners, or curling irons on a wet bathroom floor; checking text messages on a plugged-in cell phone while wet after a shower; inserting a kitchen knife into a plugged-in toaster to remove a stuck bagel or English muffin; leaving electrical appliances like straighteners or irons unattended and switched on. Doing these things risks electric shock, fire, or death by electrocution. Electrical products and gadgets possess inherent hazards if not handled cautiously [35]. All it takes is one careless mistake.

Numerous studies and investigations have shed light on the occurrence of headlines emphasizing adolescent electrical accidents. This alarming trend has sparked significant interest in public safety, prompting researchers to dive deeper into the underlying reasons and potential preventive strategies. The amount of publications on this subject emphasizes the critical need for enhanced awareness and focused actions to reduce the dangers that young people experience from electrical hazards. A tragic occurrence involving a 16-year-old juvenile from Uttar Pradesh, according to a recent Times of India investigation, has shone a light on the potential dangers linked with the use of high-end smartphones. The young person died unexpectedly as a result of an electric shock experienced while charging their smartphone, which was linked to a power source. This terrible incident is a stark reminder of the significance of understanding the potential hazards and dangers of using electronic gadgets plugged into an electrical source. The ease of always having a device attached to a power source can expose users to electrical hazards, as was the situation with the adolescent.

Moreover, another report according to The Sun, Khorn Srey Pov, a 17-year-old girl from Cambodia, was discovered deceased on her phone after bathing at her residence. The fatality has incited an online discourse over the security of mobile phone chargers. Netizens argue that public awareness initiatives should focus on educating people about electricity management, as Tahir (2022) stated. In addition, there is another story from Mirror U.K. An adolescent died as a result of a substantial electric shock she received after sleeping off on her charging mobile phone after taking a shower. Before this event, the adolescent, who was 17 years old, had taken a shower and connected her phone to a charger, activating its flashlight feature [6]

Also, Sun Star revealed that on October 26, 2022, an 18-year-old boy died from being electrocuted while trying to touch a pole that was leaning against a house in Barangay Agus, Lapu-Lapu City. The victim reportedly tried to touch the post without realizing that there was an active electrical wire nearby, which caused him to be electrocuted. Nagiel Bañacia, head of the City Disaster Risk Reduction and Management Office, told Sun Star Cebu that another woman was in a severe condition after being shocked while trying to help the man at 12:55 p.m. The victim

got an electric shock because they were not aware that the wire was live. So, it is imperative to determine how much adolescents know about electricity hazards and how to stay safe around them. The direct touch with live parts is one of the electrical hazards in this case. In this case, two electrical safety measures that can be used are watching out for power lines and never touching or climbing a utility pole. An electric current can flow through their body when exposed to an electrical voltage. This can cause electrical shocks and burns. As a result, severe hurt or death may happen. On the other hand, the woman involved in this accident should have helped the boy by calling for help [14]

Research Gap

The study addresses a significant gap in current literature, which tends to focus on individuals employed in electrical fields rather than senior high school students. There is a lack of comprehensive research specifically targeting Grade 12 students regarding awareness levels of electrical hazards and safety measures. Moreover, there is also a lack of research that specifically focuses on the implications of these differences for community and literacy development. This study aims to fill this crucial gap by providing in-depth insights into the electrical safety awareness of Grade 12 students at Letran-Bataan. It seeks to establish baseline data that can contribute to community and literacy development initiatives at the Colegio. Additionally, the research aims to investigate potential statistically significant differences in awareness levels based on gender and academic and technical track, further enhancing the understanding of differences in safety education among students.

Conceptual Framework

The researchers constructed an Input-Process-Output-Outcome (IPOO) model which serves as a guiding framework that enhances the study's analytical rigor, problem-solving capabilities, and strategic planning for implementing effective safety education measures and improving community safety awareness among Grade 12 students.

