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Evaluation of Technical-Vocational Teacher Education Program towards an Academe-and Industry-responsive Curriculum

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Abstract: Technical-vocational teachers should adhere to the demands of the academe and the industry. The alignment of the technical and pedagogical skills to the standards set for teaching and working in the industry is necessary for graduates to thrive in the profession. Thus, this study focused on assessing the technical-vocational teacher education program using the lenses of graduates and their respective supervisors in the academe and industry. The study utilised a quantitative research design. It measured the adequacy of the skills acquired by graduates from the curriculum. The general assessments of the Bachelor of Technical-Vocational Teacher Education (BTVTEd) graduates of the curriculum in terms of pedagogical and technical skills were "very adequate" ($\bar{x}$ = 3.42) and "very useful" ($\bar{x}$ = 3.47). On the other hand, the supervisors assessed the graduates in terms of pedagogical and technical skills as "very adequate" ($\bar{x}$ = 3.40) and "very useful" ($\bar{x}$ = 3.45). Graduates and supervisors both have the same assessment of the program. However, the differences in the values of the mean show a slight variation in their perceptions. Based on the findings and conclusion, it is recommended to synchronize the BTVTEd program with the academe's and industry's expectations and demands; modification or revision of curriculum is needed. Universities and schools should welcome and entertain inputs from expert graduates and authorities in their respective fields of practice. There is also a need for continuous tracking of graduates at least every five years to monitor their acquired skills and professional advancements in their respective fields, which could be used in crafting an ever-evolving curriculum.

Keywords: Tech-voc teacher, tech-voc curriculum, academe-responsive, industry-responsive

1. Introduction

Technical teachers are essential agents of change in society. Their roles underpin developments necessary in the formation of technical workers and the labour force of the country. From the fundamental fields of technology to its complex forms, technical teachers are behind the success of every technician that contributes to nation-building. In its Memorandum Order Number 56 series of 2007, the Commission on Higher Education (CHED, 2007) issued the Policies and Standards for the Bachelor of Technical Teacher Education (BTTE). These rules and guidelines comply with the requirements of RA 7722, the Higher Education Act of 1994. The purpose is to rationalize the country's undergraduate teacher education to keep up with developments in society. Just recently, Republic Act 10533 (2013) imposed the K to 12 Program. Thus, curricula of tertiary education have been adjusted and modified for alignment. The BTTE program was shifted to BTVTEd or the Bachelor of Technical-Vocational Teacher Education under CMO No. 79 series of 2017 (CHED, 2017). The name shift reflects a significant change in the curriculum and the whole approach to the course. Subjects were taken out of the original curriculum, and some subjects were added. However, the revised version is not as well ladderised (CHED, 2007), unlike the old one. A state university under this present study is piloting its Technical Teacher Education

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program. The said program addresses the current needs of the Senior High School - Technical Vocational and Livelihood (TVL) Track of the K to 12 curriculum for technical teachers.

Since the Bachelor of Technical-Vocational Teacher Education (BTVTEd) is a new curriculum, the research locale is continuously reviewing its substance for some modification points in the future. According to the study of Alinea (2013), technical graduates of university lack vital skills needed for an entry-level technician. There is a big gap between the expectations of the industry from technical graduates and their acquired skills. Because of this, additional financial concerns are needed to provide the necessary training and skill acquisition for newly hired industry workers. Radermacher et al. (2014) reported an increasing number of technical students who lack the necessary abilities, knowledge, or skills to perform the tasks that they will end up doing in the field. A lack of these skills and abilities can prevent someone from being productive or being unable to find work.

The skill gap is also an emerging trend worldwide (Cappelli, 2014). In recent years, complaints have been widespread because of the gap between the skill needs of the industry and that of the skills graduates acquired from school. Cappelli (2014) added that interviews with employers who claim that they are unable to fill open positions are prominent in the industry. An extensive amount of independent organizations, individual companies, and business associations have also investigated shortages in skills. During that time, the pool of applicants, most of whom have recently been employed, surpassed the available job opportunities in the market. The evidence behind this unemployment is not where experts in the labour market expect to see it, like rising wages. The data comes from employers who report that they are having difficulty hiring workers. The reason why graduates have difficulty getting jobs is the lack of technical skills that are supposed to be acquired in college years (Bureau of Labor Statistics, 2014).

On the above premise, this research is proposed to investigate several aspects of the curriculum for technical-vocational teacher education. The investigation attempted to discover venues of strengths and need for improvements by evaluating the curriculum using the lenses of the graduates, the industry, and the academe. Moreover, ways and means were also recommended for the possible improvement of the currently existing curriculum to minimise and bridge the gap between the industry's and academe's technical and pedagogical skill requirements and the graduates' acquired skills. Curriculum evaluation is the last step in the cyclical process of curriculum development. However, the inputs that it brings to the cycle of curriculum modifications are substantial. It extracts the results and experiences that take place in the teaching field. Evaluation of the curriculum is the process of measuring and assessing the extent to which the desired results are produced by the formal curriculum and written learning plan. If the implementation is effective, this process is able to help make decisions about how further improvements and progress can be made (UNESCO, 2019).

This research paper primarily aimed to propose an improvement in the curriculum. Therefore, the existing curriculum was evaluated based on the quality of its graduates. Curriculum evaluation (Bilbao et al., 2015) provides students with feedback and is a component of curriculum development that responds to public accountability. The process investigates how teachers within the educational system have reformed or innovated the classroom, the school, district, division, or the whole educational system. With that, a curriculum's merit and worth are established. Merit pertains to the worth and value of the curriculum. The evaluation outcomes will be used only as one piece of assessment evidence. In the end, the purpose of the assessment is to enhance the curriculum. The premise of the curriculum evaluation is the alignment of the intended, implemented, and achieved curricula (Barnett, 2011). It attempted to provide feedbacks if planned and written courses, programs, and activities, as implemented, produce outcomes that are desirable. Also, the results will be the improvements of the school curricula.

