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Analysis of Learning Competencies of Bachelor of Technical Vocational Teacher Education (BTVTEd) Students Major in Electronics Technology

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Abstract:
This study analyzed the learning experience of the Bachelor of Technical-Vocational Teacher Education (BTVTEd) ELX students along with their specialization courses in Camarines Sur Polytechnic Colleges (CSPC). This study aimed to determine the level of learning competency and determine the challenges they encounter affecting the teaching-learning process in their specialized courses. This study utilized a descriptive method of research and purposive sampling to gather data from the respondents. A developed and validated survey questionnaire was used to gather the data, and a weighted mean was employed to analyze and determine the level of competency and factors affecting students' competency along in the specialized courses. Two groups of participants were involved: 5 technical experts for survey validation and 58 incoming 3rd-year BTVTED ELX students for the level of competency and experience assessment. The study revealed that the students rated an overall rating of 2.80 with a verbal interpretation of Competent along Electronics Technology Program in the following qualifications: Electronic Products Assembly and Servicing, Computer Systems Servicing, Instrumentation and Control Servicing, Mechatronics Servicing, and Broadband Installation. This means that they are Competent with the prescribed competencies per CMO 79 s. 2017. Also, with the teaching-learning process they experienced in their specialized courses which got an overall weighted mean of 2.93 which means Agree along with the Academic Challenges, Instructional, Institutional and Personal Barriers which affects in the acquisition of the necessary knowledge, skills and attitudes for Electronics Technology program. It can also be gleaned from the result that generally the Core Competencies of the different specializations got lower ratings compared with the Basic Competencies suggesting that there is really a need to enhance the current delivery of the program to achieve high level of competency. The mechatronics servicing got the lowest result out of the qualifications which the researcher suggests a training for the ELX instructors to address this concern thus, the researcher also recommends reinforcing various factors affecting the quality of education to achieve Highly Competent results and along with its vision of providing the best polytechnic education to its students by continuously creating opportunities such as professional and skills development for the electronics instructors, revisiting of the curriculum, upgrading of the facilities to achieve the necessary skills stipulated in the BTVTED Electronics Technology program.

Keywords: BTVTED, Camarines Sur Polytechnic Colleges, Electronics Technology, Specialized Courses, Technical Vocational Education

INTRODUCTION

The Bachelor of Technical Vocational Teacher Education (BTVTEd) program aims to develop highly competent and motivated teachers in their area of specialization, technical and vocational education (CMO 79, 2017). These pre-service teachers are expected to be educators in the TLE and TVL tracks for junior and senior high school. Also, as TVET trainers/assessors and college instructors who must possess the necessary knowledge, skills, attitudes, and values in technical vocational education.

The Electronics Technology (ELX) program as per (CMO 79, 2017) focuses on the knowledge, skills and attitudes aligned with the Training Regulation (TR) set by the Technical Education Skills Development Authority (TESDA) for Electronics Products Assembly and Servicing (EPAS) NC II such as assembling electronic products, servicing consumer electronic products and systems and servicing industrial electronic modules, products and systems. Aside from that, this area of specialization covers the Computer System Servicing, Instrumentation and Control Servicing, Mechatronics Servicing and Broad Band Servicing. Which are integrated in the different specialized subjects offered for this program.

Aside from the professional education and experiential learning courses that the students are required to complete in the BTVTEd program, the specialized course in their chosen area of specialization is an integral part of the acquisition of practical skills concerning the competency standards, which provides them with a hands-on/practical learning experience through laboratory activities and industry immersion. In this 21st century time it is necessary to ensure that the students must be provided with the competencies required in their field of specialization in accordance with the TESDA Training Regulations, CHED Memorandum Orders and Industry Requirements for the benefit of the students, stakeholders and to our global landscape.

The Bachelor of Technical Vocational Teacher Education is one of the programs being offered in the Camarines Sur Polytechnic Colleges under the College of Technological and Developmental Education. This program comprises of different courses from professional education to specialized courses for which the students are being honed to become educators and technical experts in the field of technical vocational education.

OBJECTIVES OF THE STUDY

This study aimed to determine the acquired learning competencies of BTVTEd major in Electronics Technology students. Specifically, it sought to answer the following questions:

1. What is the level of learning competencies among BTVTEd students specializing in Electronics Technology?
2. What are the perceived challenges and barriers faced by BTVTEd students in acquiring and mastering the learning competencies in Electronics Technology?
3. What strategies and interventions can be implemented to enhance the acquisition and mastery of learning competencies among BTVTEd students specializing in Electronics Technology?

