On Instruments for Closing the Loop for ABET Accreditation

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Abstract

One of the important Criteria in obtaining accreditation from ABET is to show the high quality performance of the graduates of a program. Instructors directly involved in the accreditation process are to produce enough evidences supporting the high standard of the student performance in an effort to display the strength of the program. The target is to show the mechanism of closing the loop for continuous improvement. More specifically the program's responsibility is to demonstrate how its publicized objectives are fulfilled. Demonstration of the performance of the continuing students is one of the assessments. This is done via traditional tests, quizzes, homework and projects. Alumni, employers, intern/coop supervisors, graduate student supervisors, industrial advisory board members are some of the sources who can prudently make assessment on the performance of an educational program. Gathering opinions from these external sources sometimes becomes very difficult often jeopardizing the accreditation of a program from ABET. Lengthy questionnaire (survey instrument), which often includes less or unrelated questions, may make the respondents reluctant to respond at all. The basis of designing a questionnaire is to gather specific information to assess certain objectives. To assess the program objectives, a set of precise instruments (questionnaires) were developed to obtain feedback information from internal and external constituents of the program. Various elements were considered in designing the instruments. One major focus was to make sure which minimum information is needed to fulfill the objectives of the program assessment. The other major focus was to increase the chance of getting response from the external bodies. This paper discusses the creation of the instruments, gathering opinions and analysis of the opinions in closing the loop in the process of continuous improvement.

Introduction

The basis of continuous improvement is to gather feedbacks from the constituents and act according to the suggestions made by the constituents. An academic program is nourished and sustained by the faculty and staff of a department and the academic environment and facilities provided by the university. Ultimate success of a program is measured by the success of the graduates (alumni) in their professional fields. These alumni as a body are the great source of getting feedback to uphold a program for continuous improvement. For engineering technology programs, this body with its experience in the profession, can guide the program to adapt emerging technology in the curricula. The employers as whole are another entity who can advise with direction for adapting new technology and engineering principles.

In assessing the program objectives, specific questionnaires were developed by keeping the elements of program objectives in the focus. The educational program objectives of the department of Engineering Technology at Prairie View A&M University are:

Program Objective 1
Produce graduates who will have successful careers in Computer Engineering
  Technology, Electrical Engineering Technology and related fields, thereby,
  fulfilling the purpose mission of the university in serving a diverse ethnic and
  socioeconomic population

Program Objective 2
Produce graduates who will be capable of advancing their careers by obtaining
  professional certificates, registrations, moving into other lucrative professions,
  and leadership positions

Program Objective 3
Produce graduates who can successfully obtain admissions to pursue graduate degrees

Program Objective 4
Produce graduates who will understand and maintain professional ethics and the need
  to safeguard the public environment and the natural resources of the nation

ABET Accreditation

The Technology Accreditation Commission of Accreditation Board for Engineering and Technology (TAC of ABET) is a driving force to keep Engineering and Technology education programs engaged in continuous improvement. The fourth Criterion[1] (2008-09) of its 9 Criteria is the Continuous Improvement. A program is required to convince ABET with documentations on how actively it is engaged in the process of continuous improvement. By tightening its rules, ABET favors a program by keeping it engaged in continuous improvement. Thus the program stays in competition with other academic institutions.

Constituents to Influence Continuous Improvement

Of course, the learners, faculty, staff, facilities and learning environment together are the major constituents in the process of continuous improvement. These are the internal players who are directly involved in the process. The evaluators and patrons of the program are the Alumni, Employers, Industrial Advisory Board Members, Graduate Degree Supervisors, Intern/Coop Supervisors. These players have a vital role as external members who extend their supports as obligation to the society, nation and so to the program.

A program is in the process of continuous improvement when its sustaining and supporting forces are in action to evaluate its status and contribute to meet the demand for the emerging technology. Figure 1 is a model which depicts how its constituents can improve a program. The internal players are the active players that put their forces to sustain and improve a program. The external ones support with their soft services to the program. Of the internal players, faculty members are the engineers to build the students equipped with knowledge and skills needed to be successful in their professional careers. Staff is the helping hand in the program. The external players do not carry direct responsibility. They contribute due to their moral, ethical and

patriotic obligation and responsibility to the society and nation as a whole. As a result, it is the responsibility of the direct players to involve the external players in the process of improvement.