The curriculum processes are scrutinised by Tyler (1949), Taba (1962) and others after a series of evaluations. They all agree that plans, designs, and implementations are only useful if they are measured. Curriculum evaluation determines the strengths and weaknesses of an existing curriculum based on the initial implementation plan as well as the intended outcomes (Houston, 2014). This is called the needs assessment. The evaluation can tell if what is being designed or implemented in the curriculum is beneficial to the students. This is related to monitoring and evaluation (Knight, 2001). Curriculum evaluation will decide if the results meet the set standards, and the curriculum is, therefore, a success. This is known as a terminal evaluation (Parker, 2007). Print (1993) stated that curriculum evaluation is needed to ascertain the current needs for policies that will improve learning outcomes. This is the basis of decision-making.

The organisation and quality of the education system depend on the development of teachers, the teaching profession and future educators. On the other hand, technical-vocational courses are oriented to develop competencies and skills among students who will become the highly skilled workers that the industries need. The two complementing concepts on teacher education and technical-vocational courses emerge from the teacher education program for technical-vocational courses. The Commission on Higher Education coined this area as the Bachelor of Technical-Vocational Teacher Education (BTVTEd). The program is contextualised into various areas of specialisation.

CMO No. 79 (CHED, 2017) detailed the principles, standards and guidelines (PSG) for the Bachelor of Technical-Vocational Teacher Education. In order to accomplish its role in the Philippine Teacher Education Framework, the shift to learning competency-based/outcomes-based education was made based on the Guidelines for the Implementation of CMO No. 46 series of 2012. Furthermore, this PSG is founded on the salient features of K to 12 Enhanced Basic Education Curriculum (RA10533), the Philippine Qualifications Framework (EO 83, series of 2012), the National Competency-Based Teacher Standards (NCBTS) now the Philippine Professional Standards for Teachers, and other relevant documents. The core competencies for Bachelor of Technical-Vocational Teacher Education (BTVTEd) graduates are detailed in the CMO regardless of the type of Higher Education Institutions (HEIs). However, there is also room for them to evolve their curriculum in order to have an outcome-based education model, according to the needs of their background, and the typology of HEIs.

Technical skills requirements vary depending on the nature of the field. In this study, three fields of specialisation are the focus. These include civil, electronics, and mechanical technology. The Philippine National Standards on technical skills are laid down on numerous national certifications (NC). The government agency responsible for this is the Technical Education and Skills Development Authority (TESDA). These standards are aligned to the basic to advanced skill requirements of the industry. Therefore, curriculum alignment to the TESDA standards is necessary. The National Certificates that TESDA issues for specific fields involved in this study are detailed in Table 1. Each NC is guided by training regulations promulgated by TESDA as well.

Table 1 - TESDA national certificates

Fields of Specialisation	National Certificates
Civil Technology	Carpentry
	Construction Painting
	Furniture Making (Finishing)
	Masonry
	Pipefitting
	Plumbing
	Technical Drafting
	Tile Setting
Electronics Technology	Audio Production Services
	Broadband Installation (Fixed Wireless Systems)
	Cable TV (CATV) Installation
	Cable TV Operation and Maintenance
	Consumer Electronics Servicing
	Electronics Back-end Operations
	Electronics Front-of-Line (FOL) Operations
	Electronic Products Assembly and Servicing
	Electronics/Semiconductor Production Line Machine Servicing
	Instrumentation and Control Servicing
	Mechatronics
Mechanical Technology	5-Axis CNC Machine Operation
	CAD/CAM Operation
	CNC Electric Discharge Machine (EDM) - Wire Cut Operation
	CNC Lathe Machine Operation
	CNC Milling Machine Operation
	Die Designing
	Electric Discharge Machine (EDM) - Sinking Operation
	Heat Treatment
	Laboratory and Metrology/Calibration Services
	Machining
	Mechanical Drafting
	Tool and Die Making

There are several skills that a pre-service teacher must acquire in teacher education institutions. Since the challenges of 21st-century classrooms are continually changing, these skills are vital in the learners' holistic development. Without the proper and appropriate acquisition of those teaching skills, graduates, who will then be part of the academe, will influence the citizens' quality who will lead the industries in the future. Although some teaching abilities may vary from teacher to teacher, according to Cox (2017), there are still a few significant personal abilities for all teachers to possess. Competent teachers also need to acquire personal skills, in addition to being knowledgeable in the field of expertise and planning and implementing lesson plans. These specialised teaching abilities will help them to be effective and successful teachers. One of the most significant traits a teacher can have is patience. A teacher can have a hard time being efficient without patience. Students, at any age, tend to like testing the patience of their teachers. The quality of patience helps teachers succeed in the classroom. In many ways, successful educators are creative. They can think beyond what is expected, use the resources they need to develop incredible lessons and activities and develop creative ways to deal with discipline in the classroom.

