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Institutional Plan for the Assessment of Student Learning

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Institutional Plan for the Assessment of Student Learning

Our Commitment: *We at the University of Puerto Rico – Mayagüez will regularly and continuously assess student learning in each area of general education and in each academic program, and will use that information for improving all programs.*

1. Introduction

The University of Puerto Rico at Mayagüez (UPRM) intends to continually review the institution's effectiveness. UPRM recognizes that excellent institutions are self-reflective and continually seeking to improve. The improvement of overall educational quality and the enhancement of effective teaching and learning will occur when faculty and administrators work together to implement a sound, institution-wide program for outcomes assessment. The ***assessment of student learning*** is one component of the institution's overall assessment and, in fact, ***the most important one***. The assessment of student learning has the ***student as its primary focus of inquiry***; therefore UPRM recognizes that the assessment of student learning first occurs on an individual student basis within a particular course, is processed mainly at the department/ program level, and is supported by the institution when and where appropriate.

The primary focus of this plan is on the ***immediate design and implementation*** of programs or processes to assess student learning outcomes. While the temptation to "start from scratch" is powerful, it is important for several reasons to begin assessment planning by building and documenting on existing practices. By using existing assessment, the institution can "start with success" to reinforce successful practices. Although some of the processes suggested in this plan are new, most are simply formalizations of procedures we have followed for many years.

In fact, over the last three years, our College of Engineering (CoE) has been formalizing the ***continuous quality improvement (CQI)*** processes used in such matters as establishing program educational objectives, program outcomes, assessment tools and strategies, making changes in the curriculum, introducing new courses in response to the needs of industry, and incorporating outcomes assessments principles, among others. This plan offers the CoE's experience as a guide or "pilot program" for other colleges and departments to modify, adjust, and use as they may see fit; ***there is no need to "reinvent the wheel."***

It is clear that a student learning assessment program will undoubtedly evolve, as academic programs evolve. The end result will be an institution actively concerned not just with what it does, but with how well it does it – especially on how effective it is in ensuring individual student development and academic achievement.

2. Purpose of Assessment

The fundamental purpose of assessing student learning is to improve student learning. The fundamental purpose of assessing other institutional outcomes is to improve those

institutional functions. A secondary purpose of assessment is accountability; demonstrating to our accreditors, governing bodies, constituencies, and other interested parties that we are effective in achieving our aims. The institution has a collective responsibility for producing, reporting, interpreting, and explaining learning outcomes.

Academic assessment ensures that departmental reviews contribute in a fundamentally important way to the attainment of the Institution's Mission. In the end … ***the assessment of student learning must demonstrate that the institution's students have knowledge, skills, and competencies consistent with institutional goals and that students at graduation have achieved appropriate higher education goals [MSCHE].***

3. Purpose of the Plan

The purpose of this plan is ***to guide UPRM academic departments/programs*** in the development of student learning outcomes assessment processes and continuous quality improvement (CQI) programs. This plan could not reasonably include in full detail all activities for the assessment of all levels of student learning goals. Rather, the focus in the plan is to set the frame for the development and implementation of assessment processes at the department/ program level. It is intended to be a source of guidance without constraining experimentation or alternate approaches that may be developed by Departments or Programs within the Institution.

Due to the nature and size of the institution, this plan will only delineate institutional level broad principles, goals, and characteristics by which departments, programs, and other academic units will develop their own subsidiary plans. This approach affords the opportunity for departments to take responsibility for their own plans, and for those closest to the students to make decisions about what students should be learning. Therefore, ***assessment of student learning at UPRM shall be primarily course-embedded and department/program-based.***

Each department/program may use this plan as a basis for developing their specific approach and plans. The choice of instruments/tools and assessment activities shall be grounded on the capabilities, idiosyncrasies, and in the approach that is typical of each discipline/ program/department. Although departmental or programmatic assessment plans will follow a format similar to the institutional assessment plan, the content of the plans, the learning outcomes, and the means used to evaluate/assess them may be very different for the various departments. ***When completed, individual department plans for the assessment of student learning will be appended to this Institutional Plan*** and published in departmental Web Pages and in UPRM's Middle States Accreditation Web Page, for easy access and full sharing with the rest of the academic community.

4. Applicability

This plan applies to all student-credit-generating academic units of UPRM, such as academic colleges, academic departments, academic programs, and certificate programs. For some units, the Dean of Academic Affairs and the Director of the Office of Institutional Research and Planning may recommend modifications to the process and procedures outlined in this plan.

5. Institutional Mission

The Mission Statement of UPRM clearly describes our institutional academic product or outcome, as follows:

> "Within the philosophical framework established by the University of Puerto Rico Act, the Mayagüez campus directs its efforts towards the development of educated, cultured citizens, ***capable of critical thinking***, and ***professionally qualified in the fields of agricultural, social, and natural sciences, engineering, humanities and business administration.*** They should be ***able to contribute in an efficient manner to the cultural, social, and economic development of the Puerto Rican and international community.*** This process is aimed at endowing our alumni with a ***strong technical and professional background*** and to instill a ***strong commitment to Puerto Rico and our hemisphere.*** Our alumni should have the necessary ***skills and knowledge to participate effectively in the search for solutions to the problems facing us***, to ***promote the enrichment of the arts and culture***, the ***development and transfer of technology*** as well as to ***uphold the essential attitudes and values of a democratic society***."

The structure and scope of UPRM's student learning assessment plans must flow from this mission. It is because of this broad mission with its responsibilities to all of Puerto Rico's citizens, and to our hemispheric and international community, that UPRM's assessment program also looks broadly at the effectiveness of our academic programs and services.

Based on UPRM's broad mission, the student learning assessment program addresses the institution's major responsibilities in education. It focuses, first, on assessment within programs; then on assessment strategies to provide evidence of the extent to which the institution is meeting broader goals identified as UPRM priorities.

As a more formal, participatory institution-wide planning process is implemented at UPRM, assessment experiences and results will help in adjusting and sharpening UPRM's mission and developing a more clearly defined and shared sense of direction. Thus, the mission statement and the assessment program at UPRM are interdependent – each more clearly defined and understood in light of the other. Hopefully, as UPRM moves forward, each will spur the university community to reflect on and reaffirm its institutional purpose and to commit to achieving institutional goals.

