

LESSONS LEARNED FROM A SUCCESSFUL EC2000 ACCREDITATION VISIT

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Abstract -- This paper describes the importance of strategic planning during assessment. A schedule of the major activities is provided. Forming advisory boards, measuring outcomes, and developing an effective improvement process are important for implementing the plan. Concrete examples are provided on our lessons learned.

Index Terms – Successful accreditation visit, EC2000 lessons learned, Engineering Criteria 2000 lessons learned

Introduction

World-wide accreditation of engineering programs in institutions should have common evaluation criteria. In the late 1980's, the Accrediting Board for Engineering and Technology (ABET) in the U.S. established comparable accreditation criteria for six nations under a mutual recognition agreement [1]. Since that time, agreements have been extended to many countries throughout the world. Now ABET International assists outside nations in developing and evaluating accreditation guidelines that are equivalent to those in the U.S. [1].

In 1998, ABET approved a new set of criteria for accrediting engineering programs: Engineering Criteria 2000 (EC2000) [1]. There are eight criteria in EC2000 that must be satisfied. Since Criteria 2 (program educational objectives) and 3 (program outcomes and assessment) are the new and less descriptive requirements, this paper will mainly focus on these criteria. EC2000 emphasizes evaluating student learning and assessing the processes and methods for continuous improvement.

Criteria 2 and 3 in EC2000 are purposely vague because ABET expects the engineering departments to develop their own processes and methods for improving student learning. The problem is many institutions are not familiar with how to satisfy these criteria. Only about 35% of the U.S. institutions are currently receiving 6 years accreditation [2]. This is because the lessons learned from the 6-year accredited institutions have not been adequately disseminated.

In the fall 2000, our Mechanical Engineering (ME) program at Loyola Marymount University (LMU), a small liberal arts university in Southern California, came up for

accreditation review. The ABET evaluation team has informed us that unofficially we will receive 6 years accreditation. However, we are currently awaiting official notification from ABET.

We are sharing these results in order to help other engineering programs improve their assessment methods. In 1999, we discussed how our assessment process was driven by the needs of our advisory board [3]. More recently, we discussed our improvement process and methodology for assessing our program outcomes [4]. This paper will discuss our recommendations, rather than the way we actually implemented EC2000. The purpose of this paper is to interpret Criteria 2 and 3 and provide a hands-on, common sense approach to strategic planning, implementing the plan, writing the self-study report, and preparing for the ABET accreditation visit

Strategic Planning

This section will discuss getting started; establishing a mission; forming an assessment committee and advisory board; setting guidelines on meetings, decision-making and scheduling activities. This is a plan that can easily be followed.

How do you get started? It is recommended that institutions start early, preferably three years in advance of the due-date for your self-study report. Departments should review the results of their last accreditation report. To understand ABET's new guidelines in EC2000, their web site should be visited [1]. There are annual assessment conferences at Rose-Hulman University, workshops/sessions sponsored by the ASEE, ABET and professional societies, and several publications to assist universities in understanding the terminology and methods of assessment [5]-[7].

How do you establish a mission and goals? The planning process begins with the faculty's self-examination of your department, which is called a SWOT (S = strengths, W = weaknesses, O = opportunities, T = threats) analysis [3], [8]. The analysis will help you

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determine your department’s mission (niche opportunity) based upon your strengths and weaknesses, taking your external threats into account. The mission is your department’s global identity (purpose), which includes your stakeholders. Here is an example: "Our department's mission is to provide a high quality, practice-oriented design-focused curriculum that prepares students for graduate school and leadership roles in government and industry." Then the institutional goals will further characterize the mission, and they could emphasize, for example, professional practice, applied research, life-long learning, communication, teambuilding, and personal fulfillment.

Why should you have a college assessment committee? It was imperative that the Dean and Associate Dean of Engineering exhibit strong leadership and share the latest assessment information with the engineering departments. The Dean organizes such a committee that represents the college. The purpose of the committee is to have two people from each department (the chair and one other faculty member) meet every 2 to 3 weeks to discuss their progress with the other departments. Then action items are developed and taken back to their departments for discussion with the faculty.

