

The Teaching of Crop Production in the Public Secondary Schools in Occidental Mindoro

Jane J. Baladiang¹, Romeo M. Guillo Jr.²

¹Master Teacher I, Abra de Ilog National High School, Abra de Ilog, Occidental Mindoro, Philippines

²Batangas State University, Batangas City, Philippines

Publication history: Received: May 5, 2026; Revised: May 29, 2026; Accepted: June 4, 2026

Email of Corresponding Author: jane.baladiang@deped.gov.ph

Abstract

This study assessed the teaching of crop production in public secondary schools in Occidental Mindoro as a basis for developing instructional activities for Technology and Livelihood Education (TLE). Specifically, it examined the characteristics of teachers handling crop production, the extent of implementation of instructional objectives, teaching strategies, instructional materials, facilities, and assessment techniques, as well as the challenges encountered in teaching the subject. The study also determined whether significant differences existed between the assessments of teachers and school heads regarding crop production instruction. A descriptive quantitative research design was employed. The respondents consisted of 158 TLE teachers selected through stratified random sampling and 82 school heads identified through total enumeration. Data were collected using a validated researcher-made questionnaire supplemented by interviews and focus group discussions. Statistical tools such as frequency, percentage, weighted mean, standard deviation, and the Mann-Whitney U Test were used to analyze the data. The findings revealed that most teachers handling crop production were TLE majors with moderate teaching experience. The instructional objectives, teaching strategies, and assessment techniques were generally implemented satisfactorily. However, instructional materials and facilities were found to be inadequate in supporting effective and hands-on crop production instruction. Significant differences were observed between the assessments of teachers and school heads across all areas of crop production teaching. Both groups identified challenges related to limited resources, insufficient facilities, funding constraints, teacher preparation, learner engagement, and restricted opportunities for practical learning activities. Based on the results, instructional activities were proposed to address identified weaknesses and enhance crop production instruction. The study concluded that crop production teaching in public secondary schools is generally satisfactory but requires improvements in instructional resources, facilities, and professional support to strengthen learning outcomes and practical agricultural competencies. The study contributes to SDG 4 (Quality Education), SDG 2 (Zero Hunger), SDG 8 (Decent Work and Economic Growth), and SDG 12 (Responsible Consumption and Production) by promoting quality agricultural education and practical skill development. Its sustainability contribution lies in strengthening educational, socio-economic, community, and environmental sustainability through improved agricultural literacy and workforce preparedness.

Keywords: Agricultural Education, Assessment Techniques, Crop Production, Instructional Materials, Public Secondary Schools, Teaching Strategies, Technology and Livelihood Education, TLE Teachers

1. Introduction

Food security and climate change have increased the importance of agricultural education, transforming it from an elective area into a developmental necessity. Within the Technology and Livelihood Education (TLE) curriculum, crop production provides students with opportunities to cultivate, manage, and harvest crops while promoting environmental stewardship and economic self-sufficiency. Philippine educational policies, including Republic Act No. 10533, Republic Act No. 10618, and the Gulayan sa Paaralan Program, emphasize experiential and skills-based learning in agriculture. Despite these initiatives, challenges remain in translating policy goals into effective classroom practices, particularly in relation to practical skill development, teacher preparedness, instructional resources, and student engagement. This study assesses the teaching of crop production in public secondary schools in Occidental Mindoro and proposes instructional activities that may enhance instructional effectiveness and student learning outcomes.

1.1 Background of Teaching Crop Production in Public Secondary Schools in Occidental Mindoro

Agricultural education plays a vital role in preparing students with practical competencies necessary for food production, environmental responsibility, and livelihood development. National educational policies emphasize technical-vocational instruction grounded in authentic learning experiences. However, many students continue to experience difficulties in soil preparation, crop management, and the application of safe farming practices. Practical learning opportunities are often limited despite evidence that laboratory and field-based instruction significantly improve skill acquisition and

understanding (Pamplona, 2023; The World Bank, 2025). Student engagement in crop production is likewise affected by the lack of interactive instructional materials and experiential activities. Saldivar (2025) emphasized that meaningful learning requires experience-based instruction, while Garcia et al. (2024) highlighted the role of laboratory work in developing scientific thinking and safe work habits. Teacher-related concerns further affect instructional quality, as some educators lack specialized agricultural training and technical confidence to conduct effective demonstrations. In addition, shortages of tools, seeds, and other agricultural resources restrict opportunities for individual practice and limit the effectiveness of experiential learning (Mercado & Osbahr, 2023). Given the agricultural significance of Occidental Mindoro and the widening disconnect between youth and farming, examining the teaching of crop production in the province is necessary to support educational improvement and strengthen agricultural education.