6. Relationship Between Plans (Strategic, Institutional Assessment, and Student Learning Assessment)

Student learning is the fundamental goal of every institution of higher education. Overall strategic planning efforts at UPRM are directed ultimately to the enhancement of student learning. The strategic plan takes into account the assessment plan, and results from student learning assessment are used to inform the strategic plan.

Evidence gathered about student's development and learning outcomes are used to make judgments about resource allocation in planning for overall institutional effectiveness and to enhance academic programs. Institutional effectiveness is also assessed to monitor and improve the environment provided for teaching and learning and for enhancing overall student success.

The assessment of student learning must always be aligned with the strategic plan and its constituent parts.

The strategic plan includes a requirement for institutional assessment that provides for regular assessment of all of the institution's components and functions, particularly its overall effectiveness in:

- achieving mission, goals, and outcomes
- implementing planning
- resource allocation
- institutional renewal process
- efficient use of institutional resources
- leadership and governance
- administrative structures and services
- institutional integrity
- assuring that institutional processes and resources support appropriate learning and other outcomes for its students and its graduates

7. Guiding Principles

The following set of principles will serve to unify departmental assessment practices without prescribing a particular content for those plans, allowing for flexibility in approach for each program. UPRM's main guiding principles for the development of student learning assessment plans at department/program and course levels are:

- Mission serves as the foundation for all planning.
- Assessment Plans are aligned with Institutional and Departmental Strategic Plans.
- Assessment of student learning interacts with and informs the self-assessment or self-study of other institutional areas.
- Assessment plans and processes take into consideration or are applicable to the requirements of all external accreditation agencies; avoid duplication of effort.
- Assessment tasks are shared. The whole campus community participates in creating and implementing plans.
- Assessment is not an event but a process that must be an integral part of the life of the institution/department/program/course/academic activity.
- Assessment focuses on key learning outcomes/goals.
- The plans acknowledge already existing assessment practices.
- The plans are created by a participatory process.
- The plans are systematic.
- The plans have realistic timetables.
- The plans are supported by institutional resources.
- The plans make wise use of faculty and staff times.
- The plans ***ARE SIMPLE !!! (to be likely to succeed)***
    - Clearly focused on institutional mission, values, and priorities
    - Directed at assessing the most important outcomes for student learning

  - Easy to interpret
  - Easy to implement
  - Easy to adapt
- The annual Student Learning Outcomes Assessment process informs the Program Review process.
- The emphasis of the annual Student Learning Outcomes Assessment is on the assessment process itself rather than on generating an extensive report.
- Do not wait for a "perfect" plan.
- Not everything needs to be assessed each year
- Assessment is conducted in a non-threatening environment.
- Most significantly … a commitment to assessment of student learning requires a parallel commitment to ensuring its use in the improvement of academic programs.

8. Process for Setting Learning Outcomes/Goals

a. Start with success: Begin with an audit or inventory of existing practices that have been successful; a basic tenet for the assessment of student learning is to begin with successful assessment activities already in place. Then develop those that are missing, are unclear, have changed, or are complimentary. In general, among those assessment instruments that may already exist at UPRM, there are:

- **Institutional Level**
  - Surveys of student satisfaction
  - Alumni career and satisfaction surveys
  - Tests; standardized and/or locally-created
  - Program reviews of both academic and support programs
  - Annual Reports
  - Self-study Questionnaires

- **Department/Program Level**
  - Senior Capstone Projects, Theses, Papers, Performances, and/or other Presentations (individual or group)
  - Student Portfolios
  - Course Portfolios
  - Student Research Evaluations
  - Departmental student and alumni surveys
  - Standardized tests of subject area or broad skills
  - Student internship evaluations
  - Self-study Questionnaires

- **Course Level:**
  - Traditional assessment elements used by faculty, such as syllabi, curricula, instructional materials and methods, homework assignments, exams, and quizzes.

- Direct evidence of student learning and development, such as student products and copies of evaluated student works resulting from the traditional homework assignments, tests, and other educational experiences.
- Evidence of indirect indicators such as opinion surveys, self-study questionnaires, placement, and other institutional research data.

b. Ensure the Quality and Relevance of Learning Outcomes: Focus on those that are most important, widely accepted by the various stakeholders, meaningful, sufficiently explicit, interconnected among the various academic levels and curricula, and consonant with UPRM's mission and with the standards of higher education within the individual disciplines. Keep in mind that ***all selected outcomes must be measurable and regularly assessed***.

- **Identify the key learning outcomes:** Focus only on ***the most important*** student learning outcomes of the course and program. Attempts to assess every possible outcome can overwhelm the departments with tasks and with too much information, diluting the focus from the areas that may need the most attention.

- **Use widely agreed-upon concepts (reach consensus):** Statements of expected learning outcomes will only be effective if they are developed with the collaboration and ***consensus (acceptance)*** of faculty members, students, staff, and by others affected by or concerned with the program (employers, alumni, etc.).

- **Communicate/publish learning outcomes:** Clearly expressed expectations for the learning outcomes of courses and programs will help students to focus their studies and, as a result, learn more effectively. Prospective students can make a better-informed decision about the program that meets their needs, especially when evidence is available that outcomes are actually achieved. ***Departments must share/publish their student learning outcomes by all possible means; catalog, brochures, posters, handouts, newsletters, student orientations, web pages.***

c. Choose outcomes/goals that can lead to improvement: Address learning as a multidimensional and integrated process, occurring over time. Do not focus on trivial learning outcomes. Meaningful learning outcomes stress higher-order thinking skills rather than memorization of facts or very simple conceptual understanding. They must be measurable, so benchmarks can be established and improvement can be pursued.

9. Conceptual Relationship of Learning Outcomes at Different Levels

Goals or outcomes for student learning are the foundation of meaningful assessment. Students learn specific content and skills in each ***course.*** In aggregate, those courses, together with other program experiences such as academic advising, internships, and research should result in the desired student learning outcomes at the ***department/program*** level. Similarly, outcomes at the program level combine with general education goals and other goals to create ***institutional*** outcomes. In other words, learning outcomes at the institution, department (or program), and course (or activity) levels are interconnected, complimentary, and reciprocal.

