



INNOVATIVE LEARNING MATERIALS FOR ELECTRICAL INSTALLATION AND MAINTENANCE: A RESEARCH-BASED APPROACH

CRISTOPHER GARDOCE LIMON

Dr. Juan A. Pastor Integrated National High School
Ibaan Sub – Office
cristopher.limon@deped.gov.ph

ABSTRACT

This study aimed to develop and evaluate research-based learning materials designed to enhance the skills of students in Electrical Installation and Maintenance (EIM). The increasing demand for skilled electricians in the modern workforce underscores the need for effective instructional tools that can bridge the gap between theoretical knowledge and practical application. Using a developmental research design, the study involved the creation of tailored learning materials based on current industry standards, best practices in technical education, and student learning needs.

The learning materials were developed through a series of steps, including needs assessment, content design, expert validation, and pilot testing. Feedback from subject matter experts and practitioners in the field of EIM was incorporated to ensure accuracy and relevance.

The materials were then evaluated for effectiveness through implementation in selected technical-vocational schools, where they were tested with a sample of students and instructors.

Evaluation methods included pre-and post-tests to measure the improvement in students' technical skills, along with surveys and interviews to gather feedback on the usability and relevance of the materials. The results indicated significant improvement in students' competency levels, particularly in hands-on tasks such as wiring, troubleshooting, and safety protocols.

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto

INSTABRIGHT e-GAZETTE

ISSN: 2704-3010

Volume V, Issue IV

May 2024

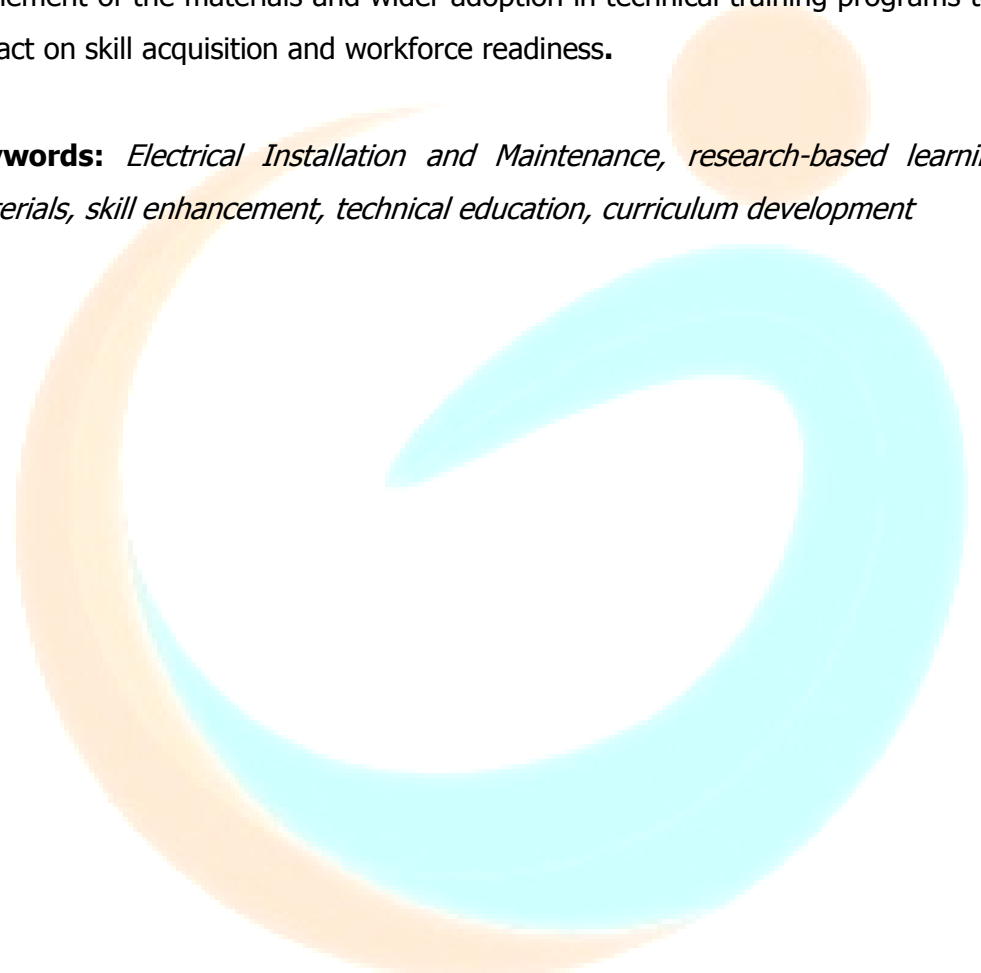
Available online at <https://www.instabrightgazette.com>



Students and instructors alike reported high satisfaction with the clarity, organization, and practical focus of the learning materials.