SCOPE AND LIMITATION

The over-all goal of this study assessed the learning competencies of the BTVTED major in Electronics Technology students in their specialization courses across the Electronic Products Assembly and

Servicing, Computer System Servicing, Instrumentation and Control Servicing, Mechatronics Servicing and Broad Band Servicing as stipulated in the CMO 79 s. 2017. The study determined the challenges encountered by the BTVTED ELX students along with their learning experience and introduce possible interventions to address the challenges encountered by the students to enhance the delivery of the teaching learning process. The study was conducted in Camarines Sur Polytechnic Colleges particularly in the College of Technological and Developmental Education. The respondents of this research were the incoming 3rd year BTVTEd ELX students. Other year levels of the BTVTEd-ELX students were not covered in this study.

REVIEW OF LITERATURE AND RELATED STUDIES

In 21st century which is also called information society period countries' development level and competitive power are measured by "raising a human, capacity of producing science, technology and innovation" rather than population, economic power and manpower (Günay D et al., 2016). It is important to ensure that students nowadays must be equipped with the necessary competencies in this 21st century time to contribute to the high demands of the labor workforce.

A training needs analysis is a process that determines which type of training an employee needs to thrive in their role, fill a knowledge/skill gap, or develop their learning to improve their job performance. Typically, the analysis focuses on specific training content that needs to be completed within a certain time period, instead of focusing on an employees' long-term training plan. (How to Conduct a Training Needs Analysis in 8 Simple Steps, 2022). The conduct of training needs analysis will determine the possible training needs or gaps by the students which will be addressed in enhancing the teaching learning process. The organization should monitor the customer perception, in this case the level of expectation in which student's needs and expectations have been fulfilled. The organization shall determine the method for obtaining, monitoring and reviewing information. Students will be satisfied with the teacher if they are able to acquire new knowledge, new concepts, comprehend new problems well as new managerial experiences are obtained (L. Rueda et al., 2017). These are some of the factors which contributes to the learning experience and needs to be addressed so that effective and efficient learning experience will be given to the students specially in the field of technical vocational education.

A study on CAD proficiency among Technical Drafting trainers at Libon Agro-Industrial High School identified competency gaps using a mixed-methods approach. Findings showed intermediate proficiency in technical, design, and teaching skills, but weaknesses in software proficiency, soft skills, and advanced CAD functionalities, particularly 3D modeling. Challenges included outdated resources, limited training opportunities, and weak industry collaboration. The study recommends workshops, improved resource allocation, industry partnerships, and curriculum updates to align training with industry needs and enhance CAD instruction (Bermundo, 2025). The study mentioned was similar with the present undertaking with the difference of the scope of specialization which is electronics technology students.

Empirical research indicates that the teacher-student relationship has an independent influence on students' successful learning, when controlling for personal characteristics. Komarraju, Musulkin, and Bhattacharya's (2010) study found that establishing some sort of connection or connectedness (comprising factors such as mutual respect, fairness, safety, etc.) are important features of a positive relationship between the mentor and mentee (Salm et al., 2016). This factor contributes to the successful delivery of teaching learning process specially in the transfer of the necessary knowledge, skills, and attitudes to the students.

Vocational education realizes the aim to strengthen education to become professional and improve economic and social development so that the increase in employment rates of vocational education graduates does not run optimally (Xiao, 2009). Since technical vocational education is anchored in the industry revolution, it is a must that education institutions must adapt to the various developments technically to produce competent individuals that will be at par with the demands of the industry.

A study on developing instructional materials for electronics technology education demonstrated their effectiveness in enhancing skill transfer and practical learning. Using descriptive and experimental methods, the research focused on assembling, servicing consumer electronics, and industrial electronic modules. Pre-test and post-test results showed significant improvement in learners' performance compared to traditional methods. The study recommends integrating instructional materials into electronic servicing courses and suggests further research on digital simulations to enhance skills training (Oliva, 2025). Availability of teaching learning resources is one of the challenges faced in the field of vocational education which affects the quality of education and with the transfer of skills for the students and teachers. A phenomenological study on BTVTED Fish Processing students at CSPC-Nabua found online learning challenging due to limited resources, poor internet, and reduced engagement. Despite difficulties, students adapted through time management and self-motivation. Benefits included flexibility and lower costs. The study recommends interactive teaching and better resources to improve online learning (Badong, 2025). This is also one of the objectives of the study to determine factors that affect the attainment of the necessary learning competencies of the BTVTEd Electronics Students.

SIGNIFICANCE OF THE STUDY

The study on the analysis of the learning competencies of BTVTEd students specializing in Electronics Technology holds substantial significance for several stakeholders in the educational and vocational institutions.

