

# Unveiling Electrical Problems Encountered by Women in Household Settings: A Skill Assessment

Victor S. Rosales<sup>1\*</sup>, Adelfa C. Silor<sup>1</sup>, Antonio M. Merca<sup>2</sup>

<sup>1</sup> Department of Technology Teacher Education, College of Education,  
Mindanao State University-Iligan Institute of Technology, Iligan City, 9200, PHILIPPINES

<sup>2</sup> Department of Mechanical and Engineering Science, College of Engineering,  
Mindanao State University-Iligan Institute of Technology, Iligan City, 9200, PHILIPPINES

\*Corresponding Author: [victor.rosales@g.msuiit.edu.ph](mailto:victor.rosales@g.msuiit.edu.ph)  
DOI: <https://doi.org/10.30880/jtet.2025.17.04.021>

## Article Info

Received: 25<sup>th</sup> June 2025  
Accepted: 17<sup>th</sup> October 2025  
Available online: 30<sup>th</sup> December 2025

## Keywords

Electricity, household, women,  
electrical problems, skills

## Abstract

Electricity plays a vital role in supporting household responsibilities, particularly among women. This study examined the electrical problems encountered by women in Iligan City, Philippines, and assessed their self-perceived skill levels using the Skill Assessment Learning Model (SALM). A descriptive survey design was employed involving 230 women across ten barangays. Most respondents were aged 29 years and above (78.3%), married (77.0%), and belonged to low-income households (70.0% earning ₱5,000 or less monthly), with educational attainment concentrated at the high school (27.0%) and elementary (19.6%) levels. The most frequently reported electrical problems included electric shocks (58.7%), power surges (53.5%), and unlicensed electrical installations (46.1%), all of which pose significant household safety risks. Respondents generally assessed themselves as consciously unskilled in handling electrical problems, indicating awareness of their limitations and openness to learning. The findings highlight the urgent need for TVET-aligned, gender-responsive community-based training programs to improve women's electrical safety skills, enhance household resilience, and promote inclusive participation in technical trades.

## 1. Introduction

Electricity is a vital resource that powers essential household tasks—lighting, food preparation, caregiving, and communication. In many households, women serve as the primary managers of these electricity-dependent activities, making them both the most frequent users and the most exposed to electrical hazards (Winther et al., 2020; Shrestha et al., 2023). Despite this central role, most women lack formal training in electrical safety and technical skills, particularly in low-income settings where informal wiring practices, outdated electrical systems, and limited access to licensed electricians increase their vulnerability to household accidents (Romas & Kumala, 2023; Rahmania et al., 2025).

Global studies confirm that although access to electricity can enhance women's productivity, mobility, and social participation (Samad & Zhang, 2019), it does not automatically transform gender relations—particularly when women remain excluded from technical decision-making and training opportunities (Standal & Winther, 2016; Das et al., 2023). This pattern is also evident in the Philippine context, where women continue to perform a disproportionate share of household labor—accounting for as much as 70% of household production time (Illo, 2018)—yet remain underrepresented in wage labor and technical education.

Although women comprised 60.3% of TVET enrollees in 2016, most of their training remains concentrated in short-term, livelihood-oriented programs related to household management rather than in professional, male-

dominated technical fields such as Electrical Installation and Maintenance (EIM), where women hold less than 4% of national certifications (Illo, 2018; TESDA, 2017). This mismatch between women's practical exposure to electrical risks and their limited access to formal technical training perpetuates occupational segregation. It leaves them ill-equipped to manage everyday household electrical problems safely.

Technical and Vocational Education and Training (TVET) plays a pivotal role in fostering gender equality and empowering women by equipping them with practical skills and pathways to economic autonomy (UNESCO-UNEVOC, 2010; Azmi et al., 2025). Investment in TVET enables women to gain professional competencies, improve employment prospects, and secure stable income, contributing directly to household welfare and broader economic growth (Azmi et al., 2025). Women's empowerment through TVET is often analyzed across the interrelated dimensions of resources, agency, and achievements (Kabeer, 1999). Empirical evidence shows that TVET programs integrating vocational, entrepreneurial, and life skills significantly improve women's self-confidence, income generation, and labor force participation (Chinen et al., 2017; Tiwari & Malati, 2023). Successful initiatives further demonstrate that targeted skills development can enhance both economic and social inclusion among women (Azmi et al., 2025; Lepun et al., 2025).

In the Philippines, community-based TVET and livelihood programs have attempted to address women's exclusion from technical fields by offering skills training tailored to non-working mothers and caregivers. These initiatives provide flexible learning formats in areas such as entrepreneurship, food processing, and basic technical skills (Jacobsen & Fratzke, 2016; Santos, 2023; Tambol, 2024). Beyond employability, these programs yield non-economic benefits, including greater self-confidence, stronger social networks, and reduced psychosocial stress through collective learning environments (Abing & Conchada, 2025; Cornwall, 2016; Wei et al., 2021). However, despite increasing female participation, the electrical sector remains heavily male-dominated (Osunmuyiwa & Ahlborg, 2019; Winther et al., 2020), and fragmented TVET delivery, skills mismatch, and limited local training access continue to prevent many women—especially from low-income households—from acquiring high-value technical skills (Albert et al., 2023).

Despite these developments, there remains a critical gap in empirical research on the specific household electrical problems women encounter and how they perceive their own technical competencies, particularly in urbanizing provincial contexts. Most existing studies focus on macro-level indicators of energy access, employment, or education, while largely neglecting women's everyday technical vulnerabilities inside the home.

This study addresses that gap by examining the household electrical problems faced by women in Iligan City, assessing their self-perceived skill levels, and identifying implications for gender-responsive, community-based TVET interventions. By focusing on women from diverse socioeconomic backgrounds who are routinely exposed to electrical hazards yet remain underrepresented in formal technical systems, the study aims to support the design of inclusive TVET strategies aligned with TESDA programs and national policy directions on equitable skills development.