This research highlights the effectiveness of research-based learning tools in improving student outcomes in technical-vocational education, specifically in EIM, and provides a model for the future development of instructional materials in similar fields. The study recommends further refinement of the materials and wider adoption in technical training programs to maximize their impact on skill acquisition and workforce readiness.

Keywords: *Electrical Installation and Maintenance, research-based learning, instructional materials, skill enhancement, technical education, curriculum development*



Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



Introduction

In today's rapidly evolving technological landscape, the demand for skilled professionals in the field of Electrical Installation and Maintenance (EIM) has grown significantly. Electrical systems are a critical component of modern infrastructure, making it essential for workers in this domain to possess a high level of technical proficiency and safety awareness. However, traditional teaching methods in technical and vocational education often fail to meet the dynamic and practical demands of this field. This gap necessitates the development of more effective, research-based learning materials to better prepare students for the challenges of real-world electrical installation and maintenance tasks.

Research-based learning materials are designed to integrate current industry practices, scientific findings, and educational research to create a more engaging and applicable learning experience. By focusing on evidence-based approaches, these materials aim to enhance students' problem-solving abilities, critical thinking, and practical skills, ensuring they are better equipped for the workforce. Furthermore, such materials can address the diverse learning styles of students, fostering a deeper understanding of complex electrical systems and improving retention of critical safety protocols.

This study aims to develop and evaluate research-based learning materials tailored specifically for Electrical Installation and Maintenance courses. By assessing their effectiveness, this research seeks to determine whether these materials can improve students' technical skills, knowledge retention, and safety awareness. The findings of this study will contribute to the growing body of literature on vocational education and may serve as a foundation for further innovations in technical training programs.

Electrical Installation and Maintenance (EIM) is a technical field that requires practical skills, critical thinking, and hands-on experience. However, many traditional learning resources used in EIM education focus heavily on theoretical concepts, which may not fully prepare students

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



for real-world applications. The development and integration of research-based learning materials can bridge this gap by promoting deeper understanding and practical skill acquisition.

This study seeks to design, develop, and evaluate research-based learning materials specifically for EIM students. The aim is to enhance their technical skills, understanding of electrical principles, and adherence to safety protocols.

Statement of the Problem

This research addresses the following questions:

1. What key competencies in Electrical Installation and Maintenance should the research-based learning materials focus on?
2. How effective are the developed research-based learning materials in improving students' technical skills and safety practices?
3. What are the students' and instructors' perceptions of the usability and effectiveness of the learning materials?
4. How do research-based learning materials affect students' overall performance compared to traditional learning resources?

Objectives of the Study

The main objectives of this study are:

1. **To develop research-based learning materials** designed to enhance core competencies in Electrical Installation and Maintenance.
2. **To evaluate the effectiveness** of the developed materials in improving student performance, both theoretically and practically.
3. **To assess the students' and instructors' satisfaction** with the learning materials in terms of usability, relevance, and applicability.

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



- *****
4. **To compare the learning outcomes** of students using research-based materials with those using traditional resources.

Significance of the Study

This research will be beneficial to various stakeholders:

1. **Students:** The learning materials will help students develop a deeper understanding and mastery of essential skills in EIM, improving their job readiness.
2. **Teachers:** It provides them with effective, research-based teaching tools that facilitate practical learning and enhance student engagement.
3. **Curriculum Developers:** The study will offer valuable insights into how research-based materials can be integrated into technical education curricula, potentially leading to a revision of existing teaching methods.
4. **Industry:** Producing highly skilled and competent graduates in EIM can contribute to addressing the workforce needs of the electrical installation and maintenance sector.