The skillset to communicate and collaborate with others is an essential personal skill to have as an educator. Teachers need this ability, whether communicating with students, parents, or colleagues, to succeed at their job. Teachers need the capacity, as well as understanding different perspectives, to communicate important information. Teachers also need to be able to work with their co-workers in addition to that. Teachers often collaborate as a team to better provide a high-quality education for students. The ability to work in tandem with others will surely assist in the education system. A personality that is engaging and likeable is another personal skill that all teachers should foster. In the classroom, even if the teacher is an introvert, he can still cultivate a likeable personality. This is not a requirement for the teacher to be funny and make the students laugh every chance he gets; it just means that being in the class will only make it more interesting and fun for a teacher who can participate and have a relationship with their students. To discipline the learners, teachers must have self-discipline. Having self-discipline implies that the teacher has the willpower and control to not be affected when the students misbehave. It is very important to be firm and fair with the techniques of the discipline. This is a basic personal feature that teachers must have in their classrooms to succeed. These are just five of the basic and personal skills that educators ought to have. Other characteristics are also at the top of the list of skills that teachers should encourage, such as being able to adapt, having self-awareness, and having a great love for the job.

In addition, effective classroom and behaviour management are critical elements of a highly qualified teacher's repertoire of skills (Flower et al. 2014). Surveys show that new teachers feel that they have insufficient skills to manage a classroom (Mitchell & Arnold, 2004) and that their teacher training programs have not prepared them adequately for behavioural management (Beran, 2005). Since many students with behavioural challenges are now being served in general education classrooms (Brigham et al.; McLeskey et al. (2012); Smith et al. (2010), these unprepared teachers report decreased student learning outcomes associated with poor classroom management, increased stress due to student behaviour problems, low job satisfaction levels and high teacher turnover rates (Brunsting et al. (2014); Oliver & Reschly, 2010). Research shows that teachers who are poor or untrained are more likely to use ineffective management strategies (Kaff et al. 2007). This has consequences for academic teaching: the quality of instructional time is reduced by time spent managing behaviours that are disruptive and distracting. There is, on the other hand, a significant link between strong management skills in the classroom and reductions in disruptive behaviours and improved student engagement (Reinke et al., 2008). Teachers who set clear expectations and manage their classrooms to maximize learning time subsequently demonstrate more significant increases in student achievement (Brophy, 1986; Kane et al., 2010). It is, therefore, no surprise that teachers have requested additional professional development and support for problems with classroom management at all grade levels (Coalition for Psychology in Schools and Education, 2006).

In order to properly prepare pre-service teachers to instruct all students effectively, preparation programs must first identify and then implement training in evidence-based management strategies. Through a comprehensive literature review, Simonsen et al. (2008) identified five categories of evidence-based classroom management practices: (a) maximizing structure and predictability; (b) posting, teaching, reviewing, tracking, and evaluating expectations; (c) active participation of students in observable ways; (d) continuum of strategies to recognize appropriate behaviour; and (e) continuum of student behaviour. However, training in evidence-based practices is necessary for the adoption and sustained use by teachers of such practices.

TESDA (2010) stipulated the standards in the training regulation for Trainers Methodology (TM) to get specific to the teaching skills related to technical-vocational education. The competencies required of a trainer are categorised into basic and core competencies. Table 2 below details the competencies.

Table 2 - TVET trainer qualifications

Code No.	Basic Competencies
500311109	Lead workplace Communication
500232101	Apply math and science principles in technical training
500232102	Apply environmental principles and advocate conservation
500232103	Utilize IT applications in technical training
500311110	Lead small teams
500232104	Apply work ethics, values and quality principles
500232105	Work effectively in vocational education and training
500232106	Foster and promote a learning culture
500232107	Ensure healthy and safe learning environment
500232108	Maintain and enhance professional practice
500232109	Develop and promote appreciation for cost-benefits of technical training
500232110	Develop and promote global understanding of labor markets
	CORE COMPETENCIES
TVT232301	Plan training sessions
TVT232302	Facilitate learning sessions
TVT232303	Supervise Work-based learning

Source: TESDA, 2010

Table 2 - Continue

Code No.	Basic Competencies
	CORE COMPETENCIES
TVT232304	Conduct competency assessment
TVT232305	Maintain training facilities
TVT232306	Utilise electronic media in facilitating training

Source: TESDA, 2010

The different competencies expected of a pre-service teacher in the field of technical-vocational education are stipulated above. Across all the National Certificate (NC) training, the same competencies are required for a trainer. TESDA administers an assessment to qualify a candidate as a TVET trainer/technical trainer, competency assessor, or training facilitator/coordinator. BTVTEd curriculum includes various courses related to the TM. However, the TM principles' alignment, the hierarchy of the competencies, and the curriculum mapping are not comprehensively integrated into the curriculum. This study attempted to comprehensively integrate the said concerns to the teacher education curriculum specific for technical-vocational education. This study aimed to propose an academe- and industry-responsive curriculum for technical-vocational teacher education programs. Specifically, the study sought answers to the following questions:

i. What is the assessment of the graduates in terms of adequacy and usefulness of the technical-vocational teacher education curriculum in the following fields of specialisation?
   a. Civil Technology
   b. Electronics Technology
   c. Mechanical Technology
ii. What is the assessment of the supervisors in terms of adequacy and usefulness of the technical-vocational teacher education curriculum in the following fields of specialisation?
   a. Civil Technology
   b. Electronics Technology
   c. Mechanical Technology

2. Methodology

The study utilised a quantitative research design using descriptive approach research. It measured the adequacy of the skills acquired by graduates from the curriculum. This also measured the usefulness of the acquired skills in the present profession they are working.