10. Learning Outcomes/Goals (Institutional Level)

In accordance with the institutional mission and with current higher education trends …

By the time of their graduation, UPRM students will be able to:

a. **Communicate effectively.**
b. **Identify and solve problems, think critically, and synthesize knowledge appropriate to their discipline.**
c. **Apply mathematical reasoning skills, scientific inquiry methods, and tools of information technology.**
d. **Apply ethical standards.**
e. **Recognize the Puerto Rican heritage and interpret contemporary issues.**
f. **Appraise the essential values of a democratic society.**
g. **Operate in a global context, relate to a societal context, and demonstrate respect for other cultures.**
h. **Develop an appreciation for the arts and humanities.**
i. **Recognize the need to engage in life-long learning.**

Every department/program at UPRM shall develop and include in their Student Learning Assessment Plans a matrix depicting the relationship of their program outcomes with these institutional learning outcomes, and a matrix or table outlining how each of the program outcomes will be assessed, and in what courses (examples in ***Appendix 4*** of this plan.

11. Assessment Process and Methods

a. Key Terms Definitions: For the purpose of avoiding confusion and for the equal interpretation of key terms in the development of student learning assessment plans throughout UPRM, ***the following definitions shall be adhered to:***

- **Program Educational Objectives (PEOs):** Statements that describe the expected accomplishments or performance of graduates during the first few (5) years after graduation.

- **Program Outcomes (POs) = Program Student Learning Outcomes/Goals:** Statements that describe what students are expected to know and be able to do by the time of graduation.

- **Course Learning Outcomes/Goals (CLOs):** Statements that describe what students are expected to know and be able to do by the end of the course.

b. Conceptual Assessment Cycle: The assessment processes at UPRM are cyclical and continuous, as conceptually reflected on ***Figure 1***. These assessments cycles are repeated after changes have been implemented. The time for completion of a cycle up to implementation, or the ***"closing of the loop"*** as it is commonly referred to, may be different for the different assessment levels. An assessment cycle or loop at the course level will likely take the least time to complete as professors, within their authority, can use assessment results to make positive changes in their

Figure 1. A conceptual assessment cycle or loop

courses almost immediately. In the other hand, at the program level, the implementation of a course or curricular change may take months or years, as the approval may take it through various levels of authority within the institution.

c. Decentralized Process: The assessment of student learning at UPRM is a decentralized process by which faculty in each academic department or program, at both the undergraduate and graduate levels, identify key learning outcomes, determine how outcomes will be measured, carry out assessment activities, analyze results, and use those results in program planning to improve student learning. Departments are free to develop their own format; however it might be helpful to use tabular formats, matrixes, and brief descriptive narratives. ***Appendix 4*** offers some good examples.

d. Institution-wide Assessment: In addition to the assessment programs focused on assessment in the departments/programs, UPRM is concerned with overall student success and the extent to which the institution is meeting its broader goals relating to educational performance and student development. The ***Office of Continuous Improvement Educational Initiative (CIEI)*** was recently created to concentrate on institution-level priorities in assessing student learning. This office is subordinate to the Office of Institutional Research and Planning, and is charged with setting a priority agenda and providing guidance on assessing student success at UPRM. It will also ***oversee and follow-up to ensure the full and timely implementation of these plans at all levels***, as well as their evaluation in time.

e. Suggested Steps in Establishing and Reviewing Department/Program Educational Objectives and Student Learning Outcomes:

- a review of the institution's, college's, and department's mission statements;
- a review of outcomes assessments criteria, along with definitions and examples of key terms;
- the writing of broad program educational objectives that could be linked to the department's mission statement;
- the identification of course and program learning outcomes;
- the identification of assessment ***strategies***, ***methods/tools, metrics,*** and ***benchmarks*** to assess the achievement of educational objectives and learning outcomes.

f. Sample Listing of Successfully Utilized Assessment Strategies and Operational Actions for Achieving Outcomes:

- Maintain regular correspondence with graduates and their employers to know their needs and to evaluate whether modifications to the program are necessary and appropriate.
- Establish an annual process in which a faculty/student committee reviews course and senior design projects to evaluate how well students in capstone courses are applying material learned throughout the curriculum.
- Draw upon students' co-op/intern/undergraduate research experiences as a source for interdisciplinary experiences, class problems, and information to other students.
- Require students to prepare written reports and oral presentations targeted to different audiences and topics.
- Make use of available resources to present case studies of actual examples in which the consequences of ethical and safety-related decisions were not properly considered.
- Require a large number of courses to have at least one major writing assignment.
- Require students to evaluate peer performance in team settings.
- Document and distribute official department policies on sexual harassment and academic and ethical misconduct.
- Have faculty design research projects appropriate for undergraduate students.
- Establish seminar series for undergraduates to present their research work results.
- Promote the use of programming, spreadsheets and the most modern hardware and software tools at all levels in the curriculum.
- Have faculty make greater use of informational sources beyond the course textbook.

- Promote student participation in the local student chapter of professional organizations and service clubs. Encourage and provide funds for student participation in local and regional events sponsored by professional and civic organizations.

g. Example of Assessment Methods/Tools with Utilization Strategy, Timing, and Execution Responsibility:

The assessment tools and procedures set forth in the Outcomes Assessment Strategies ***Table 1*** have been followed in UPRM's Civil Engineering Program with great acceptance by all involved, and were rated highly during a recent extremely successful professional accreditation visit. When analyzed closely, most professors execute only one, two, or three of these assessments per semester, on things they were already doing in their courses, which does not constitute an additional heavy load on them and, therefore, they accept and perform without resistance.

h. Metrics:

Metric goals should be simple to use and to analyze. ***Departments/programs shall establish the metrics*** necessary to measure the degrees of achievement or satisfaction of their learning outcomes. However, for easier reference and comparison between departments/ programs within the institution, it is suggested that most assessment tools/forms/rubrics rate responses from ***1*** to ***5***, where ***5*** is ***"excellent"*** or ***"extremely satisfied,"*** and ***1*** is ***"poor"*** or ***"extremely dissatisfied."***

i. Evidence Successfully Used at UPRM's College of Engineering to Show Achievement of Learning Outcomes:

Listed below is the suggested evidentiary documentation that can and should be filed/maintained (as appropriate for the particular levels) to prove that processes for the Assessment of Student Learning that lead to the continuous improvement of our educational programs are in place. For a listing of multiple other examples of possible evidence of academic quality and assessment refer to ***Appendix 3.***