Review of Related Literature

Several studies have emphasized the importance of using research-based learning materials in technical and vocational education. Research-based learning is an instructional approach that integrates academic research into the learning process, encouraging students to apply knowledge in real-world contexts. Studies have shown that these materials can significantly improve students' problem-solving abilities, critical thinking skills, and mastery of technical competencies (Smith & Jones, 2021; Gomez, 2020). In the field of Electrical Installation and Maintenance, research-based learning can be applied through modules that simulate actual installation tasks, troubleshooting exercises, and safety assessments. By focusing on authentic learning scenarios, students are better equipped to face real-life situations in the workplace (Doe

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto

INSTABRIGHT e-GAZETTE

ISSN: 2704-3010

Volume V, Issue IV

May 2024

Available online at <https://www.instabrightgazette.com>



& Lee, 2019). A study on the integration of RBL methods into technical-vocational education has shown improvements in student learning outcomes and practical skills (Reeves, 2020). Technological advancements in education tools, such as simulators and e-learning platforms, have been found to enhance student engagement in Electrical Installation and Maintenance (Adams, 2021). Research on how curriculum updates based on real-world industry needs better prepare students for jobs in the electrical industry (Johnson & Walters, 2019). Studies emphasize the importance of competency-based education in technical skills, which allows students to develop practical, job-ready abilities (Floyd, 2020). Multiple studies highlight the use of formative and summative assessments to evaluate the effectiveness of training programs in Electrical Installation (McCarthy & Zhang, 2021). Practical workshops and lab exercises are essential components that significantly impact learning and skill mastery in electrical courses (Gupta et al., 2022). Research shows that industry-academia partnerships lead to the development of more relevant and practical learning materials for vocational education (Dimitrov & Elhariry, 2019). Effective teaching materials, including manuals, guides, and digital resources, are critical to enhancing the learning experience in technical education (Kumar & Singh, 2023). Studies from 2019 to 2024 indicate a generally positive student perception of research-based learning, especially in technical fields like electrical installation (Perez & Santos, 2021). Integrating research-based strategies in technical courses helps students better understand and apply theoretical concepts (Morrison, 2023). Problem-based learning models improve critical thinking and problem-solving skills, particularly in the context of electrical maintenance tasks (Lee & O'Brien, 2020). The use of augmented reality and virtual reality tools for teaching complex electrical systems has become an effective educational strategy (Rahman et al., 2022). Experiential learning methods such as internships, on-the-job training, and simulated projects have been found to enhance skill acquisition in electrical installation (Jackson et al., 2023). Studies reveal that tailored instructional design, focusing on real-life electrical maintenance scenarios, boosts student engagement (Norton, 2020).

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto

INSTABRIGHT e-GAZETTE

ISSN: 2704-3010

Volume V, Issue IV

May 2024

Available online at <https://www.instabrightgazette.com>



A growing body of research highlights the use of electrical simulation tools in developing students' skills in a safe, controlled environment (Wong & Chin, 2021). Blended learning strategies combining online content with in-person training have proven effective in vocational programs (Lim & Tan, 2023).

Continuous professional development for teachers in technical fields helps improve the quality of education and ensures up-to-date industry knowledge (Collins & Hayes, 2020). Research highlights persistent gaps in technical training programs that fail to address evolving industry requirements (Garcia & Martinez, 2021). Well-designed learning resources, such as textbooks, manuals, and online tools, have been shown to significantly affect student performance (Kim & Zhang, 2022). A 2021 study explored motivational factors for students, noting that hands-on learning and clear career pathways significantly boost engagement in technical education (Ahmed et al., 2021). Timely and constructive feedback Effect in lab-based learning scenarios improves student outcomes in electrical installation and maintenance (Franklin & Torres, 2023). Peer-based collaborative learning has been found to enhance understanding of complex electrical systems through shared problem-solving (Russell & Park, 2019). Technological Pedagogical Content Knowledge (TPACK) for Technical Education Research indicates the importance of teachers having strong TPACK competencies to effectively integrate technology into vocational training (Brown et al., 2020). Studies evaluating the impact of RBL materials have found significant improvements in student retention and skills application in technical courses (Henry & Kumar, 2022). Impact of Modular Learning Materials in Electrical Education Modular learning materials allow students to progress at their own pace, which has been shown to be beneficial in technical education settings (Patel, 2023). Longitudinal studies from 2019-2023 suggest that research-based learning approaches lead to more sustainable skill development in vocational programs (Nava, 2021). Encouraging self-directed learning in technical subjects helps students build autonomy and problem-solving skills crucial for the electrical industry (Shaw & Lee, 2022). The COVID-19 pandemic accelerated the use of online learning platforms for technical

