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Research Article

Effectiveness of A Teacher-Made Instructional Module in Electrical Installation and Maintenance for Grade 10 Students

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ABSTRACT

This study aimed to develop and assess the effectiveness of a teacher-made instructional module in Electrical Installation and Maintenance for Grade 10 students. Using a descriptive-experimental research method, the study involved seventy (70) Grade 10 students from Gumaca National High School enrolled in EIM. The results showed that the respondents found the module very acceptable across several criteria: topics, learning objectives, content, activities, assessment, applicability, presentation, layout, and user-friendliness. A significant improvement was also observed between the pre-test and post-test scores after using the module, indicating its positive impact on students' cognitive skills. However, no significant relationship was found between the module's features and the respondents' technical skills.

Keywords: *Instructional module, Electrical installation and maintenance, Learning activities, Assessment, Applicability, Presentation, User-friendliness, Technical skills*

Introduction

Educational institutions in the Philippines continue to face challenges in adapting to a complex, technology-driven society and economy. Teachers are tasked with addressing the needs of diverse learners while ensuring that instructional materials effectively promote skill development and meaningful learning. This need is particularly evident in technical-vocational education, where practical skills must be acquired alongside theoretical knowledge.

The COVID-19 pandemic underscored the critical role of instructional modules when schools transitioned to alternative learning modalities. Modular learning became a primary mode of delivery, offering students flexible and self-directed opportunities to study at home. Defined as self-contained instructional packages organized around clear objectives and topics, modules facilitate independent learning and help students master specific competencies at their own pace (Garcia & Lopez, 2019).

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In the Philippine context, the Department of Education (DepEd) actively encourages the development and use of teacher-made instructional materials to ensure learning continuity, particularly in areas with limited internet access and resources. These localized modules aim to provide contextually relevant, accessible, and engaging content that addresses students' developmental and educational needs (DepEd, 2020).

However, while much research has focused on modular learning in general education, there remains a notable gap in examining instructional module design and its effectiveness within **Electrical Installation and Maintenance (EIM)** courses in Philippine public schools. As a technical-vocational specialization under the K–12 curriculum, EIM requires instructional materials that integrate both cognitive and psychomotor domains, ensuring students acquire competencies aligned with industry standards. Studies (Smith & Johnson, 2020; Navarro & De Jesus, 2021) have shown that well-designed, competency-based modules in vocational education improve student engagement, skill acquisition, and readiness for employment.

Despite these findings, few studies have specifically evaluated whether teacher-developed instructional modules in EIM adequately support these goals within Philippine secondary schools. This study, therefore, seeks to address this gap by assessing the effectiveness of an instructional module in EIM based on students' perceptions, performance, and skill outcomes. The findings aim to contribute to the enhancement of instructional design practices in technical-vocational education and inform policy and program improvements for greater inclusivity and effectiveness in skill-based learning environments.

Objectives of the Study

This study aims to determine the Effectiveness of a Teacher-Made Instructional Module in Electrical Installation and Maintenance for Grade 10 Students. Specifically, it seeks to describe the profile of the student respondents in terms of their age, sex, parents' educational attainment, parents' occupation, and family monthly income. Furthermore, it intends to assess the perceived level of respondent satisfaction regarding the features of the module, focusing on its components such as content—including topics, learning objectives, learning contents, learning activities, and assessment—applicability, presentation and layout, and user-friendliness. The study also aims to evaluate the pre-test and post-test scores of the respondents before and after using the module, as well as to determine their technical skill performance following the use of the module. Additionally, it investigates whether there is a significant difference between the pre-test and post-test scores of the respondents and examines if the perceived level of satisfaction with the module's features is significantly related to their technical skill performance using teacher made rubrics.

Methodology

This study used an experimental research design. It aimed to measure the learning performance and effectiveness of a Teacher-Made Instructional Module in Electrical Installation and Maintenance for Grade 10 Students. The students' knowledge and skills were tested before and after using the module through pre-tests and post-tests.

Sampling Technique

The study did not include the entire population but selected participants through **purposive sampling**. This means that only Grade 10 students enrolled in the Electrical Installation and Maintenance program at Gumaca National High School were chosen because they are the most relevant group to evaluate the module.

