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Civil Engineering Program Compliance of SUCs in Western Visayas to Philippine Technological Council – Washington Accord Standards

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Abstract

This descriptive study determined the institutional status of the Bachelor of Science in Civil Engineering (BSCE) program of State Universities and Colleges (SUCs) in Western Visayas in terms of years of implementation, AACCUP level of accreditation, the total number and educational qualification of the faculty, and level of practice of the program to the Philippine Technological Council – Washington Accord (PTC-WA) based on the nine (9) criteria. Data gathered through a survey questionnaire were presented in tabular and narrative presentations and were confirmed through triangulation using comparative analysis and review questions. Results revealed that the majority of the SUCs in Western Visayas had offered the BSCE program for 5-10 years, with Level II accreditation. Most of the faculty members are full-time and have master's degrees, and the average passing percentage of the graduates in the board examination for the last three years was 75.55% as against the national passing percentage of 41.05%. As an entire group, SUCs in Western Visayas offering the BSCE program had '*Very Highly Practiced*' the PTC-WA criteria on students and '*Highly Practiced*' on all the other eight criteria of PTC-WA. As a whole, they had '*Highly Practiced*' the nine criteria of PTC-WA. Consequently, respondents recommend to the SUCs management to pursue the development of the BSCE program by empowering its heads of units, faculty members, and support staff to cope with the improvement needed in terms of program educational objectives, faculty and support staff, continuous quality improvement, community-oriented programs, and industry-academe linkages.

Keywords: *engineering education, institutional status, program compliance, level of practice, accreditation*

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1. Introduction

In the Philippines, engineering education is patterned after the Accreditation Board for Engineering and Technology. The Commission on Higher Education (CHED), through the Technical Panel for Engineering and Technology (TPET), has mandated all higher education institutions (HEIs) to follow the outcomes-based education (OBE) system in all engineering programs fully by Academic Year 2016-2017. For its part, the Philippine Technological Council (PTC), as the one in charge of accrediting undergraduate engineering programs, led the Philippines in applying for and getting provisional status and eventually full membership in the Washington Accord (ASME Congress and Exposition, 2013).

While we believe that the future of the world is in the hands of young engineers, we need to give them as much help as we can in facing the challenges of the future. The PTC-WA accreditation scheme could be the way that would help HEIs offering engineering programs produce better equipped and ever-skillful technical men comparable with the best engineers in the world. Graduates of engineering programs in the Philippines aligned with the Washington Accord of 1989 become exempted from educational requirements for practicing in any country that is also a signatory to the accord (Vea, 2007).

There are state universities and colleges (SUCs) in Western Visayas that offer the Bachelor of Science in Civil Engineering (BSCE) program. It is in this context that this study was conducted to find out whether or not these government HEIs adhere to the requirements of the PTC-WA to produce engineers as prescribed in the criteria set by accredited Washington Accord institutions. It aimed at establishing the following: institutional status of the BSCE program of SUCs in Western Visayas in terms of the number of years of implementation in the institution, AACCUP level of accreditation, average passing percentage in the board examination for the last 3 years, the total number of part-time and full-time faculty, and educational qualification of faculty; and compliance level of practice of SUCs of their BSCE program to PTC-WA standards classified according to the nine (9) criteria: program educational objectives; student outcomes (graduate attributes for engineers); students; faculty and support staff; curriculum; facilities and learning environment; leadership and institutional support; extension service, community support programs, and industry–academe linkage; and continuous quality improvement.

2. Literature review

2.1. The Washington Accord

The Washington Accord (WA) is the engineering part of the International Engineering Alliance (IEA). In engineering practice, sustainability is explicitly included in the World Federation of Engineering Organization (WFEO) Model Code of Ethics under Canon 4 protection of the natural and built environment. The WFEO Model Code of Practice for Sustainable Development and Environmental Stewardship provides a comprehensive approach to sustainability in engineering practice (WFEO, 2016).

The IEA Graduate Attributes and Professional Competencies (GAPC) are the foundation for the accreditation of engineering programs under the Washington Accord (IEA, 2021). As Wo (2018) puts it, accreditation of engineering educational programs serves to provide a quality assurance framework as a foundational basis to practice the profession. It is expected that graduates possess the attributes substantially equivalent to the IEA exemplars to be recognized under the WA. The expected level of knowledge of these graduates is WK7 which includes: a) comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; and b) the impacts of engineering activity: economic, social, cultural, environmental and sustainability (Kelly, 2016).

2.2. Quality Assurance Mechanisms in Higher Education

According to Laguador and Dotong (2014), providing quality products and services is always the ultimate goal of every educational institution making it part of the vision and mission that proliferates from top management down to the rank-and-file employees of the organization. They added that measuring one’s capability to promote excellence is an enduring process to meet certain standards of evaluation wherein a specific level of quality is determined to provide substantial information for the intended community and global market.