Program

| Internal Constituents |
| External Constituents |

| Students |
| Faculty |
| Staff |
| Facility |

| Suggestions and Actions |

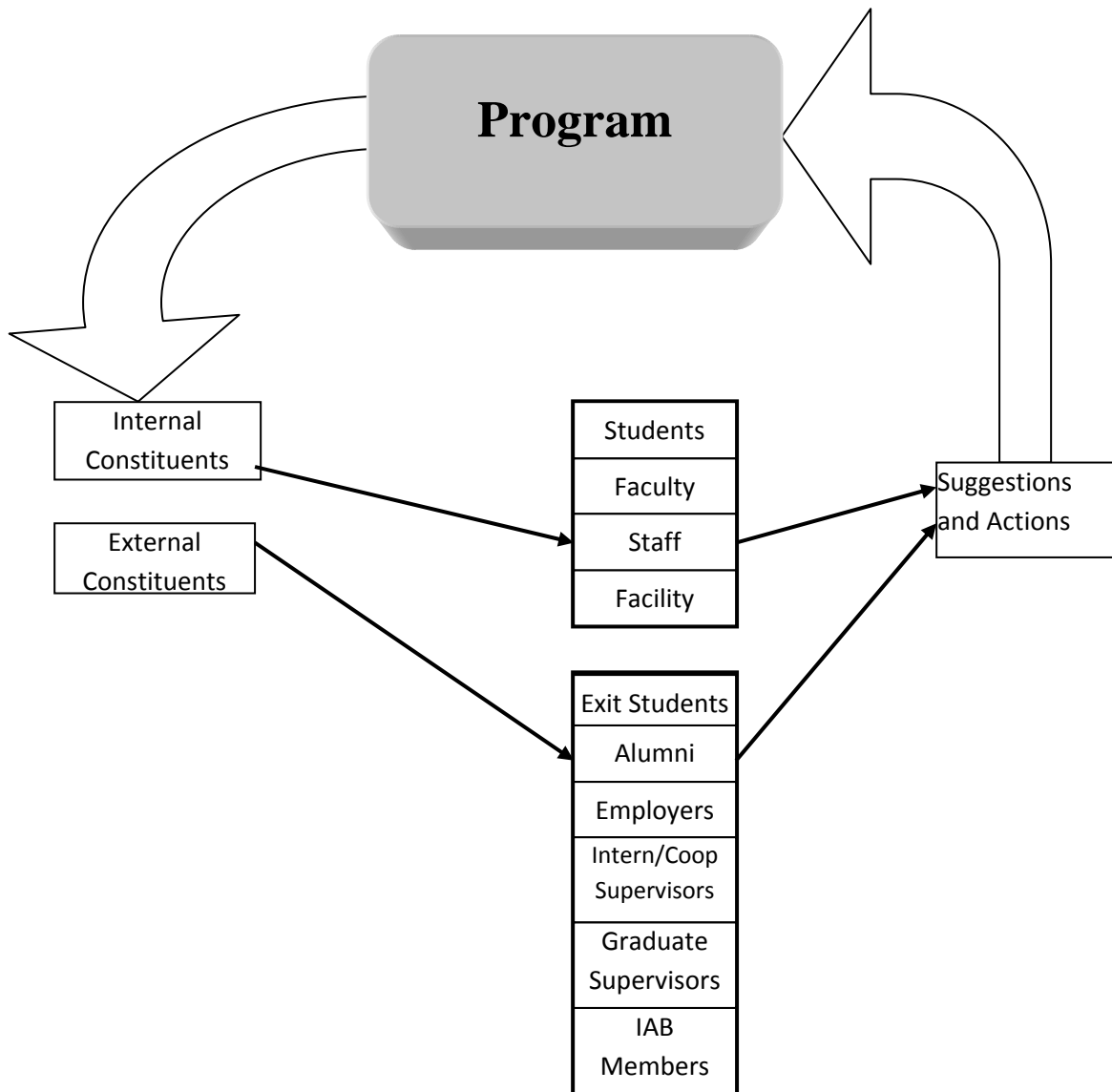| Exit Students |
| Alumni |
| Employers |
| Intern/Coop Supervisors |
| Graduate Supervisors |
| IAB Members |

Figure 1. Continuous Improvement process in a program

Of all the external contributors (players), the members of Industrial Advisory Board (IAB) get a first hand view of the academic program, its curricula and laboratory facilities and have chance to talk to the continuing students. They can make on-the-spot advice and suggestions for improvements. Others contribute by participating in Expert Opinion Survey.