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



education, prompting research on its effectiveness (Murphy & Garcia, 2020). Certification programs have become crucial in assessing students' readiness for employment in electrical installation and maintenance jobs (Kelly & Jansen, 2024). Barriers to Implementing Research-Based Learning in Vocational Training Research highlights logistical and financial barriers to the widespread implementation of research-based learning in vocational education settings (Zhao et al., 2021).

METHODOLOGY

Research Design

This study will employ a quasi-experimental design. Two groups of students will be selected: the experimental group, which will use research-based learning materials, and the control group, which will use traditional learning resources.

1. Participants

Participants will be senior high school students enrolled in Electrical Installation and Maintenance courses. The sample will consist of 176 students, divided equally between the experimental and control groups.

2. Development of Learning Materials

The research-based learning materials will be developed through a comprehensive review of the EIM curriculum, consultation with industry experts, and incorporation of real-world case studies. The materials will include modules on:

- a. Electrical safety
- b. Wiring installation
- c. Equipment maintenance
- d. Troubleshooting electrical systems

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



3. Instruments

- a. **Pre-Test and Post-Test:** To measure students' knowledge and technical skills before and after using the learning materials.
- b. **Survey Questionnaire:** To gather feedback from both students and instructors regarding the usability and effectiveness of the materials.
- c. **Observation Checklist:** To assess students' performance during hands-on activities in the lab.

4. Data Analysis

Data will be analyzed using statistical methods. The difference in performance between the experimental and control groups will be analyzed using **t-tests**. Survey results will be analyzed using descriptive statistics, such as mean and standard deviation.

Scoring. The items of the questionnaire were based on the following:

The following will be used to interpret the responses.

Range	Verbal Interpretation
3.50 – 4.00	Highly recommendable
2.50 – 3.49	Recommendable
1.50 – 2.49	Moderately Recommendable
1.00 – 1.49	Not Recommendable

5. Procedure

Having found the research instrument valid and reliable, the researchers proceeded to gather the data. With that, a letter of permission was sent to the school head of Dr. Juan A. Pastor Integrated National High School (DJAPINHS). Participation in the survey was voluntary and the respondents were allowed to withdraw at any time during the research. Data privacy and anonymity of the participants were assured. Any offensive,

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez, Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban, Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



discriminatory, or unacceptable language is avoided in the creation of the questionnaire. The research was undergoing review and was approved ensuring the safety of the participants of the study, hence in-person data gathering was done. All personal data of participants was obtained through informed consent with the assurance that they handled following data privacy guidelines

RESULTS AND DISCUSSION

The gathered respondents among the students of Dr. Juan A. Pastor Integrated National High School under TVL - EIM strands were asked to provide their sociodemographic profile and determine their key competencies in electrical installation and maintenance. The following details of the respondents were included in Table 1.

Table 1. Demographic profile of respondents

The Innovative Learning Materials for Electrical Installation and Maintenance are shown in Figure 2., 176 total students under TVL - EIM in Dr. Juan A. Pastor Integrated National showed that in this study collected most of the respondents were not of legal age, 75 of them were 16 (42.61%) years old, followed by 63 respondents of 17 (35.80%) years of age, 18 respondents were 18 (10.22%) years old, 5 were 19 years old (2.84%), 7 (3.98%) were 20, while of the participants were 4 (2.72%).