1.2 Themes and Insights on Teacher Characteristics and Crop Production Instruction

Literature consistently identifies teacher competence, instructional practices, learning resources, facilities, and assessment methods as critical factors influencing agricultural education. Studies show that teacher competence is closely associated with instructional effectiveness. Anong and Gayta Jr. (2024) reported that higher teacher competence corresponded with improved teaching practices. Similarly, Alcaide and Blanca (2024) and Basal (2022) found that effective teachers demonstrate strong instructional competencies, classroom management skills, and the ability to design inclusive learning experiences. However, several studies revealed concerns regarding teacher preparedness, particularly among teachers assigned outside their specialization (Espiritu, 2020; Tingzon and Buyok, 2022; Ortiz, 2026). Research on crop production instruction emphasizes the importance of clear learning objectives, experiential learning, and appropriate assessment practices. Objectives guide instruction and help learners acquire targeted competencies (Singh, 2021; Schenk, 2024). Studies further indicate that experiential and hands-on learning significantly improve agricultural skills, safety awareness, and student attitudes toward farming (Wakiluzzaman, 2025; Sagario and Versano, 2023; Sandoval, 2023). Teaching strategies that combine teacher-centered and learner-centered approaches support effective learning environments (Mallilim et al., 2021; Zhang et al., 2024; Zahid and Nawab, 2025). Practical activities such as gardening, project-based learning, and authentic farm experiences enhance student engagement and performance (Agumin, 2024; Torres and Andicoy Jr., 2025). Instructional materials and facilities are equally important. Effective agricultural instruction relies on modules, manuals, tools, equipment, and learning resources that support practical competency development (Bacia, 2024; Abdala, 2024). However, many schools continue to face shortages of updated instructional materials and adequate facilities (Bautista, 2025; Damola and Castino, 2025). Assessment practices that incorporate practical demonstrations, observations, and performance-based tasks have also been shown to improve learning outcomes (De Vries et al., 2024; Samala, 2022; Pregoner, 2024).

1.3 Local, National, and Global Perspectives on Agricultural and Crop Production Education

Globally, agricultural education is increasingly recognized as a response to food security concerns, workforce development, and sustainable agricultural practices. Research highlights the need for practical agricultural training that equips learners with competencies applicable to modern farming systems (Cruz et al., 2025). Nationally, Philippine educational reforms emphasize competency-based technical-vocational instruction aligned with workforce requirements. Republic Act No. 10533 promotes experiential learning, while DepEd policies encourage agricultural education through programs such as the Gulayan sa Paaralan Program. Nonetheless, studies continue to report challenges related to teacher specialization, instructional resources, and curriculum implementation (Tingzon and Buyok, 2022; Salvador, 2025). At the local level, Occidental Mindoro remains heavily dependent on agriculture. Despite this, limited studies have examined the effectiveness of crop production instruction within the province. Understanding local instructional conditions is therefore essential for strengthening agricultural education and supporting future workforce development.

1.4 Theoretical and Conceptual Foundations of Crop Production Instruction

This study is anchored on Agricultural Education Theory, Experiential Learning Theory, and the Integrative Curriculum Approach. Agricultural Education Theory emphasizes the integration of academic knowledge and practical skill development to improve learning outcomes and workforce readiness (Faliyandra, 2025). This perspective supports the view that effective crop production instruction requires both conceptual understanding and practical application. Experiential Learning Theory highlights learning through direct experience, participation, and reflection (Sagario and Versano, 2023). Practical activities such as planting, cultivation, harvesting, and tool handling enable students to develop agricultural competencies and deeper understanding of agricultural concepts (Mariappan, 2025; Batdi, 2024). The Integrative Curriculum Approach promotes connections among multiple disciplines to facilitate holistic learning and interdisciplinary understanding. Integrating crop production with biology, ecology, economics, community engagement, and information technology enhances relevance and strengthens students' appreciation of agriculture's role in society (Francis et al., 2020). Collectively, these theories support the study's focus on improving instructional effectiveness through the integration of knowledge, practical experiences, and interdisciplinary learning.

1.5 Research Gaps and Rationale for Assessing Crop Production Teaching in Occidental Mindoro

Although numerous studies have examined teacher competencies, instructional practices, and challenges in agricultural education, limited research has focused specifically on the teaching of crop production in public secondary schools in Occidental Mindoro. Existing literature consistently identifies concerns related to insufficient instructional materials, inadequate facilities, limited professional development opportunities, out-of-field teaching assignments, and restricted opportunities for experiential learning (Mora et al., 2021; Paninsoro and Resurreccion, 2025; Gerona and Betito, 2025; Manlangit, 2025). Most previous studies have investigated these issues in other regions, leaving a gap in localized evidence regarding instructional conditions in Occidental Mindoro. This study addresses that gap by examining teacher characteristics, instructional practices, challenges, and stakeholder assessments to generate evidence-based instructional activities that may strengthen crop production education.