The findings of the study would be beneficial not only to the respondents, but it will also be helpful to the following significant groups:

1. **Educational Institutions.** The findings of this study will aid universities and colleges, technical vocational institutions offering BTVTEd programs in evaluating and enhancing their curriculum. By identifying strengths and gaps in the current learning competencies, institutions can make data-driven decisions to enhance course content, teaching methodologies, and assessment strategies. This ensures that the education provided aligns with industry standards and meets the evolving needs of the electronics technology field.
2. **Students.** The study highlights the essential competencies required to excel in the field of electronics technology. It offers a clear understanding of the skills and knowledge they need to acquire during their studies, enabling them to focus their efforts more effectively. Moreover, the study provides feedback on their current competency levels, helping them to identify areas for improvement and prepare better for their future careers.
3. **Educators and Instructors.** This study serves as a valuable resource for educators and instructors by providing a detailed analysis of the learning competencies of their students. It helps them to tailor their instructional approaches to better meet the needs of their students, ensuring more effective teaching and learning experiences. Additionally, the study can provide professional development programs for educators, emphasizing areas where they can enhance their teaching practices.

4. **Industry and Employers.** Employers in the electronics technology sector benefit from this study as it provides a benchmark for the skills and knowledge that graduates should possess. It helps in aligning educational outcomes with industry expectations, ensuring that graduates are job-ready and capable of meeting the demands of the workplace. This alignment can lead to more effective hiring practices and better integration of new employees into the workforce.
5. **Future Researcher.** The study also contributes to the academic community by providing a foundation for future research in the field of technical vocational education. It opens avenues for further studies on competency development, curriculum effectiveness, and educational outcomes in various technical disciplines. Researchers can build on the findings to explore new methodologies, pedagogical approaches, and tools to enhance vocational education.

DEFINITION OF TERMS

The following terms were defined conceptually and or operationally to help the readers easily understand the study.

BTVTEd. Bachelor of Technical-Vocational Teacher Education. Is an undergraduate teacher education program that equips learners with adequate and relevant competencies in teaching specific areas in Industrial Arts or Home Economics or ICT or Agri-Fishery – the four areas of technical and vocational track in the K to 12 curricula. This served as the focus of the study.

CMO. CHED Memorandum Order. It is an official directive issued by CHED that outlines specific guidelines, policies, standards, and regulations that higher education institutions (HEIs) in the Philippines must follow. It cover various aspects of higher education, including curriculum development, program standards, accreditation, quality assurance, and administrative procedures.

COMPETENCY. A competency is any observable and/or measurable knowledge, skill, ability or behaviour that contributes to successful job performance. The study will determine the level of competency among BTVTEd ELX students along with their specialized courses.

ELX. Electronics Technology. One of the specializations offered in the BTVTEd program which focuses on the development of the knowledge, skills, and attitudes of an Electronic Products Technician. This group of students served as the respondents of the study.

SPECIALIZATION. Field of concentration where the students will focus based on their interest.

METHODOLOGY

Research Method

A descriptive research design was utilized in this study. The study likewise employed a purposive sampling technique. The main objective of purposive sampling is to produce a sample that can be logically assumed to be representative of the population ("Purposive Sample," 2008). Problems 1 and 2 were answered using a developed and validated survey questionnaire through a 4-point Likert Scale to gather data on the students' level of competency in the following areas: Electronic Products Assembly and Servicing, Computer Systems Servicing, Instrumentation and Control Servicing, Mechatronics Servicing, and Broadband Installation and learning experience in terms of: Academic Challenges , Instructional Barriers, Institutional Barriers, and Personal Barriers in their specialized courses.

This research utilized mixed methods of quantitative and qualitative research. For the quantitative methods, survey through questionnaires was used in gathering data and weighted mean was employed in determining the significant result of responses of the respondents. For the qualitative part, open ended

questions were used to further strengthen the results of the data gathered by the survey questionnaire. Research ethics were strictly observed during the study.

Respondents/Participants of the Study

Two sets of respondents/participants of this study were considered. The first group was the technical experts who validated the survey questionnaire to ensure that the instrument is aligned with the overall objectives of the study. A total of 5 experts from the CSPC- College of Technological and Developmental Education validated the survey instrument. Two experts are handling BTVTEd-ELX specialized courses. Another two experts who are core faculty of the BTVTEd program and One expert who is an English/Language expert.

The second group of respondents/participants were the incoming 3rd year of the Bachelor of Technical Vocational Teacher Education major in Electronics Technology composed of 58 students who served as the main subject of the study to determine and analyze their acquired learning competencies as well as their learning experiences and challenges.

Instrument

The instrument used was developed by the researcher to answer the research objectives. Said instrument was validated by the technical experts using the validation tool developed by P.M Veroy RN, MAN. A 4-scale Likert scale will be used: 1, "not yet competent to 4, "highly competent" to answer problem number 1, and for problem number 2, 1, "strongly disagree to 4, "strongly agree" and it will be interpreted as shown in the table below.