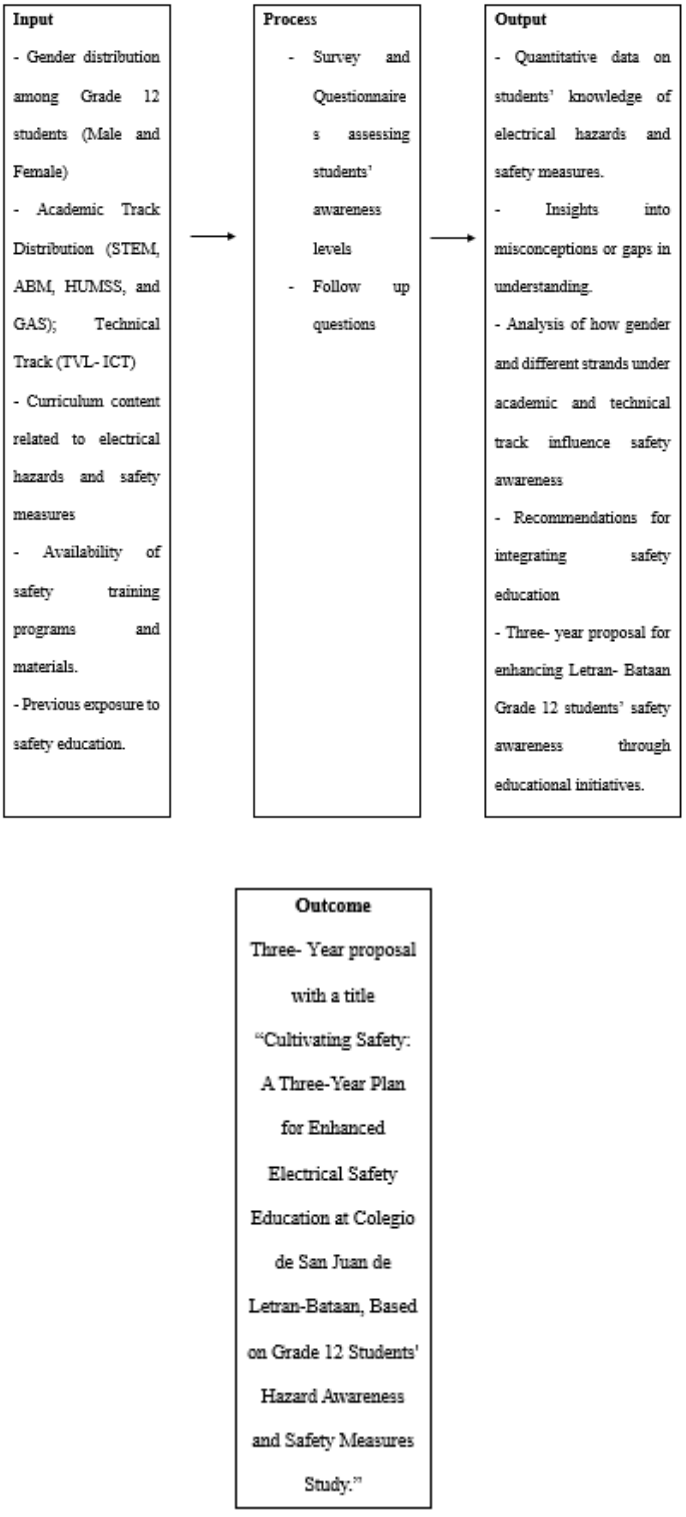


Figure 1: Conceptual Framework (IPOO)

Figure 1 presents an Input-Process-Output model showcasing the key components relevant to the research: inputs (demographics, educational environment, student background),

processes (data collection), and expected outputs (awareness levels, community impact, literacy development). This conceptual framework also outlines the anticipated outcome, a three-year proposal titled "Cultivating Safety: A Three-Year Plan for Enhanced Electrical Safety Education at Colegio de San Juan de Letran-Bataan, Based on Grade 12 Students' Hazard Awareness and Safety Measures Study." Thus, this IPOO framework serves as a structured guide for organizing the research methodology and guiding result evaluation.

Hypotheses

In order to guide the study, the researchers formulated the following null hypotheses. These hypotheses will be tested with a significance level of $P < 0.05$. If p(sig value) is less than 0.05, there is a significant difference.

Hypothesis for Gender

Null Hypothesis (Ho): There is no significant difference between the mean responses of male and female students regarding their perception of the level of electrical hazards and safety measures.

Alternative Hypothesis (Ha): There is a significant difference in the average responses between male and female student users regarding their perceptions of the amount of electrical hazards and safety measures.

Hypothesis for Level of Awareness on Electrical Hazards and Safety Measures when grouped according to Academic and Technical Track

Null Hypothesis (Ho): There is no significant differences in the level of awareness and understanding of electrical hazards and safety measures among grade 12 students across different strands under academic and technical tracks.

Alternative Hypothesis (Ha): There is significant differences in the level of awareness and understanding of electrical hazards and safety measures among grade 12 students across different strands under academic and technical tracks.

METHODOLOGY

The methodology for this study involved assessing the level of awareness of electrical hazards and electrical safety measures among male and female Grade 12 students of Letran-Bataan. The data collection methods included the use of questionnaires administered to the target population.

Research Design

The research used a quantitative research design that utilized a descriptive study to assess the level of awareness about electrical hazards and safety measures for the 12th grade students of Letran-Bataan.

The research adopted the mixed- mode survey that involved both the online survey and paper and pen survey. Purposive sampling method is utilized to select participants based on specific criteria relevant to the research objectives, further enhancing the study's validity and relevance.

The combination of the approaches enables a comprehensive examination of students' awareness and safety practices related to electrical hazards. By systematically analyzing the collected data, this study aims to provide valuable insights while ensuring methodological coherence and reliability in the research results.

Research Locale

This research was conducted in the 12th grade of Colegio de San Juan de Letran- Bataan. The study population primarily consists of students hailing from the proximate areas of Bataan.

Bataan is a province in Central Luzon, Luzon Island. The region is a peninsula surrounded by Manila Bay and the West Philippine Sea. This area was the last stronghold of American forces in the Philippines during World War II. Bataan's household population is 99.6%. Bataan Province's population on May 1, 2020, was 853,373. The household population was 849,575 individuals.

Research Instruments

The study population consists of 120 grade 12 students, with a gender distribution of 56 males and 64 females. The present study employed the Raosoft sample calculator to survey a sample of 92 grade 12 students. The sample will be evenly divided, consisting of 46 male and 46 female students.

The primary data collection instrument is a structured questionnaire The questionnaire includes Likert's Scale items and at the latter part is an open- ended questions to assess various aspects of electrical hazard awareness and safety measures. These follow-up questions help enrich the study and better understand the factors that influence students' knowledge and views about electrical safety. Refer to Appendix B for the questionnaire utilized in this research.

For the Likert Scale part, the researchers made alterations to two sets of questionnaires: one focused on the Level of Awareness regarding Electrical Safety Measures, while the other addressed the Level of Awareness concerning Electrical Hazards. The study utilized a questionnaire from the International Journal of Engineering Research and Technology, specifically from a research article titled "An Assessment of the Electrical Safety Awareness of Senior Secondary School Students," to measure the level of awareness of electrical safety measures. This paper asserts that the questionnaire is the established and extensively

utilized research instrument for addressing this subject.