Developing Survey Instruments

The Engineering Benchmark Inc. does business to conduct survey. It has as many as 83 questions with lot of redundant and boring questions. It is difficult to relate these questions to the objectives and assessment plan of the programs in the department of engineering technology. As a result, this department has abandoned the idea to use the services of this company and developed its own set of survey instruments. During designing a questionnaire (instrument), the psychology of the respondent should be carefully thought about. It is likely that a respondent may not respond to a long list of questions. Even if he does, he may not put his valuable thoughts but put random tick marks just to get through it. To obtain meaningful response from a targeted person, a survey instrument (questionnaire) needs to be prepared with adequate judgment and thought. The two most important considerations are:
- Size of questionnaire limited to a single page
- Questions which relate directly to the major objectives of the program. Any subsidiary question should totally be avoided.

Survey Instruments
The Survey Instruments are shown in Appendix Figures A.1 to A.6 at the end of the paper. Each one is only one page long. Basis of each instrument is indicated with a single line theme of emphasis at the top.

Exit Survey
This survey is conducted at the end of each semester on the graduating students. The ABET a-k outcome tool is used to measure the confidence level of the graduates. We measure their skills as students. At graduation they measure themselves as to what level of confidence and expertise they have earned as they get ready to enter the Corporate America (Figure A.1.)

Graduate Advisor Opinion Survey
Readiness for graduate study is one of the objectives of our program. This survey is conducted to assess the opinions of the graduate advisors the preparedness of the alumni for graduate studies (Figure A.2.)

IAB Member Survey
Industrial Advisory Members meet at least once a year to assess our programs and suggest for improvement. This survey captures their opinions on the quality of the programs reflecting the students, faculty and laboratory facilities (Figure A.3.)

Intern/Coop Supervisor Survey
This survey is conducted to assess the opinions of the Intern/Coop supervisors on the skills and performance of the continuing students. The ABET a-k outcome tool is used in this survey (Figure A.4.)

Alumni Survey
This survey is conducted on those alumni who are in the profession at least for two years. Their performance in the industry is the major indicator of achievement of the program objectives. The questionnaire is prepared to reflect the program objective elements (Figure A.5.)

Employer Survey
Employers are the persons only who can rightfully assess the performance of our alumni. An educational program achieves its objective when the employers are satisfied with the performance of the graduates of the program. This questionnaire is prepared in the light of the program objective elements as in the case of alumni survey (Figure A.6.)

Results and Discussion

The responses from the alumni and employers were encouraging with the new instruments. A total of 26 alumni and 16 employers responded immediately. The department was able to receive adequate responses from other external constituents as well. The alumni and employer questionnaires were designed to assess the four program objectives with opinions from the perspectives of the alumni working in the Corporate America and their employers as well. Responses from the alumni are a Yes or a No, while that from the employers are on a scale of 1 to 10. Figures 2 and 3 show the analyses of responses from the alumni and employers, respectively.
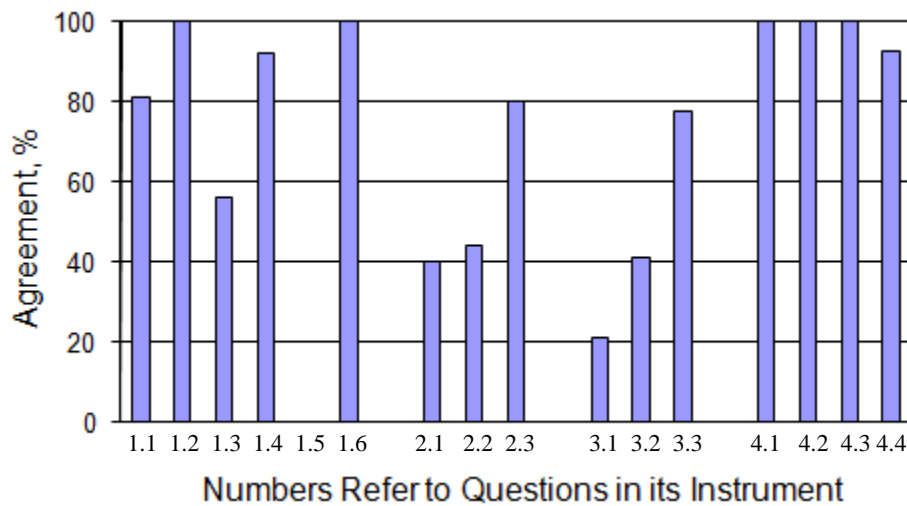

