

Implementing an Integrated System for Program Assessment and Improvement

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INTRODUCTION

Criterion 2 of the ABET Engineering Criteria 2000 requires that, to gain accreditation, an engineering program must have:

- (a) detailed published educational objectives that are consistent with the mission of the institution and [ABET] criteria,
- (b) a process based on the needs of the program's various constituencies in which the objectives are determined and periodically evaluated,
- (c) a curriculum and process that ensures the achievement of these objectives, and
- (d) a system of ongoing evaluation that demonstrates achievement of these objectives and uses the results to improve the effectiveness of the program.¹

In this paper, we describe an integrated program assessment model, developed in direct response to the requirement for “a system of ongoing evaluation” specified in Criterion 2(d) above. The model has been implemented successfully through two annual assessment cycles in the ABET-accredited civil engineering program at the United States Military Academy, West Point.

For the purpose of this paper, we assume that program objectives have already been formulated, consistent with Criterion 2(a) and (b) above, and that appropriate assessment tools are available to measure the achievement of these objectives. For a discussion of our own program objectives and assessment tools, see Reference 2.

THE PROGRAM ASSESSMENT MODEL

Our program assessment model is an annual cycle, consisting of a systematic assessment of every course in the program, followed by an assessment of the program as a whole. The annual cycle is illustrated in Figure 1. The large yellow arrow represents one annual iteration of the **Program**. Within the program, a series of courses (represented by the black arrows designated **Course A**, **Course B**, and **Course C**) run concurrently. On an annual basis, each individual course is the subject of a formal **COURSE ASSESSMENT**. The principal purposes of this event are to measure how well the course is accomplishing its objectives, to determine if the course objectives contribute appropriately to the program objectives, and to generate appropriate **course changes** (indicated by the innermost “feedback loops” in Figure 1). Course assessment results also serve as input to an annual **PROGRAM ASSESSMENT**, the first of two program-level assessment activities. The program assessment measures how well the program is accomplishing its objectives, determines if the program objectives contribute appropriately to the institutional goals, and generates **internal program changes**—global modifications to the program *that are within the authority of the program director to change*. The program assessment also serves to

identify required changes to the curriculum, which (at USMA) require consideration by the institutional Curriculum Committee and approval by the institution’s senior leadership. These **curriculum change** recommendations are formalized and justified in a **PROGRAM REVIEW**, which concludes the annual assessment cycle.