In the second portion, the researchers altered the previously validated questionnaire on awareness of electrical hazards, which was already validated by the Federal University of Technology Minna. Moreover, the methodology for structuring open ended questions on awareness of electrical hazards and safety measures involved a systematic approach. Key themes such as education effectiveness, accessibility of safety tools, student perspectives, safety habits, personal experiences, and communication channels were identified. Structured questions were then formulated to address each theme clearly and concisely, avoiding ambiguity and using straightforward language. The questions were arranged logically to facilitate a smooth flow of responses and were primarily open-ended to encourage detailed insights from participants. Before finalization, the questions underwent rigorous review and validation by Engr. Sophia Ysabelle N. Malig, REE, Engr. Yoji Manaloto, REE, and Assistant Professor Franz Jude S. Abelgas, M.A.

A pilot test was also conducted to refine the questions based on feedback, ensuring that they elicited valuable information from respondents while aligning with the research objectives. This structured methodology ensured that the questions effectively captured insights on electrical safety awareness, contributing to the rigor and quality of the research study

Respondents of the Study

The study will include grade 12 students from Letran-Bataan who reside in Bataan. According to Commission on Higher Education, individuals falling within the age bracket of 16 to 18 years are presently registered in the educational levels commonly referred to as Grades 11 and 12, which are part of the Senior High School program. The present study will encompass the complete population of grade 12 students from Letran-Bataan. This study utilized purposive sampling to precisely select and include only the grade 12 students from Letran-Bataan as the target population for the study.

Pilot Testing

Initial evaluation of the questionnaire was carried out with a limited sample of Grade 12 students from Bonifacio Camacho National High School (SHS) prior to the primary data gathering phase. The purpose of the pilot test is to identify any ambiguities or difficulties in understanding the questionnaire items using Cronbach's alpha. As well as to assess the clarity of questions and format.

Reliability testing, particularly through measures such as Cronbach's alpha, holds a significant importance in ensuring the reliability and validity of measurement tools utilized in research. According to OARC Stats, Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability.

This test contributes to the overall quality and credibility of research findings (Tavakol, 2011).

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Figure 2: Cronbach's alpha and Internal Consistency

a. Cronbach's Alpha Test for Section 1: Awareness of Electrical Safety Measures

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.716	12

b. Cronbach's Alpha Test for Section 2: Awareness of Electrical Hazards

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.745	12

Based on the feedback and results from the pilot test, using Cronbach's Alpha, the results indicates an acceptable reliability value for both Electrical Hazards and Safety Measures questionnaires. With a level 0.716 for Section 1: Awareness of Electrical Safety Measures and 0.745 for Section 2: Awareness of Electrical Hazards making the questionnaires reliable.

Data Gathering Procedure

The questionnaire was disseminated to the Grade 12 students during the data collection phase. The data collection instrument was an online form as well as paper and pen questionnaire. The students' Science Teacher of the Grade 12 participants administered the instrument. The Science Teacher of the Grade 12 students supervised the administration process and clarified any questions raised by the participants. Completed questionnaires were collected and checked for completeness before data entry and analysis. Hence, quantitative data collected from both online and paper surveys are compiled and entered statistical software for analysis.

Data Analysis

The collected quantitative data from the questionnaires was subjected to data analysis employing descriptive statistics. The analysis involved the application of both parametric and non- parametric test for Level of Awareness for Electrical Hazards and Safety Measures to determine whether there is a statistically significant difference in how the grade 12 respondents were divided into two categories by gender, and the Kruskal- Wallis H test to indicate whether any differences existed across the different strands under academic and technical track. Moreover, after executing Kruskal- Wallis H test, in this study, a post-hoc test is also done to identify exactly which groups differ from each other. Furthermore, a descriptive statistic was used to determine the level of awareness of the Grade 12 students, in general. The role of the analytical process was to provide valuable information regarding the respondents' understanding and knowledge of electrical hazards and safety measures.

Ethical Considerations

The study rigorously adheres to ethical considerations, such as getting informed consent, guaranteeing participant confidentiality, and following ethical norms for research involving human people.

Overall, this research design provides a systematic and structured approach to investigating the level of awareness on electrical hazards and safety measures among Grade 12 students, considering both quantitative data analysis and ethical considerations.

RESULTS AND DISCUSSION

Normality Test

Normality test was used to determine the normal distribution of the data. Both sets of questions for Grade 12 students was tested for normality. The p-value is abbreviated as Sig. on the table. If $p>0.05$, the data is normally distributed. If $p<0.05$, the data is non-normal. If the data is normally distributed, parametric test will be used (mean, standard deviation, t-test, One-Way Anova, etc.). If the data is not normally distributed, non-parametric test will be used (median, interquartile range, Mann-Whitney U test, Kruskal-Wallis test, etc.).

Table 1: Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
ESMQ1	.336	92	<.001	.751	92	<.001
ESMQ2	.212	92	<.001	.865	92	<.001
ESMQ3	.308	92	<.001	.725	92	<.001
ESMQ4	.277	92	<.001	.829	92	<.001
ESMQ5	.259	92	<.001	.825	92	<.001
ESMQ6	.260	92	<.001	.845	92	<.001
ESMQ7	.270	92	<.001	.839	92	<.001
ESMQ8	.232	92	<.001	.870	92	<.001
ESMQ9	.255	92	<.001	.855	92	<.001
ESMQ10	.222	92	<.001	.870	92	<.001
ESMQ11	.279	92	<.001	.787	92	<.001
ESMQ12	.264	92	<.001	.781	92	<.001
EHQ1	.260	92	<.001	.834	92	<.001
EHQ2	.256	92	<.001	.850	92	<.001
EHQ3	.239	92	<.001	.847	92	<.001
EHQ4	.272	92	<.001	.840	92	<.001
EHQ5	.339	92	<.001	.733	92	<.001
EHQ6	.251	92	<.001	.821	92	<.001
EHQ7	.278	92	<.001	.815	92	<.001
EHQ8	.251	92	<.001	.802	92	<.001
EHQ9	.266	92	<.001	.765	92	<.001
EHQ10	.266	92	<.001	.834	92	<.001
EHQ11	.297	92	<.001	.760	92	<.001
EHQ12	.249	92	<.001	.871	92	<.001

a. Lilliefors Significance Correction

Based on Table 1, the Kolmogorov- Smirnov and Shapiro-Wilk test shows that majority of the data gathered deviates from a non- normal distribution ($p<0.001$). As a result, non-parametric tests (such as median, interquartile range, Mann-Whitney U test and Kruskal-Wallis test) would be more appropriate for analyzing this data, as they are designed to handle non-normally distributed data.