1.6 Alignment of Crop Production Education with Relevant Sustainable Development Goals (SDGs)

This study aligns with several Sustainable Development Goals (SDGs):

SDG 4 – Quality Education. The study supports the improvement of teaching strategies, instructional resources, facilities, and assessment practices to enhance educational quality and learner outcomes.

SDG 8 – Decent Work and Economic Growth. By strengthening crop production instruction and agricultural competencies, the study contributes to workforce preparedness and livelihood development.

SDG 2 – Zero Hunger. Agricultural education promotes knowledge and skills related to food production, supporting long-term food security goals.

SDG 12 – Responsible Consumption and Production. Crop production education encourages responsible agricultural practices and sustainable resource management.

1.7 Importance of Crop Production Instruction to Multidisciplinary Sustainability

The study contributes to multiple dimensions of sustainability. From a socio-economic perspective, strengthening agricultural education helps prepare students for employment, entrepreneurship, and livelihood opportunities. From an educational sustainability perspective, improved instructional practices support long-term learner development and competency acquisition. The study also contributes to community sustainability by encouraging agricultural awareness among youth and supporting local agricultural development. Furthermore, the promotion of practical farming skills and responsible resource management supports environmental sustainability by fostering informed agricultural practices and stewardship of natural resources.

2. Material and methods

2.1 Research Design

The study employed a descriptive quantitative research design to assess the teaching of crop production in public secondary schools in Occidental Mindoro and to serve as the basis for proposing instructional activities for TLE. Descriptive research was utilized to describe existing conditions and characteristics related to the teaching of crop production and to obtain firsthand data from respondents.

2.2 Locale of the Study

The study was conducted in the public secondary schools across the eleven districts of Occidental Mindoro. The locale was selected because of its agricultural significance and the need to examine the status of crop production instruction within the province.

2.3 Respondents of the Study

The respondents consisted of teachers handling crop production and school heads from the eleven districts of Occidental Mindoro. The total population included 163 TLE teachers and 82 school heads, for an overall population of 245 respondents.

2.4 Sample and Sampling Procedure

Stratified random sampling was used to determine the teacher-respondents from each district to ensure proportional representation. Using the Raosoft sample size calculator with a 5% margin of error, the required sample size for teachers was computed at 158 respondents. Meanwhile, all 82 school heads were included through total enumeration because of the manageable population size. The distribution of respondents was proportionally allocated across the eleven districts to maintain balanced representation.

2.5 Research Instrument

The study utilized a researcher-made questionnaire as the primary data-gathering instrument, supplemented by focus group discussions and interviews to enrich the findings. The questionnaire was developed based on the objectives of the study, related literature, interviews, and the researcher's observations regarding the teaching of crop production. The instrument

consisted of three parts. The first part gathered information regarding the respondents' profile. The second part assessed competencies related to crop production instruction, while the third part focused on school practices in teaching the subject. The questionnaire underwent a systematic process of construction and validation. Initial drafts were reviewed by the research adviser and revised based on recommendations. Subsequently, experts in the field evaluated the instrument for content validity. A pilot test involving 30 elementary teachers handling Crop Production was conducted to determine validity and reliability. The collected data were analyzed by a statistician, and Cronbach's alpha was used to assess internal consistency. The instrument obtained a Cronbach's alpha coefficient of 0.78, indicating acceptable reliability and confirming its suitability for the actual conduct of the study. The questionnaire was administered after securing approval from the Office of the Schools Division Superintendent. Distribution and retrieval were conducted through personal visits, printed questionnaires, online communication, and Google Forms to maximize accessibility, convenience, and response rates. Responses were measured using a four-point Likert scale. Scores ranged from 1 to 4, corresponding to Strongly Disagree, Disagree, Agree, and Strongly Agree, respectively. Verbal interpretations were assigned to facilitate the analysis of numerical results.

2.6 Data Gathering Procedure

The researcher first secured permission from the appropriate educational authorities before conducting the study. After approval was granted, coordination was made with school administrators, TLE teachers, and school heads. The questionnaires were then distributed and collected through both face-to-face and online methods. Upon completion of data collection, the responses were organized and submitted to a statistician for processing. The resulting data were subsequently analyzed and interpreted to address the objectives of the study.

2.7 Data Analysis Techniques

Several statistical tools were employed to analyze the collected data. Frequency and percentage were used to describe the distribution of respondents and summarize categorical data. Weighted mean was utilized to determine the respondents' assessments of crop production instruction by computing average ratings based on assigned weights. Standard deviation was used to determine the consistency and variability of responses. The Mann-Whitney U Test was employed to determine whether significant differences existed between the assessments of teachers and school heads.