Point	Scale Range	Interpretation
4	3.50-4.00	Highly Competent/ Strongly Agree
3	2.50-3.49	Competent/ Agree
2	1.50-2.49	Slightly Competent/ Disagree
1	1.00-1.49	Not Yet Competent/ Strongly Disagree

Table 1. Four-Point Likert Scale Range Interpretation

Data Collection Procedure

The researcher sought permission to distribute the questionnaires to the respondents/participants. The researcher used electronic/digital platforms such as Google Forms due to the limitations such as the academic break for the students since its already the end of the semester during the time of conduct of this study.

Before administering the survey questionnaire, proper orientation was given to explain the nature and importance of the study to the participants through virtual orientation. The researcher ensured their answers were treated with the utmost respect and confidentiality under the Data Privacy Act. The survey questionnaire was not timed, but the respondents/participants were asked to answer honestly based on their experience.

Parameters	Frequency								∑fX	$\overline{X}$	Descriptive Interpretation
	4		3		2		1				
	f	fx	f	fx	f	fx	f	fx			
Electronic Products Assembly and Servicing 1.I can apply safety rules and procedures in Electronics.	24	**96**	28	**84**	5	**10**	1	**1**	**191**	**3.29**	**Competent**
2.I can prepare and check required materials, tools and equipment.	27	**108**	25	**75**	5	**10**	1	1	**189**	**3.25**	**Competent**
3.I can perform assembly procedures of electronic products.	9	**36**	35	**105**	14	**28**			**169**	**2.91**	**Competent**
4.I can maintain/repair consumer electronic products and systems.	7	**28**	32	**96**	18	**36**	1	**1**	**161**	**2.77**	**Competent**
5.I can maintain/repair industrial electronic products and systems.	5	**20**	33	**99**	20	**40**	2	**2**	**161**	**2.77**	**Competent**
Average										**2.99**	**Competent**

The data was collected once the respondents/participants completed the questionnaire. Each submitted questionnaire was checked to ensure that all the items were answered. The data was tallied, and the results were analyzed and interpreted.

Data Analysis

The data was analyzed using statistical tools. The quantitative analysis included the presentation of the descriptive statistical data. The weighted mean was used to analyze the survey questionnaire results. Through the result, the students' level of competencies as well as the challenges and barriers they've encountered were identified based on their answers from the different parameters, and likewise, the strategies and interventions were also formulated from the data gathered. The data was supported by statistical tools such as Microsoft Excel in analyzing and interpreting the results.

Research Protocol

An informed consent form was given to the respondents before data gathering. The consent form ensures agreement between the researcher and the respondents. Important provisions of the Data Privacy Act were included to safeguard the confidentiality of the data gathered among the respondents of this study.

Results and Discussion

1. Level of learning competencies among BTVTEd students specializing in Electronics Technology

Table 2. Level of Learning Competency along Electronic Products Assembly and Servicing

Parameters	Frequency								∑fX	$\overline{X}$	Descriptive Interpretation
	4		3		2		1				
	f	fx	f	fx	f	fx	f	fx			
Computer Systems Servicing 1. I can use appropriate personal protective equipment and follows OH & S policies and procedures.	22	**88**	28	**84**	5	**10**	3	**3**	**185**	**3.18**	**Competent**
2. I can obtain tools, equipment and testing devices needed to carry out the installation work in accordance with established procedures and check for correct operation and safety.	14	**56**	31	**93**	12	**24**	1	1	**174**	**3**	**Competent**
3. I can set up computer networks.	8	**32**	23	**69**	24	**48**	3	**3**	**152**	**2.62**	**Competent**
4. I can perform testing of network through file and printer sharing documentation and pre-deployment procedures.	3	**12**	33	**99**	19	**38**	3	**3**	**152**	**2.62**	**Competent**
5. I can diagnose faults or problems in the computer systems and networks according to requirements and in line with the standard procedures.	4	**16**	21	**63**	30	**60**	3	**3**	**142**	**2.44**	**Slightly Competent**
								Average		**2.77**	**Competent**

Electronic Products Assembly and Servicing focuses on assembling electronic products, preparing printed circuit boards (PCB) modules and installing and servicing consumer and industrial electronic products and systems. Table 2 shows that in Electronic Products Assembly and Servicing, there's a good grasp of safety rules 3.29 and preparation of materials 3.25, indicating strong readiness. Assembly procedures score 2.91, showing decent proficiency. Maintenance and repair for both consumer and industrial electronics are at 2.77, reflecting competency. Overall, with a weighted mean of 2.99, there's solid preparation for roles in electronic product servicing and assembly, pointing out areas to improve such as continuous improvement and adapt to new technologies and industry needs to achieve high competency in this area.