At Course level -- *COURSE PORTFOLIOS/Binders, for each course, with:*

- *Syllabi with detailed course outlines, descriptions, and course learning outcomes*
- *Examples of student works for required courses, including representative samples of homework assignments, quizzes, exams, and project works.*
- *Copies of completed assessment tools/instruments and summaries of results*
- *Videos of student oral presentations*
- *Any other materials that support student learning outcomes assessment efforts*

TABLE 1

OUTCOMES ASSESSMENT TIMING & STRATEGIES

Assessment Tools	Utilization Strategy – Timing – Responsibility
Pre-Engineering	
Freshman Orientation Questionnaire	at UNIV-0004 Freshman Orientation Course (by Departmental Counselor)
Ethics Integration Assessment Form	at UNIV-0004 Freshman Orientation Course (by Departmental Counselor)
Course Assessment	
Laboratory Reports *(copies of)*	at all Laboratory Courses (by Lab Instructors)
Exams, Quizzes, Homeworks *(copies of)*	retain examples of these tools (by all Professors/Instructors)
EIT Exam Statistical Report	obtain annually from Examining Board (by Department)
Written Report Evaluation	anytime written reports are required (labs, etc) (by all Professors/Instructors)
Oral Presentation Assessment	at all student oral presentations (by all Professors/Instructors)
Teamwork Assessment Form (I)	at end of any semester where work done in groups (Professors/Instructors)
Teamwork Assessment Form (II)	at end of any semester where work done in groups (Professors/Instructors)
Peer Evaluation Form	at end of any semester where work done in groups (Professors/Instructors)
Undergrad Research Exp Assessm. Form	at end of any such experience (by Mentors)
Course/Project Skills Assessment Form	at end of every course (by all Professors/Instructors)
Student Evaluation of Teaching (SET)	at end of every course (by all students)
Video of Presentations	at Design/Project Presentations (by all Professors/Instructors)
Program Assessment	
Ethics Integration Assessment Form	at end of CAPSTONE Courses (by CAPSTONE Professors)
Graduating Student Exit Survey (Part I)	at end of CAPSTONE Courses (by CAPSTONE Professors)
Graduating Student Exit Survey (Part II)	at Graduation time (by Department)
Internship Assessment Form (Student)	at completion of all Internships (by Mentors)
Internship Assessment Form (Mentor)	at completion of all Internships (by Mentors)
COOP Supervisory Evaluation Form	at completion of COOP terms (by Mentors)
COOP Student Evaluation Form	at completion of COOP terms (by Mentors)
Student Resume ***(Special Format)*** **	start at UNIV-0004 Course; maintain up-to-date thru college years
Post Graduation	
Alumni Survey	mail to 2nd and 5th year alumni, every year, Feb-Apr (by Department)
Employers Survey	mail to employers with 5-yr graduates, every year, Feb-Apr (by Department)
FE Exam Statistics	obtained by CoE every year
Advisory Board Input	obtained at annual meeting, Jun-Jul

At Department/Program level -- *PROGRAM PORTFOLIOS/Binders and/or FILES, with:*

- *Posters/Catalogs/Brochures listing Student Learning Outcomes, Educational Objectives, etc.*
- *Graduation Exit Survey documentation and results*
- *Alumni Survey documentation and results*
- *Employer Survey documentation and results*
- *Stats from Licensing Exam (where applicable)*
- *Copies of minutes of the Department's Faculty Meetings, Academic Affairs Committees, and Advisory Board meetings and recommendations (where applicable)*
- *Copies of curriculum development/revisions*
- *Student transcript samples*
- *Copies of completed assessment instruments and summaries of results*
- *Minutes of faculty meetings where assessment results considered and actions taken*
- *Any other materials that support student learning outcomes assessment efforts*

At Other levels/Offices -- *GOOD FILES, with:*

- *Institutional research results/statistics, with their analysis, recommendations, and actions taken (if any).*
- *Students/Graduates/Alumni/Employer Satisfaction Survey results/statistics, with their analysis, recommendations, and actions taken (if any).*
- *GPA/Grade trends, Graduation Rates, Retention Rates, etc., and any other statistical data gathered throughout the institution, with their analysis, recommendations, and actions taken (if any).*

12. Reporting and Utilization of Assessment Results

All reporting shall be accomplished in accordance with the guidelines provided for each level of responsibility in ***Section 13 (next)*** of this plan. Utilization of assessment results shall be in accordance with guidelines and suggestions presented throughout this plan.

13. Responsibility for Enacting and Maintaining the Plan

a. Department/Program Directors:

- Each department/program must develop and enact a student learning assessment process with documented results.
- This must be done through a participatory process of faculty, students, staff, and other stakeholders of the department.
- Evidence must be maintained that the results are applied to the further development and improvement of the program.
- The assessment process must demonstrate that those learning outcomes important to the mission of the institution and of the department/program are being measured.
- Within each year's ***Annual Report***, each academic department will include a section on academic outcomes assessment, composed of:
  - The list of learning outcomes in their program;
  - A brief description of how the department is ensuring that students achieve these outcomes by the time of their graduation;

- A brief description of how the department is assessing these outcomes;
- A brief report on positive evidence of what students have learned as a result of the assessment over the past year; and
- A brief report on how the department has used assessment results in the past year to improve student learning.

[If a department does not have all these elements in place by the time its Annual Report is prepared, it will include in its Report the steps it will take to ensure that the missing elements are in place by the time of its next Annual Report]

- All of this planning and execution shall be done in accordance with the general guidelines established throughout this plan.

b. Deans of Academic Colleges: Each academic college will establish and implement the necessary infrastructure, resources, and training to institutionalize these processes and to supervise/oversee, guide, and support department/program assessment efforts, in accordance with the general guidelines established throughout this plan.

c. Institutional Leadership: UPRM leadership is fully committed to the implementation and support of student learning assessment efforts at all levels. In addition, UPRM leadership is committed to support the resulting program improvement initiatives through the established means and procedures in the governance structure of the institution. The institution will provide outcomes assessment training support to the faculty and staff of all academic units, as justifiably requested and/or needed, through workshops and seminars organized and coordinated by the UPRM's ***Center for Professional Enrichment (CEP*** – for its acronym in Spanish).

14. Time Line

a. General: This plan is for ***immediate implementation***. All design and development activities by the individual academic departments/programs shall start immediately upon receipt of the draft plan. Departments will not wait for the "final" or "perfect" plan to get started; plans will always evolve with time. Implementation of the student learning outcomes assessment process will begin as the various components are completed.