What guidelines need to be set-up for department meetings? Under the leadership of the department chair, the key questions that the faculty need to discuss are: How often will meetings be held? Where will they be held? How will they be conducted? How will disagreements be handled? How will consensus be achieved? How will decisions be made? The discussion of these issues is left up to the creativity of the department chair to promote the best exchange of ideas in a non-threatening way. It is recommended that weekly department meetings be held so that homework assignments can be given to the faculty.

How does the faculty achieve consensus? Since the faculty have diverse interests, backgrounds and capabilities, obtaining a unanimous opinion on every

issue is impossible. After the issues are discussed, the chair should attempt to integrate the opinions and concerns of the faculty into a solution. If this is not possible, the chair should ask the faculty, "What can you live with?" (some kind of negotiated agreement that everyone can "buy into"). When this happens, consensus is achieved. However, if the faculty cannot achieve consensus, the chair needs to move forward to the decision-making process. Here, chair needs to keep the discussion on track and not let it degenerate into personal vendettas.

How are decisions made? Since many decisions have to be made quickly, the faculty should not get bogged down in the paralysis of analysis. On the issue that the faculty could not reach consensus, a motion should be proposed which incorporates the best solution possible. The faculty should vote on it, and the results should be documented in the minutes of the meeting. The decision is reached by a simple majority of votes. Once a decision is reached, activities and "due-dates" can be delegated to the faculty.

How are advisory boards set-up? The purpose of advisory boards is to acquire feedback from the institution’s constituents (stakeholders). Two advisory boards are recommended – one for the college, and one for the department. The college advisory board can include employers, alumni, and friends of the university. This board advises the Dean and acted as an independent auditor for evaluating the results of the engineering programs. The department's advisory board represents a broad cross-section of its constituents, i.e., representatives from industry, graduate schools, students, alumni, professional societies and faculty [3]-[4]. They advise the department on the constituents’ needs and approve the department's processes, methods and procedures.

What are the scheduled activities? In order to the plan for assessment, a time line should be created for the major activities. This provides a roadmap for the journey. For example, an abridged schedule is shown in **Figure 1**.

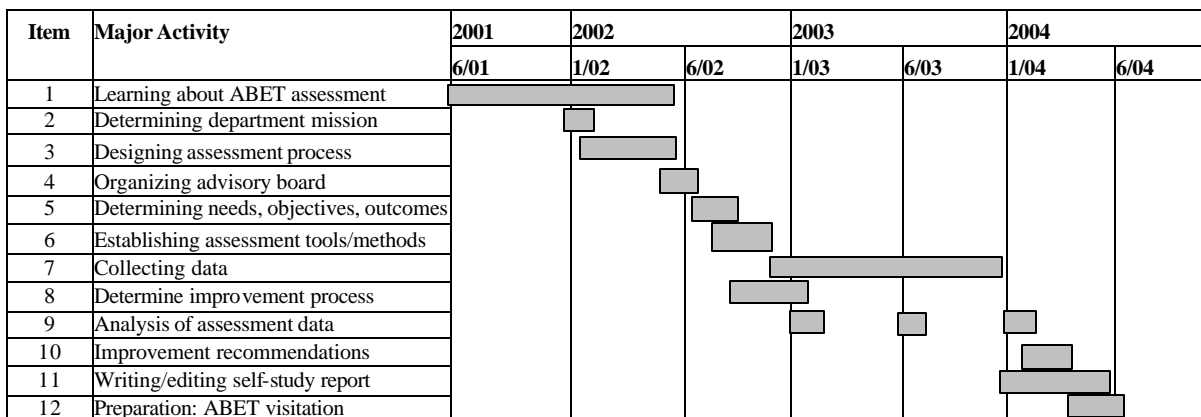


Figure 1. Recommended Schedule: Activities vs. Time

It assumes a start date of June 2001 for a Fall 2004 ABET visit and spans a ~3 year period. This is based upon our experience and recommendations for institutions that are doing this for the first time. Faculty collaboration and achieving consensus consumes extra time. Also, additional time is needed to collect and analyze the assessment data. Nevertheless, it is possible to collapse the schedule into ~2 years.