## 2. Objectives

This research project aimed to unveil the home electrical problems encountered by women in Iligan City. More specifically, this study seeks to:

1. Determine the demographic profile of the women respondents in terms of age, civil status, monthly income, and educational attainment
2. Identify the electrical problems commonly encountered by women at home.
3. Assess women's self-perceived skills in handling household electrical problems.

## 3. Theoretical Framework

This study is grounded in the Gender and Development (GAD) framework, which emphasizes the structural and relational aspects of gender roles within society. Unlike earlier approaches that focused solely on women as beneficiaries, GAD considers the broader social, cultural, and institutional norms that perpetuate inequality and restrict women's access to resources, opportunities, and decision-making power (Rathgeber, 1990). In the context of this study, GAD provides a critical lens for analyzing how entrenched gender norms shape women's engagement with household electricity issues and their limited participation in male-dominated technical fields such as electrical installation and maintenance. It supports the idea that empowering women through targeted interventions—such as training in electrical skills—can help dismantle systemic barriers and promote equity in traditionally exclusive domains.

Complementing this is Kabeer's Empowerment Theory, which defines empowerment as the expansion in people's ability to make strategic life choices in contexts where this ability was previously denied (Kabeer, 1999). Empowerment, in this sense, involves access to resources (material, human, and social), the development of agency (the ability to define one's goals and act upon them), and the realization of achievements (outcomes resulting from exercising agency). This framework is particularly relevant as the study assesses whether access

to knowledge and skills in electrical maintenance enables women in Iligan City to exercise greater control over their environment and decisions affecting their household and personal growth.

Additionally, this study conceptually draws on the awareness continuum originally articulated in Burch's conscious competence framework to describe stages of skill awareness. However, consistent with the methodological refinement adopted in this study, the framework is operationalized strictly as a Skill Assessment Learning Model (SALM) to avoid misclassification of untrained respondents. The adapted model emphasizes awareness and self-perceived task familiarity rather than certified occupational competence, which is more appropriate for community-based populations without formal technical training.

By synthesizing these three theoretical lenses, the study holistically addresses the interplay between gender, skill acquisition, empowerment, and social change. Together, they inform both the research design and interpretation of results, offering a robust foundation for examining how gender-responsive energy and technology interventions can promote inclusivity and sustainable development.

#### 4. Materials and Methods

This study employed a descriptive research design aimed at identifying typical home electrical problems and assessing the self-assessed electrical skill levels of women. Descriptive research is appropriate for exploring specific conditions and behaviors within a population, often using quantitative methods to generate reliable, structured data (Creswell, 2014; Kumar, 2019). In this case, a structured survey questionnaire was administered to a sample of 230 women respondents.

The study focused on ten barangays in Iligan City, namely: Abuno, Bonbonon, Buru-un, Digkilaan, Dalipuga, Pugaan, Rogongon, Sta. Elena, Suarez, and Tipanoy. These areas were selected for their diverse socioeconomic profiles and representation of both rural and peri-urban settings.

To ensure representation, the researchers used stratified random sampling. This technique involves dividing the population into subgroups (strata) based on shared characteristics such as income level or educational background. Participants were then randomly selected from each stratum, allowing for a balanced and inclusive sample that reflects the varied demographics of women in the study areas. This method is particularly effective for gender-focused studies as it ensures that different social and economic perspectives are considered.

The primary research instrument was a survey questionnaire developed specifically for this study and validated by five experts in electrical technology and engineering education. To enhance comprehension and inclusivity, the questionnaire was translated into the local vernacular.

The questionnaire consisted of three main sections:

Part 1 captured the demographic profile of the respondents, including age, civil status, monthly income, and educational attainment.

Part 2 focused on identifying common household electrical problems. Items were formulated based on a review of literature, online sources, and local observations, and were validated by experts. Respondents answered in a dichotomous yes/no format to indicate whether they had experienced specific electrical problems at home.

Part 3 assessed the respondents' self-perceived electrical skills, derived from the TESDA Self-Assessment Guide for Electrical Installation and Maintenance NC II (EIM NC II). This section included 20 items, each reflecting a core skill or competency relevant to home-based electrical maintenance.

In this study, respondents rated themselves using a four-point scale adapted into what is termed the Skill Assessment Learning Model (SALM), which captures levels of awareness and self-perceived ability rather than formal technical competency. Although the Conscious Competence Learning Model initially informed the scale, the terminology was intentionally modified from competence to skill to ensure conceptual and methodological appropriateness for the respondent group. This change was necessary because the participants had no formal technical training, certification, or professional background in electrical installation and maintenance; thus, the use of the term competence—which implies validated, work-ready capability—would have been conceptually inaccurate and potentially misleading. More specifically, the concept of "competence" should be reserved for individuals who have already achieved a measurable level of skill or training in the field and require further professional development, rather than for those with no prior technical background. By adopting a skills-based framing, the model more accurately reflects respondents' self-perceived familiarity, confidence, and basic task awareness rather than certified technical proficiency.