In fact, over 50 percent of UPRM's student body is involved in, and have already implemented, the outcomes assessment processes outlined in this plan. These include all of the departments of the College of Engineering, which after a two year implementation, underwent a highly successful ABET accreditation visit in November 2002. In addition, the UPRM Department of Nursing has been conducting and documenting these assessment processes for the past few years. And more recently, within the UPRM College of Arts and Sciences, the Departments of Biology and Chemistry, and the College of Business Administration, have aggressively started to develop plans and to implement these outcomes assessment processes and techniques within their departments. Therefore, the assessment tools, instruments, and techniques outlined and suggested in this plan have been tested here and are already in use at UPRM.

b. Timetable Summary for Development and Implementation: As applicable, to departments who have already implemented, for formal continuation and maintenance, and for departments who have not implemented yet, for timely and immediate compliance. Individual academic departments can set their own internal assessment timelines as long as they comply with the following institutional deadlines:

Spring 2003

- Dr. Anand Sharma, UPRM's new director of the Office of Continuous Improvement Education Initiative (CIEI), began work in January.
- Members of the accreditation Steering Committee met for the first time in mid-January.
- Process for securing office space, equipment, and staff began.
- Institutional accreditation and assessment Web Page created.
- Initial budget requests made.
- Structure of general meetings agreed upon.
- Assessment Task Force Members identified and notified.

Summer 2003

- Institutional Plan for the Assessment of Student Learning drafted based on "pilot plan" from the CoE.
- Plan reviewed, analyzed, discussed, and unanimously approved by UPRM Steering Committee and by the new Office of CIEI.

Fall 2003

- Plan submitted for Chancellor's review and subsequent presentation to the UPRM Administrative Board and Academic Senate for approval.
- Begin presentation of plan to all academic colleges/units for comment/consensus and for the immediate initiation of their own plans development processes.
- Begin the assessment of current status of academic departments and units by means of the 39 newly develop Questionnaires.
- Determine the needs of faculty members and instructional staff across UPRM and the ways in which the CIEI and the CEP may be of assistance.

- Each academic department develops assessment plans by a participatory process and consensus.

- Each academic department begins to conduct and document student learning assessment for selected outcomes.

- UPRM implements process for faculty orientation, training, and consultation.

- UPRM and individual academic departments encourage and elicit more participation from faculty, staff, and students.

- Distinguish and define roles and responsibilities of the Steering Committee, Task Forces, OIRP, CIEI, CEP, and key personnel involved in outcomes assessments.

Winter 2003-2004 (by mid-December 2003)

- Complete the assessment of current status of academic departments and units by means of the 39 newly develop Questionnaires.

- Academic departments complete their assessment plans and submit them to CIEI (OIRP) to be appended to Institutional Plan.

- Academic departments close, analyze, and document student learning assessment activities and decisions for the past semester (an assessment cycle closes).

- Continue process for faculty orientation, training, and consultation.

Spring & Summer 2004

- Academic departments close, analyze, and document student learning assessment activities and decisions for the Spring semester (a second assessment cycle closes).

- Department Directors submit their first report on student learning assessment as part of their Annual Report, as stated in ***Section 13*** of this Plan.

- Task Forces consolidate and analyze responses to the 39 Questionnaires and draft a Self-Study Report.

- Office of CIEI (OIRP) assesses implementation process to this date and reviews plans and procedures, and adjusts them, if appropriate.

Fall & Winter 2004

- Academic departments continue implementation of student learning assessment and Continuous Quality Improvement (CQI) processes, results and decisions documented, evidence maintained, and plans adjusted, if appropriate.

- Academic departments close, analyze, and document student learning assessment activities and decisions for the Fall semester (a third assessment cycle closes).

- Student learning assessment plans and processes fully in-place and implemented throughout all academic departments of UPRM, and set for permanent continuation.

Spring & Summer 2005

- Academic departments repeat full assessment processes/cycles of previous two semesters.

- Academic departments and all UPRM offices/units involved and concerned with student learning assessment organize all documentary evidence for presentation to and review/inspection by MSCHE during the Middle States Accreditation Visit of April 2005.

Thereafter

- Academic departments and units repeat assessment cycles, continuously and permanently, unless otherwise directed by a new plan.

15. Process for Reviewing the Plan

Departments/programs shall review assessment plans during and, as part of, the cyclic reviews of assessment results. Therefore, the evaluation of assessment plans shall be incorporated into the assessment process itself and conducted on a regular basis. This review need not be complicated or cumbersome. It should lead to the refinement or improvement of the plans and to the elimination of ineffective assessment practices that are likely to promote exasperation with and rejection of the assessment process and the concept of assessment in general.

The Institutional ***Office of Continuous Improvement Educational Initiative (CIEI)*** shall review this institutional student learning assessment plan on an annual basis.

16. Provision for Funding and Support Resources

Resources can be generally defined as any input to an educational program that is necessary for the program to succeed, as shown in ***Figure 2***. Adequate resources must be available to the department/program at all times to be successful and have on-going accreditation. The following subsections highlight the major resource categories and the means by which the department and the institution will monitor progress in each category.

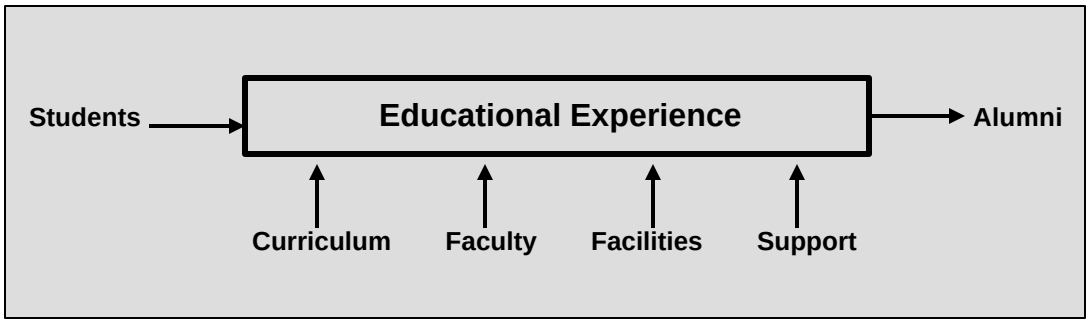

Figure 2. Resource Perspective

a. Students:

- The institution and the department/program evaluate, advice, and monitor students to determine long-term success in meeting learning outcomes.
- The institution will retain responsibility to ensure that students admitted to the departments/programs meet the qualifications needed and that correspond to the expected achievement level.
- Further, each department/program will have assessment processes and improvement mechanisms in place to monitor the progress of their students. Each department /program will also monitor the progress of its alumni and solicit their input for program improvement.

b. Curriculum:

- Each department/program establishes its uniqueness through its educational objectives, learning outcomes, and curriculum design.
- The institution assumes responsibility to ensure that all departments/programs operate within a certain envelope and to ensure that all graduates matriculate with specific qualifications. Towards this end, the Office of the Dean of Academic Affairs is charged with the responsibility to "Review and approve or disapprove proposals for new courses and proposals for changes in courses and curricula which are recommended by departments."
- Thus, Dean of Academic Affairs plays the critical role of quality curriculum control within UPRM.

c. Faculty:

- The faculty must be sufficient number; and must have competencies to cover all of the curricular areas of the program.
- It is the responsibility of the departments/programs to assure that no Program of Study is offered or continued unless requirements for faculty are met or exceeded.

d. Facilities:

- Classrooms, laboratories, and associated equipment must be adequate to accomplish the program educational objectives and provide an atmosphere conducive to learning.
- Each department/program assumes the responsibility to periodically assess priorities for equipment purchase and replacement, and to plan for the maintenance of adequate laboratory facilities.
- The institution will coordinate distribution of student computing funding based on the student laboratory fees and matching funds.

e. Institutional Support and Financial Resources:

- Institutional support, financial resources, and constructive leadership must be adequate to assure the quality and continuity of the engineering program.
- To assure that this is monitored, the Department Chairs will annually report to their faculty regarding resources and expenditures of the departments/programs in all categories. Where feasible, the Department Chairs will use both internal and external benchmarks.

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APPENDICES

1. Assessments Terms Glossary
2. Some Principles of Good Practice for the Assessment of Student Learning
3. Examples of Evidence of Academic Quality
4. Examples of Department Student Learning Assessment Plans:
    a. **Department of Civil Engineering and Surveying (UPRM) Assessment Plan – *(Pilot Plan for UPRM)***
    b. Assessment Plan: Department of Mechanical Engineering (NIU)
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    d. Undergraduate Assessment Plan BS in Chemistry (NIU)
5. **UPRM's Departmental Plans for the Assessment of Student Learning:**
    ******* Under Construction by Academic Departments/Programs *******
    a. Department A
    b. Department B
    c. Department C
    d. *and so on …*

APPENDIX 1: Assessment Terms Glossary

Annual update: A brief report from each academic program based on its assessment plan and submitted annually, which outlines how evidence was used to improve student learning outcomes through curricular and/or other changes or to document that no changes were needed.

Archival records: Biographical, academic, or other file data available from the college or other agencies and institutions.

Assessment: The act of assessing; to evaluate; appraise. In higher education, assessment is the process of systematically collecting information about some aspect of institutional performance and then using the results to improve that performance. It usually focuses on assessing outcomes, specifically what students have learned. Colleges and universities have other outcomes, such as faculty scholarship, community service, and others, and these can be assessed as well.

Assessment plan: A document that outlines the student learning outcomes (for academic programs) or unit outcomes (for support units), the direct and indirect assessment methods used to demonstrate the attainment of each outcome, a brief explanation of the assessment methods, an indication of which outcome(s) is/are addressed by each method, the intervals at which evidence is collected and reviewed, and the individual(s) responsible for the collection/review of evidence.

Backlog (--Ed, --ding): Amount of effort required after the data collection.

Behavioral observations: Measuring the frequency, duration, ***topology***, etc. of student actions, usually in a natural setting with non-interactive methods. For example, formal or informal observations of a classroom. Observations are most often made by an individual and can be augmented by audio or videotape.

Commercial, norm-referenced, standardized exams: Group administered mostly or entirely multiple-choice, "objective" tests in one or more curricular areas. Scores are based on comparison with a reference or ***norm*** group. Typically must be purchased from a private vendor.

Competency: Level at which performance is acceptable.

Confounded: Confused.

Constituents: Individuals whom we serve and provide input to help us assess our academic programs.

Constituencies: Classifications of individuals whom we serve, including students, faculty, industry, government, and others.

Continuous Quality Improvement (CQI): The systematic pursuit of excellence and satisfaction of the needs of constituencies, in a dynamic and competitive environment, by assessing current practices and using the results of that assessment to continually improve those practices.

Convergent validity: General agreement among ratings, gathered independently of one another, where measures should be theoretically related.

Criterion-referenced: Criterion-referenced tests determine what test-takers can do and what they know, not how they compare to others. Criterion-referenced tests report on how well students are doing relative to a predetermined performance level on a specified set of educational goals or outcomes included in the curriculum.

Exit and other interviews: Asking individuals to share their perceptions of their own attitudes and/or behaviors or those of others. Evaluating student reports of their attitudes an/or behaviors in a face-to-face-dialogue.

External examiner: Using an expert in the field from outside your program, usually from a similar program at another institution to conduct, evaluate, or supplement assessment of your students. Information can be obtained from external evaluators using many methods including surveys, interviews, etc.

Externality: Externality refers to the extent to which the results of the assessment can be generalized to a similar context.

External validity: External validity refers to the extent to which the results of a study are generalizable or transferable to other settings. ***Generalizibality*** is the extent to which assessment findings and conclusions from a study conducted on a sample population can be applied to the population at large. ***Transferability*** is the ability to apply the findings in one context to another similar context.

Focus groups: Typically conducted with 7-12 individuals who share certain characteristics that are related to a particular topic related a research or evaluation question. Group discussions are conducted by a trained moderator with participants (several times, if possible) to identify trends/patterns in perceptions. Moderator's purpose is to provide direction and set the tone for the group discussion, encourage active participation from all group members, and manage time. Moderator must not allow own biases to enter, verbally or nonverbally. Careful and systematic analysis of the discussions provides information that can be used to evaluate and/or improve the desired outcome.

Follow-up report: A report requested by the academic or accreditation authorities following program review to address specific issue(s)/concern(s) that result from their review of program review documents. The report is submitted within the time frame identified by the reviewing authority.