Any quality assurance mechanism recognized either locally or internationally that is being utilized and adopted by the HEIs must reflect the quality of their graduates which is one way of measuring the performance of an institution. However, Ryan (2015) noted that the framework for quality assurance, particularly on how it is defined and interpreted is not common, the accreditation structures are decentralized and complex at both the regional and international levels. It was noted that QA process concerns involving the faculty members, students, and other stakeholders are also a challenge.

Houston and Paewai (2013) also noted that the QA systems are designed by government and agencies outside of the university to serve their external accountability purposes without the involvement of the academics inside the university. Thus, differences in the purpose of crafting the system and the understanding of the implementers of the said system result in quality assurance systems that are unable to contribute to the improvement of teaching and research in the university.

The standards for the quality of teaching and research programs in higher education should be measured against the relevance to the local context (quality and extent of impact), the professional practice (standards of programs and innovations), and the international context (world ranking). Higher education institutions should bear in mind that they are the core source of skilled labor supply and for the generation of new ideas and appropriate practices for a local context/country.

Seyfried and Pohlenz (2018) were able to prove that support by higher education institutions' higher management and cooperation with other education institutions are relevant preconditions for larger perceived degrees of quality assurance effectiveness. And the role of quality managers being the promoter of quality assurance is significant to this effectiveness.

2.3. Accreditation System for Higher Education Institutions in the Philippines

According to Conchada and Tiongco (2015), for any developing country, improving the quality of higher education institutions is of paramount interest to government agencies, especially the CHED. CHED Memorandum Order No. 1, series of 2005 declares that the commission "encourages the use of voluntary non-governmental accreditation systems in aid of the exercise of its regulatory function," if higher education institutions desire to attain standards of quality over and above the minimum required by the State.

In the Philippines, higher education accreditation is centered on four key areas, namely: quality of teaching and research, support for students, relations with the community, and management of resources (Ching, 2013). HEIs can have their academic programs accredited by private organizations, although this is not compulsory, by member agencies of the Federation of Accrediting Agencies of the Philippines (FAAP), as follows: Philippine Accrediting Association of Schools, Colleges and Universities (PAASCU); Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA); Association of Christian Schools, Colleges and Universities – Accrediting Council, Inc. (ACSCU-ACI); and Accrediting Agency for Chartered Colleges and Universities in the Philippines, Inc. (AACCUP). Accredited programs receive accreditation levels that can be used as bases to get benefits from government agencies like the Commission on Higher Education (NUFFIC).

Aside from the CHED, accreditation of engineering programs in the country is done by the Accreditation and Certification Board (ACBET) of the Philippine Technological Council (PTC). It ensures that HEIs offering the program adheres to the policies, processes, procedures, and authorities prescribed by its Certification and Accreditation System for Engineering Education (CASEE) based on the provisions of the WA. Today, the PTC has granted 26 engineering programs from three HEIs full accreditation, and 40 programs from eight HEIs with partial accreditation (PTC, 2016).

2.4. Engineering Education and Training Today

Garcia and Mazzotti (2016) state that many engineering courses today are disproportionately focused on the rigorous reasoning inherent in math, while professional practice requires further skills and competencies. Improving the effectiveness of teaching-learning processes in engineering requires a change in the instructional approach, a switch from exposition to argumentation. As Kamp (2016) observed, many of today's engineering tasks (and curricula in higher education in engineering) still focus on typically 20th-century how-to-do-it activities, associated with product and service design, manufacturing, and support that made sense in the 20th century. Tomorrow's engineers will be called upon to perform an increasing number of what-to-do functions, and engage with experts from multiple fields. They will be the new breed of engineers who will not only need to be comprehensive problem solvers but also problem definers, leading multidisciplinary teams in setting agendas and fostering innovation producing many new technologies that will change the world.

Wormley (2003) has described that the recent changes in the practice of engineering education in the United States did not only focus on curriculum content but also covered the organizational and operational principles of engineering education programs, and the opportunities for learning available in the field not only in higher education but also in the K-12 program. The Accreditation Board for Engineering and Technology (ABET) Engineering Criteria 2000 requires engineering programs to incorporate critical professional skills and content in the curricula, and strive for adaptability and accountability to HEIs as part of the new approaches to engineering accreditation.

Mohamed (2015) found out that engineering instructors are facing the challenges of preparing engineering students for the modern era through innovative pedagogical practices that reflect modern ideas about teaching and learning in a world of rapid change and high technology. Thus, he presented teaching-learning approaches for developing creativity, critical learning, cooperative learning, learning through teaching, learning through thematic-based case studies, group learning, communication skills, and problem-solving and learning approaches.

