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Charting New Waters: Curriculum Improvement in the Light of Applicable ABET-EAC Criteria Beginning in the 2019–2020 Cycle*

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The Electrical Engineering program at Texas A&M University-Texarkana is accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET). This paper explains how Texas A&M University-Texarkana (TAMUT) Electrical Engineering faculty implemented the newly approved ABET-EAC Criterion 3 – Student Outcomes (SOs). As the new criterion has been voted to be effective, beginning of the 2019–2020 assessment cycle with no transition period for implementation, many programs question the utility of the new SOs as compared with the ubiquitous a–k outcomes. Moreover, programs actively started to abide by the new criteria in the midst of uncertainties and confusion about the new language used in Criterion 3. This paper not only discusses the new changes to the ABET-EAC criteria but also presents a practical assessment plan that can serve as a reference for other programs that are in the process of implementing the new changes. Moreover, different methods of presenting and documenting the assessment process are explained.

Keywords: accreditation; ABET assessment; TAMUT

1. Introduction

Gaining academic accreditation is vital for many engineering programs across the world. In the USA, there are two main types of accreditation: regional and program accreditation. Regional accreditation provides accreditation to academic institutions as a whole, and this applies to all schools within the institution. There are six regional accrediting agencies that are formed by the Department of Education in the USA: Middle States Association of Colleges and Schools, New England Association of Schools and Colleges, North Central Association of Colleges and Schools, Northwest Association of Schools and Colleges, Southern Association of Colleges and Schools (SACS), and Western Association of Schools and Colleges. The other type of accreditation is special program accreditation that only accredits specific programs within a regionally accredited institution. Accreditation Board for Engineering and Technology (ABET) is considered one of the most recognizable accreditation agencies for engineering programs [1]. ABET is comprised of 35 professional societies that contribute to developing accreditation criteria, setting standards and rules of the accreditation process [2]. As an outcomes-based accreditation agency, ABET focuses on evaluating student learning outcomes rather than the topics taught within a certain program. These learning outcomes are a set of marketable professional skills that students must possess to excel in their future professional careers. While literature that discusses newly approved ABET-EAC criteria is scarce [3–5], this paper provides an in-depth explanation for new changes. It also presents an approach for implementing these changes in the Electrical Engineering program at TAMUT. Some preliminary assessment results are presented and discussed. The main contribution of this paper includes a detailed description of changes in ABET-EAC criteria while proposing strategies that were implemented to comply with the new criteria.

2. Understanding the New Criteria

The new Engineering Accreditation Commission (EAC) General Criteria for Baccalaureate Programs have been approved for implementation in the 2019–2020 review cycle. The revised sections of ABET-EAC includes new definitions, criterion 3 (Student Outcomes), and criterion 5 (Curriculum) [7]. It is anticipated that all engineering programs applying for ABET reviews will be evaluated based on the new criteria in 2019/20. In this section, these changes are explained in an attempt to prepare fellow researchers, faculty, and concerned adminis-

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trators for the successful implementation of the new criteria.

2.1 Changes to Criterion 3 and Developed Performance Indicators (PI)

The new version of ABET-EAC requires that students attain the following student outcomes (1) through (7).

(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics,
(2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors,
(3) an ability to communicate effectively with a range of audiences,
(4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts,
(5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives,
(6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions,
(7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Although it may seem easier to implement the new seven outcomes compared to the ubiquitous eleven student outcomes (a)–(k), faculty should pay a great deal of attention to the new terminologies embedded in the recent version of Criterion 3. Some programs that already have well-established assessment plans based on previous SOs (a)–(k) may attempt to map them to the new SOs (1)–(7) [4]. However, mapping outcomes introduces the risk of inaccurate measurement because of the new terminologies that are only introduced in SOs (1)–(7). New terms and definitions include items such as complex engineering problems, a range of audiences, new considerations for teams, and an inclusive environment. Moreover, many other terminologies have been removed, such as the design of experiments and design constraints such as political and sustainability.

The ABET committee at TAMUT has conducted an in-depth study of the new outcomes in an attempt to develop performance indicators (PIs) that will facilitate the assessment of the newly approved Criterion 3. In the following sections 2.1.1 through 2.1.7, The committee has provided some helpful performance indicators that address each outcome.