Ethical Considerations

Prior to data collection, the researcher obtained permission from the school principal and secured informed consent from all participants. Students and their parents/guardians were informed about the purpose of the study, the voluntary nature of participation, and their right to withdraw at any time without penalty. Confidentiality and anonymity of the respondents were maintained throughout the study by

assigning codes instead of names and ensuring that all data were stored securely and used solely for research purposes.

Instrument Development and Validation

The main instrument was a teacher-made instructional module developed based on TESDA training regulations and DepEd learning competencies. To assess learning, pre-test and post-test questionnaires were created. A self-made survey questionnaire was also developed to measure students' satisfaction with the module's features such as content, applicability, presentation, and user-friendliness.

Because the survey was not standardized, it underwent validation by experts and master teachers to ensure its accuracy and clarity. A pilot test was done to check the reliability of the survey, and the results showed it was consistent and dependable.

Data Collection Procedure

The data collection started with getting permission from school officials to conduct the study. The module was first validated and revised based on expert feedback. Then, the pre-test was given to students to determine their initial knowledge. After teaching with the module, the post-test and satisfaction survey were administered. Data collection was carefully done to ensure all responses were complete and accurate.

Data Analysis

Data were analyzed using different statistical tools. Frequency counts and percentages described the profile of the respondents. The mean and standard deviation showed the level of satisfaction with the module. A paired sample t-test compared pre-test and post-test scores to find any significant learning improvements. Lastly, the Pearson Product-Moment Correlation Coefficient was used to examine the relationship between students' satisfaction and their technical skill performance, with a 0.05 significance level.

Results and Discussion

Table 1: Distribution of respondents according to age and gender

Sex	Age			Total
	15	16	17	
Male	35	24	2	61
Female	4	3	0	7
Total	**39**	**27**	**2**	**68**

Table 1 is the age distribution shows that most respondents were within the typical high school age range (15–16), aligning with Dela Cruz (2021), who identified this age group as the prime demographic for vocational education. However, the gender distribution reflects the male-dominated nature of EIM, confirming gendered participation in technical fields noted by Dela Cruz (2021) and suggesting persistent cultural and social barriers for females. These findings imply the need for gender-sensitive strategies to make vocational programs more inclusive.

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Note. Two students were excluded (one transferred and one dropped out), leaving 68 respondents.

Table 2: Distribution of Respondents' Parents' Educational Attainment, Occupation, and Monthly Income

Category	Details	Father (f)	Father (%)	Mother (f)	Mother (%)
Educational Attainment	High School Graduate	23	33.8%	30	44.1%
	High School Level	16	23.5%	7	10.3%

Category	Details	Father (f)	Father (%)	Mother (f)	Mother (%)
	College Level	9	13.2%	18	26.5%
	College Graduate	16	23.5%	3	4.4%
	Others (Elem/Voc/Grad Sch)	4	5.8%	10	14.7%
Occupation	Employed	35	51.5%	36	52.9%
	Self-Employed	26	38.2%	16	23.5%
	Unemployed	7	10.3%	16	23.5%
Monthly Income	Below ₱10,000	29	42.6%	28	41.2%
	₱10,000–₱20,000	24	35.3%	25	36.8%
	₱20,001 and above	15	22.1%	15	22.0%
Total		**68**	**100%**	**68**	**100%**

The majority of parents have at least a high school education, with many mothers reaching or completing college. This suggests that students come from families with basic to moderate educational backgrounds, which may influence their orientation toward practical careers. Income data reveal that most families belong to low- to middle-income brackets, echoing DepEd policies and studies (Garcia, 2020) linking socioeconomic factors to vocational education enrollment. The implication is that affordability and accessibility of instructional materials are critical for these learners.

Respondent's Perception of the Instructional Module in Electrical Installation and Maintenance

The perception of the respondents on the Instructional Module in Electrical Installation and Maintenance in terms of topics, learning objectives, learning content, learning activities, assessment, applicability, presentation and layout, and user friendliness are presented in the following tables.