Figure 2. Responses from alumni to reflect the degree of achievement of Program Objectives

To maximize information related to an objective, multiple questions were made for each objective. For example, Objective 1 contains sub-questions as 1.1 to 1.6 and Objective 2 has sub-questions as 2.1 to 2.2.

Alumni responses are exhibited in percentages while the responses from the employers are shown in a scale of 1 through 10. A closer look at Figures 2 and 3 indicate a close match between the responses. Objective 1 measures the degree of success of the alumni in their profession terms of technical skills, comfort of work, recognition in the profession, attitude to challenging skills, skill to work in teams, and the so forth. Figure 2 shows the alumni point of view in their success. Their claim of success does not seem to be exaggerated as the employers are seen to have the same level of appreciation about the alumni (Figure 3). For example, question 1.2 indicates that the employers are 90% inclined to hire graduates from the same institution. This is a very strong finding to support the achievement of Objective 1 of the program.

Objective based questionnaire with few but specific sub-questions makes such particular statement in favor of achieving a particular objective of a program.
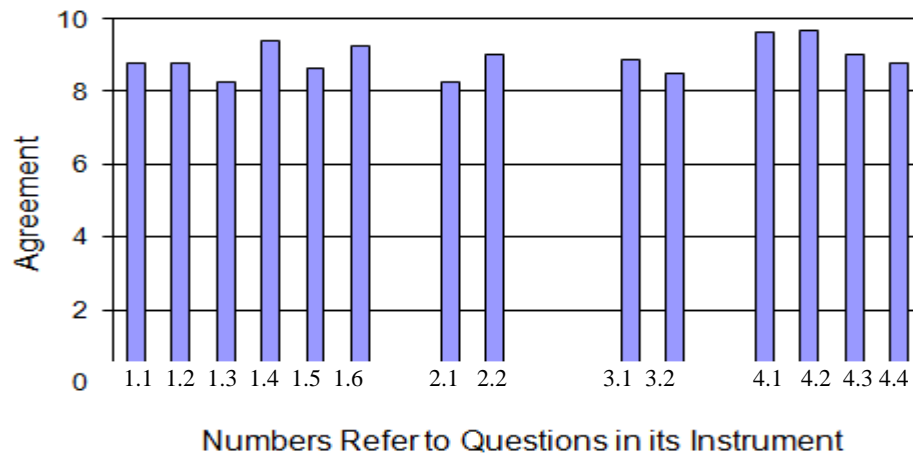

Figure 3 Responses from employers in reflecting the degree of achievement of Program Objectives.

Conclusions

In designing a survey instrument to collect opinions, certain key factors need to be considered. The respondent is not obliged to respond in any way. A questionnaire more than a single page long is usually discarded. Focus should be made to obtain information to reflect only the key elements of an objective. In setting a question, its benefit to meet the objectives should be emphasized. A less effective question should always be avoided in order to obtain realistic opinion from a respondent. The instruments presented in the Appendix proved very effective in the past in getting adequate responses from target population. However, there is always room for improvement.

References

1. Criteria for Accrediting Engineering Technology Programs. Effective for Evaluations During the 2008-2009 Accreditation Cycle. p.2. http://www.abet.org.

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Exit Survey

Theme: Gaining Academic Confidence by achieving knowledge and skills
(a-k Outcomes used as a method to measure)

Student Name _____

Student Graduated with Major: <u>CPET/ELET</u> Date Responded _____

Response scale: 1 – Not agreed at all.   10 – Agreed the most.
Instruction: Focus on the entire length of study period here