Table 3. Level of Learning Competency along Computer Systems Servicing

Parameters	Frequency								∑fX	$\overline{X}$	Descriptive Interpretation
	4		3		2		1				
	f	fx	f	fx	f	fx	f	fx			
Instrumentation and Control Servicing 1.I can plan and prepare for configuration work according to job requirements and identify the Instrumentation & Control servicing devices for configuration.	5	**20**	28	**84**	24	**48**	1	**1**	**153**	**2.63**	**Competent**
2.I can demonstrate knowledge on instrumentation & control principles and installation	4	**16**	33	**99**	20	**40**	1	**1**	**156**	**2.68**	**Competent**
3.I can install and check Instrumentation & Control servicing device according to job requirements, follow Instrumentation standards, and use PPE according to OH&S requirements.	7	**28**	35	**105**	16	**32**			**165**	**2.84**	**Competent**
4.I can calibrate and check the Instrumentation & Control servicing devices according to standard procedures, follow Instrumentation standards, and use PPE according to OH&S requirements.	6	**24**	34	**102**	17	**34**	1	**1**	**161**	**2.77**	**Competent**
5.I can configure and check the Instrumentation & Control servicing devices according to standard procedures, follow Instrumentation standards, and use PPE according to OH&S requirements	5	**20**	34	**102**	19	**38**			**160**	**2.75**	**Competent**
								Average		**2.73**	**Competent**

Computer Systems Servicing focuses on installing and configuring computer systems, set-up computer networks and servers and maintaining and repairing computer systems and networks. As shown in Table

3 reveals competency across various skill areas: achieving weighted means of 3.18 for using personal protective equipment and following OH&S policies, and 3.0 for obtaining and checking tools and equipment, indicating strong adherence to safety and procedural standards. Setting up computer networks and testing through file and printer sharing documentation both scored 2.62, reflecting proficiency in network setup and initial testing procedures. Diagnosis of faults in computer systems and networks achieved a weighted mean of 2.44, indicating some competency but with room for improvement. The overall weighted mean of 2.77 suggests a competent level overall, highlighting readiness in computer systems servicing tasks, with opportunities identified for further skill enhancement, particularly in fault diagnosis and advanced network troubleshooting.

Table 4. Level of Learning Competency along Instrumentation and Control Servicing

Parameters	**Frequency**								∑fX	$\overline{X}$	Descriptive Interpretation
	4		**3**		**2**		**1**				
	F	fx	f	fx	f	fx	f	fx			
Mechatronics Servicing 1. I can pre-test components and devices in accordance to product specifications.	7	**28**	35	**105**	13	**26**	3	**3**	**162**	**2.79**	**Competent**
2. I can install and test mechatronics and automation devices in accordance with manufacturer's instructions, requirements, and without damage to the surrounding place or environment.	7	**28**	22	**66**	25	**50**	4	**4**	**148**	**2.55**	**Competent**
3. I can prepare documentation (as built) on installation and testing of equipment in accordance with the company requirements.	3	**12**	32	**96**	20	**40**	3	**3**	**151**	**2.60**	**Competent**
4. I can check mechatronics and automation devices for configuration & testing to conform to the specifications and requirements	5	**20**	27	**81**	22	**44**	4	**4**	**149**	**2.56**	**Competent**
5. I can inspect and test the configured mechatronics and automation system	9	**36**	24	**72**	22	**44**	3	**3**	**155**	**2.67**	**Competent**
Average										**2.63**	**Competent**

Instrumentation and Control Servicing focuses on installing, calibrating, and configuring various instrumentation & control devices and systems, as well as microcomputer hardware, operating systems, common user applications, network systems, and various common peripherals in a manufacturing or processing environment. From the Table 4, indicates competency across key areas: planning and preparing for configuration work scored 2.63, demonstrating readiness in job preparation and device identification. Knowledge of instrumentation principles and installation achieved 2.68, indicating solid understanding and application of theoretical concepts. Installation and checking of devices scored 2.84, reflecting proficiency in adhering to standards and safety protocols. Calibration and checking of devices scored 2.77, showing capability in precise calibration according to standard procedures. Configuration of devices achieved 2.75, highlighting competence in configuring devices to meet operational standards. With an overall weighted mean of 2.73, the competency level is deemed competent overall, with areas identified for further enhancement in technical skills and procedural adherence in Instrumentation and Control Servicing roles.