Engineering graduates under a curriculum patterned after the Washington accord were found to have soft skills in communication, teamwork, entrepreneurial skills, problem-solving, decision-making, ethic, self-management skills, life-long learning, and creativity and/or innovation (Wilson & Marnewick, 2018).

Among the BRIC countries (Brazil, Russia, India, and China), it was observed that only a minority of engineering students receive high-quality training in elite institutions while the majority receive low-quality training in non-elite institutions. But because of the great increase in the number of engineers trained and the improvement in the quality of elite institutions in the BRIC countries, the high-quality minority engineering graduates have reached about 40% of the total output of graduates in developed countries (Loyalka et al., 2013).

These achievements in engineering education do not mean, however, that students have the same competence as graduates from other countries in the international talent market. This is the reason why China continuously improves its education quality from an international perspective (Xiaodong et al., 2018).

2.5.Theoretical framework

This study was anchored on Ralph W. Tyler's "Objectives-Based Curriculum Evaluation Model" or the Tylerian Model. The essence of the Tylerian model is that evaluation consists of the comparison between a program's objectives and the actual practices.

3. Methodology

3.1. Research design

This study utilized the descriptive survey research method. According to Fox and Bayat (2007), descriptive research "aimed at casting light on current issues or problems through a process of data collection that enables them to describe the situation more completely than was possible without employing this method." For Creswell (2013), survey research "provides a quantitative description of trends, attitudes or opinions of a population by studying a sample of that population. It includes cross-sectional and longitudinal studies using questionnaires or structured interviews for data collection – with the intent of generalizing from a sample population."

3.2. Locale

Only five (5) of the twelve (12) SUCs in Western Visayas were considered in the conduct of the study as other SUCs do not offer the Bachelor of Science in Civil Engineering (BSCE) program. These SUCs are the Aklan State University (ASU) in Kalibo, Aklan; Capiz State University (CAPSU) in Roxas City, Capiz; Carlos Hilado Memorial State College (CHMSC) in Talisay City, Negros Occidental; Northern Iloilo Polytechnic State College (NIPSC) in Estancia, Iloilo; and University of Antique (UA) in Sibalom, Antique.

3.3. Respondents

All the deans and/or department chairpersons, program coordinators, faculty, and student representatives of the BSCE programs served as respondents to this study. For confidentiality and to safeguard the identity of the institutions, these institutions were labeled as SUC A for Capiz State University, SUC B for Northern Iloilo Polytechnic State College, SUC C for Aklan State University, SUC D for Carlos Hilado Memorial State College, and SUC E for the University of Antique.

3.4. Instrumentation

A three-part survey questionnaire based on the standard criteria set by the Philippine Technological Council – Washington Accord (PTC-WA) was utilized in gathering data. The first part was used to gather data on the profile of the respondents and the institutional status of the BSCE program in Western Visayas. The second part was the standardized questionnaire for the Civil Engineering Program Compliance to Philippine Technological Council - Washington Accord Standards.

The third part contained the details of the Self-Study Report Guidelines, a set of review questions for each of the respondents as a follow-through after answering Part II of the questionnaire. The review questions used in this part of the standardized questionnaire were based on the nine criteria of the PTC-WA Self-Study Report (existing for accreditation to Philippine Technological Council – Washington Accord (PTC-WA) under the Certification and Accreditation System for Engineering Education (CASEE)). The Self-Study Report (SSR) guidelines explain the extent to which the program meets applicable PTC-WA standards and policies as documented in the PTC-CASEE. The SSR provides sufficient information for a thorough on-site review of the program.

3.5. Data analysis

For computation purposes, numerical weights were assigned to the responses in rating the peer self-evaluation on the compliance level of SUCs in Western Visayas of their BSCE program to PTC-WA.

All the data shared by the respondents were encoded, tallied, and tabulated for statistical analysis. For scoring purposes, the scale of means was arbitrarily used for the Civil Engineering Program Compliance to Philippine Technological Council - Washington Accord Standards among SUCs in Western Visayas. The basis of the scale was the rounding-off of numbers.

For descriptive-survey data analysis, frequency count, percentage distribution, rank, and weighted means were used with the aid of Microsoft Excel software.