2.1 Sampling and Population

The study involved selected individuals and experts in the field of technical-vocational teacher education. They were chosen purposively. There were two categories of respondents: BTVTEd graduates and their supervisors (academe and industry). All out enumeration of the BTVTEd graduates is used, seventy-one (71) in total. Stratified random sampling was used. The strata include three (3) BTVTEd specialisations -civil technology, electronics technology, and mechanical technology. Supervisors from cooperating school of the research locale (cooperating teachers, subject coordinators, and school heads) represented academe, five (5) from each specialisation; industry was represented by cooperating industry linkage of the University in the BTVTEd program, five (5) from each specialisation as well. Table 3 below details the distribution of the respondents:

Table 3 - Distribution of respondents

BTVTEd Specialisation	Graduates	Supervisors	
		Academe	Industry
Civil Technology	29	5	5
Electronics Technology	22	5	5
Mechanical Technology	20	5	5
Total	**71**	**15**	**15**

2.2 Instrument and Data Collection Procedure

A questionnaire was utilised in gathering the data. It was a four-point Likert scale that measured the perception of the respondents regarding specific aspects or elements of the curriculum based on their experience. The first part elicited data on the socio-demographic profile and employment of the graduates. This includes such variables as waiting time before employment, nature and job position, current employment status, previous employment, salary, degrees, and in-service training concerning the current job. The second part obtained data on the respondents' general assessment, in terms of adequacy and usefulness, of the pedagogical and technical knowledge and skills gained from the curriculum in the different fields of specialisation and their relevance in their actual jobs or the workplace. The scale used in terms of adequacy was very adequate, more than adequate, fairly adequate, and inadequate. In terms of usefulness, the scale used was very useful, more than useful, fairly useful, and useless.

The statements on pedagogical skills were obtained from the parameters set by the Philippine Professional Standards for Teachers (PPST) for beginning teachers. Statements on technical skills and knowledge were based from the Training Regulations (TR) of Technical Education and Skills Development Authority (TESDA). There were three research instruments, one each for the specific job descriptions of every field of specialisation. The difference between the instruments is the technical knowledge and skills part where graduates are categorised based on their specialisation. These were explicitly given to graduates who are already practicing or employed in any particular field. The same instruments were given to their respective supervisors.

For the construction of the questionnaire, the researcher used the curriculum of BTVTEd; read documents and books on instrument development; reviewed theses and dissertations; interviewed professors and students of the concerned program and known-alumni. The lifted standards from PPST were converted into questions. The first drafts were written and, after deliberations were revised. The number of questions on pedagogical skills is reported in Table 4 below.

Table 4 - Item distribution on pedagogical skills

Areas	No. of Items
Content Knowledge and Pedagogy	7
Learning Environment	6
Diversity of Learners	5
Curriculum and Planning	5
Assessment and Reporting	5
Community Linkages and Professional Engagement	4
Personal Growth and Professional Development	5
Total	37

The item distribution for the technical skills were lifted standards from TESDA. The same with the pedagogical skills, some of the items in technical skills were combined to eliminate ambiguity. The item constructs were the core competencies indicated in the training regulations of each skill category. The item distribution is detailed in Table 5, 6 and 7.

Table 5 - Item distribution on technical skills (civil technology)

Areas	No. of Items
Carpentry	9
Construction Painting	6
Furniture Making (Finishing)	3
Masonry	8
Pipefitting	4
Plumbing	12
Technical Drafting	6
Tile Setting	3
Trainer's Methodology	16
Total	**67**

Table 6 - Item distribution on technical skills (electronics technology)

Areas	No. of Items
Audio Production Services	6
Broadband Installation (Fixed Wireless Systems)	4
Cable TV Installation	5
Cable TV Operation and Maintenance	5
Consumer Electronics Servicing	4
Electronics Back-end Operations	3
Electronics Front-of- Line Operations	3
Electronics Products Assembly and Servicing	3
Electronics/Semiconductor Production Line Machine Servicing	4
Instrumentation and Control Servicing	7
Mechatronics Servicing	8
Trainer's Methodology	16
Total	**68**

Table 7 - Item distribution on technical skills (mechanical technology)

Areas	No. of Items
5-axis CNC Machine Operation	4
CAD/CAM Operation	2
CNC EDM - Wire Cut Operation	4
CNC Lathe Machine Operation	3
CNC Milling Machine Operation	3
Die Designing	5
EDM - Sinking Operation	3
Heat Treatment	2
Laboratory and Metrology/Calibration Services	6
Machining	10
Mechanical Drafting	2
Tool and Die Making	3
Trainer's Methodology	16
Total	**63**

The research instrument underwent pilot testing to get the internal consistency of the items. The items also underwent validation from the technical experts in curriculum and instruction. These were pilot-tested to non-respondents, but with the same qualifications as the target respondents. The Cronbach's alpha coefficient obtained from the pilot testing were detailed in Table 8.

Table 8 - Cronbach's alpha coefficient

Instrument	α
Pedagogical Skills	0.852
Technical Skills - Civil Technology	0.821
Technical Skills - Electronics Technology	0.840
Technical Skills - Mechanical Technology	0.705

This study aimed to determine graduates' practical skills and knowledge through participation in the current program offered in the research locale. First, instruments were administered to collect numerical data on the different and current actual practices in the field of technical-vocational teacher education; additionally, the technical know-how and skills gained from the curriculum, and the usefulness of the curriculum in the different field of specialisation in technical-vocational teacher education was assessed.

2.3 Data Analysis

Frequency count and percentages were utilised in obtaining the profile of the respondents. Descriptive statistics like mean scores, standard deviations, and overall weighted mean were used to compute the evaluation of the respondents in the curriculum. The study was exposed to several ethical issues like outright refusal of the respondents to participate in the study and data privacy. Therefore, the written consent of the respondents was sought. They have the freedom to participate and to refuse to answer the research instrument or to engage in the interview. Substantial reasons were provided to them to clarify the importance of their participation. Respondents were assured that the output of the research out-balanced the potential ethical issues. Since several companies and schools took part as industry-respondents and academe-respondents, permission from the heads of offices was sought.