2.1.1 Student Outcome 1 (SO1)

> "*an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics*"

This outcome emphasizes the evaluation of complex engineering problems, as defined in section 2.1.3. The ABET committee has developed the following PIs to address this outcome:

1a. Choose an appropriate engineering method for formulating a complex engineering problem.
1b. Apply appropriate solution method using math/science/ engineering principles.
1c. Demonstrate the use of software tools for solving a complex engineering problem.

2.1.2 Student Outcome 2 (SO2)

> "*an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors*"

The key point of SO2 is to consider all factors even if some factors may not apply to the given design problem. A helpful way of considering all factors is to generate a checklist that marks all applicable factors. The PIs that were developed to address this outcome are shown below:

2a. Specify activities/procedures necessary to implement an engineering design.
2b. Consider realistic constraints and required specifications.
2c. Develop a feasible design that complies with the required needs.

2.1.3 Student Outcome 3 (SO3)

> "*an ability to communicate effectively with a range of audiences*"

Communication skills include oral and written communications. Although the criteria do not define the range of audiences, SO3 implies the necessity of evaluating communication skills with an array of audiences. Audiences can include a diverse set of individuals with different academic backgrounds, skill sets, experiences, and ages. Courses that include design projects or oral presentations can be good assessment tools for SO3.

The ABET committee at TAMUT has developed the following PIs to address this outcome:

3a. Demonstrate effective writing skills following the required guidelines.
3b. Demonstrate effective oral communication with a range of audiences.
3c. Use of graphs, charts, tables, and drawings.

2.1.4 Student Outcome 4 (SO4)

"*an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.*"

SO4 addresses ethical and professional responsibilities in engineering. The key point in implementing this outcome is the consideration of global, economic, environmental, and societal contexts before making an informed judgment about engineering solutions. Engineering codes of ethics such as the NSPE Code of Ethics for Engineers and IEEE Code of Ethics can be used as references when making such judgments. The PIs developed to address this outcome are:

4a. Evaluate different ethical perspectives/concepts.
4b. Recognize the impact of engineering solutions on the globe, environment, economy, and society as a whole.

2.1.5 Student Outcome 5 (SO5)

"*an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives*"

The outcome addresses the student's ability to function effectively in a team. Many tools and techniques can be used to assess this outcome such as timetables, meeting minutes, progress reports, final reports, and decision matrices. The outcome emphasizes having an inclusive environment for the team. Inclusiveness can be characterized in various ways that include effective listening, and respect among team members. The PIs developed for SO5 are:

5a. Develop a work plan and distribute tasks.
5b. Take responsibility for team efforts to complete the assigned tasks.
5c. Demonstrate effective listening skills to other team members.

2.1.6 Student outcome 6 (SO6)

"*an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions*"

The outcome emphasizes a student's ability to conduct hands-on experimentations while being able to analyze, interpret, and provide meaningful conclusions for data. Lab courses are successful candidates for evaluating this outcome.

PIs that were developed to address this outcome are:

6a. Perform a systematic and structured experiment with organized data,
6b. Analyze and critically interpret data, and
6c. Draw meaningful conclusions.

2.1.7 Student Outcome 7 (SO7)

"*an ability to acquire and apply new knowledge as needed, using appropriate learning strategies*"

The outcome promotes self-learning as a required skill for acquiring and applying new knowledge. It also addresses using appropriate learning strategies that can include research, interviewing experts, and professional training. The outcome can be assessed using course projects, undergraduate research courses, open-ended engineering case studies, and senior design projects.

PIs that were developed to address this outcome are:

7a. Review scientific articles and other research sources to acquire new knowledge, and
7b. Use new knowledge effectively.

2.2 New Definitions

To have a consistent understanding of some important terminologies, the current version of ABET-EAC criteria has clearly defined basic science, college-level mathematics, complex engineering problems, engineering design, engineering science, and team.

2.2.1 Basic Science

The new criteria define basic science as "*Basic sciences are disciplines focused on knowledge or understanding of the fundamental aspects of natural phenomena. Basic sciences consist of chemistry and physics and other natural sciences including life, earth, and space sciences.*"

Compared to the old definition of basic science, the new definition is more specific as it includes natural sciences with a focus on chemistry, physics, life, earth, and space sciences. In some definitions, natural science is inclusive of life science and physical science. That gives engineering programs more options to satisfy the basic science component in the engineering curriculum. However, ABET-EAC does not consider computer science as basic science.