Criteria	Criteria Description	Response: 1 - 10
a	Appropriate mastery of knowledge, techniques, skills, and modern tools of their disciplines	
b	An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology (MSET)	
c	An ability to conduct, analyze, and interpret experiments and apply experimental results to improve process	
d	An ability to apply creativity in the design of systems, components or processes appropriate to program objectives	
e	An ability to function effectively on teams	
f	An ability to identify, analyze, and solve technical problems	
g	Ability to communicate effectively	
h	A recognition to the need for and an ability to engage in life-long learning	
i	An ability to understand professional, ethical, and social responsibilities	
j	A respect for diversity and knowledge of contemporary professional, societal, and global issues	
k	A commitment to quality, timeliness, and continuous improvement	

 Your email address which you will keep the longest:_____
(hotmail, yahoo, or gmail account)

Figure A.1 Instrument to survey of the strength and skills of the exiting students

GRADUATE ADVISOR Opinion Survey

Theme: Preparedness for Graduate Studies

Graduate Student (Alumnus) Name _____ **Major at PVAMU <u>CPET/ELET</u>**

Graduate Advisor Name_____

Department _____**University** _____

Date Responded _____

Response scale: 1 – Not agreed at all.   10 – Agreed the most.

Nos.	Description	Response: 1 - 10
1	Adequately prepared for graduate studies	
2	An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology (MSET)	
3	An ability to conduct, analyze, and interpret experiments and apply experimental results to improve process	
4	An ability to apply creativity in the design of systems, components or processes appropriate to program objectives	
5	An ability to function effectively on teams	
6	An ability to identify, analyze, and solve technical problems	
7	Ability to communicate effectively	
8	A recognition to the need for and an ability to engage in life-long learning	
9	An ability to understand professional, ethical, and social responsibilities	
10	A respect for diversity and knowledge of contemporary professional, societal, and global issues	
11	A commitment to quality, timeliness, and continuous improvement	

Figure A.2. Instrument to obtain the opinions of Graduate Study Supervisors on the preparedness of the Alumni from the Engineering Technology department

IAB MEMBER Feedback on the Programs

Theme: Educational Program Quality and Facility

Note:
This questionnaire is designed for the IAB members to assess the performance of the department as a whole in terms of quality teaching, motivation and dedication of the faculty and staff to achieve the goals of the department and the environment for the students to learn.

Member Name _____

Affiliation _____

Date Responded _____

Response scale: 1 – Not agreed at all.   10 – Agreed the most.

Nos.	Description	Response: 1 - 10
1	IAB meeting outcomes are implemented in the programs	
2	Faculty members strive to continuously update the course and curricula	
3	Laboratories are being updated with modern equipment and software	
4	Faculty members are actively involved in their professional developments	
5	Student scholarships are properly managed by the department	
6	Department engaged in exploring Coop/Internships for students	
7	Students are involved in professional societies and clubs	

Figure A.3. Instrument to obtain the opinions of the IAB members on the programs of the Department of Engineering Technology

INTERN/COOP SUPERVISOR Survey
Theme: Quality of the Continuing Students

Intern Supervisor Name _____ **Organization Name** _____

PVAMU Student Name _____ **Major** <u>CPET/ELET</u> Date Answered_____

Response scale: 1 – Poor.   10 – Excellent.

Program Objective 1

Produce graduates who will have successful careers in Computer/Electrical Engineering Technology and related fields, thereby, fulfilling the purpose mission of the university in serving a diverse ethnic and socioeconomic population

Questions	Answer: 1 to 10
1.1 How do you rate the technical skill of the intern	
1.2 How comfortable you are in hiring our students as intern in the future?	
1.3 The intern deserves special recognition/appreciation	
1.4 The intern is enthusiastic about taking challenging tasks	
1.5 The intern's communication skills	
1.6 The intern's skill to work on teams	

Program Objective 2

Produce graduates who will be capable of advancing their careers by obtaining professional certificates, registrations, moving into other lucrative professions, and leadership positions

Questions	Answer: 1 to 10
2.1 Do you see any leadership **potential** in the intern?	
2.2 The intern's **motivation to advance career** by obtaining certifications, involvement in leadership, etc.	