Table 3: Respondents' Perception of the Features of the EIM Module in terms of Topics

Indicators	Mean	SD	Verbal Interpretation
1. The topics of the module are interesting.	4.87	0.34	Strongly Agree
2. The topics of the module are relevant to real-life applications.	4.79	0.48	Strongly Agree
3. The learning materials for Electrical Installation and Maintenance (EIM) provide clear and easy-to-understand instructions.	4.82	0.38	Strongly Agree
4. The module contains all the topics necessary for the course.	4.79	0.44	Strongly Agree
5. The topics of the module are presented in a logical order.	4.81	0.40	Strongly Agree
Overall	**4.82**	**0.31**	**Strongly Agree**

Legend: 4.50-5.0-Strongly Agree ,3.50-4.49-Agree,2.50-3.49- Moderately Agree, 1.50-2.49-Disagree,1.0-1.49-Strongly Disagree

The table 3 show that the respondents rated the module's topics highly in terms of interest, relevance, and logical organization. This suggests that the module effectively captures attention and facilitates engagement, consistent with Smith & Johnson's (2020) finding that engaging, well-structured materials enhance vocational learning. The relevance of topics to real-life applications underscores the module's potential to bridge school-based learning with workplace skills, suggesting the value of incorporating even more authentic, industry-based scenarios in future iterations.

Table 4: Respondents' Perception of the Features of the EIM Module in terms of Learning Objectives

Indicators	Mean	SD	Verbal Interpretation
1. The learning outcomes are specific and clearly stated.	4.87	0.34	Strongly Agree
2. The learning outcomes are achievable within the module.	4.87	0.38	Strongly Agree
3. The learning outcomes align with the topics.	4.93	0.26	Strongly Agree
4. The learning outcomes enable higher-order thinking.	4.87	0.34	Strongly Agree
5. The learning objectives guide progress in acquiring technical skills.	4.88	0.33	Strongly Agree
Overall	**4.88**	**0.23**	**Strongly Agree**

Legend: 4.50-5.0-Strongly Agree ,3.50-4.49-Agree,2.50-3.49- Moderately Agree, 1.50-2.49-Disagree,1.0-1.49-Strongly Disagree

The table 4 respondents strongly agreed (M = 4.88) that the learning objectives were clear, achievable, and aligned with the module content. The highest-rated item was the alignment of objectives with topics (M = 4.93), affirming the coherence of instructional design. This reflects Anderson & Krathwohl's (2001) emphasis on clear objectives enhancing skill acquisition and Bloom's taxonomy promoting higher-order thinking. Future iterations should continue ensuring that objectives remain specific and realistic within instructional time frames.

Table 5: Respondents' Perception of the Features of the EIM Module in terms of Learning Contents

Indicators	Mean	SD	Verbal Interpretation
1. The content is error-free and free from inaccuracies.	4.82	0.38	Strongly Agree
2. The content elaborates on key concepts in detail.	4.85	0.40	Strongly Agree
3. The content is clearly stated for easy comprehension.	4.79	0.44	Strongly Agree
4. The content provides enough information for practical applications.	4.87	0.34	Strongly Agree
5. The content is attainable within the required period.	4.90	0.31	Strongly Agree
Overall	**4.85**	**0.24**	**Strongly Agree**

Legend: 4.50-5.0-Strongly Agree ,3.50-4.49-Agree,2.50-3.49- Moderately Agree, 1.50-2.49-Disagree,1.0-1.49-Strongly Disagree

Table 5 shows that the students strongly agreed (M = 4.85) that the content was detailed, error-free, and practical. The highest rating went to attainability of content within the allotted time (M = 4.90). While clarity of content also scored highly (M = 4.79), this suggests room to simplify technical language or include more visuals. Anchoring content in real-world applications, as Kolb (1984) recommends, strengthens learning outcomes and confidence (Cheng et al., 2020).