4. Findings and Discussion

Table 1

Institutional Status of the BSCE Program of SUCs in Western Visayas

Institutional Status	SUCs				
	A	B	C	D	E
Number of Years of Implementation of the BSCE Program in the Institution	> 5 to 10 yrs	> 15 Yrs	5 to 10 yrs	10 to 15 yrs	> 5 to 10 yrs
AACCUP Level of Accreditation	Preliminary Survey for Level I	Level II	Level II	Level III	Level I
Average Passing Percentage of BSCE Graduates in Board Examination for the last three (3) years	67.86%	47.67%	59.03%	88.91%	38.74%
Total Number of Faculty:					
Full Time	5	6	7	6	5
Part Time	2	0	0	7	1
Educational Qualification of Faculty:					
Full Time:					
Doctoral Degree	2	2	0	0	0
Master’s Degree	3	3	6	6	1
Baccalaureate Degree	0	1	1	0	4
Part Time:					
Doctoral Degree	0	0	0	1	0
Master’s Degree	0	0	0	3	0
Baccalaureate Degree	2	0	0	3	1

The Bachelor of Science in Civil Engineering program of SUCs in Western Visayas was offered in state-run tertiary institutions in the last 5-15 years, with an average AACCUP Level II accreditation level. It attained an average board examination passing percentage of 88.91% in the last three 3 years above the national passing percentage of 41.05% from 2015 to 2017. Most of the faculty teaching BSCE courses were full-time, and the majority are master's degree holders. These suggest that the BSCE programs offered in Western Visayas HEIs are following the standards set by the Commission on Higher Education (CHED).

Table 2

The Civil Engineering Program Compliance to PTC - WA Standards in Criterion 1

Criterion 1. Program Education Objectives (PEO):	**Mean**
• There was a documented and published Program Educational Objectives (PEO).	3.80
• Program Educational Objectives (PEO) was consistent with the mission and vision of the institution.	4.40
• Program Educational Objectives (PEO) reflects the particular field of engineering practice and the associated area(s) of specialization, the desired characteristics and/or capabilities of the graduates after a few years of their career following graduation, the anticipated career destinations of graduates and the needs of the appropriate external constituencies.	4.20
• A formal and documental process to develop and review the Program Educational Objectives (PEO's) is in place.	3.40
• The review process was periodic, and ensures and demonstrates that the objectives are based on the needs of the program's various stakeholders.	3.10
• External stakeholders' inputs were critical to the development, review and monitoring process of the objectives.	3.30
Sub-Group Mean	**3.70**

Legend: 4.50-5.00 (Very Highly Practiced); 3.50-4.49 (Highly Practiced); 2.30-3.49 (Moderately Practiced; 1.50-2.49 (Less Practiced); 1.00-1.49 (Never Practiced)

The BSCE program's compliance to the nine (9) criteria of the PTC-WA standards was as follows: a) the program's educational objective was '*Highly Practiced*' and consistent with the mission and vision statements of the institution. The review process to ensure and demonstrate that the objectives were based on the needs of the program's various stakeholders was '*Moderately Practiced*' but generally. The majority of the SUCs change their mission and vision statements to be consistent with their program educational objectives if the need arises or these statements were very broad, very specific, or not relevant to the program after a thorough review of their stakeholders and joint approval of their academic and administrative council, and most of the program educational objectives addressed the needs of the program's identified constituencies to increase program enrolment and graduates would be job-ready. These identified program's constituencies were involved in the planning process and their inputs were considered based on their needs. Further, most of the SUCs program educational objectives were measurable by conducting a tracer study or getting feedback from the program's identified constituencies, and most of the program educational objectives were consistent with the SUCs' vision and mission statement.

The low involvement of stakeholders in crafting the system that the SUCs implement is parallel to what Houston and Paewai (2013) noted. As they put it, the systems are designed by the government and agencies outside of the university to serve their external accountability purposes without the involvement of the academics inside the university. This then results in differences in the purpose of crafting the system and the understanding of the implementers of the said system that will lead to its inability to contribute to the improvement of teaching and research in the university.

Table 3

The Civil Engineering Program Compliance to PTC - WA Standards in Criterion 2

Criterion 2: Student Outcome, Graduate Attributes for Engineers	Mean
• The program had established and documented student outcomes	4.50
• Student outcomes foster the attainment of program educational objectives by the graduates	4.30
• Graduates were expected to build on the following foundations as they progress with their practice of engineering:	
o Ability to apply knowledge of mathematics and science to solve engineering problems	4.60
o Ability to design and conduct experiments as well as to analyze and interpret data	4.60
o Ability to design a system, component, or process to meet the desired needs within realistic constraints in accordance with standards	4.60
o Ability to function on multidisciplinary teams	4.40
o Ability to identify, formulate, and solve engineering problems	4.60
o Understanding of professional and ethical responsibility	4.50
o Ability to communicate effectively	4.20
o Broad education necessary to understand the impact of engineering solutions in a global economic, environmental, and societal context	4.30
o Recognition of the need for, and an ability to engage in life-long learning	4.30
o Knowledge of contemporary issues	4.00
o Ability to use techniques, skills and modern engineering tools necessary for engineering practice	4.40
o Knowledge and understanding of engineering and management principles as a member and leader in a team, to manage as a member and leader in a team, to manage projects and in multidisciplinary environments	4.40
Sub-Group Mean	**4.41**