2.2.2 College-level Mathematics

While the previous version of ABET-EAC criteria does not explicitly define college-level mathematics, the new criteria define college-level mathematics as "*College-level mathematics consists of mathematics that requires a degree of mathematical sophistication at least equivalent to that of introductory calculus. For illustrative purposes, some examples of college-level mathematics include calculus, differential equations, probability, statistics, linear algebra, and discrete mathematics.*"

Based on the definition, developmental mathematics, college algebra, pre-calculus, and plane trigonometry are not considered college-level math.

2.2.3 Complex Engineering Problems

Complex engineering problems is a new terminology introduced in the new version ABET-EAC criterion 3 (student outcomes). ABET-EAC defines complex engineering problems as "*Complex engineering problems include one or more of the following characteristics: involving wide-ranging or conflicting technical issues, having no obvious solution, addressing problems not encompassed by current standards and codes, involving diverse groups of stakeholders, including many component parts or sub-problems, involving multiple disciplines, or having significant consequences in a range of contexts.*"

The new version of student outcome 1 (SO1) in criterion 3 calls for identifying, formulating, and solving complex engineering problems. Simple engineering and mathematical problems can no longer be considered to satisfy outcome 1. The introduction of complex engineering problems in SO1 will require programs to evaluate this outcome using advanced engineering courses (junior or senior level). Capstone design can be a good candidate for assessing complex engineering problems.

2.2.4 Engineering Design

Engineering design was defined in the previous version of ABET-EAC Criteria as "*Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and the engineering sciences are applied to convert resources optimally to meet these stated needs.*"

The current version of ABET-EAC criteria has an inclusive definition of engineering design with several examples of possible constraints. The current definition emphasizes skills such as analysis and synthesis, identifying opportunities, generating multiple solutions, considering risks, and obtaining high-quality solutions given specific constraints. The definition also provides some examples of possible constraints such as ergonomics, legal considerations, marketability, aesthetics, functionality, manufacturability, and interoperability. The current criteria do not consider these examples mandatory nor comprehensive for consideration in engineering design. The current definition of engineering design is "*Engineering design is a process of devising a system, component, or process to meet desired needs and specifications within constraints. It is an iterative, creative, decision-making process in which the basic sciences, mathematics, and engineering sciences are applied to convert resources into solutions. Engineering design involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade-offs, for the purpose of obtaining a high-quality solution under the given circumstances*. [7]"

2.2.5 Engineering Science

The definition of engineering science is almost unchanged. The current definition is "*engineering sciences are based on mathematics and basic sciences but carry knowledge further toward creative application needed to solve engineering problems. These studies provide a bridge between mathematics and basic sciences on the one hand and engineering practice on the other*."

2.2.6 Team

"Team" as terminology was not specifically defined in the previous ABET-EAC criteria. However, the current criteria explicitly define it as follows: "*A team consists of more than one person working toward a common goal and should include individuals of diverse backgrounds, skills, or perspectives* [7]". The definition emphasizes interdisciplinary teamwork.

2.3 Changes in Criterion 5 – Curriculum

Changes to criterion 5 can be summarized in two significant points as follows:

2.3.1 The requirement of Mathematics and Basic Science Courses

The previous version of criterion 5 requires at least one year of college-level mathematics and basic science with experimentation. One year was defined as the lesser of 32 credit hours or one-fourth of total credit hours towards graduation. The current version of criterion 5 has better redefined this requirement as 30 credit hours regardless of the total number of degree hours.

2.3.2 The Requirement of Engineering Topics

The previous version of criterion 5 requires at least one and one-half years of engineering topics consisting of engineering design appropriate to the program. The current version of the criterion requires at least 45 credit hours of engineering topics consisting of engineering, computer science, engineering design, and utilizing modern engineering tools.

3. Assessment Plan and Implementation

To develop the assessment plan for the updated 2019–2020, ABET-EAC criteria, the engineering faculty at TAMUT divided the work into three areas. These were to develop performance indicators (PIs), map these indicators to courses in the curriculum, and create a process for evaluating student achievement as measured by the PIs. The process was informed by all faculty attending IDEAL scholar training offered through ABET [8]. The IDEAL training aims to prepare faculty to be leaders in the development and implementation of a program accreditation plan [8]. This investment in time and resources allowed all of the faculty to experience high-quality training concurrently and learn best assessment practices together.