Table 5. Level of Learning Competency along Mechatronics Servicing

Parameters	Frequency								∑fX	$\overline{X}$	Descriptive Interpretation
	4		3		2		1				
	F	fx	f	fx	f	fx	f	fx			
Broadband Installation 1. I can prepare necessary tools, equipment, materials and PPE in line with job requirements.	24	**96**	29	**87**	4	**8**	1	**1**	**192**	**3.31**	**Competent**
2. I can set up cable installation equipment.	11	**44**	30	**90**	16	**32**	1	**1**	**167**	**2.87**	**Competent**
3. I can test cable for continuity as per requirements.	9	**36**	30	**90**	17	**34**	2	**2**	**162**	**2.79**	**Competent**
4. I can install and configure customer premise equipment.	5	**20**	31	**93**	19	**38**	3	**3**	**154**	**2.65**	**Competent**
5. I can conduct effective and efficient customer interactions.	15	**60**	30	**90**	11	**22**	2	**2**	**174**	**3**	**Competent**
								Average		**2.92**	**Competent**

Mechatronics Servicing focuses on installing, configuring and test mechatronics and automation devices/system. As shown in Table 5, competency levels are evaluated across several key areas: pre-testing components 2.79, installation and testing of devices 2.55, preparation of documentation 2.60, checking configuration and testing 2.56, and inspecting configured systems 2.67. These scores collectively indicate a competent level of proficiency in servicing mechatronics and automation systems, with strengths in pre-testing and documentation preparation. Areas for potential improvement include ensuring thorough adherence to installation instructions and enhancing precision in device configuration and testing, aiming to further optimize operational compliance and efficiency in mechatronics servicing roles.

Table 6. Level of Learning Competency along Broadband Installation

Competency	$\bar{X}$	Descriptive Interpretation
Electronic Products Assembly and Servicing	2.99	**Competent**
Computer Systems Servicing	2.77	**Competent**
Instrumentation and Control Servicing	2.73	**Competent**
Mechatronics Servicing	2.63	**Competent**
Broadband Installation	2.92	**Competent**
Average	2.80	**Competent**

Broadband Installation focuses on installing mast and accessories, lay out and install CAT5e cables and configure CPE as well as to render service excellence to customers. As shown in Table 6 shows competency levels across key areas include: preparation of tools, equipment, materials, and PPE 3.31, indicating strong readiness in resource management. Setting up cable installation equipment scored 2.87, demonstrating proficiency in equipment setup. Testing cables for continuity achieved 2.79, highlighting capability in ensuring connectivity standards. Installation and configuration of customer premise equipment scored 2.65, indicating competence in setup and integration tasks. Effective customer interactions scored 3.0, reflecting adept communication skills. With an overall weighted mean of 2.92, competency in broadband installation is established, emphasizing preparedness in technical execution and customer service, while suggesting opportunities for further refinement in installation techniques and customer engagement strategies.

Table 7. Summary of Level of Learning for Electronics Technology

Parameters	Frequency								∑fX	$\bar{X}$	Descriptive Interpretation
	4		3		2		1				
	F	fx	f	fx	f	fx	f	fx			
Academic Challenges 1.Theoretical concepts in Electronics Technology are difficult to understand.	7	**28**	27	**81**	20	**40**	4	**4**	**153**	**2.63**	**Agree**
2.Practical applications (labs, hands-on activities) in Electronics Technology are challenging.	11	**44**	33	**99**	12	**24**	2	**2**	**169**	**2.91**	**Agree**
3.The learning materials provided (modules, online resources, etc.) are adequate for my studies	10	**40**	36	**108**	11	**22**	1	**1**	**171**	**2.94**	**Agree**

Average	**2.82**	**Agree**

Based on the result th overall weighted mean of 2.80 as shown in Table 7, with a descriptive interpretation of Competent, indicates that students in BVTED Electronics Technology program possess the necessary skills to perform their tasks effectively. However, there are consistent needs for improvement across all areas to move from basic competence to higher levels of competency. Which is one of the objectives of this degree program as stipulated in the CMO 79 s. 2017 that this program is intended to develop & enhance the knowledge, skills & attitudes of an Electronic Products Technician in accordance with the industry standards. Interventions must be done in order to properly address the needs in improving the competency level of the BTVTEd-ELX students particularly in acquiring the necessary knowledge, skills and attitudes along with their specialized courses.

Perceived challenges and barriers faced by BTVTEd students in acquiring and mastering the learning competencies in Electronics Technology.