Legend: 4.50-5.00 (Very Highly Practiced); 3.50-4.49 (Highly Practiced); 2.30-3.49 (Moderately Practiced; 1.50-2.49 (Less Practiced); 1.00-1.49 (Never Practiced)

For student outcome (Graduate Attributes for Engineers), the SUCs had '*Very Highly Practiced*' on their graduates' expectation to build on the following foundations as they progress with their practice of engineering: the ability to apply knowledge of mathematics and science to solve engineering problems; the ability to design and conduct experiments as well as to analyze and interpret data; the ability to design a system, component, or process to meet the desired needs within realistic constraints following standards; and the ability to identify, formulate and solve engineering problems. Moreover, these were '*Highly Practiced*' on the need to improve their graduates' ability to communicate effectively and the knowledge of contemporary issues but generally, they were *'Highly Practiced'*. Such practices reflect how engineering students are prepared and honed as future shapers of the technology-driven community.

This same observation was noted by Kamp (2016) that many of today's engineering curricula in higher education still focus on typically 20th-century how-to-do-it activities.

Table 4

The Civil Engineering Program Compliance to PTC - WA Standards in Criterion 3

Criterion 3. Students	Mean
• Students admitted to the program had the educational background to undertake the engineering degree courses and have reasonable prospect of achieving the student outcomes	4.30
• Policies were in place and enforced for: ○ Admission	4.70
○ Transfers	4.70
○ Progression	4.70
○ Retention	4.60
○ Progress Monitoring and Performance Evaluation	4.60
○ Student advising on curricular and career matters	4.60
○ Guidance and support academic exchange	4.60
○ Promotion and graduation	4.70
○ Ensure that the students continually achieve desired learning outcomes	4.60
Sub-Group Mean	**4.61**

Legend: 4.50-5.00 (Very Highly Practiced); 3.50-4.49 (Highly Practiced); 2.30-3.49 (Moderately Practiced; 1.50-2.49 (Less Practiced); 1.00-1.49 (Never Practiced)

For students, the criterion was '*Very Highly Practiced*' as the policies are in place and enforced for admission, transfers, progression and promotion, and graduation. Student admission to the program criterion was '*Highly Practiced*' on the educational background to undertake the engineering degree courses and have a reasonable prospect of achieving the student outcomes.

Generally, these were '*Very Highly Practiced'* by SUCs. This reflects how student-centered WV institutions are in terms of student selection and preparation for future career. As stated by Acredita CI (2018), institutions following the WA facilitates the arrangement and participation of its students in all its locations, sessions and modalities. Their programs should have quality assurance policies and instruments on admission, teaching-learning processes and evaluation, and records of academic progression of students.

Table 5

The Civil Engineering Program Compliance to PTC - WA Standards in Criterion 4

Criterion 4. Faculty and Support Staff	Mean
• There was sufficient number of competent faculty to: ○ Cover all of the curricular areas of the program	4.80
○ Assure adequate levels of student–faculty interaction and student advising.	4.50
• The faculty had the appropriate academic qualifications and professional competencies needed to assure the continuity and stability of the program.	4.50
• The program was not critically dependent on an individual; the faculty must be involved in the implementation and decisions of the program.	4.70
• The program had professional development opportunities for the faculty to participate in research, scholarly work, professional development activities and industrial interaction.	4.20
• The program had established an evaluation method to determine the educational contributions of each faculty member and to provide it to the faculty members involved in the program.	4.00
• The evaluation of educational contributions had implemented in accordance with the method.	3.90
• There was sufficient number of technical laboratory and support staffs to ensure that there is a satisfactory level of technical support in shops, maintenance of equipment, management of laboratories and general support.	3.60
• The technical laboratory and support staffs must have adequate qualifications and experience to assure the quality of the program.	3.20
• There was adequate staff development.	3.40
Sub-Group Mean	**4.08**

Legend: 4.50-5.00 (Very Highly Practiced); 3.50-4.49 (Highly Practiced); 2.30-3.49 (Moderately Practiced; 1.50-2.49 (Less Practiced); 1.00-1.49 (Never Practiced)

For faculty and support staff, the criteria were '*Very Highly Practiced'* in terms of the sufficient number of competent faculty to conduct all the curricular areas of the program; '*Highly Practiced*' in terms of the program development opportunities for the faculty to participate in research, scholarly work, professional development activities, and industrial interaction; and '*Moderately Practiced*' in terms of staff development adequacy and the technical laboratory and support staff qualifications and experiences to assure the quality of the program. Generally, they were '*Highly Practiced'*.

According to the Institution of Engineers, Sri Lanka (2021), the industry experience and exposure to professional engineering practice, as well as practical experience in an engineering environment outside the teaching establishment by the faculty and support staff assure the students to develop an engineering approach and learn to appreciate professional engineering ethics. The same experiences are regularly implemented among civil engineering institutions in the region.