Implementation

The implementation of a strategic plan will be addressed by answering a series of questions that are given below.

What is the assessment matrix? ABET's matrix for implementation of assessment explains the 5 levels for establishing the educational objectives, constituents, processes, outcomes assessment, results and system [1], [9]. It is recommended that institutions strive for the highest level (level 5). Currently, in order to obtain 6 years accreditation, institutions will probably have to obtain at least level 3. In the future, ABET will raise the level to obtain 6 years accreditation. Specific examples will be given below for the factors in this matrix.

What are educational objectives & program outcomes? These objectives are statements that describe the capabilities that the graduates are expected to exhibit 2-4 years after completing the curriculum. The educational objectives should be specific and measurable, and they should link to the university mission and the constituents' needs [3]. There should be about 4-6 objectives that are compatible with the institution's goals. They should be reviewed and up-dated every 2-4 years. An example is: "Our graduates will have a spirit of professionalism, ethics and service to society."

Program outcomes are specific, measurable statements that link to educational objectives [3], [4] and describe the capabilities that our graduates are expected to have at the time of graduation. They should be reviewed every year for changes. They consist of ABET's 11 program requirements, (a - k) plus a few additional outcomes that identify with the department's mission. An example of a program outcome is: "Graduating students will have an ability to form interpersonal and humanistic relationships."

What is the purpose of our constituents? The two advisory boards, one for the college and the other for each department, represent the "voice of your constituents" for the Dean and the department's faculty, respectively. The college advisory board should conduct student interviews, analyze survey results and act as an independent reviewer for confirming the faculty's assessment results. The department's advisory board should determine their needs and assist the faculty in establishing their educational objectives, extra program outcomes, assessment methods and improvement. Their approval should be documented.

The advisory boards should meet at least once a semester to show a sustained effort. The members on each board should be expected to contribute 10-20 hours per year.

What processes are needed? Two processes are mandatory - an overall assessment process and detailed improvement process. An example of the assessment process is shown in **Figure 2** which shows the links between constituent needs, & course topics and demonstrates the "double-loop" feedback [3], [4]. An example of an improvement process is shown in **Figure 3**, where data from the assessment tools are analyzed against a performance standard and the results are discussed in terms of weaknesses and strengths [4]. Here weaknesses should be construed as opportunities for improvement. ABET expects that institutions will have weaknesses. Universities will not be penalized for having perceived weaknesses, so long as the faculty have an improvement process and have taken corrective action for improving the weakness.

It is recommended that your processes and results be presented at society conferences. In this way, the responses from other institutions can be documented and be used to benchmark your program against other university programs.

How should outcomes assessment be performed? The nomenclature in your processes and methods should be explained in a table of common terminology. All processes should be able to systematically assess and improve the program outcomes every 1-2 years (see the "inner loop" of **Figure 2**, and **Figure 3**).

The assessment tools, educational methods, and performance standards should be developed to measure the program outcomes. No more than four independent assessment tools are suggested (see **Figure 3**). Too many overlapping assessment tools create more work, and the analysis may yield conflicting results.

The educational methods or practices explain how the assessment tool is implemented. For example, the following items should be provided: description of the tool, how it is used in assessment, who administers it, the performance standard, and the method of analyzing the data. These items should be discussed for each assessment tool [4].

The performance standard is the level of achievement that indicates whether the results are a strength or weakness. When the analyzed data exceed the performance standard, the results are considered a strength. The converse holds for a weakness.

How are the results used? Showing sustained results is the reason that 3 years of preparation is recommended. Through a sustained effort, many of the prior problems and weakness will have been eliminated by improving the program.

The data are compared with the performance standard for each assessment tool that measures the program outcome. If the gap is consistently negative for two or

more assessment tools, then corrective actions are recommended by the faculty. The changes are implemented, documented and fed back to our advisory board and/or program outcomes (Figure 3).