Program Objective 3

Produce graduates who can successfully obtain admissions to pursue graduate degrees

Questions	Answer: 1 to 10
3.1 The intern has **intuition/potential** to do research and analytical skills to solve problems	
3.2 The intern demonstrates **potential** for graduate studies in the future	

Program Objective 4

Produce graduates who will understand and maintain professional ethics and the need to safeguard the public environment and the natural resources of the nation

Questions	Answer: 1 to 10
4.1 How do you rate the intern in maintaining the professional code of conduct	
4.2 The intern maintains high ethical standard in his/her career	
4.3 The intern is aware of the importance of public safety in his/her career	
4.4 The intern is aware of protecting the environment and the natural resources of the nation	

Figure A.4. Instrument to obtain the assessment of Coop/Intern Supervisors of performance of the Continuing students of the Department of Engineering Technology

ALUMNI SURVEY
Program Objective Based Questionnaire
Theme: Professional and Career Satisfaction to meet the Educational Program Objectives

1. Name _____ 2. Semester Graduated _____ 3. Major_____
4. Name and Address of Organization working_____ 5. Date _____

Program Objective 1:

Produce graduates who will have successful careers in Computer/Electrical Engineering Technology and related fields, thereby, fulfilling the mission of the university in serving a diverse ethnic and socio-economic population

Questions	Yes	No
1.1 Are you working in the area of your expertise (CPET/ELET major)?		
1.2 Do you feel comfortable and secured with your job performance?		
1.3 Did you receive any special recognition from your employer?		
1.4 Do you think your company is comfortable in hiring CPET/ELET graduates of PVAMU in the future?		
1.5 Do you have or applied for any patent?		
1.6 Do you think you received adequate academic foundation from PVAMU for this job?		

Program Objective 2:

Produce graduates who will be capable of advancing their careers by obtaining professional certificates, registrations, moving into other lucrative professions, and leadership positions

Questions	Yes	No
2.1 Are you in a leadership position?		
2.2 Have you received any professional certification or registration?		
2.3 Did you receive any professional training to advance your career?		

Program Objective 3:

Produce graduates who can successfully obtain admissions to obtain admissions to pursue graduate degrees

Questions	Yes	No
3.1 Do you have graduate degrees (MS or PhD)?		
3.2 Else do you have graduate admission but did not complete yet?		
3.3 Else do you have plan for graduate studies in near future?		

Program Objective 4:

Produce graduates who will understand and maintain professional ethics and the need to safeguard the public environment and the natural resources of the nation

Questions	Yes	No
4.1 Do you maintain the professional code of conduct?		
4.2 Do you maintain your high ethical standard in your career?		
4.3 Are you aware of the importance of public safety in your career?		
4.4 Are you aware of protecting the environment and the natural resources of the nation?		

Figure A.5 Survey Instrument to opinions from Alumni

Employer Survey

Theme: Achieving Educational Program Objectives through the Performance of Alumni

Supervisor Name _____ **Organization Name** _____

Employee Majored in **CPET/ELET**   Date Answered_____

Response scale: 1 – Poor.   10 – Excellent.

Instruction: Respond for those who graduated from PVAMU

Program Objective 1

Produce graduates who will have successful careers in Computer/Electrical Engineering Technology Engineering and related fields, thereby, fulfilling the mission of the university in serving a diverse ethnic and socioeconomic population

Questions	1 to 10
1.1 How do you rate the technical skill of the employee	
1.2 How comfortable you are in hiring our graduates in the future?	
1.3 The employee deserves special recognition	
1.4 The employee is enthusiastic about taking challenging tasks	
1.5 The employee's communication skills	
1.6 The employee's skill to work on teams	

Program Objective 2

Produce graduates who will be capable of advancing their careers by obtaining professional certificates, registrations, moving into other lucrative professions, and leadership positions

Questions	1 to 10
2.1 The leadership skill of the employee	
2.2 The employee has the potential to advance career by obtaining certifications, etc.	

Program Objective 3

Produce graduates who can successfully obtain admissions to pursue graduate degrees

Questions	1 to 10
3.1 The employee has higher degrees (MS or PhD) or potential for. (1 - Poor, 10 - Excellent)	
3.2 The employee has intuition to do research and analytical skills to solve problems	

Program Objective 4

Produce graduates who will understand and maintain professional ethics and the need to safeguard the public environment and the natural resources of the nation

Questions	1 to 10
4.1 How do you rate the employee in maintaining the professional code of conduct	
4.2 The employee maintains high ethical standard in his/her career	
4.3 The employee is aware of the importance of public safety in his/her career	
4.4 The employee is aware of protecting the environment and the natural resources of the nation	

Figure A.**6.** Survey Instrument to obtain opinion from the Supervisors of Alumni (their employee)