Descriptive Statistics- Grade 12 students

The researchers used descriptive statistics in assessing the overall level awareness of Grade 12 students. The interpretation range used for the 4- point Likert Scale is as follows:

1- Strongly Disagree (1.00- 1.75)

2- Disagree (1.76- 2.50)

3- Agree (2.51- 3.25)

4- Strongly Agree (3.26- 4.00)

For the association of Level of Agreement to Level of Awareness: Based on how the questions on each item was formulated, it indicates that if the respondents agree on the statement stated on each item, the more they have awareness on the electrical safety. Thus, as the level of agreement of respondents is higher, the higher is the level of awareness.

a. Electrical Safety Measures

Table 2: Descriptive Statistics for ESM

Questions	Mean	Median	Mode	IQR	Percentiles		
					25	50	75
ESMQ1	3.185	3.000	3.0	1.0	3.000	3.000	4.000
ESMQ2	2.8370	3.0000	3.00	2.00	2.0000	3.0000	4.0000
ESMQ3	3.2935	3.0000	3.00	1.00	3.0000	3.0000	4.0000
ESMQ4	3.0326	3.0000	3.00	1.00	3.0000	3.0000	4.0000
ESMQ5	3.0435	3.0000	3.00	1.00	3.0000	3.0000	4.0000
ESMQ6	2.9783	3.0000	3.00	1.75	2.2500	3.0000	4.0000
ESMQ7	2.5870	3.0000	2.00	1.00	2.0000	3.0000	3.0000
ESMQ8	2.6630	3.0000	3.00	1.00	2.0000	3.0000	3.0000
ESMQ9	2.3370	2.0000	2.00	1.00	2.0000	2.0000	3.0000
ESMQ10	2.791	3.000	3.0	2.0	2.000	3.000	4.000
ESMQ11	3.1848	3.0000	3.00	1.00	3.0000	3.0000	4.0000
ESMQ12	3.2391	3.0000	3.00	1.00	3.0000	3.0000	4.0000
ESMOverall	2.9309	3.0000	3.08	0.4167	2.7500	3.0000	3.1667

The result shows that the overall level of awareness of Grade 12 students has a median = 3.00 that falls under the range of "Agree" from the 4-point Likert Interpretation Scale. This is then supported by the results under mode which has an overall result of 3.08 that also falls under the "Agree". Moreover, the overall IQR of 0.4167 indicates that the middle 50% of Grade 12 students have Level of Awareness on Electrical Safety Measures ranging from 2.750 to 3.167 which fall under Agree. This implies that majority of Grade 12 students are aware about safety measures.

However, question no. 9 which states "I do not load an adapter or wall socket with many appliances" shows the lowest median = 2.00 with an interquartile range 2 to 3 which varies from disagree to agree. This may indicate that most of the Grade 12 students disagree on whether they are not loading an adapter or wall socket with many appliances.

b. Electrical Hazards

Table 3 shows the Level of Awareness among Grade 12 Students at Letran Bataan Regarding Electrical Hazards.

Table 3: Descriptive Statistics for EH

Questions	Mean	Median	Mode	IQR	Percentiles		
					25	50	75
EHQ1	3.0435	3.0000	3.00	1.00	3.0000	3.0000	4.0000
EHQ2	2.8804	3.0000	3.00	1.00	2.0000	3.0000	3.0000
EHQ3	2.9783	3.0000	3.00	2.00	2.0000	3.0000	4.0000
EHQ4	2.9783	3.0000	3.00	1.00	3.0000	3.0000	4.0000
EHQ5	3.3152	3.0000	3.00	1.00	3.0000	3.0000	4.0000
EHQ6	3.0978	3.0000	3.00	1.00	3.0000	3.0000	4.0000
EHQ7	3.0870	3.0000	3.00	1.00	3.0000	3.0000	4.0000
EHQ8	3.2174	3.0000	3.00	1.00	3.0000	3.0000	4.0000
EHQ9	3.2500	3.0000	3.00	1.00	3.0000	3.0000	4.0000
EHQ10	3.0326	3.0000	3.00	1.00	3.0000	3.0000	4.0000
EHQ11	3.2935	3.0000	3.00	1.00	3.0000	3.0000	4.0000
EHQ12	2.3587	2.0000	2.00	1.00	2.0000	2.0000	3.0000
EHOverall	3.0444	3.0417	3.00	0.3958	2.9167	3.0417	3.3125

The result shows that the overall level of awareness of Grade 12 students has a median = 3.04 that falls under the range of "Agree" from the 4-point Likert Interpretation Scale. This is then supported by the results under mode which has an overall result of 3.00 that also falls under the "Agree". Moreover, the IQR of 0.3958 indicates that the middle 50% of Grade 12 students have Level of Awareness on Electrical Hazards ranging from 2.9167 to 3.3125 which then varies from Agree to Strongly Agree. This implies that majority of Grade 12 students have high level of awareness about electrical hazards which varies from aware to highly aware.