In developing performance indicators, faculty applied the principles from ABET's IDEAL scholar program. Some literature has addressed effective methods for applying direct and indirect assessment as in [9]. Understanding direct and indirect measures, creating appropriate rubrics, and ensuring that measurement techniques were effectively measuring the PIs allowed faculty to create PIs that met the standards of the IDEAL program. Meetings were scheduled where each criterion was discussed and faculty used techniques such as brainstorming and a modified nominal group technique to propose PIs. Suggestions were evaluated, chosen, and modified to find the best solutions for PIs.

Although some discussion regarding where PIs would be measured took place in the PI development phase, a separate discussion was necessary to finally determine which courses would be used for which PIs. This process called for creating a curriculum map that identified all courses where a given criterion was presented. As an example, a total of 12 distinct courses contained elements relevant to solving complex engineering problems as specified in criteria 1. Creating the curriculum map required involvement from all faculty because no single faculty member is intimately familiar with what is taught in all the courses. Once the whole list of classes was developed, it became clear which courses would be the best for collecting summative data. Another issue addressed in the mapping phase was to set up measurements on a two-year cycle. This allowed faculty to spread out the data collection, analysis, and curriculum revision tasks over time and establish a manageable workload for assessment.

The ongoing process for using the PIs in a continuous improvement mode was divided into a four-step iterative cycle. The cycle begins with PI measurement and continues with the analysis of measurement data, implementation of curriculum refinements, then concludes with teaching the curriculum with the refinements in place for a reasonable period of time before entering the cycle again. Fig. 1 shows how the process flows from one step to the succeeding steps.

In the measurement phase of the cycle, faculty in the specified courses use the holistic rubrics developed by the Electrical Engineering faculty to measure the PIs. The rubrics measure PIs on a four-point scale ranging from "Beginning" to "Excellent". This normally occurs near the end of each semester and is documented for analysis in the following semester. Care is taken to preserve student artifacts and data so that evidence is easily produced should it be needed during the analysis part of the cycle or for questions that might arise during an accreditation visit.

Analysis of the measurement data begins in the following semester. Results are shared with the committee before meeting in order to evaluate the collected data and suggest an improvement plan for each evaluated outcome, if necessary. It is important to note that within the two-year cycle, the 7 program outcomes are staggered so that the committee is normally considering 1 or 2 outcomes per semester. Program outcomes are identified as being measured in fall or spring semesters and in even or odd years. For example, program outcome 1 is measured in the fall semester of odd-numbered years and program outcome 2 is measured in the spring of odd-numbered years. This tends to balance the workload of assessment over time and also allows the faculty to focus on a few improvements at

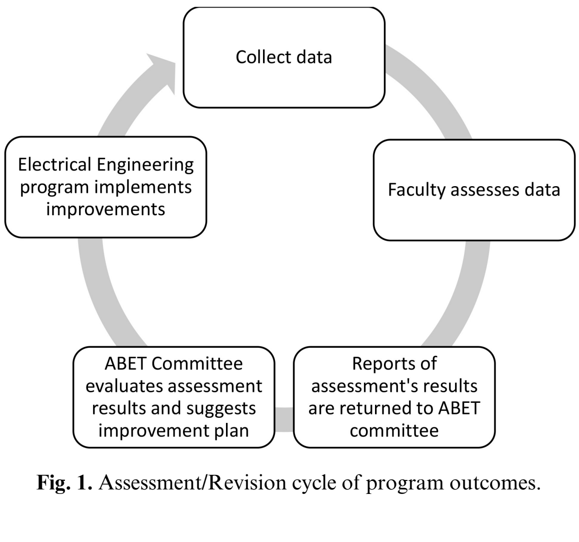


Fig. 1. Assessment/Revision cycle of program outcomes.

a time. Other aspects of the analysis segment of the cycle are that performance thresholds are evaluated and any indirect measures that might shed light on the program outcome are taken into account. As an example, the survey of senior students solicits student perceptions (an indirect measure) for each of the program outcomes so that the survey is referenced in the analysis discussion. The result of the analysis phase is that faculty create curriculum updates or refinements that are expected to improve student performance in the outcome under consideration.