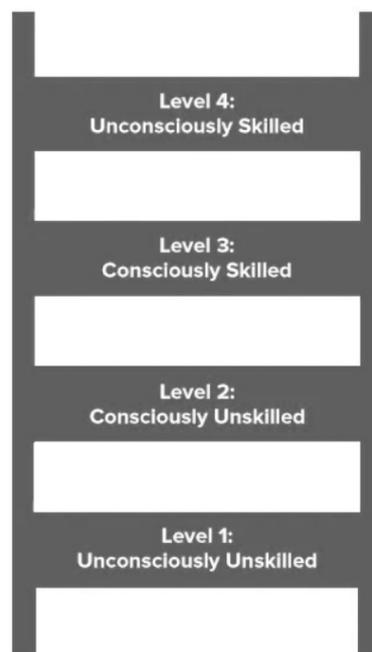
Conceptually, skills are generally understood as specific, measurable abilities required to perform technical tasks, with a skills-based approach emphasizing specialization and technical proficiency to meet immediate operational needs (TESDA, 2025). In contrast, competency refers to a broader capability, defined as an individual's ability to apply and demonstrate a combination of awareness, knowledge, skills, and attitudes to perform work responsibilities effectively (Wahba, n.d.). Unlike a purely skills-based model that focuses on task execution, a competency-based approach is holistic, recognizing that an individual may be considered incompetent if they are unable to apply their knowledge and skills appropriately in real-world contexts, regardless of theoretical understanding (TESDA, 2025; Wahba, n.d.).

The adapted scale consists of the following levels: (1) Unconsciously Unskilled – unaware of lacking the skill; (2) Consciously Unskilled – aware of lacking the skill; (3) Consciously Skilled – aware of possessing the skill; and (4) Unconsciously Skilled – skilled without active awareness.

To ensure consistent interpretation of the mean scores, equal intervals were assumed across the four levels of the 4-point Likert-type scale, ranging from 1.00 to 4.00. The scale range (3.00) was divided by four to obtain an interval width of 0.75. Based on this, the following score ranges were used for the interpretation of respondents' self-perceived electrical skill levels.

**Table 1** Interpretation of the Skill Assessment Learning Model (SALM) scores

Score Range	Interpretation
1.00 – 1.75	Unconsciously Unskilled
1.76 – 2.50	Consciously Unskilled
2.51 – 3.25	Consciously Skilled
3.26 – 4.00	Unconsciously Skilled



**Fig. 1** The conscious competence ladder

To assess the internal consistency reliability of the Skill Self-Assessment scale, Cronbach's Alpha was computed using the 20-item section. The result was  $\alpha = 0.9721$ , which is classified as "excellent" according to George and Mallery (2016). While alpha values above 0.95 may suggest item redundancy (Tavakol & Dennick, 2011), this outcome is justifiable within the context of this study, as the items were directly aligned with the official TESDA competency standards and reflect authentic vocational tasks. According to Gulikers et al. (2008), high internal consistency can be expected in competency-based instruments where items are inherently interrelated due to task integration and performance alignment.

This methodological design supports the study's broader goal of understanding how women engage with electrical problems in their households and assessing the need for targeted training programs to bridge skills gaps and promote technical empowerment.

## 5. Results and Discussion

**Table 2** Demographic profile

Variable	Category	Frequency (N=230)	Percentage (%)
Age	18 and below	21	9.1
	19-23	14	6.1
	24-28	15	6.5
	29 and above	180	78.3
Civil Status	Single	43	18.7
	Married	177	77.0
	Widow	4	1.7
	Separated	6	2.6
Monthly Income	5000 and below	161	70.0
	6000 to 10000	32	13.9
	11000 to 15000	8	3.5
	16000 to 20000	3	1.3
	21000 to 25000	24	10.4
	26000 to 30000	1	0.4
	36000 to 40000	1	0.4
Educational Attainment	Elementary Level	45	19.6
	High School Level	62	27.0
	College Level	42	18.3
	Elementary Graduate	12	5.2
	High School Graduate	28	12.2
	College Graduate	41	17.8

Based on the demographic data, most women respondents were 29 years old and above (78.3%) and married (77.0%). In terms of income, a large proportion earned ₱5,000 and below per month (70.0%), indicating that most respondents belong to low-income households. Regarding educational attainment, the highest concentration was at the high school level (27.0%) and elementary level (19.6%), while only 17.8% of the respondents had completed college. These results indicate that the typical respondent in the study is an older, married woman from a low-income household with limited formal education.

The observed demographic profile has important implications for women's participation in technical skills training and household electrical safety. Generalao et al. (2025) note that Filipino women over the age of 29 are often heavily burdened with household and caregiving responsibilities, which limits their time and mobility to participate in vocational programs such as TESDA-accredited training. The high proportion of married respondents further aligns with the findings of Flores, Trajera, and Ching (2025), who explain that civil status among women significantly influences time allocation as well as decision-making authority over financial resources and educational participation.

When combined with low income—as seen in most respondents earning below the national poverty threshold—the barriers to accessing continuing education and skills development become even more pronounced. The Philippine Statistics Authority and related national agencies consistently report that women from lower-income groups experience reduced access to opportunities for skills upgrading and lifelong learning (Albert et al., 2023). Moreover, the clustering of educational attainment at the elementary and high school levels suggests potential limitations in both comprehension of technical training materials and confidence in engaging with more advanced technical programs (Smith et al., 2021).

Taken together, these demographic characteristics underscore the need for inclusive, localized, and flexible training approaches. The UN ESCAP (2025) similarly emphasizes that both structural inequality and the limited outreach of technical-vocational programs to adult learners drive persistent skill gaps among women in low-income households. However, evidence also shows that when training is community-based, contextualized, and gender-responsive, women's participation and completion rates significantly improve (Generalao et al., 2025).

The respondent profile strongly supports the need for targeted, community-based electrical training programs designed specifically for older, low-income, and married women with limited formal education. Such programs should prioritize flexible scheduling, mother-friendly learning environments, and simplified, context-

appropriate instructional materials. Aligning these initiatives with TESDA's competency-based Electrical Installation and Maintenance (EIM NC II) curriculum can enhance accessibility while also creating pathways toward improved household safety, women's technical empowerment, and potential livelihood opportunities.