However, question no. 12 which states "I can use a lower wattage LED bulb in a fixture with a higher wattage rating" shows the lowest median = 2.00 with an interquartile range 2 to 3. This may indicate that most of the Grade 12 students disagree or agree on whether they can use a lower wattage LED bulb in a fixture with a higher wattage rating.

Non- Parametric and Parametric Test for Gender- Based

The researchers employed both parametric and non-parametric tests in this study in answering the second research question- What is the level of awareness among Grade 12 students at Letran- Bataan regarding electrical hazards and safety measures when grouped according to gender?

In a study, Cuesta et al. (2022) emphasizes the significance of utilizing parametric and non-parametric tests for examining gender differences in safety awareness within hazardous settings. This method guarantees a comprehensive assessment of gender differences in awareness of electrical hazards and safety measures, enhancing the credibility of research findings.

Firstly, the researchers utilized an Independent Sample t-test (Unpaired t-test) as a parametric test to compare the mean awareness levels between males and females. This test assumed normality and homogeneity of variance in the data, providing insights into potential differences in mean awareness scores between the genders.

Additionally, the researchers conducted a Mann-Whitney U test as a non-parametric alternative to further examine the awareness levels based on gender. This test did not assume a normal distribution and was robust to outliers, making it suitable for analyzing data that may not meet parametric assumptions. By employing both tests, the researchers aimed to assess robustness, account for data characteristics, and increase confidence in results (Field, 2013). Comparing results across these test types helps validate findings under different assumptions and data distributions.

a) Non- Parametric Test (Mann- Whitney U Test)

Mann-Whitney U test was used to determine if there is a statistically significant difference between the level of awareness of Grade 12 students of Letran-Bataan regarding Electrical Safety Measures and Electrical Hazards when group according to Gender. If the p-value (abbreviated as Sig.) > 0.05, the difference is not statistically significant, thus accepting the null hypothesis. If the p-value < 0.05, the difference is statistically significant, thus rejecting the null hypothesis.

Table 4: Ranks

	Gender	N	Mean Rank	Sum of Ranks
ESMOverall	Female	46	37.88	1742.50
	Male	46	55.12	2535.50
	Total	92		
EHOverall	Female	46	41.61	1914.00
	Male	46	51.39	2364.00
	Total	92		

Table 5: Test Statistics[a]

	ESMOverallMean	EHOverallMean
Mann-Whitney U	661.500	833.000
Wilcoxon W	1742.500	1914.000
Z	-3.108	-1.764
Asymp. Sig. (2-tailed)	.002	.078

a. Grouping Variable: Gender

The test result shows that there is a statistical difference on the Level of Awareness on Electrical Safety Measures between Male and Female Grade 12 students (mean = 661.500, p = 0.002). In addition, Male Grade 12 students have a higher mean rank = 55.12 than Female Grade 12 students, mean rank

= 37.88. This implies that Male Grade 12 students have significantly higher level of awareness than Female Grade 12 students in terms of Electrical Safety Measures.

On the other hand, the test results shows that the difference on the Level of Awareness on Electrical Hazards between Male and Female Grade 12 students are not statistically significant (mean = 833.00, p = 0.078). This shows that Male and Female Grade 12 students of Letran Bataan have the same Level of Awareness about Electrical Hazards.

b) Parametric Test (Independent Sample t- test)

For Parametric test, Independent Sample t-test (Unpaired t-test) was used to determine if there is a statistically significant difference between the Level of Awareness of Grade 12 students of Letran-Bataan regarding Electrical Safety Measures and Electrical Hazards when group according to Gender. If the p-value (abbreviated as Sig.) > 0.05, the difference is not statistically significant, thus accepting the null hypothesis. If the p-value < 0.05, the difference is statistically significant, thus rejecting the null hypothesis.

Table 6: **T- test Group Statistics**

	Gender	N	Mean	Std. Deviation	Std. Error Mean
ESMOverall	FEMALE	46	2.8455	.31687	.04672
	MALE	46	3.0163	.39776	.05865
EHOverall	FEMALE	46	2.9746	.38804	.05721
	MALE	46	3.1141	.36992	.05454

Table 7 ***Independent Samples Test***

			ESMOverallMean		EHOverallMean	
			Equal variances assumed	Equal variances not assumed	Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		3.491		.000	
	Sig.		.115		.984	
t-test for Equality of Means	t		-2.278	-2.278	-1.765	-1.765
	df		90	85.717	90	89.795
	Significance	One-Sided p	.013	.013	.041	.041
		Two-Sided p	.025	.025	.081	.081
	Mean Difference		-.17078	-.17078	-.13949	-.13949
	Std. Error Difference		.07498	.07498	.07905	.07905
	95% Confidence Interval of the Difference	Lower	-.31975	-.31985	-.29653	-.29664
		Upper	-.02182	-.02172	.01754	.01765

The result shows that there is a statistical difference on the Level of Awareness on Electrical Safety Measures between Male and Female Grade 12 students (t(90) = -2.278, p = 0.025). In addition, Male Grade 12 students have a higher mean = 3.02 than Female Grade 12 students, mean = 2.54. This implies that Male Grade 12 students have significantly higher level of awareness than Female Grade 12 students in terms of Electrical Safety Measures.

On the other hand, the test results shows that the difference on the Level of Awareness on Electrical Hazards between Male and Female Grade 12 students are not statistically significant (t(90) = -1.765, p = 0.081). This shows that Male and Female Grade 12 students of Letran Bataan have the same Level of Awareness about Electrical Hazards.