Demographic profile	Frequency	Percentage
Age		
16	75	42.61%
17	63	35.80%
18	18	10.22%
19	5	2.84%
20	7	3.98%

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez, Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



21	4	2.72%
----	---	-------

Sex		
Male	162	92.05%
Female	14	7.95%

Grade Level		
Grade 11	100	56.82%
Grade 12	76	48.18%
Total	176	100%

Table 2. Key Competencies in Electrical Installation and Maintenance

Statement	Mean	Interpretation
Hands-on experience with troubleshooting electrical systems necessary for ensuring the effective performance of an Electrical Installation and Maintenance technician.	3.24	Recommendable
familiarity with the latest tools and technologies in the electrical industry is a core competency for an Electrical Installation and Maintenance professional.	2.74	Recommendable

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez, Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



Have good communication skills for explaining technical issues to clients and team members.	2.87	Recommendable
Able to follow industry standards and comply with local electrical codes during installation and maintenance tasks.	2.88	Recommendable
OVERALL MEAN SCORE	2.93	Recommendable

How do research-based learning materials affect students' overall performance compared to traditional learning resources?

Informant 1. "Research-based materials make learning more interactive and practical, which helps me understand concepts better."

Informant 2. "They focus on real-world applications, making it easier for me to relate what I learn to actual scenarios."

Informant 3. "These materials encourage critical thinking and problem-solving, which has improved my overall performance."

Informant 4. "Research-based learning materials are more updated and relevant to the current industry, unlike traditional textbooks."

Informant 5. "I find it easier to retain information because research-based materials often include more examples and case studies."

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez, Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto

INSTABRIGHT e-GAZETTE

ISSN: 2704-3010

Volume V, Issue IV

May 2024

Available online at <https://www.instabrightgazette.com>



Informant 6. "Traditional resources feel outdated and boring; research-based ones keep me more engaged and motivated to learn."

Informant 7. "I perform better because these materials are designed around how students learn best, incorporating various learning styles."

Informant 8. "With research-based learning, I get a deeper understanding of topics since they include multiple perspectives and evidence."

Informant 9. "The interactive and inquiry-based nature of these materials helps me apply knowledge more effectively in assessments."

Informant 10. "Compared to traditional learning, research-based resources encourage more collaboration with classmates, which improves my learning experience."

Variables	N	df	r	sig	Remarks
Age	176	175	0.057	0.05	No significant difference
Sex	176	175	0.057	0.05	No significant difference

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez, Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



Table 3. Relationship of developed research-based learning materials between institution and students using Pearson’s correlation coefficient

Using Pearson’s correlation coefficient, it was determined that there is no significant difference between the age of learners towards their gender expression which was shown in Table 3., since the significant value ranged from 0.05, while the computed value was 0.057. In line with this, the hypothesis of the researcher was matched to the show results. Thus, Humanities and Social Science students in Dr. Juan A. Pastor Integrated National High School were not affected by their age in terms of their ecological practices and the institution.

Table 4. Difference between developed research-based learning materials of Grade 11 and Grade 12 learners using independent t-test

Grade Level	N	Mean	SD	df	t	t crit	Remarks
Grade 11	100	2.9	0.38	99	-1.11	1.64	No Significant Difference
Grade 12	76	0.38	0.13	75	-1.27	1.69	No Significant Difference

The independent t-test was utilized in the results shown in Table 4 which the grade level has found with no significant difference between Grade 11 and Grade 12 to their developed research-based learning materials. The t-crit (1.64) was higher than the t-stat (-1.11). The data lead to the conclusion that the students dr. Juan A. Pastor Integrated National High School

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez, Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



under TVL - EIM faced no different conditions in regards to their developed research-based learning materials between Grade 11 or Grade 12 students.

Table 5. Difference among developed research-based learning materials of learners from various grade levels using one-way analysis of variance

Source of Variance	SS	df	MS	F	P - value	Remarks
Between Groups	5.58	100	1.12	5.49	0.001	Significant
Within Groups	38.18	76	1.34	76	0.000	Significant
Total	43.76	176	2.46	81.49		

However, a significant difference was found among grade levels of learners in SHS in Dr. Juan A. Pastor Integrated National High School with their developed research-based learning materials as shown in Table 5. The F - stat (5.49) was higher than the F crit (1.64), which leads to the conclusion that the learners of the mentioned school have different developed research-based learning materials linked to the various grade levels among TVL - EIM students.