Table 8. Perceived experiences along Academic Challenges

Parameters	**Frequency**								∑fX	$\overline{X}$	Descriptive Interpretation
	4		**3**		**2**		**1**				
	F	fx	f	fx	f	fx	f	fx			
Instructional Barriers 1.Instructors effectively explain complex concepts in Electronics Technology.	21	**84**	31	**93**	4	**8**	2	**2**	**187**	**3.22**	**Agree**
2.I receive enough practical, hand-on training in my courses.	11	**44**	37	**111**	10	**20**			**175**	**3.01**	**Agree**
3.Instructors are accessible for additional help outside of class hours.	14	**56**	32	**96**	12	**24**			**176**	**3.03**	**Agree**
								Average		**3.08**	**Agree**

Table 8 shows the academic challenges in Electronics Technology which highlights several areas of concern based on the data provided. Understanding theoretical concepts received a weighted mean of 2.63, indicating agreement that these concepts pose difficulties for students. Practical applications, such as labs and hands-on activities, scored notably higher at 2.91, suggesting widespread agreement on the challenges faced in applying theoretical knowledge to practical settings. However, there is consensus that the learning materials provided, including modules and online resources, are generally adequate for studies, with a weighted mean of 2.94. Overall, the total weighted mean of 2.82 reflects a collective agreement on these challenges in Electronics Technology education, underscoring the need for targeted support and resources to enhance comprehension and application skills among students.

Table 9. Perceived experiences along Instructional Barriers

Parameters	Frequency								∑fX	$\overline{X}$	Descriptive Interpretation
	4		3		2		1				
	F	fx	f	fx	f	fx	f	fx			
Institutional Barriers 1. Lab equipment and tools necessary for my courses are readily available.	12	**48**	32	**96**	14	**28**			**172**	**2.96**	**Agree**
2. The laboratory facilities are sufficient to meet the needs of my practical sessions.	14	**56**	34	**102**	10	**20**			**178**	**3.06**	**Agree**
3.Financial Challenges (e.g., purchasing materials, transportation) impact my ability to fully participate in the program.	12	**48**	29	**87**	15	**30**	2	**2**	**167**	**2.87**	**Agree**
								Average		**2.96**	**Agree**

As shown in Table 9, instructional barriers in Electronics Technology indicate positive perceptions overall. Instructors are perceived to effectively explain complex concepts, receiving a weighted mean of 3.22. There is also agreement that students receive sufficient practical, hands-on training, with a weighted mean of 3.01. Additionally, instructors are accessible for additional help outside of class hours, scoring 3.03. The total weighted mean of 3.08 reflects general agreement that instructional support and accessibility are satisfactory in Electronics Technology courses. These findings suggest that while there are challenges in understanding theoretical concepts and practical applications, the instructional support and resources provided play a crucial role in supporting student learning and comprehension in the field.

Table 10. Perceived experiences along Institutional Barriers

Parameters	Frequency								∑fX	$\overline{X}$	Descriptive Interpretation
	4		3		2		1				
	F	fx	f	fx	f	fx	f	fx			
Personal Barriers 1. I feel confident in my ability to master the competencies required in Electronics Technology.	6	**24**	40	**120**	11	**22**	1	**1**	**167**	**2.87**	**Agree**

2. I have sufficient time to study and practice outside scheduled class hours.	9	**36**	32	**96**	16	**32**	1	**1**	**165**	**2.84**	**Agree**
3. Personal challenges (e.g., family responsibilities, health issues) affect my learning.	10	**40**	34	**102**	12	**24**	2	**2**	**168**	**2.89**	**Agree**
									Average	**2.86**	**Agree**

Based on the data provided in Table 10, institutional barriers in Electronics Technology reveal several key insights. Students generally agree that lab equipment and necessary tools for courses are readily available, with a weighted mean of 2.96. Additionally, the adequacy of laboratory facilities to meet practical session needs scores 3.06, indicating satisfaction with the facilities provided. However, financial challenges, such as purchasing materials and transportation costs, impact program participation, receiving a weighted mean of 2.87. The total weighted mean of 2.96 suggests overall agreement on these institutional barriers affecting student engagement and participation in Electronics Technology programs. Addressing financial challenges while maintaining and potentially enhancing equipment availability and facility sufficiency could further support student success and satisfaction in the program

Table 11. Perceived experiences along Personal Barriers

Plan of Action	Description	Timeline	Needed Resources	Responsible Person	Possible Means of Verification
Enhanced Practical Training in Specialized Course	Curriculum review to Increase hands-on laboratory sessions, projects, and use of industry-standard equipment.	As per scheduled	Laboratory Supplies, Administrative support from CSPC,	Supply Officer, VPAA, College Dean, Faculty, Lab-in charge, Students	Attach training/curriculum design, attendance sheets and results of training evaluation, Learning Management System
Interactive Learning Methods and Technology Integration	Utilize interactive simulations, multimedia resources, and group-based learning activities. Incorporate technology enhanced learning tools and online resources into the curriculum	As per scheduled	Computers, Simulation Softwares, Stable Internet Connection, Technical Support from MICT, Administrative support from CSPC,	MICT Personnel, Supply Office, VPAA College Dean, Faculty, Students	Attach training/curriculum design, attendance sheets and results of training evaluation, outputs