2.8 Ethical Considerations

The study adhered to established ethical principles throughout the research process. Informed consent was secured from all participants after providing information regarding the study's purpose, procedures, potential benefits, and possible risks. Participation was voluntary, and respondents were informed of their right to withdraw at any stage without penalty. Confidentiality and anonymity were maintained by protecting respondent identities and securely storing all collected information. The study avoided any form of coercion and ensured that participants would not experience physical, psychological, or social harm. The perspectives of both teachers and school heads were treated with respect, and findings were presented objectively and without bias. The ethical use of research results was emphasized to support the improvement of crop production instruction and professional development initiatives. Throughout the study, participant welfare, trust, and research integrity were prioritized to uphold the standards of educational research.

3. Results and Discussion

3.1 Characteristics of Teachers Handling Crop Production

3.1.1 Field of Specialization

The findings revealed that the majority of both teachers and school heads were TLE majors, indicating that most respondents possessed educational backgrounds aligned with crop production instruction. However, a considerable proportion of respondents were non-TLE majors, particularly among school heads. This finding suggests that most teachers possess the foundational knowledge necessary for teaching both theoretical and practical aspects of agriculture. Nevertheless, the presence of non-specialists highlights the need for continuous professional development and technical support. This supports the findings of Tingzon and Buyok (2022), who noted that out-of-field teachers often encounter difficulties teaching TLE subjects. Likewise, Abella et al. (2021) emphasized that teaching outside one's specialization may negatively affect instructional effectiveness and student outcomes.

3.1.2 Years of Teaching Experience

Most teachers belonged to the 6–15 years teaching bracket, indicating that the majority were in the middle stage of their professional careers. Fewer respondents were classified as beginning or highly experienced teachers. The predominance of mid-career teachers suggests a balance between experience and openness to instructional innovation. Their teaching experience may contribute positively to classroom confidence and instructional quality. This finding supports Hussain,

Khan, and Bidar (2022), who emphasized that teaching experience increases teachers' confidence and effectiveness in delivering instruction.

3.2 Assessment of Crop Production Teaching

3.2.1 Achievement of Learning Objectives

Both teachers and school heads generally agreed that the objectives of crop production teaching were being attained. Strong ratings were given to the identification of farm tools, equipment, and workplace hazards. Lower ratings were observed in more technical competencies such as farm layout design, irrigation planning, preventive maintenance, safety implementation, and the application of planting systems. The findings indicate that teachers are more confident in delivering foundational competencies than advanced technical skills. While tool identification and safety awareness were strengths, practical and technical applications remain areas for improvement. These findings are consistent with Cristobal (2024), who reported that teachers effectively utilized agricultural materials, but differ from Torres and Andicoy Jr. (2025) and Villacorta and Arnado (2023), who found stronger implementation of practical agricultural activities. The results suggest a need for enhanced training, improved facilities, and additional opportunities for practical learning experiences.

3.2.2 Teaching Strategies

Teachers and school heads positively assessed the teaching strategies employed in crop production classes. High ratings were observed in student participation, cooperative learning, differentiated instruction, and learner engagement. Lower ratings were given to technology integration, project-based learning, and educational games. The results indicate that teachers effectively create participatory learning environments but face challenges in implementing innovative and technology-based approaches. Limited resources and insufficient access to modern technology may explain these lower ratings. This finding supports Tingzon and Buyok (2022), who noted that resource limitations and instructional constraints create challenges in the effective delivery of TLE subjects. The results also suggest the need for capacity-building programs that strengthen teachers' skills in technology integration and student-centered pedagogies.

3.2.3 Instructional Materials

Teachers generally disagreed that instructional materials were adequate, while school heads expressed agreement. Both groups strongly agreed that online materials and interactive resources supported instruction. However, respondents reported shortages of reference materials, supplementary resources, equipment, and community partnerships. The findings suggest a discrepancy between the perceptions of classroom implementers and school administrators. Teachers directly experience limitations in resources and instructional materials, while school heads may view available materials as generally sufficient. These findings support Abayan et al. (2021), who reported that inadequate instructional resources limit meaningful learning opportunities. Similarly, Tingzon and Buyok (2022) emphasized that insufficient resources create additional challenges, particularly for teachers teaching outside their specialization.

3.2.4 Facilities

Teachers disagreed that schools possessed adequate facilities for crop production instruction, while school heads generally expressed agreement. Both groups acknowledged the availability of lecture rooms and school clinics but reported deficiencies in laboratories, greenhouses, demonstration farms, agricultural equipment, and specialized facilities. The findings reveal that theoretical instruction is adequately supported, whereas practical agricultural learning remains constrained by insufficient facilities and equipment. These results align with Accad and Dordas (2025), who identified inadequate facilities and funding as barriers to quality instruction. Improving agricultural infrastructure is therefore essential to strengthen experiential learning opportunities.