Forced-choice: The respondent only has a choice among given responses (e.g., very poor, poor, fair, good, very good). Formative assessment: Intended to assess ongoing program/project

activity and provide information to improve the project. Assessment feedback is short term in duration.

Formative assessment: Intended to assess ongoing program/project activity and provide information to improve the project. Assessment feedback is short term in duration.

Frontload (--ed, --ing): Amount of effort required in the early stage of assessment method development or data collection.

Generalization (generalizability): The extent to which assessment findings and conclusions from a study conducted on a sample population can be applied to the population at large.

Goal-free evaluation: Goal-free evaluation focuses on actual outcomes rather than intended program outcomes. Evaluation is done without prior knowledge of the goals of the program.

Inter-rater reliability: The degree to which different raters/observers give consistent estimates of the same phenomenon Internal validity: Internal validity refers to (1) the rigor with which the study was conducted (e.g., the study's design, the care taken to conduct measurements, and decisions concerning what was and wasn't measured) and (2) the extent to which the designers of a study have taken into account alternative explanations for any causal relationships they explore.

Internal validity: Internal validity refers to (1) the rigor with which the study was conducted (e.g., the study's design, the care taken to conduct measurements, and decisions concerning what was

Locally developed exams: Objective and/or subjective tests designed by faculty of the program, or course sequence being evaluated.

Longitudinal studies: Data collected from the same population at different points in time

Norm (--ative): A set standard of development or achievement usually derived from the average or median achievement of a large group.

Norm-reference: A norm-referenced test is designed to highlight achievement differences between and among studies to produce a dependable rank order of students across a continuum of achievement from high achievers to low achievers.

Observer effect: The degree to which the assessment results are affected by the presence of an observer

Open-ended: Assessment questions that are designed to permit spontaneous and unguided responses

Operational (--ize): Defining a term or object so that it can be measured. Generally states the operations or procedures used that distinguish it from others.

Oral examination: An assessment of student knowledge levels through a face-to-face dialogue between the student and examiner-usually faculty.

Performance appraisals: A ***competency***-based method whereby abilities are measured in most direct, real-world approach. Systematic measurement of overt demonstration of acquired skills.

Portfolios: Collections of multiple student work samples usually compiled over time and rated using ***rubrics***. The design of a portfolio is dependent upon how the scoring results are going to be used.

Program review: The administrative and peer review of academic programs conducted on an annual or regularly-established cycle, the results of which are reported to the UPR Board of Trustees and the PRCHE. This review includes a comprehensive analysis of the structure, processes, and outcomes of the program. The outcomes reported in the program reviews should include program outcomes (e.g. costs, degrees awarded) as well as student learning outcomes (i.e. what students know and can do at the completion of the program).

Reliability: Reliability is the extent to which an experiment, test or any measuring procedure yields the same result on repeated trials.

Rubrics: A rubric is a set of categories that define and describe the important components of the work being completed, critiqued or assessed. Each category contains a graduation of levels of completion or competence with a score assigned to each level and a clear description of what criteria need to be met to attain the score at each level.

Salience: A striking point or feature.

Simulations: A ***competency***-based measure where a person's abilities are measured in a situation that approximates a "real world" setting. Simulation is primarily used when it is impractical to observe a person performing a task in a real world situation (e.g. on the job).

Stakeholder: Anyone who has a vested interest in the outcome of the program/project.

Status report: A description of the implementation of the plan's assessment methods, the findings (evidence) from assessment methods, how the findings were used in decisions to maintain or improve student learning (academic programs) or unit outcomes (support units), the results of previous changes to improve outcomes, and the need for additional information and/or resources to implement an approved assessment plan or gather additional evidence.

Summative assessment: Assessment that is done at the conclusion of a course or some larger instructional period (e.g., at the end of the program). The purpose is to determine success or to what extent the program/project/course met its goals.

Third Party: Person(s) other than those directly involved in the educational process (e.g., employers, parents, consultants).

Triangulate (triangulation): The use of a combination of assessment methods in a study. An example of triangulation would be an assessment that incorporated surveys, interviews, and observations.

Topology: Mapping of the relationships among subjects.

Utility: Usefulness of assessment results.

Variable (variability): Observable characteristics that vary among individuals responses.

Validity: Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. Validity has three components:

- relevance - the option measures your educational objective as directly as possible
- accuracy - the option measures your educational objective as precisely as possible
- utility - the option provides formative and summative results with clear implications for educational program evaluation and improvement

Written surveys/questionnaires: Asking individuals to share their perceptions about the study target- e.g. their own or others skills/attitudes/behavior, or program/course qualities and attributes.

APPENDIX 2: Some Principles of Good Practice for the Assessment of Student Learning

Purpose of Assessment: The fundamental purpose of assessing student learning is to improve student learning.

Characteristics of "Good" Assessment

1. **There are clear, measurable goals/learning outcomes that flow from institutional mission, meet the needs of students and other constituents, and are widely accepted by the institutional community.**

    - *Program descriptions and course syllabi, especially in General Education, have clear learning outcomes. Multi-section courses have common learning outcomes. Where appropriate, disciplines share learning outcomes.*
    - *There is a clear sense of which learning outcomes are most important and most valued.*

2. **There are clear strategies to achieve those goals.**

3. **The assessment tools are valid and apt.**

    - *Multiple measures-including different kinds of measures-are used systematically over time.*
    - *There is a good match between the goal and the assessment tool used to assess it (e.g., research skills are assessed using a research project rather than an objective test, thesis assignments are teamed with opportunities to learn how to write a thesis).*
    - *Assessments that are either embedded in learning activities or indirect, rather than stand-alone assessments are used when appropriate and feasible.*

4. **The results of the assessments are put to good and appropriate use.**

    - *There is no heavy reliance on any one assessment for any major decision.*
    - *There are clear standards for sufficient and exemplary performance. Where appropriate, disciplines and institutions share common standards.*
    - *Appropriate frames of reference (e.g., standards-based, norm-referenced) are used to interpret assessment results.*
    - *Because the fundamental purpose of assessment is to help students learn, assessments examine how students learn as well as what they learn.*
    - *Results are shared with those in a position to use them to improve the processes being assessed.*
    - *Assessment efforts lead to conversations across campus on teaching/learning, mission, and institutional effectiveness.*
    - *Results are celebrated and used, as appropriate, to improve goals, pedagogy, curricula and/or assessment strategies as well as for planning and budget decisions.*