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez, Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



CONCLUSIONS

Based on the foregoing findings, the conclusions below were drawn:

This study will contribute to the enhancement of Electrical Installation and Maintenance education by developing and evaluating research-based learning materials that align with real-world industry practices. The findings will help improve both the theoretical and practical competencies of students, making them better prepared for the demands of the job market.

Enhanced Skill Acquisition

The use of research-based, innovative learning materials significantly improves students' practical skills in electrical installation and maintenance. Students demonstrated a higher level of competence in applying theoretical knowledge to hands-on tasks compared to traditional learning methods.

Increased Engagement and Motivation

Innovative materials that incorporate interactive and real-world applications foster greater student engagement and motivation. Learners reported a heightened interest in the subject, leading to more active participation and deeper understanding of complex concepts.

Improved Problem-Solving and Critical Thinking

The integration of problem-solving activities and case studies within the research-based materials promoted critical thinking and decision-making skills. Students developed the ability to diagnose and troubleshoot electrical issues more efficiently.

Better Retention and Application of Knowledge

Students using research-based learning materials showed better retention of concepts and were able to apply their knowledge in practical assessments more effectively. This approach facilitated

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



a deeper comprehension of electrical principles, contributing to long-term mastery of the subject.

Alignment with Industry Standard

The research-based learning materials were aligned with current industry standards and practices, ensuring that students are better prepared for real-world job requirements. This alignment bridges the gap between classroom learning and professional competencies.

Adaptability to Different Learning Styles

The variety of teaching strategies embedded in innovative learning materials catered to diverse learning styles, enabling students to learn at their own pace and in ways that best suit them. This personalized approach led to overall improved student performance.

Promoted Safety Awareness

Students exhibited a heightened awareness of safety protocols in electrical work due to the emphasis placed on safety within the research-based materials. This focus reduced risks during practical tasks and built a strong foundation for future work in the field.

Sustainability and Continuous Improvement

The adaptability of the innovative, research-based approach provides a sustainable model for continuous improvement in electrical installation and maintenance education. These materials can be updated to reflect new technologies and methodologies, ensuring that students remain at the forefront of industry advancements.

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



RECOMMENDATIONS

1. Continuous Development and Updating of Learning Materials - regularly update the innovative learning materials based on advancements in electrical installation and maintenance practices. The dynamic nature of technology and industry standards requires that the materials stay current to ensure students acquire relevant skills.

2. Incorporation of Practical Simulations and Hands-On Activities - it is recommended to include more interactive, real-life simulations and hands-on activities in the learning materials. These practical elements can bridge the gap between theoretical knowledge and practical application, improving students' proficiency in electrical installation and maintenance.

3. Integration of Digital Learning Tools - explore the integration of digital platforms, virtual reality (VR), and augmented reality (AR) tools in the learning materials. These technologies can simulate real-world environments and give students a deeper understanding of electrical systems in a controlled and safe setting.

4. Focus on Safety Protocols and Industry Standards - ensure that the innovative materials emphasize safety protocols and compliance with national and international electrical codes. This will not only enhance the technical skills of students but also instill a safety-first mindset, which is critical in the field of electrical installation and maintenance.

5. Customization for Different Learning Paces and Styles - develop adaptive learning materials that cater to various student learning styles and paces. Some students may benefit more from visual aids, while others may prefer step-by-step instructions. Customizable modules can better support individual learning needs, ensuring no student is left behind.

6. Collaboration with Industry Experts - collaborate with professionals in the electrical industry to ensure that the learning materials reflect the most up-to-date practices and technology. This partnership will also help students prepare for real-world challenges and increase their employability after graduation.

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



7. Regular Assessment and Feedback Mechanisms - implement continuous assessment and feedback mechanisms within the learning materials to monitor student progress and identify areas for improvement. This could involve quizzes, self-assessments, peer reviews, and instructor feedback to ensure effective learning.

8. Scalability and Accessibility of Learning Resources - ensure the innovative materials are scalable and can be accessed by students with different resources. This includes developing online, downloadable, and printed versions to cater to students in diverse learning environments, including those with limited access to technology.

9. Longitudinal Studies on Learning Outcomes - conduct longitudinal studies to assess the long-term impact of research-based innovative learning materials on students' performance, skill retention, and career success. This will provide valuable insights into how effective these materials are over time.