Table 6

The Civil Engineering Program Compliance to PTC - WA Standards in Criterion 5

Criteria 5. Curriculum	Mean
• Engineering Accreditation Commission (EAC) requires the following areas that there was at least:	
○ One year in mathematics and basic science; and	4.30
○ One- and one-half years of engineering science including design, research, and practical training.	4.30
• There was sufficient coverage to ensure achievement of student outcomes. The curriculum must cover the following six (6) areas:	
○ Mathematics and Basic Sciences: The study of mathematics and basic sciences is fundamental in understanding the physical world in relation to engineering. It will serve as a foundation to the engineering theories and principles.	4.60
○ Engineering Sciences: Engineering Sciences has roots in the mathematical and physical sciences, and where applicable, in other basic sciences but extend knowledge and develop models and methods in order to lead to engineering applications and solve engineering problems.	4.60
○ Engineering Design and Synthesis: The creative, iterative and often open-ended process of conceiving and developing components systems and processes. Design requires the integration of engineering, basic and mathematical sciences, working under constraints, taking into account economic, health and safety, social and environmental factors, codes of practice and applicable laws, and standards in the field. Students must be prepared for engineering practice through a culminating in a major design experience based on knowledge and skills acquired earlier course and incorporating appropriate engineering standards and multiple realistic constraints.	4.60
○ Complimentary Studies: Disciplines outside engineering which are essential for professionalism and ethics. Studies are selected from political science, economics, effective communication, literature, history, art, philosophy, psychology, ethics, etc.	4.40
○ Laboratory and Field Work: Courses should be supported by meaningful laboratory work, well-coordinated with the lecture material and supported with relevant up-to-date equipment.	4.60
○ Practice Training: Exposure of the students to industry, which puts theory into practice.	4.40
Sub-Group Mean	**4.48**

Legend: 4.50-5.00 (Very Highly Practiced); 3.50-4.49 (Highly Practiced); 2.30-3.49 (Moderately Practiced; 1.50-2.49 (Less Practiced); 1.00-1.49 (Never Practiced)

For curriculum, the SUCs had it '*Very Highly Practiced'* in terms of sufficient coverage of the curriculum to ensure achievement of student outcomes in the following areas: Mathematics and Basic Sciences, Engineering Sciences, Engineering Design and Synthesis, and Laboratory and Field Work but they had '*Highly Practiced'* in Complementary Studies, and Practice Training.

Overall, they had '*Very Highly Practiced'* on this criterion. This is a proof that all BSCE programs are compliant to the policies, standards, and guidelines set by the regulating body in the country.

This is expected since an engineering education to become internationalized, "institutions of higher learning must design new program structures, identify desired learning outcomes, determine ways to align and attain their outcomes through revising course content, provide pedagogical training for faculties, adopt a variety of teaching and learning methods, and devise appropriate assessment criteria and methods" (Chung, 2011).

Table 7

The Civil Engineering Program Compliance to PTC - WA Standards in Criterion 6

Criteria 6. Facilities and Learning Environment	**Mean**
• Classrooms, offices, laboratories, and associated equipment was adequate to support the attainment of the student outcomes and to provide an atmosphere conducive to learning.	4.20
• Modern tools, equipment, computing resources and laboratories appropriate to the program were available, accessible and systematically maintained and upgraded to enable students to attain the student outcomes and to support program needs.	4.10
• Students had provided appropriate guidance regarding the use of the tools, equipment, computing resources, and laboratories available to the program.	4.40
• The library services and the computing and information infrastructure must be adequate to support the scholarly and professional activities of the student and faculty.	4.10
Sub-Group Mean	**4.23**

Legend: 4.50-5.00 (Very Highly Practiced); 3.50-4.49 (Highly Practiced); 2.30-3.49 (Moderately Practiced; 1.50-2.49 (Less Practiced); 1.00-1.49 (Never Practiced)

For facilities and learning environment, SUCs had '*Very Highly Practiced*' the provision of appropriate guidance to students regarding the use of tools, equipment, computing resources, and laboratories available to the program, and had '*Highly Practiced'* on the remaining standard, but generally, they had '*Highly Practiced'* in this criterion. As required by the CHED, all institutions in the country offering civil engineering programs must provide access to modern tools in civil engineering. These include software in spreadsheet, graphing, mathematical, programming language environment, open or commercial simulation tools, and design analysis. These tools should be sufficient to achieve the course outcomes (CMO 92, Series of 2017).