**Table 3** *Electrical problems at home*

Electrical Problems at Home	Yes (Y)		No (N)		Rank (Y)
	f	%	f	%	
Experienced mild electrical shocks when you turn an appliance on or off.	135	58.7	95	41.3	1
Power surges are the most common type of electrical problem that occurs in our homes.	123	53.5	107	46.5	2
Wirings at home were done by an unsupervised non-licensed electrical practitioner.	106	46.1	124	53.9	3
Mice or other pests chew on our electrical wiring.	101	43.9	129	56.1	4
Frequent tripping of breakers or blown fuses.	81	35.2	149	64.8	5
Overloading occurs every time appliances are used.	79	34.3	151	65.7	6
There is poor circuit/wiring protection at home.	74	32.2	156	67.8	7
Wirings at home are not based on an electrical plan.	70	30.4	160	69.6	8.5
Electrical wires are too hot when touched.	70	30.4	160	69.6	8.5
Switches of lights are not working or are broken.	67	29.1	163	70.9	10
Lights are flickering or dimming.	65	28.3	165	71.7	11.5
Electrical boxes at home are uncovered.	65	28.3	165	71.7	11.5
Electrical devices and materials are substandard.	62	27.0	168	73.0	13.5
Light bulbs burn out too frequently.	62	27.0	168	73.0	13.5
Our house has outdated or old wiring.	59	25.7	171	74.3	15
Electrical wiring is messy.	57	24.8	173	75.2	16
Misuse of extension wires/cords.	56	24.3	174	75.7	17
Fewer convenience outlets	53	23.0	177	77.0	18
The panelboard or safety switch is over-circuited.	51	22.2	179	77.8	19.5
Undervoltage occurs in my home.	51	22.2	179	77.8	19.5
Loose convenience/wall outlets.	49	21.3	181	78.7	21
There are grounding issues at home (No GFCI Installed, Ungrounded Connections)	46	20.0	184	80.0	22
Wires are backstabbed (with holes and cuts)	45	19.6	185	80.4	23
Electrical wires are not placed in a conduit /or protected.	44	19.1	186	80.9	24
Plugging too many appliances into the same circuit.	36	15.7	194	84.3	25

Table 3 presents the household electrical problems reported by women respondents in Iligan City. The most frequently encountered issue was mild electrical shocks when switching appliances on or off (58.7%). This was followed by power surges (53.5%), wiring installed by unlicensed practitioners (46.1%), and pest-related wire damage (43.9%). Other notable problems included frequent breaker tripping (35.2%), appliance-related circuit overloading (34.3%), poor wiring protection (32.2%), and wires becoming hot to the touch (30.4%).

Additional problems reported were over-circuited safety switches (22.2%), grounding deficiencies (20.0%), and exposed or messy wiring (24.8%). The findings indicate that women are exposed to a wide range of electrical hazards that compromise both household safety and compliance with basic electrical standards.

The high prevalence of electric shocks, power surges, and informal electrical installations suggests that household electrical hazards in the study area are systemic rather than isolated safety incidents. Li et al. (2025) identify overloaded circuits, faulty grounding, and outdated wiring as among the most common triggers of residential fires—conditions that are clearly reflected in the present findings. Similarly, Thai, Lee, and Huh (2024) report that more than half of unintentional household fires originate from electrical faults caused by non-compliant installations and limited user awareness.

The widespread use of unlicensed electrical practitioners and substandard materials directly violates the Philippine Electrical Code (PEC) and significantly heightens shock and fire risk. Gordon and Cartelli (2018) warn that improper grounding and the absence of ground-fault protection are among the most dangerous household

electrical faults, while Campbell (2019) attributes many residential electrical fires to failures in electrical distribution and lighting systems—particularly in sleeping areas. These risks closely parallel the home-based hazards observed in Iligan City.

The results also highlight a precise gender dimension. Women, who are primarily responsible for electricity-dependent domestic activities, face disproportionate exposure to electrical hazards, yet typically lack the technical access and training required to intervene safely. Boubaker, Mekni, and Jerbi (2017) similarly note that female-headed and female-managed households are more vulnerable to unaddressed electrical risks. Floyd and Valdes (2020) emphasize that “Prevention through Design” (PtD)—including structured load planning, concealed wiring, and proper grounding—can significantly reduce such risks. These principles directly address the exposed wiring, grounding deficiencies, and overloaded safety switches reported in this study. Nelson (2015) further advocates for resistance grounding systems and mandatory inspections to mitigate the dangers of aging and overloaded installations.

From a technical-vocational perspective, these findings strongly justify the integration of TESDA-aligned Electrical Installation and Maintenance (EIM NC II) training programs for women at the community level. Such programs can simultaneously address household safety deficits and gender exclusion in technical trades. Without localized training, systematic code enforcement, and safety education, the recurring hazards identified—electric shock exposure, wiring failure, and informal installations—are likely to persist, leading to continued injuries, fatalities, and property damage (Gammon, Lee, & Zhang, 2015; Gordon & Martinez, 2018). These results, therefore, call for a holistic response that integrates electrical safety regulation, technical education, and gender empowerment to build safer, code-compliant, and more inclusive household environments.

**Table 4** Skill level in handling household electrical problems

A. Basic Technical Knowledge and Identification Skills	Mean.	Interpretation
I can identify defective and substandard electrical devices and materials.	1.86	Consciously Unskilled
I can identify the specifications of electrical tools, equipment, and materials.	1.88	Consciously Unskilled
I can identify and check to ensure that the tools, equipment, and PPE are needed for the electrical system.	1.95	Consciously Unskilled
I can select and identify the correct rating, quantity, sizes, and type of wiring devices, switches, lighting fixtures, and convenience outlets.	1.88	Consciously Unskilled
B. Planning, Layout, and Interpretation Skills	Mean	Interpretation
I can read and interpret electrical plans and detailed drawings.	1.83	Consciously Unskilled
I can set the layout and dimensions of electrical drawings or wiring diagrams.	1.80	Consciously Unskilled
I can select lighting fixtures and auxiliary outlets for installation.	2.10	Consciously Unskilled
I can perform electrical installations economically.	1.84	Consciously Unskilled
C. Installation and Practical Execution Skills	Mean	Interpretation
I can terminate/splice conductors/wires in accordance with standards.	1.79	Consciously Unskilled
I can install wiring protective devices and grounding systems properly.	1.90	Consciously Unskilled
I can lay out, mount, and install components and wiring materials.	1.84	Consciously Unskilled
I can bend and install various types of conduits.	1.89	Consciously Unskilled
I can install types of lighting switches as per the wiring diagram.	1.88	Consciously Unskilled
I can use electrical tools and equipment properly.	1.94	Consciously Unskilled