3.2.5 Assessment Techniques

Both teachers and school heads strongly agreed that assessment practices were effective. High ratings were observed in providing feedback, maintaining student records, using assessment results for instructional improvement, and supporting remediation. Lower ratings were given to practical assessment tools and alignment between assessments and learning objectives. The findings suggest that assessment systems are generally effective and supportive of student learning. However, the lack of facilities and equipment limits opportunities for authentic and performance-based assessments. This observation supports Cristobal (2024), who reported that teachers often rely on simpler forms of assessment because of limited opportunities for field-based evaluation. The results indicate the need to strengthen practical assessment strategies aligned with agricultural competencies.

3.3 Differences Between the Assessments of Teachers and School Heads

Statistical analysis using the Mann–Whitney U Test revealed significant differences between the responses of teachers and school heads across all areas, including objectives, teaching strategies, instructional materials, facilities, and assessment techniques. The null hypothesis was therefore rejected. The findings indicate that school heads consistently rated crop production teaching more positively than teachers. This difference may stem from the distinct roles of the two groups. School heads tend to evaluate programs based on policies and administrative expectations, whereas teachers directly

experience classroom realities, resource shortages, and implementation challenges. The findings support Escanda (2024), who emphasized that effective teaching requires both institutional support and sufficient resources. The results underscore the need for stronger communication and collaboration between teachers and school leaders to establish a shared understanding of instructional conditions and priorities.

3.4 Challenges and Constraints in Teaching Crop Production

The findings revealed that both teachers and school heads strongly agreed that significant challenges affect crop production instruction. Teachers identified limited access to instructional resources, inadequate facilities, insufficient funding, lack of equipment, and limited time for practical activities as major concerns. School heads identified low student interest, inadequate time for hands-on learning, diverse learner needs, excessive workloads, and insufficient teacher training as primary challenges. These findings indicate that both groups recognize substantial barriers to effective crop production instruction, although they differ regarding the most pressing concerns. Teachers emphasized material and facility-related constraints, while school heads focused more on learner engagement and instructional time. These results support Geraldizo and Dabasol (2022), Agumin (2024), Gerona and Betito (2025), and Salvador (2025), who identified resource shortages, insufficient training, and limited practical opportunities as persistent challenges in agricultural education. Addressing these concerns requires improved resource allocation, expanded professional development opportunities, stronger industry and community partnerships, and instructional approaches that maximize available resources.

3.5 Proposed Instructional Activities

The study proposed instructional activities designed to address the weaknesses identified in crop production teaching. The proposed activities focused on improving technical competencies, teaching strategies, instructional materials, facilities utilization, assessment practices, and the major challenges encountered by teachers. The proposed activities emphasize experiential learning, project-based approaches, technology integration, practical assessment methods, and resource maximization. They seek to strengthen teachers' confidence, improve student engagement, and bridge the gap between theoretical instruction and practical agricultural skills. These recommendations are supported by Fadlillah et al. (2024), Akem (2025), Yan and Adrian (2025), and Braydent and Fajar (2025), whose studies highlighted the effectiveness of hands-on learning, digital technologies, project-based learning, and simulation-based approaches in agricultural education.

4. Conclusion & Recommendations

The study found that crop production instruction in public secondary schools in Occidental Mindoro is generally handled by qualified and experienced TLE teachers. While the objectives, teaching strategies, and assessment techniques were generally implemented satisfactorily, limitations in instructional materials and facilities constrained the effective delivery of hands-on learning experiences. Significant differences existed between the assessments of teachers and school heads across all areas of crop production teaching, indicating varying perceptions regarding instructional practices and resource availability. Both groups acknowledged the presence of challenges related to resources, facilities, and instructional support. The proposed instructional activities were developed as a response to the identified instructional gaps and challenges in crop production teaching.

The proposed instructional activities should first undergo expert validation prior to implementation. School administrators should strengthen the provision of instructional materials and improve facilities to support effective and safe crop production instruction. Regular collaborative discussions between teachers and school heads should be conducted to promote a shared understanding of instructional objectives, teaching strategies, assessment practices, and resource needs. Professional development programs, including training and workshops, should be provided to enhance teachers' competencies in both theoretical and practical aspects of crop production. Future studies may employ qualitative or mixed-method approaches to generate deeper insights into crop production instruction.

The study was limited to public secondary schools in Occidental Mindoro and focused on the perceptions of TLE teachers and school heads regarding crop production instruction. Data were primarily gathered through a researcher-made questionnaire, making the findings dependent on the responses and perceptions of the participants. The investigation was confined to the variables examined, namely teacher characteristics, objectives, teaching strategies, instructional materials, facilities, assessment techniques, and challenges encountered in teaching crop production. Consequently, factors beyond the scope of the study were not considered in the analysis.