In order to document the results of our data, an “outcome assessment” table can be developed for each of

the 11 program outcomes (a - k). For example, Table I shows the outcome assessment for communicating effectively [4]. The student proficiency is recorded for each assessment tool in terms of a strength or weakness.

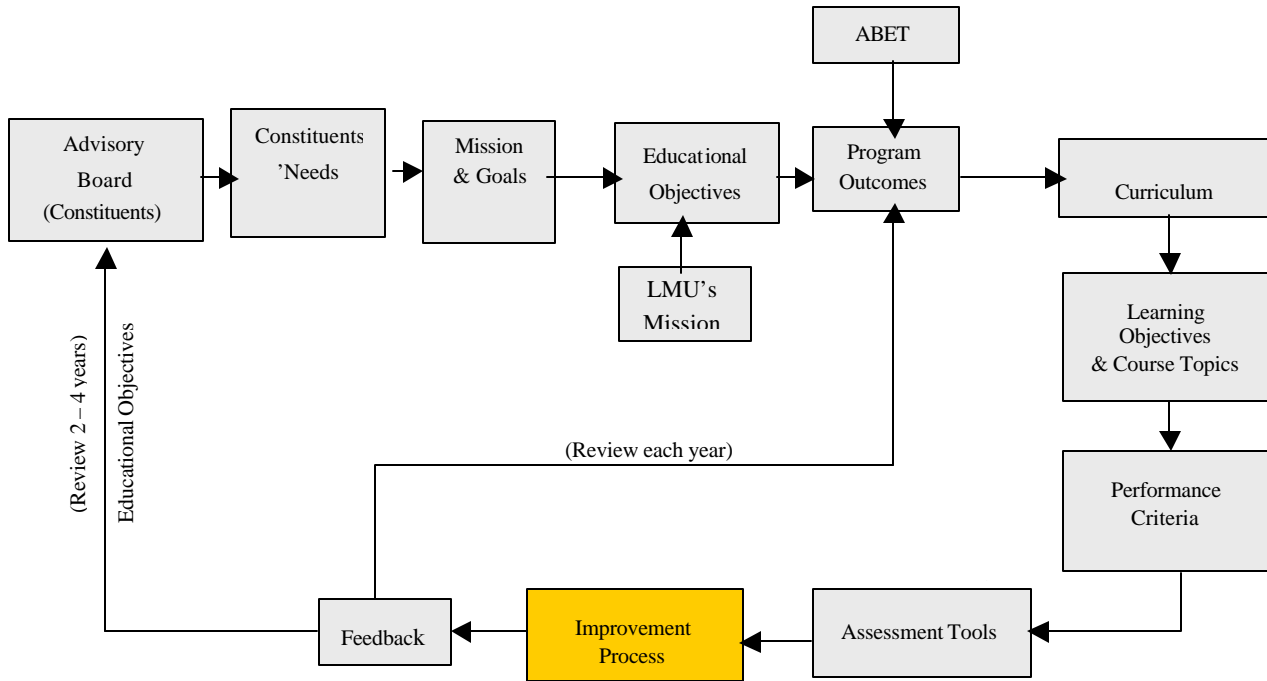


Figure 2. Overall Assessment Process with Improvement (see Figure 2).