Table 8

The Civil Engineering Program Compliance to PTC - WA Standards in Criterion 7

Criteria 7. Leadership and Institutional Support	Mean
• Institutional support and leadership were adequate to ensure the quality and continuity of the program.	4.70
• Resources including institutional services, financial support and staff (both administrative and technical) provided to the program must be adequate to meet the program needs.	4.30
• The resources available to the program were sufficient to attract, retain, and provide for the continued professional development of a qualified faculty.	4.40
• The resources were sufficient to acquire, maintain, and operate infrastructures, facilities, and equipment appropriate for the program, and to provide for the environment in which student outcomes can be attained.	4.40
Sub-Group Mean	**4.45**

Legend: 4.50-5.00 (Very Highly Practiced); 3.50-4.49 (Highly Practiced); 2.30-3.49 (Moderately Practiced; 1.50-2.49 (Less Practiced); 1.00-1.49 (Never Practiced)

For leadership and institutional support, SUCs had '*Very Highly Practiced'* the adequacy of institutional support and leadership to ensure the quality and continuity of the program among SUCs and had '*Highly Practiced'* the availability of resources to the program as very sufficient to attract, retain, and provide for the continued professional development of qualified faculty. Generally, they had '*Very Highly Practiced'* this criterion. This is relevant considering that the Asian Development Bank (2011) has emphasized that for HEIs to attain quality of teaching, the academic staff need appropriate training to become adept at using effective teaching strategies, both within traditional classrooms and in technology-mediated contexts that actively engage diverse students in achieving learning goals.

For extension service, community-oriented programs, and industry-academe linkage, SUCs had '*Highly Practiced'* in student and student organizations programs and projects to assist communities. These include assistance to high school students on potential science/engineering fairs, helping design low-cost computing, low-cost access to the internet, and general utilization of their technological expertise. SUCs also had '*Highly Practiced'* dialogues with communities to determine their needs. In terms of industry–academe linkage, there was faculty/student industry exposure through internships, industry visits, collaborative projects under professionals in the industry and industry-based final year, and other areas on this criterion. Generally, SUCs had '*Highly Practiced'* on this criterion.

Table 9

The Civil Engineering Program Compliance to PTC - WA Standards in Criterion 8

Criteria 8. Extension Service, Community Oriented Programs, and Industry-Academe Linkage	Mean
• Extension Service: The program had provided non-degree educational service such as short courses on new technologies and new professional topics, to assist engineers from industry in keeping abreast of new developments in the field. Some short courses may provide summaries of findings from the research of the faculty. New courses may be developed with collaboration from industry and engineering societies.	3.50
• Community Oriented Programs: There was evidence that students and student organizations have programs to assist communities. Possible projects may involve assistance to high school students on potential science/engineering fairs. Community assistance may involve helping design low-cost computing, low-cost access to the internet and general utilization of their technological expertise. Dialogs with the communities to determine their needs should be explored first.	4.00
• Industry – Academe Linkage:	
o There was faculty/student industry exposure through internships, industry visits, collaborative projects under professionals in industry and industry-based final year projects.	3.70
o There was regular active participation from industry in planning and defining program educational objectives, student outcomes and curricula to ensure that these are relevant and up-to-date with societal and professional requirements.	3.50
Sub-Group Mean	**3.68**

Legend: 4.50-5.00 (Very Highly Practiced); 3.50-4.49 (Highly Practiced); 2.30-3.49 (Moderately Practiced; 1.50-2.49 (Less Practiced); 1.00-1.49 (Never Practiced)

The study of Bidad and Campiseño (2010) revealed that the extension program of SUCs in Region IX was well implemented by faculty and students along education, livelihood generation, health and nutrition, good governance and environmental awareness implementation. In a private HEI in Manila, representative faculty members from different engineering departments conducted a needs assessment to residents living beside the perimeter fence of the institution and found out that the most pressing needs of the community were livelihood training, family planning, financial literacy, health education, skills training and computer literacy. Upon evaluation of the implemented programs and projects, it was found that the beneficiaries learned the importance of saving money and other resources, the value of family members' interpersonal relationship, and the importance of family planning, good housekeeping and sanitation (Llenares & Deocaris, 2018).

Table 10

The Civil Engineering Program Compliance to PTC - WA Standards in Criterion 9

Criteria 9. Continuous Quality Improvement	Mean
• There was a recorded process for assessment and evaluation of the student outcomes.	4.20
• There was a recorded process for assessment and evaluation of program education objectives.	3.90
• There was evidence that the results of the evaluation of student outcomes and results of the evaluation of program educational objectives are utilized as inputs to the process for continuous quality improvement such as changes in course syllabi, curriculum, and any other aspect of the program to improve the degree of which student outcomes and program educational objectives are achieved.	3.80
• There was feedback to and from all concerned stakeholders on the achievement of the graduates.	3.50
• There was maintenance of a continuous quality, improvement program with adequate supporting resources.	3.50
Criterion 9 Sub-Group Mean	3.78
Overall Mean	4.23