3. Results and Discussions

The table below details the demographic profile of the respondents of the study. In Table 9, among the graduates, female dominated in numbers except for mechanical technology where male comprised seventy (70) percent. Sixty-seven (67) percent are female among supervisors in the academe. Industry supervisors were dominated by male. The participation of all the graduates in the three specialisation is exceptional taking the most accurate responses as possible out of the whole population.

Table 9 - Demographic profile in terms of sex

BTVTEd Specialisation	Graduates		Supervisors (Academe)		Supervisors (Industry)	
	Male	Female	Male	Female	Male	Female
Civil Technology	8	21	1	4	4	1
Electronics Technology	6	16	2	3	3	2
Mechanical Technology	14	6	2	3	4	1
Total	**28**	**43**	**5**	**10**	**11**	**4**

As shown in Table 10, in terms of the nature of work of the graduates, at the time of the study, seventeen (17) are working in the academe while the remaining fifty-four (54) are pursuing their career in their field of specialisation.

Table 10 - Demographic profile in terms of nature of work

BTVTEd Specialisation	Graduates	
	Academe-based	Industry-based
Civil Technology	8	21
Electronics Technology	4	18
Mechanical Technology	5	15
Total	**17**	**54**

The following tables present the assessment of graduates and their academic and technical supervisors in the pedagogical and technical skills, respectively, obtained from the BTVTEd curriculum. The assessment was limited to the level of acquired skills and its usefulness in the TVTEd profession. The presentation includes Civil Technology, Electronics Technology, and Mechanical Technology.

3.1 BTVTEd-Civil Technology

Table 11 detailed the curriculum evaluation of graduates and supervisors in terms of pedagogy of civil technology. Graduates rated the acquired knowledge from the curriculum as “very adequate” ($\bar{x}$ = 3.37) which means that the pedagogical knowledge and skills they acquired suit the needs of their current profession. Since pedagogical skills are associated with trainings and other office related jobs that require good oral and written communication skills, they also rated the curriculum as “very useful” ($\bar{x}$ = 3.47). It is possible that the content they have learned from the curriculum were all applicable in their current jobs.

Table 11 - Pedagogical skills (CT)

Areas	Acquired Knowledge and Skills						Usefulness					
	G	Scale	SD	S	Scale	SD	G	Scale	SD	S	Scale	SD
Content Knowledge and Pedagogy	3.34	VA	0.10	3.54	VA	0.25	3.45	VU	0.05	3.60	VU	0.12
Learning Environment	3.39	VA	0.09	3.53	VA	0.10	3.42	VU	0.04	3.67	VU	0.16
Diversity of Learners	3.27	VA	0.11	3.40	VA	0.20	3.46	VU	0.05	3.40	VU	0.14
Curriculum and Planning	3.39	VA	0.10	3.32	VA	0.30	3.49	VU	0.05	3.40	VU	0.28
Assessment and Reporting	3.45	VA	0.05	3.12	MA	0.11	3.56	VU	0.07	3.20	MU	0.14
Community Linkages and Professional Engagement	3.32	VA	0.06	3.05	MA	0.53	3.44	VU	0.08	3.10	MU	0.12
Personal Growth and Professional Development	3.46	VA	0.06	3.08	MA	0.3	3.45	VU	0.03	3.24	MU	0.26
AWM	3.37	VA		3.29	VA		3.47	VU		3.37	VU	

Legend: G = Graduates' Assessment
S = Supervisors' Assessment
3.26-4.0 = Very Adequate (VA)/Very Useful (VU)
2.51-3.25 = More than Adequate (MA)/More than Useful (MU)
1.76-2.50 = Fairly Adequate (FA)/Fairly Useful (FU)
1.00-1.75 = Inadequate (I)/Useless (U)

Generally, in Table 12 below, the technical skills specific for civil technology were rated as "more than adequate" both by the graduates and the supervisors. Even if it is still acceptable, this falls to a lower scale description, thus indicating some rooms for improvement. Pipefitting skills were rated by the graduates the lowest among the competencies. This includes cutting bevel and thread pipes, installing overhead piping system, installing underground piping system, and performing tack welding. It may be inferred that there are factors that affect the acquisition of the said skills in the curriculum. It should be given emphasis since the supervisors marked those skills as "very useful" in the industry.

Table 12 - Civil technology skills

Areas	Acquired Knowledge and Skills						Usefulness					
	G	Scale	SD	S	Scale	SD	G	Scale	SD	S	Scale	SD
Carpentry	3.24	MA	0.12	3.36	VA	0.26	3.34	VU	0.09	3.51	VU	0.33
Construction Painting	3.26	VA	0.14	3.17	MA	0.14	3.28	VU	0.12	3.40	VU	0.15
Furniture Making (Finishing)	3.10	MA	0.18	3.20	MA	0.20	3.20	MU	0.21	3.20	MU	0.20
Masonry	3.43	VA	0.14	3.23	MA	0.15	3.40	VU	0.17	3.50	VU	0.11
Pipefitting	2.96	MA	0.25	3.43	VA	0.24	3.03	MU	0.26	3.66	VU	0.19
Plumbing	3.27	VA	0.18	3.21	MA	0.15	3.32	VU	0.21	3.42	VU	0.17
Technical Drafting	3.14	MA	0.15	3.11	MA	0.11	3.34	VU	0.09	3.31	VU	0.11