In some cases, the refinements are easily implemented and can be brought into the curriculum during the same semester that the analysis is done. In other cases, faculty need time to modify the curriculum and introduce the change in a subsequent semester. Therefore, the implement refinement phase may take anywhere between a few weeks to as much as a year. In a case where a new course may need to be introduced, or an existing course must be significantly changed, this phase can take time to complete.

The final phase of the cycle is to teach the curriculum with the changes in place. This time is variable depending on how long the previous step took, but it ends after two years when the next measurement is scheduled. Faculty are encouraged to carefully consider significant changes outside of the ABET committee recommendations so that the impact of the recommended course improvements can be measured as accurately as possible, and confounding variables are minimized.

Table 1. Assessment plan for EE program at TAMUT

	Even year		**Odd year**	
Program Outcomes	**Spr.**	**Fall**	**Spr.**	**Fall**
Outcome 1				×
Outcome 2			×	
Outcome 3			×	
Outcome 4		×		
Outcome 5	×			
Outcome 6			×	
Outcome 7	×			

4. Preliminary Evaluation Results & Continuous Improvement

4.1 Assessment Strategy

Outcome assessment is performed at the PIs level. Each PI uses specific rubrics that classify student's performance into four categories: (1) Beginning, (2) Developing, (3) Proficient, and (4) Excellent. ABET Committee at TAMUT has identified a benchmark for all PIs that is 70% of students are at the "proficient" level or higher. For any PI that falls below this benchmark, an action of improvement shall be required at the course and the program level. A five-year assessment plan (Table 1) is developed so that all SOs are being evaluated before the next ABET review cycle in AY 2022-2023. There are various ways of selecting courses required for the summative assessment of SOs. In [3], three courses are used to assess all SOs. Some programs suggest using only capstone senior design courses for summative assessment as they are considered the culminating experience of engineering programs as in [10]. However, lab courses are more suitable for measuring hands-on and data analysis skills. Therefore, EE 336 (Electronic Laboratory) is used for assessing Student Outcome 6 which is directly related to experimentation development skills. SO 1 addresses students' abilities to apply math and science for solving complex engineering problems. Since not all senior design projects require sophisticated mathematical modeling, it was decided that assessing this outcome using a course that relies heavily on mathematics and analysis of complex engineering problems such as EE 345 (Introduction to Electromagnetics) is more appropriate. Therefore, four courses are being used for summative assessment of all SOs: EE 336, EE 345, EE 490, and EE 491 as shown in Table 2.

4.2 Assessment Results and Documentation

Assessment results and improvement plans are documented as required by ABET. Documentation is done using a course assessment report (CAR), a spreadsheet that shows how scores are calculated, and electronic copies of all artifacts used for assessment. Moreover, meeting minutes of the ABET committee can also be used for documenting

Table 2. Outcomes and corresponding assessment courses

	SOs						
	1	**2**	**3**	**4**	**5**	**6**	**7**
EE 336 (Electronic Laboratory)						×	
EE 345 (Introduction to Electromagnetics)	×						
EE 490 (Senior Design I)				×			
EE 491 (Senior Design II)		×	×		×		×

improvement plans. The course assessment report is formed after Estell [11]; it includes sections for previous course changes, assessment tools and results, description of assessment results, and improvement plan.

Collecting data is not necessarily adequate for effective assessment. Analysis of assessment data is crucial for effective evaluation. It is important not to aggregate assessment results in a way that hides possible weaknesses. For example, if performance indicators are used for evaluating a student outcome, aggregating or averaging assessment scores of PIs could obscure certain weaknesses and defeat the purpose of assessing outcomes at the PI level. Instead, all scores of PIs should be separately analyzed.