Kruskal Wallis Test

The Kruskal-Wallis identifies significant differences in awareness and understanding of electrical hazards across different strands under academic and technical tracks in the collected data (Finlay et al., 2009). Since the test is non-parametric, its assumption do not include a normal distribution of data. Given that the population size of each academic and technical track in the research stage was unequal, this test would be suitable rather than the one requiring equal or at least relatively similar populations (Pallant, 2016). Moreover, the researchers utilized purposive, and also had equal numbers of males and females. Therefore, it ensures that the test results are not skewed by sampling biases (Creswell, 2014). This strengthens the validity of the comparisons made across academic and technical track.

In this study, the Kruskal-Wallis test was employed due to its capability to address variations in sample sizes and its appropriateness for non-parametric analyses, establishing it as a dependable approach to identify noteworthy differences in awareness levels among various academic and technical tracks (Tabachnick et al., 2019). Kruskal-Wallis Test was used to determine the significant difference among the strands of Grade 12 students on their Level of Awareness regarding Electrical Safety Measures and Electrical Hazards.

Kruskal-Wallis Test was used rather than One-Way ANOVA test because the data deviates from a non-normal distribution. If the p-value > 0.05, the difference is not statistically significant, thus accepting the null hypothesis. If the p-value < 0.05, the difference is statistically significant, thus rejecting the null hypothesis. If the result shows a statistically significant difference, post-hoc analysis must be performed to identity which among the pair of groups have significant differences.

a) Nonparametric Test (Independent- Samples Kruskal-Wallis Test)

Table 8: Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of ESMOverall is the same across categories of Strand.	Independent-Samples Kruskal-Wallis Test	<.001	**Reject the null hypothesis.**
2	The distribution of EHOverall is the same across categories of Strand.	Independent-Samples Kruskal-Wallis Test	.002	**Reject the null hypothesis.**

a. The significance level is .050.

b. Asymptotic significance is displayed.

b) Electrical Safety Measures across Strands

Table 9: ***Independent-Samples Kruskal-Wallis Test Summary***

Total N	
Test Statistic	17.9
Degree Of Freedom	
Asymptotic Sig.(2-sided test)	<.0

a. The test statistic is adjusted for ties.

c) Electrical Hazards across Strands

Table 10: ***Independent-Samples Kruskal-Wallis Test Summary***

Total N	92
Test Statistic	14.381[a]
Degree Of Freedom	3
Asymptotic Sig. (2-sided test)	.002

a. The test statistic is adjusted for ties.

The test result shows that there is statistically significant difference on the Level of Awareness among the strands of Grade 12 students regarding Electrical Safety Measures ($H(3) = 17.961$, $p<0.001$) and Electrical Hazards ($H(3) = 14.381$, $p = 0.002$). This implies that there is a strong evidence to reject the null hypothesis which further indicates that the different strands under academic and technical track of Grade 12 students have statistically significant different level of awareness.

Post- Hoc Analysis

In this study, a post-hoc test is done to identify exactly which groups differ from each other. A post hoc analysis refers to statistical tests conducted after the initial analysis of data, often used to explore specific relationships or patterns that were not part of the original research hypothesis ("11.8: Post hoc tests," 2024). It's crucial in research papers because it helps uncover unexpected findings or relationships that can contribute significantly to the understanding of the research topic.

One common post-hoc test used after Kruskal-Wallis is the Dunn-Bonferroni Adjustment. The Dunn-Bonferroni Adjustment is a pairwise comparison test that adjusts the significance level to control for multiple comparisons. The adjusted significance level is calculated by dividing the original alpha level by the number of comparisons made.

If the adjusted significance level is greater than 0.05, it means that there is no evidence to reject the null hypothesis that there is no significant difference between the groups. In other words, none of the pairwise comparisons are statistically significant at the adjusted significance level.

If the Dunn-Bonferroni adjustment results in adjusted p-values that are less than the desired significance level, then the pairwise comparison is considered statistically significant. If the adjusted p-values are greater than the desired significance level, then there is insufficient evidence to reject the null hypothesis of no significant difference between the groups.

Post- Hoc Analysis for Electrical Safety Measures

Table 11: **Ranks**

	Strand	N	Mean Rank
Awareness of Electrical Safety Measures (Overall)	ABM	8	19.06
	HUMSS	11	29.95
	STEM	72	51.47
	TVL-ICT	1	90.00
	Total	92	
Awareness of Electrical Hazards (Overall)	ABM	8	17.69
	HUMSS	11	35.23
	STEM	72	51.08
	TVL-ICT	1	71.50
	Total	92	

Table 12: **Test Statistics**

	Awareness of Electrical Safety Measures (Overall)	Awareness of Electrical Hazards (Overall)
Kruskal-Wallis H	17.961	14.381
df	3	3
Asymp. Sig.	.000	.002

a. Kruskal Wallis Test

b. Grouping Variable: Strand

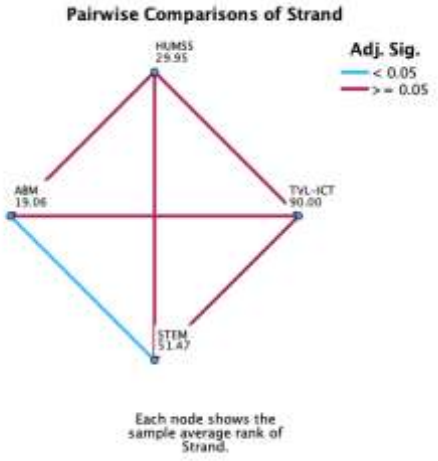
Table 12.1: Pairwise Comparisons of Strand

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
ABM-HUMSS	-10.892	12.359	-.881	.378	1.000
ABM-STEM	-32.410	9.912	-3.270	.001	.006
ABM-TVL-ICT	-70.937	28.211	-2.515	.012	.072
HUMSS-STEM	-21.518	8.610	-2.499	.012	.075
HUMSS-TVL-ICT	-60.045	27.780	-2.161	.031	.184
STEM-TVL-ICT	-38.528	26.782	-1.439	.150	.902

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is .050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.



