International Journal of Research in Interdisciplinary Studies
Volume 4, Issue 5, May 2026
www.ijris.com | E-ISSN: 2584-1017

Learning Barriers of Senior High School Learners in Electrical Installation and Maintenance

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Abstract—This study determined the learning barriers encountered by Grade 12 Senior High School learners in Electrical Installation and Maintenance (EIM) in selected schools in the Division of Albay during the School Year 2025–2026. Specifically, the study assessed the extent of barriers encountered by learners in terms of availability and accessibility of tools and equipment, adequacy of instructional materials, teacher-related factors, learning environment and facilities, and learner-centered factors. It also examined the level of difficulty experienced by learners in acquiring EIM competencies and tested the significant relationship between learning barriers and competency acquisition. A descriptive-quantitative research design was employed involving 136 Grade 12 EIM learners. Data were gathered using a validated researcher-made questionnaire, interviews, observations, and library research. Statistical tools such as weighted mean and Chi-square test of independence were utilized in analyzing the data. Findings revealed that learners experienced a moderate extent of barriers in terms of tools and equipment, instructional materials, teacher-related factors, learning environment, and learner-centered factors. Learners also experienced difficulty in acquiring competencies related to electrical tasks, interpreting plans, safety practices, tool usage, and troubleshooting techniques. The study further revealed a significant relationship between learning barriers and learners' level of difficulty in acquiring EIM competencies. Based on the findings, a supplemental learning module was proposed to address identified barriers and enhance competency acquisition among learners. The study concluded that addressing educational barriers through contextualized instructional support materials may improve learners' practical skills, engagement, and competency development in Electrical Installation and Maintenance.

***Index Terms*—Electrical installation and maintenance, learning barriers, competency acquisition, supplemental learning module, technical-vocational education, Grade 12 learners.**

1. Introduction

Technical-Vocational Education and Training (TVET) plays a significant role in preparing learners with practical competencies and employable skills necessary for workforce readiness and national development. In the Philippine educational system, the Technical-Vocational-Livelihood (TVL) track under the K to 12 curriculum aims to equip learners with industry-relevant competencies through competency-based instruction and hands-on learning experiences. One of the specialized strands under the TVL track is Electrical Installation and Maintenance (EIM), which develops learners' technical knowledge and practical skills in electrical systems, installation procedures, safety practices, and troubleshooting techniques.

Despite the objectives of the EIM program, many learners encounter educational barriers that affect competency acquisition and practical skill development. These barriers include limited access to tools and equipment, inadequate instructional materials, insufficient laboratory facilities, teacher-related challenges, and learner-centered difficulties. Such barriers may negatively affect learner engagement, confidence, motivation, and overall academic performance in technical-vocational education.

The study is anchored on the Challenge-Responsive Learning Theory (CRLT), which explains that competency acquisition is influenced not only by instructional resources but also by learners' responses to educational challenges. The theory emphasizes that learners develop adaptive strategies such as collaboration, self-directed learning, resilience, and problem-solving in overcoming barriers encountered during learning. External support systems, including teacher guidance, institutional support, and access to learning resources, further strengthen learners' ability to acquire competencies effectively.

Several studies highlighted persistent challenges in technical-vocational education. Research findings revealed that outdated tools, inadequate infrastructure, insufficient instructional materials, and limited hands-on opportunities significantly hinder competency development among TVET learners. These challenges became more evident during the transition to technology-driven instruction and emergency remote learning, where learners struggled with inadequate facilities and limited instructional support.

Although previous studies discussed barriers in TVET implementation, limited empirical evidence exists regarding the relationship between learning barriers and competency acquisition among Grade 12 EIM learners in the Division of Albay. Furthermore, few studies proposed localized instructional interventions specifically designed to address the identified challenges encountered by EIM learners.

This study aimed to determine the learning barriers encountered by Grade 12 Senior High School learners in Electrical Installation and Maintenance and develop a

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supplemental learning module based on the findings. Specifically, the study assessed the barriers encountered by learners, examined their level of difficulty in acquiring competencies, determined the significant relationship between learning barriers and competency acquisition, and proposed contextualized learning support materials to improve instructional delivery and learner performance.

2. Materials and Methods

A. Research Design

The study employed a descriptive-quantitative research design. Descriptive research was utilized to systematically describe the barriers encountered by Grade 12 EIM learners and their level of difficulty in acquiring competencies. Quantitative research enabled the collection and analysis of numerical data using statistical tools to determine trends, patterns, and relationships among variables.

B. Respondents of the Study

The respondents of the study were Grade 12 Senior High School learners enrolled in the Electrical Installation and Maintenance strand in selected schools within the Division of Albay during the School Year 2025–2026. The total population consisted of 136 learners who were directly involved in the acquisition of EIM competencies.

C. Sampling Technique

The study utilized Slovin's Formula with a 5% margin of error in determining the sample size. Based on the computation, the study obtained 101 respondents from the total population of 136 learners.