Personalized Support Services	Offer academic advising, tutoring, mentoring, and counseling services tailored to students' needs.	As per scheduled	Technical Support/ Intervention from the College/Unit, Administrative support from CSPC,	VPAA, OSAS, College Dean, Faculty, Students	Attach training/activity design, attendance sheets and results of training evaluation, outputs
Continuous Assessment, Monitoring and Feedback	Implement regular assessments, feedback mechanisms, and self-assessment tools.	As per scheduled	Technical Support/ Intervention from the College/Unit, Administrative support from CSPC,	VPAA, College Dean, Faculty, Students	Attach training and evaluation design, attendance sheets and results of training evaluation, outputs
Professional Development for Instructors	Provide enhancement training workshops, seminars, and mentorship opportunities for instructors.	As per scheduled	Technical Support/ Intervention from the College/Unit, Administrative support from CSPC,	VPAA, HRMDO, College Dean, Faculty, Students	Attach training design, attendance sheets and results of training evaluation, outputs
Career Preparation and Industry Partnerships	Facilitate internships, work-based education programs, and industry partnerships.	As per scheduled	Technical Support/ Intervention from the College/Unit, Administrative support from CSPC,	VPAA, College Dean, Faculty, Students	MOA, Attach training design, attendance sheets and results of training evaluation, outputs

As seen in the Table 11, personal barriers in Electronics Technology indicate several common challenges. Students generally agree on their confidence in mastering competencies required for the field, with a weighted mean of 2.87. There is also agreement that they have sufficient time for study and practice outside of scheduled class hours, scoring 2.84. However, personal challenges such as family responsibilities and health issues impact learning, receiving a weighted mean of 2.89. The total weighted mean of 2.86 reflects overall agreement on these personal barriers affecting student engagement and learning experiences in Electronics Technology. These insights underscore the importance of supportive measures and flexible learning opportunities to address personal challenges and enhance student success in the program.

Strategies and intervention to enhance the acquisition and mastery of learning competencies among BTVTEd students specializing in Electronics Technology

CONCLUSION

In conclusion, BTVTEd students specializing in Electronics Technology are generally competent with their technical knowledge and skills but face various challenges that needs to be addressed through different strategies and interventions. The data also revealed that generally, the core competencies got lower results compared with the basic competencies suggests that there are areas for improvements such as improving resource allocation, expanding support services, review and enhancing the curriculum, and supporting continuous professional development for instructors, where the overall learning experience and competency levels of students can significantly be enhanced to acquire the necessary competencies needed for the BTVTEd Electronics Technology program.

RECOMMENDATIONS

Based on the conclusions drawn from the data, the following recommendations are proposed to enhance the level of the learning competencies among BTVTEd students specializing in Electronics Technology:

1. **Upgrading Lab Facilities and Equipment:** Invest in modern tools, materials, and equipment to provide students with better hands-on learning experiences. Also, Increase the number of laboratory sessions to give students more opportunities for practical application.
2. **Enhance Academic Support:** Curriculum review and enhancement must be done to ensure the effectiveness and efficiency of the BTVEd program. Implement interactive learning methods such as simulations and virtual labs to make theoretical concepts more understandable. Another is to offer tutoring and mentoring programs to support students facing academic challenges.
3. **Address Institutional Barriers:** Ensure adequate resources are available for laboratory facilities and equipment. And simplify administrative processes to improve access to necessary resources such specially in the procurement process.
4. **Expand Personal Support Services:** Provide counseling and wellness programs or activities to help students manage personal challenges. And offer flexible class schedules to accommodate students' personal commitments.
5. **Provide Professional Development for Instructors:** Offer regular training workshops and seminars to help instructors improve their teaching methods and technical knowledge. Also encourage collaboration with industry experts to bring real-world insights into the classroom.
6. **Implement Continuous Assessment and Feedback:** Use regular assessments to provide students with feedback on their progress. Another is to conduct course evaluations to gather student feedback and make necessary improvements.

As a polytechnic education institution, quality polytechnic education as its best is one of the most important mandates to be given to its stakeholders specially for the students in the Bicol region and beyond. The proposed measures to enhance the BTVTED ELX program must be adopted and evaluated periodically. Students and faculty development program should be developed and implemented so that knowledge, skills and attitudes of faculty and students are enhanced. Future study must follow-up the proposed interventions to enhance the competency level of the students.

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