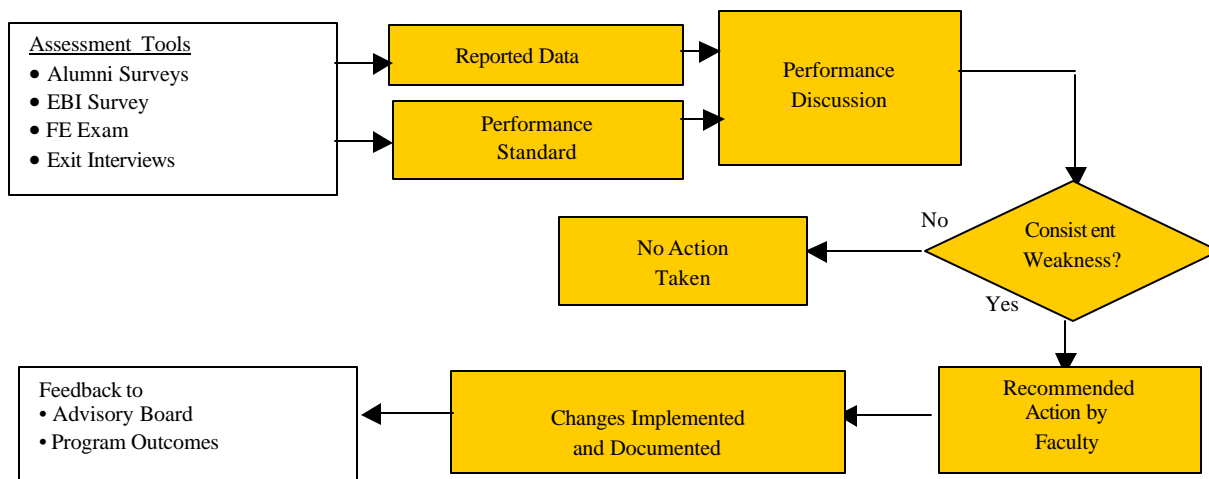


Figure 3. Detailed Improvement Process (colored “yellow” from Figure 1sd/

The strengths or weaknesses are discussed at the bottom of the table. When a check mark () is placed opposite a weakness, it is documented for corrective action to improve the program. When the corrective actions are actually implemented, the date and person(s) who implemented them can be recorded on the sheet. This process creates a systematic approach for documenting improvements.

How reliable is your system? Your institution's approach and methods should be dependable and should at least be deployed throughout the college and hopefully, in the future, by the institution. In all cases, this approach should be driven by the constituents' needs, institutional mission and the program's educational objectives. Your institution's approach must stand the test of time, whereby improvements have been made based upon the results of your data. Hence, again 3 years of preparation is suggested.

Writing the Self-Study Report

The success or failure of an accreditation visit largely depends on the quality of the self-study report (SSR). It should be submitted at least 5 months prior to ABET's visit. The SSR should contain information on the program being evaluated, why the program exists, who it serves, how it serves, how it operates, actions to correct

Table I. Documentin g Outcome (g): Ability to Communicate Effectively

Assessment Tool	Student Proficiency
Alumni Surveys	High scores in both written and oral reports
EBI Survey	Good skills in written & fair skills in oral communication
FE Exam	Not applicable (NA)
Exit Interviews	None indicated
Discussion: Students showed an improved trend in good written and oral communication skills in their course work [strength].	

previous deficiencies, and how it meets the 8 program criteria of EC2000. When the SSR is being planned, the Program Evaluators Worksheet should be used as an outline [1]. However, the report should be written in accordance with program self-study instructions [1]. The nomenclature that is used in the report should be summarized in a table at the beginning of the SSR. The report is typically 25-50 pages long with appendices that describe the program (tabular data, course syllabi, and faculty curriculum vitae), institutional profile, and assessment tools and data.

While all faculty are involved in the development of the SSR, the faculty member with the best written communication skills should write the report. The other

more experienced faculty members, who have gone through previous accreditation visits, should assist the author. It is important to periodically check ABET's web site for the latest instructions on the SSR [1]. It has been observed that changes in the instructions can occur. It is of utmost importance that the SSR be easy to read and easy to locate the desired information.

It is important to start writing the SSR about 6 months before it is due. This will provide ample time to make corrections. The process starts with a detailed outline, which should be approved by the faculty. Then a first draft is written and edited by the faculty. The draft should be checked for consistencies, e.g., links of outcomes to the course syllabi, and design courses vs. lecture and lab courses. A second draft is written, and this should be reviewed by somebody outside of the department, e.g., the Associate Dean. After corrections are made, a third and final draft should be written.

Preparation for ABET Visit

The faculty should review the final SSR one last time before it is sent to the ABET team (chair and departmental evaluator) to ensure that there are no mistakes. However, if any mistakes are found after the SSR has been sent out, the corrections should be summarized in an addendum and sent to ABET.