Table 12 - Continue

Areas	Acquired Knowledge and Skills						Usefulness					
	G	Scale	SD	S	Scale	SD	G	Scale	SD	S	Scale	SD
Tile Setting	2.98	MA	0.03	3.06	MA	0.10	3.06	MU	0.12	3.26	VU	0.10
Trainer's Methodology	3.46	VA	0.09	3.20	MA	0.00	3.45	VU	0.10	3.40	VU	0.00
AWM	3.20	MA		3.22	MA		3.27	VU		3.41	VU	

3.2 BTVTEd-Electronics Technology

As shown in Table 13, graduates of electronics technology rated their pedagogical skills as "very adequate." Among the top competencies they perceived as highly acquired include assessment and reporting, community linkages and professional engagement, and personal growth and professional development. Though the academic supervisors agree with the graduates' curriculum assessment, they looked at curriculum and planning and content knowledge and pedagogy as the highest competencies acquired from the curriculum. Since all statements used in the research instrument for pedagogy were adapted from the Philippine Professional Standard for Teachers, both the graduates and the academic supervisors considered them all as "very useful."

Table 13 - Pedagogical skills (ELX)

Areas	Acquired Knowledge and Skills						Usefulness					
	G	Scale	SD	S	Scale	SD	G	Scale	SD	S	Scale	SD
Content Knowledge and Pedagogy	3.51	VA	0.06	3.48	VA	0.04	3.53	VU	0.08	3.51	VU	0.04
Learning Environment	3.56	VA	0.05	3.46	VA	0.04	3.55	VU	0.08	3.47	VU	0.05
Diversity of Learners	3.48	VA	0.02	3.39	VA	0.07	3.54	VU	0.13	3.38	VU	0.10
Curriculum and Planning	3.38	VA	0.16	3.50	VA	0.04	3.44	VU	0.10	3.49	VU	0.03
Assessment and Reporting	3.57	VA	0.09	3.46	VA	0.04	3.55	VU	0.10	3.47	VU	0.02
Community Linkages and Professional Engagement	3.57	VA	0.06	3.41	VA	0.01	3.58	VU	0.10	3.45	VU	0.06
Personal Growth and Professional Development	3.57	VA	0.08	3.41	VA	0.02	3.60	VU	0.04	3.45	VU	0.04
AWM	3.52	VA		3.44	VA		3.54	VU		3.46	VU	

Table 14 - Electronics technology skills

Areas	Acquired Knowledge and Skills						Usefulness					
	G	Scale	SD	S	Scale	SD	G	Scale	SD	S	Scale	SD
Audio Production Services	3.47	VA	0.16	3.25	MA	0.10	3.49	VU	0.14	3.24	MU	0.08
Broadband Installation (Fixed Wireless Systems)	3.01	MA	0.21	3.45	VA	0.06	3.09	MU	0.15	3.47	VU	0.05
Cable TV (CATV) Installation	2.87	MA	0.18	3.41	VA	0.07	2.98	MU	0.11	3.42	VU	0.07
Cable TV Operation and Maintenance	2.70	MA	0.08	3.53	VA	0.05	2.87	MU	0.06	3.54	VU	0.05
Consumer Electronics Servicing	3.26	VA	0.04	3.31	VA	0.05	3.30	VU	0.06	3.31	VU	0.04
Electronics Back-end Operations	3.11	MA	0.07	3.46	VA	0.11	3.24	MU	0.03	3.44	VU	0.11
Electronics Front-of-Line (FOL) Operations	3.03	MA	0.03	3.49	VA	0.09	3.14	MU	0.00	3.47	VU	0.09
Electronics Products Assembly and Servicing	3.42	VA	0.07	3.43	VA	0.09	3.42	VU	0.05	3.43	VU	0.09
Electronics/ Semiconductor Production Line Machine Servicing	3.24	MA	0.04	3.34	VA	0.11	3.33	VU	0.04	3.35	VU	0.12
Instrumentation and Control Servicing	3.21	MA	0.07	3.36	VA	0.06	3.21	MU	0.05	3.36	VU	0.06
Mechatronics Servicing	3.25	MA	0.17	3.49	VA	0.10	3.26	VU	0.18	3.51	VU	0.12
Trainer's Methodology	3.31	MA	0.11	3.41	VA	0.06	3.32	VU	0.10	3.41	VU	0.04
AWM	3.16	MA		3.41	VA		3.22	MU		3.41	VU	

Legend: G = Graduates' Assessment
S = Supervisors' Assessment
SD = Standard Deviation
3.26-4.0 = Very Adequate (VA)/Very Useful (VU)
2.51-3.25 = More than Adequate (MA)/More than Useful (MU)
1.76-2.50 = Fairly Adequate (FA)/Fairly Useful (FU)
1.00-1.75 = Inadequate (I)/Useless (U)

Table 14 reflects the technical skills of BTVTEd-Electronics Technology graduates. It is remarkable in the table that there are differences in the evaluation of the graduates and the supervisors in terms of the adequacy of acquired technical skills. Generally, graduates viewed themselves as "more than adequate" but supervisors considered them better as "very adequate." These results may infer that graduates see themselves as less capable than what the supervisors can see on them. Though these may be positive, but this calls for improvement on the curriculum specific to the self-confidence. It is also remarkable that the graduates perceived most of the technical skills they acquired as "more than useful." This rating is a step lower on the scale description where the supervisors considered those skills as "very useful."