Legend: 4.50-5.00 (Very Highly Practiced); 3.50-4.49 (Highly Practiced); 2.30-3.49 (Moderately Practiced; 1.50-2.49 (Less Practiced); 1.00-1.49 (Never Practiced)

For continuous quality improvement (CQI), SUCs had '*Highly Practiced'* in terms of the recorded process for assessment and evaluation of the student outcomes and the program educational objectives. Generally, they had '*Highly Practiced'* on this criterion. In the evaluation study on the student development programs and services of SUCs in Samar Island, Philippines, it was established that the implementation was very satisfactory in the following programs: cultural development, leadership training, multi-faith services, social and community development, sports development, student organization and services, student publication, and student council/government (Amit, 2019).

The BSCE program compliance to PTC-WA standards among SUCs in Western Visayas, when classified according to PTC-ACBET-EACH's nine standard criteria, was '*Very Highly Practiced*' on Criterion 3, and '*Highly Practiced'* on the remaining criteria. Program compliance to PTC-WA standards among SUCs in Western Visayas as an entire group was '*Highly Practiced'*; with SUC C as the highest while SUC E was the lowest. This implies that these state colleges and universities in Western Visayas are more particular about who they select to be enrolled in the program as they foresee the challenges they will undergo while pursuing the career as well as their preparation for the demands after graduation.

Table 11

Summary on the Civil Engineering Program Compliance to PTC - WA Standards when grouped according to nine (9) Criteria.

Criterion	Mean (μ)
• Criterion 1. Program Educational Objectives (PEO)	3.70
• Criterion 2. Student Outcome. Graduate attributes for engineers.	4.41
• Criterion 3. Students.	4.61
• Criterion 4. Faculty and Support Staff.	4.08
• Criterion 5. Curriculum	4.48
• Criterion 6. Facilities and Learning Environment	4.23
• Criterion 7. Leadership and Institutional Support.	4.45
• Criterion 8. Extension Services, Community Oriented Programs, and Industry-Academe Linkage	3.68
• Criterion 9. Continuous Quality Improvement	3.78
Overall Mean	**4.16**

Legend: 4.50-5.00 (Very Highly Practiced); 3.50-4.49 (Highly Practiced); 2.30-3.49 (Moderately Practiced; 1.50-2.49 (Less Practiced); 1.00-1.49 (Never Practiced)

5. Conclusions and Recommendations

It is established that the majority of the administrators, deans, and faculty members of the BSCE programs in SUCs are male, master's degree holders, and work full-time in the institution. The BSCE program has been offered in SUCs for 5 to 15 years, with Level III accreditation status from AACCUP, and has produced graduates whose performance in the licensure examination is above the national passing percentage for the last 3 years.

The majority of the SUCs have '*very highly practiced'* the following criteria ranked from highest to lowest: students, curriculum, leadership and institutional support, student outcome, and facilities and learning environment. These institutions have highly practiced the PTC-WA criteria in faculty and support staff development, quality improvement, and program educational objectives but only moderately practiced in extension services, community-oriented programs, and industry-academe linkages.

Nevertheless, the state-run institutions of higher learning should document and publish program educational objectives (PEO) as evidence of the evaluation of the student outcomes. These results should be utilized as inputs to the process for continuous quality improvement, such as changes in course syllabi, curriculum, and any other aspect of the program to improve the degree to which student outcomes and program educational objectives can be achieved.

The SUCs should also work for the improvement of their student outcomes in knowledge of contemporary issues, establish a program or system of evaluation to determine the educational contributions of each faculty member, and provide this scheme to the faculty members involved in the program, and deans and program heads should maintain files and documentary pieces of evidence of students and student organizations' programs to assist communities, as well as an evaluation of educational contributions that were implemented following the existing methods.

They should also improve, maintain, and strengthen industry-academe linkages where faculty/student industry exposure through internships, industry visits, collaborative projects under professionals in industry and industry-based final year projects are undertaken; provide the number of and develop technical laboratory and support staffs to ensure that there is a satisfactory level of technical support in shops, maintenance of equipment, and management of laboratories; and maintain extension services where the BSCE program has provided non-degree educational services, such as short courses on new technologies and new professional topics, to assist engineers from industry in keeping abreast of new developments in the field, short courses that may provide summaries of findings from the research of the faculty, new courses that may be developed with collaboration from industry and engineering societies, regular active participation on industry-academe linkage in planning and defining program educational objectives, student outcomes and curricula to ensure that these are relevant and up-to-date with societal and professional requirements, feedbacks to and from all concerned stakeholders on the achievement of the graduates, and maintenance of continuous quality improvement (CQI) program with adequate supporting resources.

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