D. Research Instrument

The primary instrument used in the study was a researcher-made questionnaire developed based on related literature, initial observations, and DepEd guidelines. The questionnaire consisted of two major parts. Part I assessed the extent of barriers encountered by learners in terms of availability and accessibility of tools and equipment, adequacy of instructional materials, teacher-related factors, learning environment and facilities, and learner-centered factors. Part II focused on the level of difficulty experienced by learners in acquiring EIM competencies.

The instrument underwent expert validation and pilot testing to ensure clarity, relevance, validity, and reliability. Necessary revisions were incorporated based on feedback from validators and pilot respondents.

E. Data Gathering Procedure

The researcher secured approval from the Schools Division Office and school administrators before conducting the study. The questionnaires were personally administered to the respondents. Instructions and the purpose of the study were clearly explained to ensure accurate responses. Ethical considerations such as voluntary participation, confidentiality, and anonymity were strictly observed.

Interviews and observations were also conducted to supplement and validate the quantitative findings. Relevant literature and studies were gathered through library research to strengthen the theoretical and empirical foundation of the study.

F. Statistical Treatment of Data

Weighted mean was used to determine the extent of barriers encountered by learners and their level of difficulty in acquiring EIM competencies. The Chi-square test of independence was employed to determine the significant relationship between learning barriers and competency acquisition using a 0.05 level of significance.

G. Ethical Statements

1) Statement of Ethical Approval

The present research work does not contain any studies performed on animals or human subjects by any of the authors.

2) Statement of Informed Consent

Informed consent was obtained from all individual participants included in the study.

3. Results and Discussion

A. Barriers Encountered by Grade 12 EIM Learners

The study revealed that Grade 12 EIM learners experienced barriers in terms of availability and accessibility of tools and equipment, adequacy of instructional materials, teacher-related factors, learning environment and facilities, and learner-centered factors.

B. Availability and Accessibility of Tools and Equipment

The findings showed that learners experienced a moderate extent of barriers related to tools and equipment, with an overall weighted mean of 3.03 interpreted as Moderate Extent. The highest-rated indicator was the insufficient number of tools and equipment available during practical lessons with a weighted mean of 3.32.

These findings imply that learners encountered limitations in performing hands-on activities because of insufficient and inaccessible tools necessary for competency-based instruction. Limited resources slowed competency acquisition and reduced opportunities for effective practical training. The findings support previous studies emphasizing that inadequate facilities and insufficient tools significantly hinder technical skill development in vocational education.

C. Adequacy of Instructional Materials

The study also identified barriers related to inadequate instructional materials. Learners experienced difficulties accessing sufficient and updated learning resources necessary for understanding theoretical concepts and performing practical tasks.

Instructional materials play an important role in competency-based learning. Inadequate modules, manuals, and learning guides limit learners' understanding and practical application of EIM concepts. Previous studies emphasized that contextualized and competency-based instructional materials enhance learner engagement, comprehension, and skill mastery in technical-vocational education.

D. Teacher-Related Factors and Learning Environment

Teacher preparedness, instructional strategies, and availability of support significantly influenced learners' competency acquisition. Studies revealed that ineffective instruction, lack of specialization, and limited training in digital pedagogy negatively affected learner performance in TVET programs.

Likewise, inadequate laboratory facilities and poor learning environments affected learners' engagement and participation in practical activities. Safe, organized, and resource-rich learning environments are necessary for effective competency acquisition in EIM instruction.

E. Level of Difficulty in Acquiring EIM Competencies

Learners experienced varying levels of difficulty in performing electrical tasks, interpreting technical drawings, applying safety protocols, using electrical tools, and troubleshooting electrical systems.

The findings indicate that practical competencies requiring hands-on application were significantly affected by the identified learning barriers. Competency acquisition became more difficult when learners lacked access to sufficient tools, instructional guidance, and practice opportunities.

F. Relationship Between Learning Barriers and Competency Acquisition

The Chi-square analysis revealed a significant relationship between learning barriers and learners' level of difficulty in acquiring EIM competencies.

The findings suggest that increased exposure to educational barriers corresponded to greater difficulty in performing required competencies. These results support the assumptions of Challenge-Responsive Learning Theory, which explains that learning barriers directly influence competency development and practical skill acquisition.

G. Proposed Supplemental Learning Module

Based on the findings, a supplemental learning module was proposed to address the identified barriers encountered by Grade 12 EIM learners. The module contains contextualized, competency-based, and practical learning activities designed to reinforce electrical tasks, safety practices, interpretation of technical plans, and troubleshooting techniques.

The proposed instructional material aims to improve learners' competency acquisition, strengthen practical skills, and support independent learning despite resource limitations.

4. Conclusion

The study concluded that Grade 12 Senior High School learners in Electrical Installation and Maintenance experienced moderate educational barriers in terms of tools and equipment, instructional materials, teacher-related factors, learning environment, and learner-centered factors. These barriers significantly affected learners' competency acquisition and practical skill development.