Dunn-Bonferroni Adjustment post-hoc test was used to determine which among the pair of Grade 12 strand groups indicates a statistically significant different Level of Awareness in terms of Electrical Safety Measures. The test shows that among the 6 pairs of groups, the difference of the Level of Awareness between ABM and STEM are statistically significant, p = 0.001. Considering this, it shows that the STEM strand (mean rank = 51.47) have a higher mean rank than ABM strand (mean rank = 19.06). This could imply that Grade 12 students under the STEM strand have a statistically higher Level of Awareness regarding Electrical Safety Measures than students under ABM strand.

Furthermore, the adjusted p-value (adj. p = 0.006) suggest that the difference on the Level of Awareness between ABM and STEM strand group is statistically significant. This further supports that there was enough strong evidence to reject the null hypothesis of no significant difference between the pairwise comparison of ABM and STEM strand group at the adjusted level.

Post- Hoc Analysis for Electrical Hazards

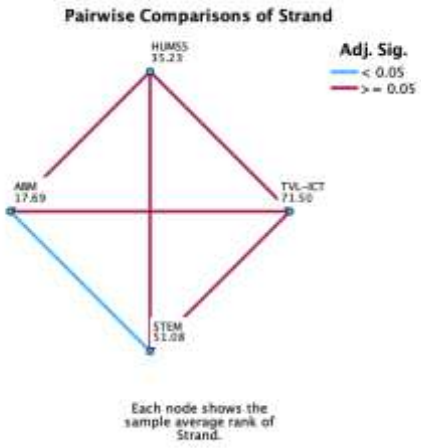
Table 13: Pairwise Comparisons of Strand

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
ABM-HUMSS	-17.540	12.358	-1.419	.156	.935
ABM-STEM	-33.389	9.912	-3.369	.001	.005
ABM-TVL-ICT	-53.812	28.209	-1.908	.056	.339
HUMSS-STEM	-15.849	8.610	-1.841	.066	.394
HUMSS-TVL-ICT	-36.273	27.779	-1.306	.192	1.000
STEM-TVL-ICT	-20.424	26.780	-.763	.446	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is .050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.



Dunn-Bonferroni Adjustment post-hoc test was used to determine which among the pair of Grade 12 strand groups indicates a statistically significant different Level of Awareness in terms of Electrical Hazards. The test shows that among the 6 pairs of groups, the difference of the Level of Awareness between ABM and STEM are statistically significant, p = 0.001. Considering this, it shows that the STEM strand (mean rank = 51.47) have a higher mean rank than ABM strand (mean rank = 19.06). This could imply that Grade 12 students under the STEM strand have a statistically higher Level of Awareness regarding Electrical Hazards than

students under ABM strand.

Furthermore, the adjusted p-value (adj. p = 0.005) suggest that the difference on the Level of Awareness between ABM and STEM strand group is statistically significant. This further supports that there was enough strong evidence to reject the null hypothesis of no significant difference between the pairwise comparison of ABM and STEM strand group at the adjusted level.

Follow- up questions: Factors that may impact students

This section discusses follow-up questions included at the latter part of the survey form. Follow-up questions clarify initial answers, ensuring accuracy and validity (Tourangeau, 2000). It eliminates ambiguity, promotes comprehensive responses, and reduces biases, making the survey results more (Converse & Presser, 1986; Fowler, 2009).

Several valid major findings are obtained after analyzing additional question in the survey:

Awareness of Electrical Safety Measures	
Electrical Safety Education	Students believe that integrating electrical safety into the education curriculum and conducting seminars are effective in enhancing awareness. They recognize the importance of structured educational initiatives and practical learning experiences in deepening their knowledge. Interactive workshops, real-life demonstrations, and engaging visual aids are considered the most effective ways to increase knowledge about electrical safety.
Accessibility of Tools	Most of the survey participants mentioned that Letran does not offer any workshops on Electrical Safety Measures. Nevertheless, some STEM strand students reported that they were able to address safety protocols in their Physics class. However, students recognize the significance of safety training programs and materials in enhancing their understanding and engagement in electrical safety. They believe that ongoing education is essential for furthering their comprehension and fostering a culture of safety awareness and expertise.
Impact of Being a Student	Students find value in learning about electrical safety, improving daily awareness and cautious behavior. They desire more knowledge, showing a proactive approach towards enhancing understanding and being more conscious of safety.
Electrical Safety Practices	Most of the students demonstrated proactive safety habits such as regular inspections of electrical cords and plugs, avoiding overloading sockets, and ensuring proper plug practices on their homes.
Impact of Personal Experiences	Personal experiences, ranging from minor grounds to mishandling electrical equipment, significantly influenced students' safety approach. These experiences underscored the necessity of proper training, awareness, and maintenance in preventing accidents.
Effective Communication Methods	Based from the responses of the students, the most effective communication channels for students to receive electrical safety information includes seminars, digital platforms like websites and interactive sessions with experts.

The results shows that integrating electrical safety into education is a must. Students value structured initiatives and practical learning experiences, including workshops and visual aids. However, Letran lacks workshops on Electrical Safety Measures, highlighting a gap. Safety training programs are seen as crucial for enhancing understanding, and students demonstrate proactive safety habits.