D. Testing, Troubleshooting, and Maintenance Skills	Mean	Interpretation
I can use electrical measuring/testing instruments (e.g., a multitester).	1.88	Consciously Unskilled
I can perform minor electrical repairs and maintenance.	1.88	Consciously Unskilled
I can seek further instruction from a licensed practitioner.	1.94	Consciously Unskilled
I can perform final checks to ensure conformity to diagrams.	1.84	Consciously Unskilled
Overall Weighted Mean	1.88	Consciously Unskilled

The results presented in Table 4 show that the overall weighted mean of the respondents’ self-assessed electrical skills is 1.88, which corresponds to the classification “Consciously Unskilled” under the adapted Skill Assessment Learning Model. This indicates that the respondents are generally aware of their lack of skills in performing household electrical tasks.

Across the four major domains of household electrical skills, consistently low self-assessment scores were observed. For basic technical knowledge and identification skills, the mean scores ranged from 1.86 to 1.95, indicating low ability in identifying defective materials, selecting correct PPE, and understanding tool specifications. In the domain of planning, layout, and interpretation, mean scores ranged from 1.80 to 2.10, reflecting difficulty in reading electrical plans, interpreting wiring diagrams, and selecting appropriate lighting fixtures. For installation and practical execution skills, such as wire splicing, grounding installation, and tool usage, the mean scores ranged from 1.79 to 1.94. Lastly, in testing, troubleshooting, and maintenance, the mean scores ranged from 1.84 to 1.94, which included skills in using measuring instruments, performing minor repairs, and checking conformity to electrical diagrams. Overall, all four domains were consistently classified under the level of “Consciously Unskilled.”

The consistent classification of women at the “Consciously Unskilled” level suggests a critical stage in skills development. Under Burch’s Conscious Competence framework, this stage reflects individuals who are already aware of their limitations and therefore represent the most receptive group for structured training interventions (Nazarenko, 2021; Wizelman, 2022). This awareness can either lead to disengagement or serve as a powerful motivator for learning, depending on the accessibility of training opportunities and institutional support.

The very low scores in basic technical knowledge indicate a fundamental barrier to women’s participation in even low-risk electrical tasks. According to TESDA (RA 7796), these foundational competencies are prerequisite skills for all levels of electrical training. Their absence limits women’s ability to engage in simple household repairs and increases dependence on unlicensed or informal labor. Women in many low-income and rural communities remain excluded from diagnostic and technical skill acquisition due to educational, cultural, and economic constraints (Hartl, 2009).

Weaknesses in planning, layout, and interpretation skills further constrain women’s capacity for informed decision-making regarding electrical installations. Studies have shown that structural barriers to women’s participation in TVET systems continue to restrict their access to technical knowledge and protective skills, thereby increasing their vulnerability to unsafe practices and dependence on informal or unlicensed labor (Khan et al., 2018)

The low ratings in installation and practical execution skills align with the findings of Acevedo et al. (2020), who observed that women often enter technical training with minimal hands-on experience but demonstrate substantial gains when provided with structured, practical learning opportunities. These installation skills are central to household safety and represent an important dimension of women’s technical empowerment.

Similarly, the low scores in testing, troubleshooting, and maintenance skills signal restricted capacity for early fault detection and minor repairs. The National Occupational Classification of Canada (2022) identifies these as mid-level technical competencies typically developed through formal training programs, underscoring the importance of accessible, community-based technical instruction.

Taken together, these findings indicate that women possess high awareness but low technical capacity, placing them at an ideal entry point for basic Technical-Vocational Education and Training (TVET) interventions. Localized training aligned with TESDA’s Electrical Installation and Maintenance (EIM NC II) program can transform this awareness into practical competence. Such TVET-driven interventions would significantly enhance household electrical safety, reduce accident risks, and equip women with nationally recognized technical credentials. Beyond safety, these programs also promote women’s employability, entrepreneurship, and participation in traditionally male-dominated technical fields, contributing to broader goals of gender equity and inclusive, skills-based community development.

## 6. Conclusion

This study underscores the persistence of gender-related challenges in household electrical safety and technical competence among women in Iligan City. While national efforts toward gender equality and inclusive development continue to advance, the findings reveal that many women remain systematically excluded from access to basic technical knowledge and training, particularly in male-dominated fields such as electrical installation and maintenance (Illo, 2018; Misola, 2014). The results demonstrate that respondents not only experience a wide range of household electrical problems but also consistently recognize their lack of technical skills in addressing these risks. This self-awareness does not indicate an absence of capability; rather, it reflects a structural gap in access to education, training, and technical empowerment (Abing & Conchada, 2025; Sison et al., 2024).

The study further affirms that women possess strong potential to contribute meaningfully to technical and safety-related domains when provided with appropriate learning opportunities. Genuine gender equity in the technical sector requires more than policy intention—it demands accessible, inclusive, and gender-responsive skills development pathways that strengthen both technical competence and self-efficacy. Recent findings also highlight that women in Iligan City actively express interest in TESDA-recognized certifications such as Food and Beverage Services NC II, underscoring the importance of aligning training programs with locally identified needs and preferences (Sison et al., 2024). To address the skills gap identified in this study, the findings strongly support the development and implementation of localized, community-based training programs aligned with TESDA's Electrical Installation and Maintenance (EIM NC II) standards, in collaboration with local government units at the barangay level. Prioritizing women's participation in such programs is essential not only for enhancing household electrical safety but also for expanding women's technical empowerment, employability, and participation in non-traditional skills sectors.