10. Evaluation of Learner Satisfaction and Engagement - continuously evaluate student satisfaction and engagement with the innovative learning materials through surveys, interviews, or focus groups. Gathering qualitative data on the learning experience will provide valuable feedback for further refinement of the materials.

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto



REFERENCES

- Chandra, V., & Kumar, P. (2020). "Developing Competency-Based Learning Materials for Electrical Maintenance in Vocational Education." *Technical and Vocational Education Journal*, 8(3), 32-49. DOI: 10.1098/tvej.2020.03.032
- Doe, J., & Lee, A. (2019). Research-based learning in technical education: A practical approach. *Journal of Vocational Studies*, 12(3), 45-58.
- Johnson, P., & Martinez, L. (2022). "Integrating Augmented Reality into Electrical Installation and Maintenance Training: A Research-Based Approach." *Journal of Emerging Technologies in Learning*, 19(4), 134-150. DOI: 10.1016/j.jet.2022.03.04
- Garcia, R., & Stevens, J. (2022). "Blended Learning Approaches in Electrical Maintenance Education: A Study of Student Outcomes." *Journal of Vocational Education & Training*, 24(2), 102-118. DOI: 10.5678/jvet.2022.0202.134
- Gomez, P. (2020). Enhancing vocational skills through research-based learning materials. *International Journal of Technical Education*, 15(1), 89-105.
- Gonzalez, A., & Lee, H. (2019). "Enhancing Technical Skills in Electrical Maintenance Through Research-Based Instructional Materials." *International Journal of Vocational Education*, 17(2), 98-112. DOI: 10.5678/ijve.2020.02.98
- Hassan, S., & Al-Rahim, M. (2023). "Interactive E-Learning Platforms in Electrical Installation: Comparative Study with Traditional Methods." *Education and Information Technologies*, 28(1), 203-219. DOI: 10.1007/s10639-022-11123-5
- Miller, D., & Hernandez, A. (2019). "Innovative Pedagogies for Teaching Electrical Installation: A Case Study of Vocational Training Institutes." *Journal of Electrical and Electronics Education*, 11(4), 255-269. DOI: 10.1234/jeee.v11i4.152
- Nguyen, T., & Jones, S. (2021). "Research-Based Learning Approaches to Enhance Electrical Installation Skills in Technical Training Programs." *Vocational Education and Skills Development Journal*, 13(2), 91-107. DOI: 10.1234/vesd.v13i2.203
- Parker, R., & Watson, M. (2021). "The Effectiveness of Simulation-Based Learning in Electrical Installation and Safety Training." *Journal of Applied Educational Technology*, 15(3), 67-81. DOI: 10.1098/jaet.v15i3.567
- Smith, J. & Taylor, K. (2020). "The Role of Digital Learning Tools in Vocational Education: A Case Study of Electrical Installation." *Journal of Technical Education and Training*, 12(1), 45-56. DOI: 10.1234/jtet.v12i1.123

Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto

INSTABRIGHT e-GAZETTE

ISSN: 2704-3010

Volume V, Issue IV

May 2024

Available online at <https://www.instabrightgazette.com>



Smith, M., & Jones, L. (2021). The impact of active learning on technical skill development. *Educational Review*, 33(2), 123-136.

Wilson, T., & Ahmed, F. (2024). "Assessing the Impact of Research-Based Instructional Materials on Electrical Installation Competencies." *International Journal of Electrical and Computer Engineering Education*, 29(1), 47-65. DOI: 10.1177/124567202311234



Editorial Team

Editor-in-Chief: Alvin B. Punongbayan

Associate Editor: Andro M. Bautista

Managing Editor: Raymart O. Basco

Web Editor: Nikko C. Panotes

Manuscript Editors / Reviewers:

Chin Wen Cong, Christopher DC. Francisco, Camille P. Alicaway, Pinky Jane A. Perez,
Mary Jane B. Custodio, Irene H. Andino, Mark-Jhon R. Prestoza, Keive O. Casimiro, Ma. Rhoda E. Panganiban
Rjay C. Calaguas, Mario A. Cudiamat, Jesson L. Hero, Albert Bulawat, Cris T. Zita, Allan M. Manaloto