Compliance with ethical standards

The authors conducted this study in accordance with established ethical principles in educational research. Throughout the research process, the authors prioritized participant welfare, voluntary participation, confidentiality, anonymity, and research integrity. Appropriate permissions were secured prior to data collection, and all information gathered was handled responsibly and reported objectively to ensure the ethical conduct of the study.

REFERENCES

- Abayan, M. R. A., Placigo, M. R., & Caluza, L. J. B. (2021). Evaluating the kindergarten instructional materials: Inputs for materials production. *International Journal of Research Publications*, 69(1). <https://doi.org/10.47119/ijrp100691120211699>
- Abdala, J. (2024). A qualitative approach on the instructional materials used in teaching and learning of English language in Tanzania's secondary schools. *Heliyon*, 10(14), e34129. <https://doi.org/10.1016/j.heliyon.2024.e34129>
- Abella, M. A., Reyes, J. M., & Cordero, M. S. (2021). Challenges of teaching outside specialization and their effects on student learning. *Philippine Journal of Educational Studies*, 34(2), 89–104.
- Accad, A. S., & Dordas, R. (2025). Pedagogical and technical competence level, problems and competency needs of Technology and Livelihood Education (TLE) teachers: Basis for professional development program. <https://ejournals.ph/article.php?id=28430>
- Agumin, A. A. O. (2024). Effectiveness of practical agriculture to the performance task of the Grade 8 junior high school students in Technology and Livelihood Education (TLE): Basis for instructional. *International Journal of Advanced Multidisciplinary Studies*, 4(4). https://www.ijams-bbp.net/wp-content/uploads/2024/03/1-IJAMS-APRIL-2024-1-11_APRYL-ANN-O.-AGUMIN.pdf
- Akem, D. A. (2025). Integrating technology into agricultural education: A pathway to sustainable farming practices. *Seminar in Agricultural Education*, University of Calabar. www.researchgate.net/publication/393373789_INTEGRATING_TECHNOLOGY_INTO_AGRICULTURAL_EDUCATION_A_PATHWAY_TO_SUSTAINABLE_FARMING_PRACTICES
- Alcaide, A. E., & Blancia, M. M. (2024). Technology and Livelihood Education (TLE) teachers' technology proficiency and instructional module writing ability in the new normal. *Asian Journal of Education and Social Studies*, 50(6), 62–71.
- Anong, A., & Gayta, J., Jr. (2024). Competence level of Technology and Livelihood Education (TLE) teachers and their teaching practices. *International Journal of Multidisciplinary Research and Publications*, 7(1), 86–90.
- Bacia, M. (2024). Role of instructional materials in students' academic performance. *Research Invention Journal of Current Research in Humanities and Social Sciences*, 3(2), 24–27. https://www.researchgate.net/publication/382004589_Role_of_Instructional_Materials_in_Students%27_Academic_Performance
- Basal, D. V. (2022). Instructional competencies of Technology and Livelihood Education (TLE) teachers: Basis for a competency-based module. *International Journal of Research Publications*, 96(1). <https://doi.org/10.47119/ijrp100961320222948>
- Batdi, V., Elaldi, Ş., Özçelik, C., Semerci, N., & Özkaya, Ö. M. (2024). Evaluation of the effectiveness of critical thinking training on critical thinking skills and academic achievement by using mixed-meta method. *Review of Education*, 12(3). <https://doi.org/10.1002/rev3.70001>
- Bautista, J. C. (2025). Response to intervention within a multi-tiered systems of support: A missing element in the literacy curricula, policies, and practices in the Philippines. *Frontiers in Education*, 10. <https://doi.org/10.3389/educ.2025.1484566>
- Braydent, B., & Fajar, M. (2025). Development of an educational farming simulation game to raise awareness of the food crisis. *BIO Web of Conferences*, 197, 02004. <https://doi.org/10.1051/bioconf/202519702004>
- Cristobal, R. M. (2024). Modernizing agricultural education: Enhancing pedagogy and technology integration for teaching agricultural crop production NC II in the 21st century. *Zenodo*. <https://doi.org/10.5281/zenodo.12073152>
- Cruz, G. B. D., Alison, M. G. F., Pedida, S. D. B., Taño, B. A. M., Milan, K. J. D., & Dimpal, G. M. (2025). Perspectives of agriculture employers on agricultural crop production trainees: The case of Davao del Norte. *Asian Journal of Advanced Research and Reports*, 19(8), 59–82. <https://doi.org/10.9734/ajarr/2025/v19i81116>
- Damola, M. B., & Castino, J. M. P. (2025). Feasibility study on establishing a rural farm school at Baluan National High School. *International Journal of Research and Innovation in Social Science*, 9(5), 6373–6403. <https://doi.org/10.47772/ijriss.2025.905000493>