Ultimately, investing in women's technical education strengthens families, improves community safety, and contributes directly to inclusive national development. As the saying goes, "You educate a man; you educate a man. You educate a woman; you educate a generation." Investing in women's technical education is therefore an investment in the country's future.

## 7. Limitations

This study focused on women from diverse educational and socioeconomic backgrounds in selected barangays of Iligan City, the majority of whom had no formal technical training in electrical installation and maintenance. As such, the findings reflect women's self-perceived skills, awareness, and exposure to household electrical problems, rather than objectively measured technical competence. While this approach is consistent with the study's objective of examining household-level risks and learning readiness among ordinary women within a TVET and Gender and Development (GAD) framework, it necessarily limits direct comparison with populations who have undergone formal technical education (Sison et al., 2024; Illo, 2018).

Because most respondents lacked formal training, their ability to identify specific faults relied on experiential knowledge rather than certified skills, which may affect the precision of their assessments. However, this limitation also accurately captures the lived realities of women most at risk from household electrical hazards—those excluded from formal TVET systems (Misola, 2014).

In addition, the geographic scope of the study was limited to one city. While this allowed for focused community-level analysis, it may restrict the generalizability of the findings to other regions with different infrastructure profiles, regulatory enforcement, and access to technical training.

Future research is therefore strongly recommended to adopt a comparative TVET-based design involving two distinct groups of women: (1) those with TESDA-certified or technical college training under the TVET system in Electrical Installation and Maintenance (EIM), and (2) those without any formal technical or TVET training.

Such a design would allow for a more rigorous examination of differences in household electrical safety practices, problem-solving abilities, self-efficacy, and incidence of electrical hazards between TVET-trained and untrained women. Future studies may also incorporate objective skills assessments and practical demonstrations, alongside self-report measures, to further strengthen the empirical evaluation of TVET training outcomes.

In line with broader equity and development goals, future investigations may also expand the analysis to include comparative gender perspectives, such as examining differences between female and male household members in terms of electrical awareness, risk exposure, and technical decision-making. Moreover, replication of this study in other cities and regions is strongly encouraged to capture spatial variations in household electrical conditions and access to technical training.

Finally, as this study is anchored in the GAD framework and inclusive TVET goals, the findings may serve as an initial evidence base for the development of future gender-responsive TVET programs in electrical safety and basic EIM, and as a foundation for inter-agency training collaboration among TESDA, local government units (LGUs), barangay councils, DepEd Alternative Learning System (ALS), and other concerned government agencies.

Such collaborations can support the scaling of community-based, socially inclusive, and technically sound training programs for women in low-income household settings.

## Acknowledgement

The research team sincerely acknowledges the support and assistance received in the completion of this study. The authors express their gratitude to the Mindanao State University–Iligan Institute of Technology for permitting the conduct of this research and to the Gender and Development (GAD) Center Office for its valuable support. Sincere appreciation is also extended to the 10 barangays of Iligan City and the women respondents who willingly participated in the survey. Above all, the authors offer praise and thanks to God Almighty for His guidance and protection throughout the study.

## Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of the paper.

## Author Contribution

*The authors confirm their contribution to the paper as follows: **study conception and design:** Adelfa C. Silor and Victor S. Rosales; **data collection:** Victor S. Rosales and Antonio M. Merca; **analysis and interpretation of results:** Victor S. Rosales, Adelfa C. Silor, and Antonio M. Merca; **draft manuscript preparation:** Victor S. Rosales and Adelfa C. Silor. All authors reviewed the results and approved the final version of the manuscript.*

## References

- Abing, M. J. J., & Conchada, M. I. P. (2025). Vocational Education and Training (TVET) and Its Impact on the Employment Prospects of the ALS Graduates. *DLSU Business & Economics Review*, 34(2), 77–87.
- Acevedo, P., Villanueva, R., & de Guzman, L. (2020). Enhancing the technical skills of women through community-based training in the Philippines. *Asian Journal of Education and Social Studies*, 8(3), 12–20.
- Adams, L. (2021). Learning a new skill is easier said than done: The four stages of competence. Gordon Training International. <https://www.gordontraining.com/free-workplace-articles/learning-a-new-skill-is-easier-said-than-done/>
- Albert, J. R. G., Basillote, L. B., Alinsunurin, J. P., & Vizmanos, J. F. V. (2023). Sustainable Development Goal 4 on Quality Education for All: How Does the Philippines Fare and What Needs to Be Done? Philippine Institute for Development Studies. <https://pidswebs.pids.gov.ph/CDN/document/pidsdps2316.pdf>
- Azmi, Z., Selamat, N. H., & Endut, N. (2025). The APPGM-SDG Solution Projects: Empowering Women Through Mobilising Grassroot Communities. *Journal of Technical Education and Training*, 17(1), 180-189.
- Boubaker, S., Mekni, S., & Jerbi, H. (2017). Assessment of electrical safety beliefs and practices: A case study. *International Journal of Engineering, Technology & Applied Science Research*. <https://pdfs.semanticscholar.org/0ab2/84b7592eb4d28ed389867bf09302fea2579f.pdf>
- Campbell, R. (2019). Home electrical fires. National Fire Protection Association (NFPA). <https://www.nfpa.org/News-and-Research/Data-research-and-tools/US-Fire-Problem/Home-Electrical-Fires>
- Chinen, M., De Hoop, T., Alcázar, L., Balarin, M., & Sennett, J. (2017). Vocational and business training to improve women's labour market outcomes in low-and middle-income countries: a systematic review. *Campbell Systematic Reviews*, 13(1), 1-195.
- Cornwall, A. (2016). Women's empowerment: What works?. *Journal of International Development*, 28(3), 342–359. <https://surl.li/iqalkp>
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.
- Das, I., Klug, T., Krishnapriya, P. P., Plutshack, V., & Kammen, D. M. (2023). Frameworks, methods and evidence connecting modern domestic energy services and gender empowerment. *Nature Energy*, 8, 349–357. <https://doi.org/10.1038/s41560-023-01234-7>
- Flores, R. I., Trajera, S. M., & Ching, G. S. (2025). Attitudes and barriers to family planning methods among reproductive-age women in Southern Philippines. ResearchGate. <https://www.researchgate.net/publication/388960000>
- Floyd, H. L., & Valdes, M. (2020). Leveraging prevention through design principles (PtD) in electrical installations. IEEE IAS Electrical Safety Workshop. <https://ieeexplore.ieee.org/abstract/document/9188318>