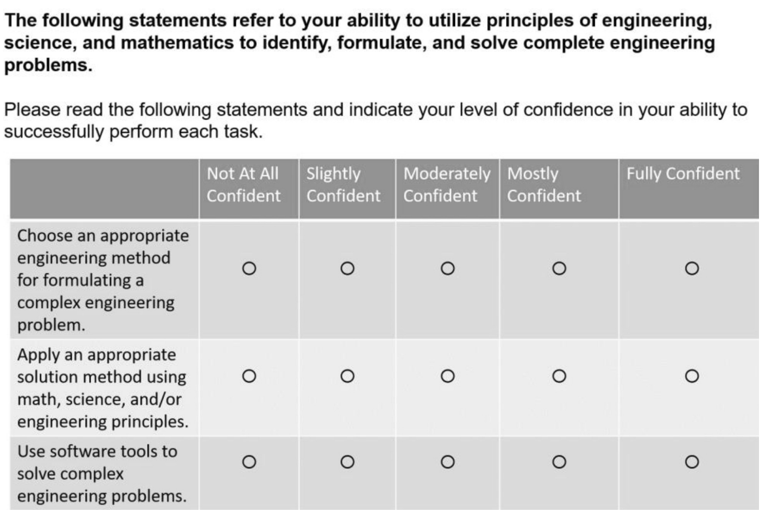
4.3 Evaluation and Improvement Plans

In this section, an example of an assessment and improvement plan for student outcome 3 is presented. The evaluation is based on a predefined threshold, assessment methods, and educational strategies as shown in Table 3. Senior surveys are also used as indirect assessment methods where senior students assess their abilities to attain specific PIs. The survey is based on a five-point Likert scale ranging from "Not At All Confident" to "Fully Confident". For example, the survey questions related to the PIs of outcome 1 are shown in Fig. 2.

The direct assessment uses a written final report for indicators 3a and 3c. PI 3b is assessed using the final senior design presentation. The department

Table 3. Assessment Plan of Outcome 3

Outcome 3: an ability to communicate effectively with a range of audiences.						
Performance Indicators	**Educational Strategies**	**Method(s) of Assessment**	**Where summative data are collected**	**Length of assessment cycle (yrs)**	**Yr/sem of summative data collection**	**Threshold for performance**
a. Demonstrate effective writing skills following required guidelines	EE: 319, 320, 322, 490, 491 ENGR 1201	Written final report (using rubric)	EE 491	2 years	Spring 2019	70% of students greater than 3 out of 4.
		Senior Surveys (Online Survey)				70% of students $\geq$ 4/5 on a Likert scale.
b. Demonstrate effective oral communication with a range of audiences.	EE: 490, 491 SPCH 1315	Oral presentation	EE 491	2 years	Spring 2019	70% of students greater than 3 out of 4.
		Senior Surveys				70% of students $\geq$ 4/5 on a Likert scale.
c. Use of graphs, charts, tables, and drawings	EE: 319, 320, 322, 490, 491 ENGR 1201	Written final report (using rubric)	EE 491	2 years	Spring 2019	70% of students greater than 3 out of 4.
		Senior Surveys				70% of students $\geq$ 4/5 on a Likert scale.


The following statements refer to your ability to utilize principles of engineering, science, and mathematics to identify, formulate, and solve complete engineering problems.

Please read the following statements and indicate your level of confidence in your ability to successfully perform each task.

	Not At All Confident	Slightly Confident	Moderately Confident	Mostly Confident	Fully Confident
Choose an appropriate engineering method for formulating a complex engineering problem.	○	○	○	○	○
Apply an appropriate solution method using math, science, and/or engineering principles.	○	○	○	○	○
Use software tools to solve complex engineering problems.	○	○	○	○	○

Fig. 2. Senior survey questions that assess the PIs of outcome 1.

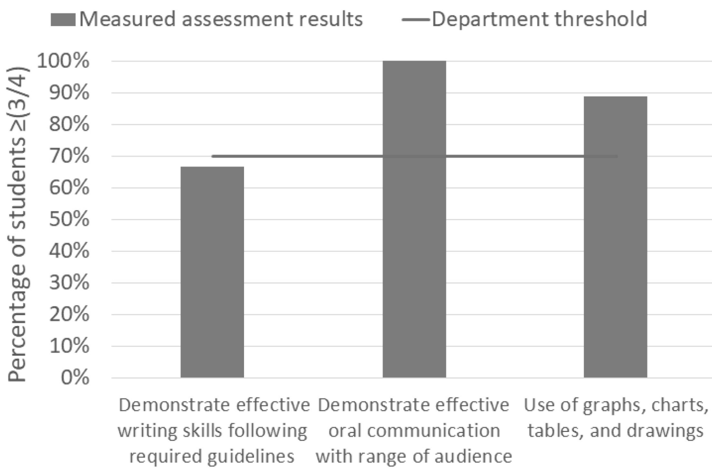


Fig. 3. Assessment results of Outcome 3.