3.3 BTVTEd-Mechanical Technology

Table 15 - Pedagogical skills (MT)

Areas	Acquired Knowledge and Skills						Usefulness					
	G	Scale	SD	S	Scale	SD	G	Scale	SD	S	Scale	SD
Content Knowledge and Pedagogy	3.38	VA	0.14	3.58	VA	0.12	3.40	VU	0.12	3.57	VU	0.10
Learning Environment	3.46	VA	0.06	3.45	VA	0.08	3.50	VU	0.04	3.48	VU	0.09
Diversity of Learners	3.33	VA	0.08	3.49	VA	0.14	3.39	VU	0.05	3.55	VU	0.09
Curriculum and Planning	3.39	VA	0.08	3.45	VA	0.09	3.41	VU	0.07	3.60	VU	0.10
Assessment and Reporting	3.33	VA	0.09	3.47	VA	0.04	3.40	VU	0.08	3.47	VU	0.15
Community Linkages and Professional Engagement	3.25	MA	0.09	3.43	VA	0.09	3.31	VU	0.00	3.43	VU	0.14
Personal Growth and Professional Development	3.39	VA	0.05	3.49	VA	0.10	3.39	VU	0.07	3.53	VU	0.04
AWM	3.36	VA		3.48	VA		3.40	VU		3.52	VU	

Legend: G = Graduates' Assessment
S = Supervisors' Assessment
SD = Standard Deviation
3.26-4.0 = Very Adequate (VA)/Very Useful (VU)
2.51-3.25 = More than Adequate (MA)/More than Useful (MU)
1.76-2.50 = Fairly Adequate (FA)/Fairly Useful (FU)
1.00-1.75 = Inadequate (I)/Useless (U)

Exceptionally, as shown in Table 15, community linkages and professional engagement was viewed by mechanical graduates as "more than adequate." It is still positive but they considered it the least among the pedagogical areas. Demonstrating understanding of the community context is one of the competencies under this area. More of community involvement should be given emphasis on the curriculum like building relationships with parents and guardians. Generally, all pedagogical areas were viewed as "very useful."

Table 16 - Mechanical technology skills

Areas	Acquired Knowledge and Skills						Usefulness					
	G	Scale	SD	S	Scale	SD	G	Scale	SD	S	Scale	SD
5-Axis CNC Machine Operation	3.00	VA	0.14	3.48	VA	0.19	2.95	MU	0.13	3.52	VU	0.17
CAD/CAM Operation	3.38	VA	0.00	3.23	MA	0.12	3.47	VU	0.04	3.20	MU	0.14
CNC Electric Discharge Machine (EDM) - Wire Cut Operation	2.97	MA	0.16	3.19	MA	0.10	2.94	MU	0.14	3.26	VU	0.08

Table 16 - Continue

Areas	Acquired Knowledge and Skills						Usefulness					
	G	Scale	SD	S	Scale	SD	G	Scale	SD	S	Scale	SD
CNC Lathe Machine Operation	3.06	MA	0.13	3.21	MA	0.04	3.08	MU	0.10	3.22	MU	0.05
CNC Milling Machine Operation	3.15	MA	0.10	3.11	MA	0.11	3.17	MU	0.10	3.18	MU	0.10
Die Designing	3.26	VA	0.07	3.10	MA	0.08	3.26	VU	0.09	3.13	MU	0.12
Electric Discharge Machine (EDM) - Sinking Operation	2.90	MA	0.04	3.43	VA	0.08	2.88	MU	0.00	3.45	VU	0.11
Heat Treatment	3.25	MA	0.09	3.25	MA	0.11	3.28	VU	0.04	3.28	VU	0.12
Laboratory and Metrology/Calibrati on Services	3.43	VA	0.06	3.61	VA	0.10	3.40	VU	0.10	3.56	VU	0.14
Machining	3.40	VA	0.08	3.65	VA	0.12	3.40	VU	0.08	3.67	VU	0.17
Mechanical Drafting	3.31	VA	0.00	3.60	VA	0.15	3.34	VU	0.04	3.57	VU	0.10
Tool and Die Making	3.23	MA	0.10	3.70	VA	0.05	3.21	MU	0.10	3.67	VU	0.10
Trainer's Methodology	3.32	VA	0.11	3.71	VA	0.11	3.31	VU	0.11	3.73	VU	0.05
AWM	3.20	MA		3.41	VA		3.21	MU		3.42	VU	

Mechanical Technology is an expensive course to offer. It demands several machines and software that cost a lot of University money. Table 16 shows several areas of mechanical technology where graduates considered themselves "more than adequate." These are the areas where expensive machines are required. However, supervisors evaluated the graduates' acquisition of knowledge and technical skills better as "very adequate." Graduates also see their acquired skills as less useful than what the supervisors see. Graduates rating of usefulness is 3.21 while supervisors rating is 3.42.

The technical teacher education program aimed to inculcate in the professionals high cognitive and psychomotor abilities to assume full responsibility of teaching technical and vocational subjects to the junior and senior high school system (Federal Ministry of Education, 2000). This is evident on the result since the supervisors and the graduates both evaluated the pedagogical skills of the latter as very adequate. The relevant application of those pedagogical skills in the current profession of the graduates are vital because it will help them handle technical courses inside the classroom. In the event that the graduates pursue different fields other than teaching, pedagogical skills are also substantial preparation for any cognitive-related jobs.

National Academy of Engineering (2017) noted that a further complication in the labor force is that someone with a 4-year degree may have earned that degree in a field unrelated to technology but ended up doing work related to technology after earning one or more certificates or a 2-year degree in the field (e.g., someone changing careers). BTVTEd graduates are primarily intended to work as technical educators but other pursue the technical field in the industry rather than teaching. Some reasoned out that they are gaining experience in the technical field to provide better learnings to their future students. In other words, the assumption that someone with a 4-year degree is working as a technologist may not be correct either. Thus, graduates may see themselves less adequate than what the supervisors are perceiving.