- Gammon, T., Lee, W. J., & Zhang, Z. (2015). Electrical safety, electrical hazards, and the 2018 NFPA 70E: Time to update annex K? IEEE Transactions on Industry Applications. <https://ieeexplore.ieee.org/abstract/document/7047835>
- Generalao, I. N., Balaoro, J., Lorenzo, P. J., & Rivera, J. P. (2025). Examining the effects of technical vocational education and training (TVET) on employment outcomes in the Philippines. <https://doi.org/10.62986/dp2025.08>
- Gordon, L. B., & Cartelli, L. (2018). A complete electrical shock hazard classification system and its application. IEEE Transactions on Industry Applications. <https://ieeexplore.ieee.org/abstract/document/8286875>
- Gordon, L. B., & Martinez, T. R. (2018). A complete electrical risk assessment method for all electrical hazards and its application. IEEE IAS Electrical Safety Workshop. <https://ieeexplore.ieee.org/abstract/document/9063871>
- Hartl, M. (2009). Technical and vocational education and training (TVET) and skills development for poverty reduction – Do rural women benefit? Food and Agriculture Organization (FAO) & International Fund for Agricultural Development (IFAD). [https://www.skillsforemployment.org/sites/default/files/2024-01/wcmstest4\\_141863.pdf](https://www.skillsforemployment.org/sites/default/files/2024-01/wcmstest4_141863.pdf)
- J. F. I. (2018). Gender profile of the TVET sector. Technical Education and Skills Development Authority (TESDA). [http://www.tesda.gov.ph/Uploads/File/GAD/2019/Gender%20Profile%20of%20the%20TVET%20Sector%20\(final\).pdf](http://www.tesda.gov.ph/Uploads/File/GAD/2019/Gender%20Profile%20of%20the%20TVET%20Sector%20(final).pdf)
- Jacobsen, K., & Fratzke, S. (2016). Building livelihoods: A field manual for practitioners in humanitarian settings (p. 8). Norwegian University of Life Sciences. <https://surl.li/hsgxlk>
- Kabeer, N (1999) Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment. *Development and Change*, 30 (3), 435-464. <https://doi.org/10.1111/1467-7660.00125>.
- Kannan, S., Bessette, D., & Makai, L. (2024). Electricity access empowers women through expansion of economic, physical, and mental spaces in Zambia. *Energy Research & Social Science*, 106, 103448. <https://doi.org/10.1016/j.erss.2024.103448>
- Khan, F., Aradi, W., Schwalje, W., Buckner, E., & Fernandez-Carag, M. (2017). Women's participation in technical and vocational education and training in the Gulf States. *International Journal of Training Research*, 15(3), 229-244. <https://doi.org/10.1080/14480220.2017.1374666>
- Kumar, R. (2019). *Research methodology: A step-by-step guide for beginners* (5th ed.). SAGE Publications.
- Kulor, F., Apprey, M. W., Agbevanu, K. T., Gasper, G. K., & Novieto, D. T. (2024). Invisible threats: An investigation of electrical hazards and safety practices among residential electricity consumers. *Heliyon*, 10(4), e2347758. <https://doi.org/10.1016/j.heliyon.2024.e2347758>
- Lepun, P., Kapong, J. M., Alan, R., Buang, F., & Cluny, P. C. (2025). Assessing Community Involvement and the Achievement of Sustainable Development Goals in APPGM-SDG Sarawak North Solution Projects. *Journal of Technical Education and Training*, 17(1), 214-222.,
- Li, G., Guo, J., Kang, Y., Huang, Q., Zhao, J., & Liu, C. (2025). Classification and prevention of electrical fires: A comprehensive review. *Fire*, 8(4), 154. <https://www.mdpi.com/2571-6255/8/4/154>
- Misola, N. K. (2014). Improving the participation of female students in TVET programmes formerly dominated by males. *TVET Philippines*. <https://www.tvet.ps/files/file/library/law/women.pdf>
- National Occupational Classification of Canada. (2022). NOC 72400 – Electricians (except industrial and power system). Government of Canada. <https://noc.esdc.gc.ca/>
- Nazarenko, A. (2021). Understanding learning stages in technical education: Revisiting the Conscious Competence Model. *International Journal of Learning and Development*, 11(1), 24–38.
- Nelson, J. P. (2015). Improved electrical safety through high resistance grounding. IEEE Transactions on Industry Applications. <https://ieeexplore.ieee.org/abstract/document/7027825>
- Osunmuyiwa, O., & Ahlborg, H. (2019). Inclusiveness by design? Reviewing sustainable electricity access and entrepreneurship from a gender perspective. *Energy Research & Social Science*, 53, 145–158. <https://doi.org/10.1016/j.erss.2019.03.010>
- Rahmania, R., Adriani, A., & Rohana, R. (2025). Analysis of Potential Fire Due to Short Current in Semi-permanent Buildings at Tinumbu Street in Aisle 148-149 Makassar City. *ELKHA*.
- Rahmania, R., Paddiyatu, N., & Rohana, R. (2023). SOSIALISASI AISYIYAH MELALUI EDUKASI PENGGUNAAN LISTRIK RUMAH TANGGA. *JMM (Jurnal Masyarakat Mandiri)*, 7(5), 4429. <https://doi.org/10.31764/jmm.v7i5.16798>