The findings further revealed that learners experienced varying levels of difficulty in performing EIM competencies such as electrical installation, interpretation of technical plans, safety procedures, tool usage, and troubleshooting. Statistical analysis confirmed a significant relationship between learning barriers and learners' level of difficulty in acquiring competencies.

The study also concluded that contextualized supplemental learning modules may serve as effective instructional support materials in addressing identified barriers and improving learner engagement, competency acquisition, and practical performance in Electrical Installation and Maintenance.

Acknowledgement

The researcher expresses sincere gratitude to the Schools Division Office of Albay, school administrators, teachers, and Grade 12 EIM learners who participated in the study. Appreciation is also extended to the research advisers, validators, and all individuals who contributed to the completion of this research.

References

[1] R. M. Alvarez, Challenges in the Implementation of Electrical Installation and Maintenance Workshops in Public Senior High Schools [Master's thesis]. Bicol University, 2022.

[2] L. C. Almendarez and M. A. Cruz, "Resource-constrained learning adaptation: A framework for understanding learner responses in underserved educational settings," *Asian Journal of Educational Research*, vol. 15, no. 3, pp. 101–115, 2023.

[3] S. Asgari, R. Moghaddam, and A. Farahani, "Pandemic disruptions in engineering education: A case from Iran," *Global Journal of Engineering Education*, vol. 22, no. 2, pp. 102–110, 2020.

[4] O. Atabek, "Teachers and technology integration: Beyond the hardware," *Educational Technology Today*, vol. 6, no. 2, pp. 67–79, 2019.

[5] M. Benabdallah, H. Chellai, and A. Berrada, "Adaptive learning under constraints: Vocational students' coping strategies," *Journal of Vocational Psychology*, vol. 10, no. 1, pp. 39–56, 2021.

[6] H. N. Boone and D. A. Boone, "Analyzing Likert data: A refresher on descriptive statistics," *Journal of Extension*, vol. 59, no. 2, Art. no. v59-2tt2, 2021.

[7] J. Cao, R. Tang, and M. Wong, "Digital adaptability and pedagogical skills in TVET: A framework for modern educators," *TVET Innovation Quarterly*, vol. 7, no. 1, pp. 17–29, 2023.

[8] C. Chitema, "Teacher preparedness and digital learning in technical education: Challenges and solutions," *Journal of TVET Research*, vol. 5, no. 2, pp. 45–61, 2021.

[9] Y. Dai, H. Liu, and W. Zhang, "Digital information literacy in vocational education: A systematic review," *International Journal of TVET*, vol. 12, no. 1, pp. 88–102, 2024.

[10] Department of Education, K to 12 Senior High School Curriculum Guide – Electrical Installation and Maintenance (EIM). Philippines: Department of Education, 2016.

[11] Department of Education, DepEd Order No. 30, s. 2017: Guidelines for the Implementation of Technical-Vocational-Livelihood Track Specializations in Senior High School. Philippines: Department of Education, 2017.

[12] A. Gener, M. Santos, and L. Cruz, "Facility readiness and student performance in industrial arts," *Asian Journal of Education*, vol. 10, no. 3, pp. 34–47, 2018.

[13] J. Grepon and P. Martinez, "Enhancing technical training through VR: A Philippine pilot study," *Philippine ICT Education Review*, vol. 2, no. 2, pp. 60–74, 2021.

[14] L. Johnson, A. Stewart, and K. Ortiz, "Practical vs. theoretical learning in TVET: What works best?" *International TVET Journal*, vol. 9, no. 3, pp. 150–168, 2020.

[15] J. Miranda, C. Delos Santos, and R. Yambao, "Simulating practice through 3D virtual tools: A response to tool shortages," *Philippine Journal of Vocational Technology*, vol. 8, no. 2, pp. 42–54, 2020.

[16] G. Okemwa, "Resource access and practical performance in electrical installation in Kenyan TVETs," *African Education Review*, vol. 18, no. 2, pp. 123–138, 2020.
[17] C. Oliquino, "21st-century skills of Filipino TVET students," *Journal of Philippine Technical Education*, vol. 5, no. 3, pp. 65–77, 2020.
[18] A. C. Orbeta and M. M. Corpus, "Access issues in Philippine TVET: Tools, trainers, and technology," *UP School of Economics Policy Paper Series*, no. 24-001, 2024.
[19] R. Salac and Y. Kim, "Barriers to online learning in technical-vocational education during COVID-19," *Philippine Journal of Education*, vol. 95, no. 1, pp. 55–67, 2020.
[20] E. Salvador, M. Dela Cruz, and J. Ramos, "Teacher assignment mismatches in Philippine TVET," *Journal of Local Educational Research*, vol. 4, no. 1, pp. 89–102, 2022.