Table 6: Respondents' Perception of the Features of the EIM Module in terms of Learning Activities

Indicators	Mean	SD	Verbal Interpretation
1. The activities are practical and easy to follow.	4.91	0.29	Strongly Agree
2. The activities are relevant to the topics discussed.	4.87	0.34	Strongly Agree
3. The activities help learners apply what they learned.	4.87	0.38	Strongly Agree
4. The activities align with learning objectives and content.	4.93	0.26	Strongly Agree

Indicators	Mean	SD	Verbal Interpretation
5. The activities guide learners in performing tasks effectively.	4.90	0.31	Strongly Agree
Overall	**4.89**	**0.21**	**Strongly Agree**

Legend: 4.50-5.0-Strongly Agree ,3.50-4.49-Agree,2.50-3.49- Moderately Agree, 1.50-2.49-Disagree,1.0-1.49-Strongly Disagree

Table 6 reveals that the learning activities were rated as the most effective component (M = 4.89), with strong alignment to objectives and content (M = 4.93). Students perceived activities as practical and applicable, supporting experiential learning and competency-based training. Minor variability (SD ~0.21) suggests that scaffolding may still be needed for some learners, aligning with Kolb's principle of guided, hands-on learning.

Table 7: Respondents' Perception of the Features of the EIM Module in terms of Assessment

Indicators	Mean	SD	Verbal Interpretation
1. Provide rubrics to determine students' performances.	4.93	0.26	Strongly Agree
2. Provide questions aligned to the learning objectives.	4.87	0.34	Strongly Agree
3. Can develop higher levels of thinking among the students.	4.85	0.36	Strongly Agree
4. Can assess the technical skill performance in EIM.	4.84	0.41	Strongly Agree
5. Can assess the theoretical performance in EIM.	4.84	0.37	Strongly Agree
Overall	**4.86**	**0.24**	**Strongly Agree**

Legend: 4.50-5.0-Strongly Agree ,3.50-4.49-Agree,2.50-3.49- Moderately Agree, 1.50-2.49-Disagree,1.0-1.49-Strongly Disagree

Table 7 reveals that the module's assessments were rated highly (M = 4.86), particularly in providing clear rubrics (M = 4.93) and assessing both theoretical and practical performance. This aligns with experiential learning theory by confirming knowledge through performance-based tasks. Continuous improvement can include offering varied assessment types to capture broader competencies.

Table 8: Respondents' Perception of the Features of the EIM Module in terms of Applicability.

Indicators	Mean	SD	Verbal Interpretation
1. Objectives and activities are aligned with the competencies required for the subject.	4.94	0.24	Strongly Agree
2. Encourages the development of skills that will be useful for future careers.	4.87	0.34	Strongly Agree
3. Enhances students' creativity and work values.	4.87	0.34	Strongly Agree
4. Allows students to explore EIM and utilize higher-level thinking skills.	4.79	0.41	Strongly Agree
5. Serves as a vehicle to learn basic knowledge about Electrical Installation and Maintenance to direct students within and outside the classroom	4.91	0.29	Strongly Agree
Overall	**4.88**	**0.24**	**Strongly Agree**

Legend: 4.50-5.0-Strongly Agree ,3.50-4.49-Agree,2.50-3.49- Moderately Agree, 1.50-2.49-Disagree,1.0-1.49-Strongly Disagree

Table 8 shows that Students strongly agreed (M = 4.88) that the module was directly applicable to their future careers and aligned with curricular competencies. The highest indicator was alignment with subject competencies (M = 4.94), affirming the module's relevance. This suggests its effectiveness in bridging classroom learning with workplace demands and fostering creativity and critical thinking

Table 9: Respondents' Perception of the Features of the EIM Module in terms of Presentation and Layout

	Indicators	Mean	SD	Verbal Interpretation
1.	The module has an efficient space utilization.	4.84	0.37	Strongly Agree
2.	The module is easy to refer to. The contents are organized hierarchically in order for the learners like the use of tabs or colors.	4.76	0.46	Strongly Agree
3.	The amount of text and its size is suitable to the module and not overwhelming to the students.	4.79	0.44	Strongly Agree
4.	There is an emphasis to the vital information of the lesson.	4.85	0.36	Strongly Agree
5.	The kind of picture or image used in are harmony with the content.	4.91	0.29	Strongly Agree
	Overall	**4.83**	**0.29**	**Strongly Agree**

Legend: 4.50-5.0-Strongly Agree ,3.50-4.49-Agree,2.50-3.49- Moderately Agree, 1.50-2.49-Disagree,1.0-1.49-Strongly Disagree

Table 9 shows that the module's presentation was well-rated (M = 4.83), especially the harmony of images with content (M = 4.91). However, hierarchical organization and navigability (M = 4.76) were slightly lower, suggesting opportunities to improve visual aids, use of tabs, or color coding to enhance usability, consistent with Kolb's emphasis on clarity and accessibility.