Awareness of Electrical Hazards	
Student Electrical Awareness	Students noted science experiments, projects raised awareness of electrical hazards, stressing. Hands-on learning and targeted educational initiatives were emphasized as key in enhancing hazard awareness.
Identifying and Handling Electrical Hazards	Students identified and managed electrical hazards: exposed wires, sparking cords, overloaded sockets. Sense of responsibility evident.
Perspective on Hazards	Students' perspectives on electrical hazards are shaped by their personal encounters. Though some believe these hazards should be taken seriously, others downplay their importance based on personal experiences.
Letran's Electrical Hazard Impact	Students pointed out the importance of education in increasing hazard awareness, but noted that Letran does not offer any training, seminars and education on Electrical Hazards. Some students in the STEM and TVL program have discussed basic electrical hazards, but they agree with Grade 12 students on the importance of more thorough education on the topic. Effective safety guidelines and practice exercises were identified as elements that improve understanding of dangers.
Occupation's Impact on Awareness:	STEM and technical track students showed increased hazard awareness due to regular handling of electrical equipment, underlining the significance of tailored educational interventions and hands-on experiences.

Regarding electrical hazards, science projects and hands-on learning raise awareness. Students can identify and manage hazards but may vary in their seriousness. Letran needs more education on Electrical Hazards. STEM students show increased awareness, emphasizing the need for tailored education. Effective communication channels like seminars and digital platforms play a key role in promoting safety awareness among students.

Overall, the research employed a 4-point Likert Scale questionnaire and follow-up questions to evaluate students' awareness of electrical hazards and safety measures in academic and technical tracks. The results from the Kruskal-Wallis Test supported the hypothesis of a significant difference in awareness levels among these tracks. Follow-up questions further confirmed this difference in awareness levels, aligning with the results from the statistical test.

Moreover, students highlighted the need to integrate electrical safety into the curriculum and conduct specialized seminars or workshops. Follow-up questions provided deeper insights into students' perspectives, emphasizing the importance of tailored educational interventions based on academic fields. Continuous learning and practical experience were identified as crucial for enhancing students' understanding and expertise in electrical hazards and safety measures, with follow-up inquiries playing a key role in revealing detailed viewpoints in quantitative studies.

CONCLUSION

A sample of 92 students with an equal number of male

and female students was drawn from Letran- Bataan. The instrument was a questionnaire containing a 4-point Likert Scale items. The data was collected and analyzed through different statistical analysis. Based on the result of this study, it can be concluded that while most students vary from aware to highly aware regarding electrical hazards and safety measures, significant variations exist across specific areas such as loading adapters or wall sockets, as well as whether they can use a lower wattage LED bulb in a fixture with a higher wattage rating.

Moreover, in terms of gender, male students exhibit significantly higher awareness levels than females regarding safety measures, emphasizing the need for targeted educational interventions. However, there is no significant difference in awareness levels regarding electrical hazards between male and female students.

The study also finds significant differences in awareness levels across academic tracks, with STEM students having a higher level of awareness compared to ABM students about both safety measures and hazards.

In conclusion, this study has successfully achieved its objectives by assessing the level of awareness of electrical hazards and safety measures among Grade 12 students at Letran-Bataan, highlighting gender and track differences. Overall, the study emphasizes the importance of integrating electrical safety education into the curriculum, providing practical training seminars, and conducting awareness campaigns to enhance safety awareness among students. Hence, refer to Appendix A for the three- year proposal entitled “Cultivating Safety: A Three-Year Plan for Enhanced Electrical Safety Education at Colegio de San Juan de Letran-Bataan, Based on Grade 12 Students’ Hazard Awareness and Safety Measures Study”.

RECOMMENDATION

Based on the study's findings, several key recommendations can be made to enhance safety education and promote community literacy development at Letran-Bataan:

1. The Letran-Bataan community can utilize the three-year proposal entitled "Cultivating Safety: A Three-Year Plan for Enhanced Electrical Safety Education at Colegio de San Juan de Letran-Bataan, Based on Grade 12 Students’ Hazard Awareness and Safety Measures Study" found on Appendix A to enhance and improve the quality of life within the community.

2. Alongside the computer and robotics literacy program, the Colegio can enrich its curriculum by including seminars, workshops, and hands-on programs focusing on electrical safety for all senior high school tracks. These supplementary educational activities will thoroughly address safety measures and hazards associated with basic to complex electrical systems, contributing to a comprehensive education in both technology and safety. This educational enhancement can be incorporated to the Colegio and Academic week conducted yearly by Letran.

3. Practical Training Seminars- The Colegio must organize workshops and practical sessions focusing on electrical safety practices, encouraging hands-on learning and skill development.

4. Awareness Campaigns- Launch awareness campaigns using digital platforms and seminars to reinforce safety messages and promote proactive safety habits among students. This can be integrated in the two events that is celebrated by the Colegio yearly, specifically Colegio Week and Academic Week.

5. Tailored Intervention- Conduct practical training seminars focusing on scenarios relevant to the strand. For example, for ABM students, conduct a practical training seminar such as office settings or business establishments, where electrical hazards may occur.

6. Institutional Policy Advocacy- Letran must strive to review and re- evaluate the institutional policies that prioritize electrical safety education and incorporate it as a critical component of overall literacy training.

7. Implement Gender-Specific Educational Interventions- To address the significant difference in awareness levels between male and female students about electrical safety measures, it is advisable to develop and execute educational interventions that are tailored to each gender. The interventions should focus on areas where female students demonstrate lower levels of awareness in comparison to their male peers.

8. Follow-up Studies- Since this is the first non- prototype research for the Engineering Department, the Colegio can use this study to conduct follow-up studies to assess the long-term effectiveness of safety education initiatives and evaluate the impact of gender-sensitive approaches on safety outcomes.

These recommendations aim to create a culture of safety awareness within the Colegio, contribute to individual student development, and enhance safety standards within the community. While specific to Letran-Bataan's Grade 12 students, these initiatives can serve as a model for broader educational frameworks and community development efforts.

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