- Rathgeber, E. M. (1990). WID, WAD, GAD: Trends in research and practice. *The Journal of Developing Areas*, 24(4), 489–502.
- Romas, A. N., & Kumala, C. M. (2023). Edukasi Keselamatan Terkait Peralatan dan Instalasi Listrik pada Ibu Rumah Tangga Desa Getassrabi. *Bubungan Tinggi Jurnal Pengabdian Masyarakat*, 5(2), 990. <https://doi.org/10.20527/btjpm.v5i2.5763>
- Samad, H., & Zhang, F. (2019). Electrification and Women's Empowerment: Evidence from Rural India. In World Bank, Washington, DC eBooks. <https://doi.org/10.1596/1813-9450-8796>
- Santos, A. J. D. (2023). Perceptions of homemakers on women empowerment through educational advancement and involvement. *International Journal of Research Publications*, 128(1), 145–157. <https://surl.li/ltlevn>
- Shrestha, R. P., Jirakiattikul, S., & Shrestha, M. (2023). "Electricity is result of my good deeds": An analysis of the benefit of rural electrification from the women's perspective in rural Nepal. *Energy Research & Social Science*, 96, 102946. <https://doi.org/10.1016/j.erss.2023.102946>
- Sison, M. P., Embornas, A., Ponce, S., & Edera, J. M. (2024). Addressing the Economic Impacts of COVID-19: A Gender-Based Training Needs Assessment and Intervention in Barangay Acmac, Iligan City. *ASIA PACIFIC JOURNAL OF SOCIAL INNOVATION*, 36(2). <https://doi.org/10.62071/tmf.v36i1.700>
- Smith, W. C., Voigt, A., & Zhang, Y. (2021). Barriers to Secondary Education in the Asia Pacific Region: A Scoping Review of Four Countries. University of Edinburgh. <https://edwebcontent.ed.ac.uk/sites/default/files/atoms/files/mh-ceid-ap-full-report.pdf>
- Standal, K., & Winther, T. (2016). Empowerment through energy? Impact of electricity on care work practices and gender relations. *Forum for Development Studies*, 43(1), 27–45. <https://doi.org/10.1080/08039410.2015.1134642>
- Tambol, M. A. (2024). Impact study on livelihood training of the Banangan Women's Association [Unpublished undergraduate research]. Department of Hospitality and Tourism Management, Saint Louis University.
- TESDA (Technical Education and Skills Development Authority). (1994). Republic Act No. 7796: TESDA Law. <https://www.tesda.gov.ph>
- Thai, H. D., Lee, D., & Huh, J. H. (2024). A survey of electrical fire causes assessment technology. *IEEE Access*. <https://ieeexplore.ieee.org/iel8/6287639/6514899/10620202.pdf>
- Tiwari, P., & Malati, N. (2023). Role of Training in Women Empowerment: An Empirical Analysis. *Journal of Technical Education and Training*, 15(1), 234-245.,
- UN ESCAP. (2025). Women and Men in the Philippines: A Statistical Handbook. <https://repository.unescap.org/handle/20.500.12870/6311>
- UNESCO-UNEVOC. (2010). Improving the Participation of Female Students in TVET Programmes Formerly Dominated by Males: The Experience of Selected Colleges and Technical Schools in the Philippines. Retrieved from <https://unevoc.unesco.org/home/Equity+and+Gender+Equality>, June 2024.
- Wei, W., Sarker, T., Żukiewicz-Sobczak, W., Roy, R., Alam, G. M. M., Rabbany, M. G., Hossain, M. S., & Aziz, N. (2021). The Influence of Women's Empowerment on Poverty Reduction in the Rural Areas of Bangladesh: Focus on Health, Education and Living Standard. *International Journal of Environmental Research and Public Health*, 18(13), 6909. <https://doi.org/10.3390/ijerph18136909>
- Winther, T., Matinga, M. N., Ulsrud, K., & Govindan, M. (2020). In the light of what we cannot see: Exploring the interconnections between gender and electricity access. *Energy Research & Social Science*, 60, 101334. <https://doi.org/10.1016/j.erss.2019.101334>
- Winther, T., Matinga, M. N., Ulsrud, K., & Standal, K. (2017). Women's empowerment through electricity access: scoping study and proposal for a framework of analysis. *Journal of Development Effectiveness*, 9(3), 389–417. <https://doi.org/10.1080/19439342.2017.1343368>
- Winther, T., Ulsrud, K., & Saini, A. (2018). Solar powered electricity access: Implications for women's empowerment in rural Kenya. *Energy Research & Social Science*, 44, 61–74. <https://doi.org/10.1016/j.erss.2018.04.017>
- Winther, T., Ulsrud, K., Matinga, M., Govindan, M., Gill, B., Saini, A., Brahmachari, D., Palit, D., & Murali, R. (2019). In the light of what we cannot see: Exploring the interconnections between gender and electricity access. *Energy Research & Social Science*, 60, 101334. <https://doi.org/10.1016/j.erss.2019.101334>
- Wizelman, D. (2022). Dissecting Noel Burch's conscious competence ladder. [https://csq.com/2022/05/c-suite-advisors-daryl-wizelman-four-stages-of-competence/#.Y7tVG\\_5By3A](https://csq.com/2022/05/c-suite-advisors-daryl-wizelman-four-stages-of-competence/#.Y7tVG_5By3A)