Table 10: Respondents' Perception of the Features of the EIM Module in terms of Users' Friendliness

	Indicators	Mean	SD	Verbal Interpretation
1.	It's understandable without any further help.	4.88	0.32	Strongly Agree
2.	The instructions for each section are very clear.	4.85	0.36	Strongly Agree
3.	The activities and assessments are direct.	4.88	0.33	Strongly Agree
4.	The design of the module is friendly for the user.	4.90	0.31	Strongly Agree
5.	The module is accessible and convenient for use.	4.93	0.26	Strongly Agree
	Overall	**4.89**	**0.23**	**Strongly Agree**

Legend: 4.50-5.0-Strongly Agree ,3.50-4.49-Agree,2.50-3.49- Moderately Agree, 1.50-2.49-Disagree,1.0-1.49-Strongly Disagree

Students perceived the module as highly user-friendly (M = 4.89), particularly for its accessibility and convenience (M = 4.93). Clear instructions and intuitive design contribute to learner independence, reflecting Kolb's and Bloom's focus on learner-centered materials. Future enhancements could include more interactive features while maintaining simplicity.

Table 11: Summary of Respondents' Overall Perception of the EIM Instructional Module Across Key Features

Module Feature	Overall	Verbal Interpretation
Topics	4.82	Strongly Agree/Highly Satisfied
Learning Objectives	4.88	Strongly Agree/Highly Satisfied
Learning Contents	4.85	Strongly Agree/Highly Satisfied
Learning Activities	4.89	Strongly Agree/Highly Satisfied
Assessment	4.86	Strongly Agree/Highly Satisfied
Applicability	4.88	Strongly Agree/Highly Satisfied
Presentation and Layout	4.83	Strongly Agree/Highly Satisfied
User-Friendliness	4.89	Strongly Agree/Highly Satisfied
Overall Mean	**4.86**	Strongly Agree/Highly Satisfied

Legend: 4.50-5.0-Strongly Agree/Highly Satisfied,3.50-4.49-Agree/Satisfied,2.50-3.49- Moderately Agree/Moderately Satisfied,1.50-2.49-Disagree/Less Satisfied,1.0-1.49-Strongly Disagree/Not Satisfied

Table 11 shows that the Across all features, respondents consistently rated the module as highly effective (overall M = 4.86). User-friendliness, learning activities, and applicability scored highest, confirming that the module succeeds in delivering engaging, relevant, and competency-linked learning. Nonetheless, refinement in layout and content clarity would further improve inclusivity and comprehension. In conclusion, the EIM module is an extremely effective learning tool that makes a major contribution to student skills acquisition and learning. To achieve its full potential, minor enhancements in layout clarity and content accessibility are recommended to make the module more inclusive, intuitive, and effective in facilitating technical education.

Table 12: Respondents' Pre-test and Post-test Scores

Score	Pre-Test (f)	Pre-Test (%)	Post-Test (f)	Post-Test (%)	Interpretation
0 – 6	6	8.8%	-	-	Poor
7 – 12	33	48.5%	1	1.5%	Needs Improvement
13 – 18	25	36.8%	9	13.2%	Satisfactory
19 – 24	4	5.9%	23	33.8%	Very Good
25 – 30	-	-	35	51.5%	Excellent
Total	**68**	**100%**	**68**	**100%**	

Table 12 shows that The post-test results show a marked improvement: over half of the students achieved "Excellent" scores (51.5%) compared to none in the pre-test. The proportion of students needing improvement dropped from 48.5% to 1.5%. These gains confirm that the instructional module significantly enhanced students' knowledge and skills, consistent with experiential learning principles that emphasize practice and feedback.

Table 13 : Significant difference in the Pretest and Posttest Score

Written Performance	Mean	SD	t	Df	Sig. (2-tailed)	Interpretation
Pretest	11.84	3.83	-19.56	67	0.000	Significant
Posttest	23.90	4.19				

Legend: Sig (2-tailed) ≤ .05 (Significant); Sig (2-tailed) ≥ .05 (Not significant)

Table 13 shows the The difference between pre- and post-test scores was statistically significant ($p < .05$), indicating that the instructional module effectively improved student

performance. The results support the hypothesis that well-designed instructional materials lead to measurable skill gains, as suggested by Bloom's Mastery Learning Theory.