- De Vries, J., Van Gasse, R., Van Geel, M., Visscher, A., & Van Petegem, P. (2024). Profiles of teachers' assessment techniques and their students' involvement in assessment. *European Journal of Teacher Education*, 47(2), 369–388. <https://doi.org/10.1080/02619768.2024.2354410>
- Escanda, M. (2024). Research-based instructional strategies, professional competence, and pedagogical approaches. *IOER International Multidisciplinary Research Journal*, 6(4). <https://www.ioer-imrj.com/wp-content/uploads/2025/01/Research-Based-Instructional-Strategies-Professional-Competence.pdf>
- Espiritu, E. V. (2020). Readiness of Technology and Livelihood Education (TLE) teachers in the implementation of K to 12 curriculums. *International Journal of Academic Multidisciplinary Research*, 4(11), 47–50.
- Fadlillah, M., Rahman, B., & Istiq'faroh, N. (2024). Development of teaching materials with agricultural insight to introduce agriculture to primary school students. *Journal of Education and Learning (EduLearn)*, 18, 1224–1233. <https://doi.org/10.11591/edulearn.v18i4.21641>
- Faliyandra, F. (2025). Participatory education for students at risk of dropping out: Expectations and educational forms among traditional farmer parents in Indonesia. *International Journal of Educational Development*. <https://www.sciencedirect.com/science/article/pii/S2590291125005686>
- Francis, C. A., Smith, J., & Lee, R. (2020). Organic agriculture teaching and learning in 2025: A transdisciplinary and holistic education model. *International Journal of Agriculture and Natural Resources*. <https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=2642&context=agronomyfacpub>
- Garcia, R., Santos, M., & Lim, J. (2024). Development and validation of a chemistry laboratory safety knowledge, attitudes, practices, and mindset questionnaire. *Ateneo Archium*. <https://archium.ateneo.edu/cgi/viewcontent.cgi?article=1061&context=hs-faculty-pubs>
- Geraldizo, G., & Dabaso, J. (2022). Assessment of senior high school technical-vocational livelihood track. *International Journal of Management and Commerce Innovation*, 9(2), 395–406.
- Gerona, J. B., & Betito, R. D. (2025). Challenges in teaching agriculture and fishery arts to Grade 7 students by non-agriculture and fishery arts faculty. *International Journal of the Humanities and Social Sciences*. <https://pantaojournal.com/wp-content/uploads/2025/05/29-Gerona-Final-Revised.pdf>
- Hussain, A., Khan, A., & Bidar, A. (2022). The impact of teaching experience on teachers' confidence. *Journal of Education and Teacher Development*, 9(2), 102–116.
- Mallillin, L. L. D., Laurel, R. D., Mallillin, J. B., Arroyo, P. A. C., Carag, E. A., Guingab-Carag, C., ... Tarayao, D. Z. (2021). Strategies, trends, methods and techniques of teaching in the new normal learning perspective of students. *East African Scholars Journal of Education, Humanities and Literature*, 4(7), 265–274. <https://doi.org/10.36349/easjehl.2021.v04i07.001>
- Manlangit, M. J. F. (2025). Exploring the teachers' challenges in the delivery of the TLE curriculum in Northern Samar, Philippines. *International Journal of Research Studies in Education*, 14(12). <https://doi.org/10.5861/ijrse.2025.25180>
- Mariappan, L. (2025). Examining the influence of outdoor experiential learning on ESL vocabulary retention. *Cogent Education*, 12(1). <https://doi.org/10.1080/2331186X.2025.2516871>
- Mercado, K. M. P., & Osbahr, H. (2023). Feeding the future: Knowledge and perceptions of the Filipino youth toward agriculture. *Asian Journal of Agriculture and Development*, 20(2), 31–50. <https://doi.org/10.37801/ajad2023.20.2.3>
- Mora, J. A., Inaizumi, H., & Shimoguchi, N. (2021). Factors affecting the teaching attitude of high school agriculture teachers in the Philippines. *International Journal of Environmental and Rural Development*, 12–14. <https://iserd.net/ijerd12/12-2-11.pdf>
- Ortiz, L. (2026). Factors influencing junior high school Technology and Livelihood Education (TLE) teachers teaching out-of-field in public secondary schools in the Province of Sorsogon. *International Journal of Sustainability and Advanced Integrated Research*, 2(2), 173–179. <https://doi.org/10.65339/ijrsair.V2.I2.176>
- Pamplona, R., & Ancho, I. (2023). Online laboratory instruction as alternative and supplementary mode: Students' assessment of the BS Agricultural Biotechnology Program. *International Journal on Open and Distance e-Learning*, 9(1). <https://doi.org/10.58887/ijodel.v9i1.106>
- Paninsoro, D. C., & Resurreccion, P. F. (2025). Exploring the best practices and strategies of sustainable learning sites for agriculture in Lanao del Norte, including Iligan City. *Journal of Sustainable Business*, 10(1). <https://doi.org/10.1186/s40991-025-00115-4>
- Pregoner, J. D. (2024). Research approaches in education: A comparison of quantitative, qualitative and mixed methods. *IMCC Journal of Science*, 4(2), 31–36. <https://myjournal.imcc.edu.ph/wp-content/uploads/2024/12/Pregoner-2024.pdf>
- Sagario, D. A., & Versano, D. D. (2023). Experiential learning approach to improve students' common competencies and attitude towards agricultural crop production. *International Journal of Social Science Humanity & Management Research*, 2(09). <https://doi.org/10.58806/ijsshr.2023.v2i9n04>
- Saldivar, J. M. N. (2025). Crafting minds: A constructivist blueprint for Philippine education reform. *Cognizance Journal of Multidisciplinary Studies*, 5(1), 247–259. <https://doi.org/10.47760/cognizance.2025.v05i01.020>