Before the arrival of the ABET accreditation team, the departmental faculty should prepare itself to answer the evaluator's questions. The possible eleven questions that you should expect are as follows: How do you feel about being a faculty in this department? What are the strengths of the department? What are the weaknesses of the department? Who are your constituents? What are your program educational objectives? How were they determined? What are your program outcomes? How were the constituents involved in developing the educational objectives and program outcomes? How do you advise your students? What support is available for professional development traveling to conferences? What is the faculty morale in your department?

One of the purposes of the accreditation visit is the review of exhibits for each math, science and engineering course that is taught. These must include examples of the students' work: the course syllabus, course calendar, grading standard, and other general course information; graded homework, project reports, progress and presentations; graded quizzes and tests; student notes; and any other work that was completed in the class

These displays should be checked thoroughly to make sure all of the required materials are in the right place.

Visit and Post Visit Activities

The dates for the engineering accreditation visit are worked out between the institution and ABET. All efforts must be made to ensure the classrooms, laboratories and course exhibits clean and organized. The day that the ABET team arrives, the Dean of Engineering should give a 20 minute presentation to ABET. The presentation should emphasize the following: university overview, university and college mission, engineering enrollments, recent significant changes, educational objectives and program outcomes, evaluation and assessment methods, assessment and improvement processes, and specific examples.

After the Dean's presentation, the program evaluator will meet with the department chair, the faculty, and the students in the department. The ABET evaluator will attempt to obtain information about the strengths and weakness of the program. Since involvement of the constituents in the program is very important in EC2000, the ABET evaluator will also want to meet with a few members of the departmental advisory board.

In all cases, the people who are interviewed by ABET should truthfully answer the evaluator's questions. In no uncertain terms should the people be told beforehand how to answer potential questions.

Conclusions

The following results originated from this paper:

1. Establishing guidelines on meetings, consensus and making decisions is important for operating effectively.
2. Advisory boards are necessary to involve the constituents in the assessment process.
3. Institutions should start planning for assessment about 3 years ahead of completing the self-study report.
4. The assessment process involves measuring the students' proficiency of achieving the outcomes with no more than four assessment tools. The weaknesses for each outcome are identified. The institution will not be penalized for describing its weaknesses, so long as corrective actions are recommended by the faculty, and future changes are documented.

5. In writing the self-study report, institutions should allow 6 months and should put forth a high quality document that involves at least three drafts.

6. The faculty should prepare for ABET's visit by setting-up the course exhibits and being able to answer several key questions about the department, assessment process and institutional support.

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References

- [1] ABET's web site - <http://www.abet.org>.
- [2] Comment from ABET evaluator, personal communication, September 2000.
- [3] M. Mendelson and R. Noorani, "Assessment Process and Role of Advisory Board," (co-authored with Rafiq Noorani) *Pacific Southwest Section ASEE Conference Proceedings*, pp. 21-28, 1999 (presented in Las Vegas, NV, March 19-20, 1999).
- [4] M. Mendelson and R. Noorani, "Improving Undergraduate Engineering Education in the US and Abroad Using EC 2000," *Proceedings of International Conference on Engineering Education (ICEE)*, published in CD ROM, Taipei, Taiwan, August 13-16, 2000.
- [5] G.M. Rogers, J.K. Sando, "Stepping Ahead: An Assessment Plan Development Guide," *Foundation Coalition*, NSF Grant #EEC-952401, Rose-Hulman Institute of Technology, 1996.
- [6] M.D. Aldridge, L.D. Benefield, "A Model Assessment Plan," *ASEE Prism*, pp. 22-28, 1998.
- [7] V.R. Johnson, "Ask, and Ye Can Assess," *ASEE Prism*, pp. 25-28, October 1998.
- [8] Kearns, K.P., "From Comparative Advantage to Damage Control: Using SWOT Analysis," *Nonprofit Management & Leadership*, vol.3 [1], pp 3-22, Fall 1992.
- [9] Evaluator Program Report, Engineering Criteria 2000, 1997-98 Pilot Visits, Figure A-1: Matrix for Implementation Assessment, 1998.