Table 4. Action plan items for Outcome 3 (PI 3a)

	Action plan items
Action 1	Course instructor gives detailed feedback on technical writing.
Action 2	EE faculty improve guidelines of technical writing across the program.
Action 3	The course instructor allows students to submit an early draft of their final report prior to final submission.
Action 4	EE faculty emphasize technical writing in early courses such as Introduction to Engineering, Digital Logic, and laboratory courses.

benchmark of direct assessment methods is that 70% of students score greater than 3.0/4.0 for all PIs. If any PI falls below this benchmark, an improvement action will be required. Responsible faculty can usually implement changes the following semester after developing improvement actions. Course improvement actions include but not limited to change of the content of a specific course, the addition of new assignments, revising the timeline of some assignments, providing additional teaching materials to students, and adding extracurricular activities. However, some improvements can be at the department level, which may take a longer time to implement, such as applying new technology (i.e., software), introducing a new course in the Electrical Engineering curriculum, or requesting new equipment. All improvement actions, whether at the course level or the department level, should be implemented within the department's 2-year assessment cycle. Fig. 3 shows the assessment results of outcome 3. It is seen that 100% of students have scored higher than the department's benchmark 3.0/4.0 for performance indicator 3b. For indicators 3a and 3c, 66.67% and 88.88% of students have scored higher than the department's benchmark 3.0/4.0. It is noticed that PI 3a needs improvement, while 3b and 3c are well above the department's threshold.

Both the course instructor and ABET committee suggest an improvement plan. The course instructor addresses an improvement plan at the course level while the ABET committee normally focuses on improvement plans at the program level.

The action plan items developed by the course instructor and ABET committee are shown in Table 4.

5. Conclusion

Preparing for ABET accreditation is a crucial duty for many engineering programs worldwide. Although the benefits of accreditation are well-understood among faculty and administrators, the ambiguity of the accreditation process and the amount of time and effort it requires could pose a serious problem. This paper documents many of the key elements of that transition that were successfully implemented by the Electrical Engineering program at TAMUT. It also aims to provide a clear pathway to ABET accreditation while offering a practical process supported with measured assessment data. The proposed accreditation process can significantly reduce the amount of required work while satisfying ABET-EAC criteria. Approval of the ABET-EAC Criterion 3 – Student Outcomes requires accredited programs to transition from the previous standards. An essential part of the transition was to develop PIs for the new outcomes. The PIs are described alongside each outcome with a rationale that explains the emphasis of the individual outcomes. The process of developing PIs was informed by material presented at the IDEAL scholar training provided by ABET. Once the PIs were established a cycle of continuous improvement was adopted, documented, and put into practice. An example of assessment results and an improvement plan is included to demonstrate the documentation and action plan for improvement. The proposed process focuses on collecting information rather than accumulating assessment data so that only four courses are used to assess the required Student Outcomes. The framework described fits the needs of the TAMUT Electrical Engineering program and may be used as a template for other programs, but care should be taken to avoid using the PIs verbatim. Individual program faculty should create PIs that effectively measure the learning outcomes for their programs and provide clear evidence that the learning outcomes are being achieved in the local environment.

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David Reavis began developing his assessment knowledge and skills as a member of the Independent Evaluation Team for a $20M Hope VI grant from The U.S. Department of Housing and Urban Development (HUD) to revitalize public housing in Texarkana, Texas from 2009 through 2012. His responsibility on the Evaluation Team was to assess the economic impact of the grant over the life of the project. The team produced annual reports and concluded the project with a final evaluation in 2012. Subsequently, Dr. Reavis was asked to serve as the Interim Assistant Vice President of Institutional Effectiveness during spring of 2012 to develop the University's 5th year assessment for the regional accreditation body, The Southern Association of Colleges and Schools Commission on Colleges (SACSCOC). The 5th year report consisted of assessment documentation on 13 standards and resulted in continued accreditation for Texas A&M University-Texarkana. This background prepared Dr. Reavis for his duties as Chair of the Assurance of Learning Committee for the College of Business, Engineering, and Technology beginning in 2015 to the present time. Dr. Reavis has also assisted the engineering faculty in developing processes to meet updated standards for ABET accreditation. He has completed training specific to assessment for AACSB accreditation and has earned the designation of an IDEAL Scholar from ABET after completing the program assessment training in 2018.

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