Table 14: Respondents' Technical Skill Performance After Using the Module

Score	Frequency (f)	Percentage (%)	Category
1 – 60	-	-	Poor
61 – 75	-	-	Needs Improvement
76 – 85	13	19.12%	Satisfactory
86 – 95	20	29.41%	Very Good
96 – 100	35	51.47%	Excellent
Total	**68**	**100.00%**	**-**

Table 14 shows the Respondents' scores Over 80% of students achieved "Very Good" or "Excellent" ratings in technical performance, with no students falling into "Needs Improvement" or "Poor" categories. This validates the module's effectiveness in fostering competency, echoing Navarro & De Jesus (2021), who emphasized that structured modules enhance mastery of vocational skills.

Table 15: Relationship between Respondents' Perceptions on the Features of EIM Module and Technical Skills

Features of Electrical Installation and Maintenance Module	Technical Skills
Content	
Topics	-0.08
Learning Objectives	-0.08
Learning Contents	-0.04
Learning Activities	0.04
Assessment	-0.07
Applicability	-0.06
Presentation and Layout	-0.16
Users' friendliness	-0.05

***. Correlation is significant at the 0.01 level (2-tailed).*

Table 15 reveals the Correlations between perceptions of module features and technical skills were weak (r = -0.164 to 0.038). This suggests that while students appreciated the module's design and usability, these perceptions alone did not strongly predict their technical performance. This highlights the multifaceted nature of skill acquisition, influenced by other factors such as prior knowledge, motivation, and instructor guidance.

Conclusion and Implications

Based on the findings of this study, the hypothesis stating that there is no significant difference between the pre-test and post-test scores of the respondents before and after using the Electrical Installation and Maintenance module is therefore **REJECTED**. The significant increase in post-test scores confirms that the module has a positive impact on the respondents' technical skills.

And for the hypothesis stating that there is no significant relationship between the respondents' perceptions of the features of the Electrical Installation and Maintenance module and their technical skills is also **REJECTED**. Although no significant correlation was found, the study indicates that students' perceptions of the module's features did not significantly influence their technical skill performance.

The results of this study underscore the efficacy of a structured and well-developed instructional module in significantly enhancing

the technical skills of students in Electrical Installation and Maintenance. The substantial improvement in post-test scores following the utilization of the module affirms its pedagogical value and supports the integration of teacher-made, competency-based instructional materials in technical-vocational education programs.

Furthermore, the absence of a significant correlation between students' perceptions of the module's features and their measured technical skills suggests that learners' subjective evaluations of instructional materials, although generally positive, do not necessarily translate into performance outcomes. This finding implies that while learner satisfaction and engagement are important, other mediating factors—such as instructional delivery, practice opportunities, and learner readiness—may exert a more direct influence on skill acquisition.

Consequently, the implementation of instructional modules should be complemented by effective teaching strategies, sufficient practice, and appropriate support systems to optimize learning outcomes in technical-vocational contexts.

Recommendations

Based on the results of the study the following recommendations are hereby offered:

1. **Department of Education** provide to support the integration of practical learning materials in technical-vocational education and ensure that resources are updated regularly to meet industry standards. Sponsor also the training workshops for educators on the latest advancements in educational modules could also enhance teaching strategy.
2. **School administrators** are encouraged to facilitate regular feedback from students regarding their perceptions of the modules, to better understand their learning needs and preferences. This feedback can be used to further improve the content and structure of the modules.
3. **Teachers** should make use of the Electrical Installation and Maintenance module in combination with hands-on learning activities to create a more immersive and engaging learning experience. And also incorporating real-world applications in the module can help students better relate the content to actual scenarios in the field.
4. **Future researchers** are encouraged to explore the relationship between learners' perceptions of instructional materials and the development of both cognitive and technical skills across different contexts and larger sample sizes. Further research could also examine the impact of additional support mechanisms, such as mentor-guided learning, on students' performance.

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