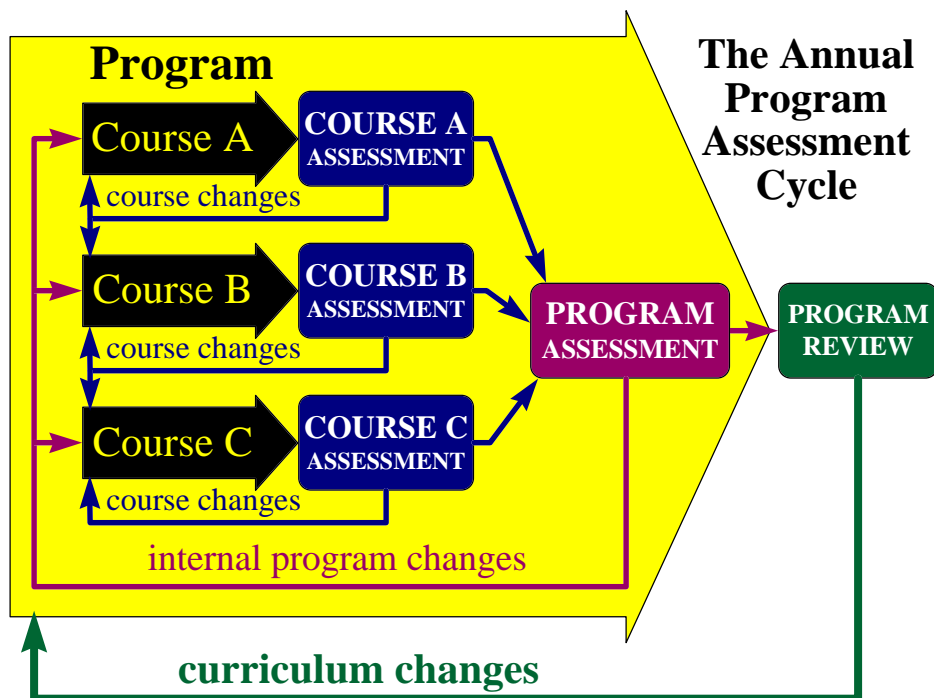


Figure 1. The Annual Program Assessment Cycle

Note in Figure 1 that the assessment of Course A generates changes not only to Course A, but to Course B as well. Similarly the Course B assessment generates changes to both Course B and Course C. These “second-order changes” might occur if, for example, Course A is a prerequisite for Course B, and Course B a prerequisite for Course C. Given the nature of a prerequisite relationship—that the *content* of Course A must be learned as a *precondition* for enrollment in Course B—it is entirely reasonable to expect that even a small change to Course A might necessitate corresponding changes to B and C. Thus in Figure 1, the bifurcation of these feedback loops illustrates a critically important point: *in a well-integrated curriculum, course assessment can never take place in isolation*. The course assessment process must take into account the formal and informal connections between courses. No change should be undertaken in any course without due consideration of its impact on related courses in the program. In practice, this means that no change should be undertaken without consultation with the *instructors of related courses* and perhaps even the directors of related programs. Thus the course assessment process must be an inclusive one. Anyone who has a stake (no matter how indirect) in the content of a particular course should have an opportunity to participate in the decision-making process.

THE ANNUAL COURSE ASSESSMENT

In our model, the annual course assessment is an *event*—a collaborative decision-making forum called the *course proposal meeting*. The meeting is conducted once per year for every course in the program, normally late in the spring semester. Each course proposal meeting is hosted by the Course Director* of the corresponding course. The Program Director and other senior leaders from the department attend all of these meetings. Course Directors of related (e.g., prerequisite) courses are strongly encouraged to attend. All members of the faculty are invited, and all understand the standard for attendance—the course proposal meeting is the *only* mechanism for changing the objectives and content of a given course; a faculty member who declines to attend also forfeits the opportunity to influence that course until the next course proposal meeting, one year later.

At least two days prior to the course proposal meeting, the Course Director prepares a *draft course assessment report* and distributes copies to all faculty members who have indicated a desire to attend the meeting. The report is divided into three major sections:

- Course description
- Course assessment
- Recommended changes

The *course description* includes a listing of course objectives, a syllabus, an analysis of engineering science and engineering design content, and discussions of the course text, graded requirements, and course policies. The *course assessment* consists of a series of charts, graphs, tables, and other data—measurements of course effectiveness acquired through the application of a wide range of course-level assessment tools during the previous semester. The course assessment also includes the Course Director’s analysis and synthesis of these data, principally focused on answering two questions:

- ***Were the course objectives achieved?*** If the answer to this question is no, then the Course Director recommends appropriate modifications to the course content.
- ***Do the course objectives (1) contribute appropriately to the program objectives and (2) lend themselves to effective assessment?*** If not, then the Course Director recommends modifications to the course objectives themselves.

The Course Director’s written assessment report serves as the framework for discussion during the course proposal meeting. Attendees are free to question or comment on any aspect of the course, the assessment, or the recommended changes. The process is highly collaborative; all attendees’ opinions are valued, and the second-order effects of the changes are given careful consideration. The ultimate purpose of the meeting is to accept or reject each of the recommended course changes. Wherever possible, these decisions are made by consensus. In the rare cases where a consensus cannot be achieved, the Program Director makes the final call. Ultimately, though, the course proposal meeting does not end until a firm decision about each recommended change is made and understood by all.

* At the United States Military Academy, the faculty member with overall responsibility for administering a course is called the Course Director. In multi-section courses, the Course Director supervises the other faculty members teaching the same course.

Within two weeks after the meeting, the Course Director finalizes the course assessment report, noting all approved changes and summarizing the justification for each one. The document is filed in an accessible location, where it serves as a ready reference for the entire faculty. Thus even after the course assessment process is complete, the final report serves as a tool for continued curriculum integration and as a historical record of the assessment process.

THE ANNUAL PROGRAM ASSESSMENT

Similarly, the annual program assessment consists of an *event*—the ***program assessment meeting***. This meeting is also conducted once per year, normally during the summer, after all of the course assessments have been completed. The Program Director hosts the meeting; the senior leaders from the department attend; and again all members of the faculty are invited.