Technology teachers are distinct from conventional teachers. According to studies of MNE (2008) related to teachers' proficiencies, it was deduced that teachers were expected to do more than simply transmitting knowledge to students quickly. Nonetheless teacher knowledge is described in different ways and the necessary characteristics have been denoted differently. For technology teachers, industry exposure is required to carry out relevant skill transfer to students. Pedagogical skills are vital but teacher will be inefficient if these skills are not partnered with quality industry exposure. Supervisors and graduates are positive in their curriculum evaluation in terms of pedagogy. The curriculum should be partnered with appropriate industry experiences and this was reflected on the succeeding tables specific for technical skills.

The preparation of the graduates received from the curriculum is contrary to what is written in the report known as "The Ill-Prepared U.S. Workforce." The data for the report were obtained by surveying two-hundred seventeen (217) employers to examine corporate practices on training newly hired graduates at the high school level, the 2-year college level, and the 4-year college level. Of the companies surveyed, almost half provided remedial training programs to erase deficiencies among their newly hired entrants in skills they are expected to have when hired. However, many of the companies found that these remedial programs did not succeed in fully accomplishing their purpose (Casner-Lotto, Rosenblum, & Wright, 2009). Curriculum has played very significant role in the provision of adequate skills needed by the graduates to perform well in the industry.

Community partnerships are critical component of 21st century education. Partners can perform a number of important roles (Little, 2011). This may include financial support from stakeholders, improved moral support from the parents, camaraderie with the barangay officials, and sense of belongingness within the community where a teacher works. Thus, community linkages and professional engagement should be empowered in the curriculum of pre-service teachers because these are important components in the development of the technical teachers.

Akinseinde (2004) found out in his study that inadequate equipment and tools hindered achievement of curriculum objectives. The effect of limited workshop and laboratory activities can cause low productivity and make teachers become ineffective and inefficient in their teaching roles. However, since the factor mentioned is not part of this study, the researcher may infer that there are several factors springing from the data that make graduates see themselves a step lower in the scale description. Thus, the results of the study have been very relevant inputs in various facets of improving the curriculum. Technical-vocational teacher education graduates should have acquired adequate and useful pedagogical and technical skills that are responsive to the changing needs of both the academe and the industry.

4. Conclusions and Recommendation

This study focused on the evaluation of technical-vocational teacher education program on the level of pedagogical and technical skills acquired by the graduates from the curriculum and its usefulness to their current profession. The BTVTEd graduates were surveyed along with their academic and technical supervisors, respectively. Academic supervisors include their cooperating teachers during practice teaching; technical supervisors were their immediate heads during on-the-job training and in their current profession.cAfter a thorough and intensive analysis of data and results in this study, the researcher concludes the following:

i. The BTVTEd curriculum is very adequate and very useful in terms of pedagogy as assessed by the graduates. However, technical skills provided by the curriculum are more than adequate and more than useful.
ii. The BTVTEd curriculum was generally very adequate and very useful in terms of pedagogical and technical skills as assessed by the supervisors.

Technical-vocational education institutions are vital in the sustainability of the industries. They should develop skills that are relevant and are responsive to the industries' needs. Since technology is continuously evolving exponentially, educational institutions should keep pace with the standards. Studies of this nature checking the alignment of academe to industries will substantially help institutions to update tech-voc curriculum periodically. This study was of primary benefit to students in technical teacher education. As defined by Ornsteins and Hunkins (2009), curriculum is an organised set of intentions for formal education and/or training. The curriculum workers want the plan's intent to be realised as fully as possible. Since the curriculum is the very framework of what is happening in the students' entire academic experience, whether within or outside the school premises, the very content, approach, learning opportunities, and all aspects within the framework influence the realization of its intent. The students are the end-users of the system. The room for modification and improvement found out in this study will help to address needs, especially students.

Institutions of higher learnings that provide technical teacher education are increasingly being made to account for their contribution to social and national development. This study verified the need for instituting carefully thought out institutional processes, as far as curriculum is concerned. This could propel technical teacher education institutions to make their course offerings produce teachers that meet the demands of the Philippine Professional Standards for Teachers (DepEd, 2017). This standard aims to set clear expectations of teachers across well-defined career phases of professional development from beginning to distinguished practice. It also wants teachers to be actively involved in an ongoing effort to achieve competence and to apply a standardised measure to assess teacher performance, identify requirements, and provide professional development support. Moreover, the curriculum should also produce teachers and technical workers where competencies are aligned to what is prescribed by the Technical Education and Skills Development Authority.

The study is also significant for curriculum developers, specifically the locale-university curriculum committee. The findings provided baseline data that are helpful in curriculum modifications that will address impending and arising problems from the design process to implementation to evaluation of the curriculum. Since the study analysed the curricula, it is significant for the University administration to consider policy formulation insofar as regulating program offerings and instructional processes involved in technical teacher education. Based on the findings and conclusion, the researcher recommends the following:

i. To synchronise the BTVTEd program with the academe's and industry's expectations and demands; modification or revision of curriculum is needed. Universities and schools should welcome and entertain inputs coming from the expert graduates and authorities in their respective fields of practice.
ii. There is a need for continuous tracking of graduates at least every five years to monitor their acquired skills and professional advancements in their respective fields which could be used in crafting an ever-evolving curriculum.
iii. Technology and education landscapes have been accelerating to unprecedented heights and the technical-vocational teacher education graduates must conform and adjust to the never-ending and continuously improving technologies of the world. The need for local and international immersion and training both in "hard" and soft skills and strong industry academe linkage must go hand in hand with a synchronised curriculum of the BTVTEd program.
iv. The skills and technical knowledge gained from the curriculum, the inputs from the experts both in the academe and industry should be utilised to facilitate the enhancement of the existing BTVTEd curriculum.

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