- Salvador, D. (2025). TLE teachers professional development on their teaching competencies and achievement. *International Journal of Multidisciplinary Research and Publications*, 8(2), 143–151. <https://ijmrmap.com/wp-content/uploads/2025/08/IJMRAP-V8N2P80Y25.pdf>
- Samala, M. T. H. (2022). The evidence-informed learning cycle of experiential learning in the core subjects and its relationship to academic performance of Grade 10 students in Manila Ecclesiastical Province School Association (MaPSA), NCR. *Education Review*, 11(1). https://serp-p.pids.gov.ph/publication/public/view?slug=the-evidence-informed-learning-cycle-of-experiential-learning-in-the-core-subjects-and-its-relations&utm_source=perplexity
- Sandoval, M. T. (2023). The evidence-informed learning cycle of experiential learning in the core subjects and its relationship to academic performance of Grade 10 students in Manila Ecclesiastical Province School Association (MaPSA), NCR. *Education Review*, 11(1), 35–50. <https://doi.org/10.70922/5693d615>
- Schenk, M. (2024, December 19). Understand the importance of learning objectives in curriculum. *Acadecraft*. <https://www.acadecraft.com/blog/understand-the-importance-of-learning-objectives-in-curriculum/>
- Singh, S. K., Agarwal, M., & Agarwal, N. (2021). Defining and measuring academic performance of HEI students: A critical review. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 12(6), 3091–3105. <https://doi.org/10.17762/turcomat.v12i6.6952>
- The World Bank. (2025). Draft Environmental and Social Systems Assessment (ESSA)—Philippines Sustainable Agricultural Transformation Program: Environmental and Social Systems Assessment for Program-for-Results (PforR) Financing. <https://documents1.worldbank.org/curated/en/099021825081533887/pdf/P50750417710b30c194cc1b0d6e357da30.pdf>
- Tingzon, L. L., & Buyok, H. J. A. (2022). Lived experiences of non-TLE teachers teaching TLE subjects: A phenomenological inquiry. *European Journal of Education Studies*, 9(11). <https://doi.org/10.46827/ejes.v9i11.4538>
- Torres, J., & Andicoy, A., Jr. (2025). Plowing through challenges: A case study of tool and equipment unavailability in TVL organic agriculture. *International Multidisciplinary Journal of Research for Innovation, Sustainability, and Excellence (IMJRISE)*, 2(2), 45–52. <https://risejournals.org/index.php/imjrise/article/view/952>
- Villacorta, F. C., Jr., & Arnado, A. A. (2023). Competencies, instructional skills, and challenges of teachers in implementing the Technical-Vocational and Livelihood Senior High School Track. *International Journal of Membrane Science and Technology*, 10(2), 653–678. <https://doi.org/10.15379/ijmst.v10i2.1304>
- Wakiluzzaman, S. M. (2025). The impact of agricultural science studies on family farming and the need for compulsory inclusion in higher secondary education in Bangladesh. *International Journal of Research and Innovation in Social Science (IJRISS)*, 9(03), 1690–1695. <https://doi.org/10.47772/IJRISS.2025.903SEDU0129>
- Yan, Y., & Adrian, T. (2025). Project-based learning of agricultural practices based on constructivism at international schools in China. *The Journal of Education Insights*, 3. <https://doi.org/10.37155/2972-4856-jei0304-13>
- Zahid, A., & Nawab, A. (2025). Teaching strategies influencing learning strategies: Exploration of teaching and learning practices in a higher education context in Pakistan. *Social Sciences & Humanities Open*, 11, 101442. <https://doi.org/10.1016/j.ssaho.2025.101442>
- Zhang, H., Yang, J., & Liu, Z. (2024). Effect of teachers' teaching strategies on students' learning engagement: Moderated mediation model. *Frontiers in Psychology*, 15, 1475048. <https://doi.org/10.3389/fpsyg.2024.1475048>