Prior to the program assessment meeting, the Program Director prepares a ***draft program assessment report*** and distributes copies to all faculty members who have indicated a desire to attend the meeting. The report is divided into three major sections:

- Program description
- Program assessment
- Recommended changes

The ***program description*** covers the program objectives, the structure of the curriculum, the composition and qualifications of the faculty, and the department's facilities. The ***program assessment*** summarizes measurements of program effectiveness, acquired through the application of a wide range of program-level assessment tools during the previous academic year. The program assessment also includes the Program Director's analysis and synthesis of these data, principally focused on answering two questions:

- ***Were the program objectives achieved?*** If not, then the Program Director recommends appropriate modifications to the program or to individual courses within the program.
- ***Do the program objectives (1) contribute appropriately to the institutional goals, (2) satisfy the ABET criteria, and (3) lend themselves to effective assessment?*** If not, then the Program Director recommends modifications to the program objectives themselves.

During the program assessment meeting, the Program Director's written assessment report serves as the framework for discussion. Like the course proposal meeting, the ultimate purpose of this event is to accept or reject each of the recommended program changes. Like the course proposal meeting, the process is inclusive and highly collaborative. The program assessment meeting concludes when the participants have produced a mutually agreeable set of program changes.

At this stage of the process, the implementation of recommended changes is subject to one additional constraint. Any changes that require significant modifications to the curriculum (e.g., addition or deletion of a course, change of a prerequisite, substantive change to the content of a course) must be recommended to the institution's Curriculum Committee and ultimately approved by the senior leadership of the institution. At USMA, curriculum change

recommendations must be submitted by the Department Head, who is normally not the Program Director. (For example, at USMA the directors of the Civil and Mechanical Engineering Programs are both subordinate to the Head of the Department of Civil and Mechanical Engineering.) Thus an additional level of review is necessary to obtain the Department Head's endorsement of program-level changes that are beyond the authority of the Program Director to change.

THE ANNUAL PROGRAM REVIEW

The annual *program review meeting* is conducted immediately after the program assessment meeting and follows the same agenda. The principal participants are the Program Director and the Department Head, though again all interested faculty are invited to attend. The purpose of the meeting is to justify and gain the Department Head's endorsement for curriculum changes emanating from the annual program assessment. At USMA, the deadline for submission of curriculum change requests is the 1st of October; thus the annual program review meeting must be held at least two weeks prior to that date.

At the conclusion of the entire program assessment process, the Program Director finalizes the program assessment report, citing all approved internal changes and recommended curriculum changes, and summarizing the justification for each one. This report completes the documentation of a full annual assessment cycle.

IMPLEMENTATION

At USMA, the annual program assessment cycle is implemented according to the following schedule:

Not Later Than	Event
May 1	Course proposal meetings for all courses taught in the Fall Semester
July 1	Course proposal meetings for all courses taught <i>only</i> in the Spring Semester
August 1	Program assessment meeting
September 15	Program review
October 1	Submission of curriculum change requests to the Office of the Dean

As of this writing, we have completed two full annual cycles. In both, the program assessment process has worked very much as intended. We have initiated numerous course-level and program-level changes in direct response to assessment data; we have modified our course and program objectives, to improve their clarity, measurability, and consistency with ABET Engineering Criteria 2000; and we have documented these changes in a series of course assessment reports.

The assessment process has benefited our faculty as well. Through our participation in the process, we have all learned a great deal about our own curriculum—about the connections between courses and about how each course supports the broader goals of the program. Because the assessment process demands that we all play a more active role in program management, we have learned to take greater ownership of the program and its objectives. And through our

participation in the collective decision-making process, we have learned to work more effectively as a faculty team.

These benefits come at a cost, however. We find that successful program assessment requires a substantial investment in time and energy. Each of our course proposal meetings lasts approximately two hours. Each Course Director typically spends six to eight hours preparing the course assessment report. For our undergraduate civil engineering program, which includes 15 courses, the Program Director and his senior leaders each spend approximately 36 hours per year attending course proposal and program assessment meetings. These time demands are great, but the benefits—enhanced program integration, rationally derived program improvements, a better informed faculty, and enhanced teamwork—are well worth the investment.

REFERENCES

1. “Engineering Criteria 2000”, Engineering Accreditation Commission, Accreditation Board for Engineering and Technology, 1997.
2. Ressler, S. J. and Lenox, T. A., “A Structured Assessment System for an Undergraduate Civil Engineering Program,” *Proceedings of the 1996 Annual Conference of the American Society for Engineering Education*, Washington, D.C., June 1996.

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