Keys to Institution-Wide Assessment Success

1. **The institutional climate encourages innovation and change.**

2. **A common understanding of assessment pervades the institutional community.**

    - *Faculty, administrators, trustees, and students all understand the nature and purpose of assessment. Students receive written information on assessment (e.g., a college statement) and on the learning outcomes they are expected to achieve.*
    - *The assessment plan (what's done, who does it, and why) is written and widely disseminated.*

3. **Teaching, learning, and assessment engage the institutional community, especially faculty.** *Assessment is department-based, with shared faculty and student ownership, rather than imposed from above.*

4. **Teaching, learning, and assessment efforts receive strong institutional support.**

    - *Institutional leaders actively stimulate faculty interest in assessment.*
    - *There are professional development opportunities for faculty to learn about assessment and to use it in practice.*
    - *Faculty are motivated and rewarded for assessment work. Tangible support, including staffing, funds, and time, is provided. Faculty engagement in assessment is a consideration in tenure and promotion decisions. Departments and programs that engage in assessment are rewarded through their budgets.*
    - *Faculty, departments, and programs are never penalized or unduly criticized for unsatisfactory assessment results; they are instead given support to address shortcomings.*
    - *The burden of assessment is minimized. Faculty, departments, and programs are encouraged to "start small," focusing initially on existing information and modest additional assessments. Centralized leadership, coordination and support for assessment are provided. Centralized data collection, analysis, and dissemination are available when appropriate. Paperwork is minimal; electronic tools are provided.*

5. **The assessment program is systematic, ongoing, and periodically evaluated.** *The assessment cycle may be biennial or triennial instead of annual.*

6. **Assessment results are celebrated.**

    - *Faculty, departments, and programs are encouraged to focus initially on assessing learning successes.*
    - *Assessment results are actively used to demonstrate the quality and uniqueness of the institution to its stakeholders and constituents.*

APPENDIX 3: Examples of Evidence of Academic Quality

Evidence of Student Learning

- Graduate school admission rate
- Graduate and professional programs into which students are accepted
- Placement into career positions
- Ratings by cooperative education/internship supervisors
- Employer ratings of satisfaction with the program
- Pass rates on appropriate licensure/certification exams (e.g., Praxis, NLN) or exit exams (e.g., MFATs, Test of Critical Thinking Ability)
- Scores on locally-designed multiple choice and/or essay tests, accompanied by test "blueprints" describing what the test assesses
- Score gains between entry and exit on published or local tests or writing samples
- "Blind" or externally-scored rubric scores on writing samples or "capstone" projects such as research papers, class presentations, exhibitions, or performances
- Rubric scores and notes for oral presentations and interviews
- Honors, awards, and scholarships awarded to students
- Student publications and conference presentations
- Student reflections on what they have learned over the course of the program
- Student reflections on their attitudes and beliefs, if developing those are intended outcomes of the program
- Excerpts of student work, before-and-after samples of student work, or portfolios of student work (e.g., teaching portfolios for students in teacher education programs)

Indirect Evidence of Student Learning

- List of the major learning outcomes of the program, distributed to all students in the program
- Percent of courses whose syllabi include a list of the major learning outcomes of the course
- Percent of courses whose syllabi state learning outcomes that include higher order thinking skills (not just simple understanding of facts and principles)
- Average proportion of final grade based on assessments of higher-order thinking skills
- Ratio of paper-and-pencil tests to performance assessments
- Test "blueprints"-outlines of the concepts and skills covered on tests
- Documentation of the match between course/program objectives and assessments
- Percent of freshman-level classes taught by full professors
- Number or percent of courses with service learning opportunities
- Number or percent of courses with collaborative learning opportunities
- Number or percent of courses taught using culturally-responsive teaching techniques
- Percent of class time spent in active learning
- Number of student hours spent in community service activities
- Percent of student majors participating in relevant extracurricular activities (e.g., clubs in discipline)

- Attendance at intellectual/cultural events germane to the program
- Student and/or alumni ratings of satisfaction with the program

Evidence of Other Aspects of Academic Quality

- Specialized accreditation
- Graduation rate
- Length of time to degree
- Student/alumni satisfaction, collected through surveys, exit interviews, or focus groups
- Library holdings in the program's discipline(s)
- Expenditures for faculty professional development
- Department-sponsored opportunities for faculty professional development
- Number and/or dollar value of grants awarded to faculty
- Number and/or dollar value of grants awarded to faculty whose purpose is improved student learning
- Number and/or dollar value of gifts to the department

APPENDIX 4

Examples of Department Student Learning Assessment Plans

APPENDIX 4a

Departmental Plan for the Assessment of Student Learning

Department of Civil Engineering and Surveying
University of Puerto Rico – Mayaguez

[Pilot Plan for UPRM]

Department of Civil Engineering and Surveying, UPRM
www.civil.uprm.edu

Departmental Plan for the Assessment of Student Learning

System for the Evaluation of Education SEED

July 1, 2001

ABET TEAM UPRM CLOSING THE LOOP

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APPENDICES 30

[NOTE: Page numbers in this Table of Contents correspond to those in the original version of the Plan]

Plan for the Assessment of Student Learning; Department of Civil Engineering and Surveying (July 1, 2001)

1. Introduction

The University of Puerto Rico at Mayagüez (UPRM) recognizes that excellent institutions are self-reflective and continually seeking to improve. The Department of Civil Engineering and Surveying (CE&S) at UPRM continually assesses its programs in a process consistent with its established vision and mission. As part of a continuous process of refinement and upgrade of our programs, our faculty maintains direct contact with practitioners in industry and government and with professional societies, which provide continuous support and collaboration. The CE&S continuously revises its curriculum to implement the feedback from our established student learning assessment processes. These processes are mostly based on the Accreditation Board for Engineering and Technology (ABET) EC 2000 Outcomes Assessments Criteria.

The ***assessment of student learning*** is one component of the department's overall assessment and, in fact, ***the most important one***. The assessment of student learning has the ***student as its primary focus of inquiry***; therefore the department recognizes that the assessment of student learning first occurs on an individual student basis within a particular course, is processed mainly at the department/ program level, and is supported by the institution when and where appropriate.

In fact, over the last three years, our College of Engineering (CoE) has been formalizing the ***continuous quality improvement (CQI)*** processes used in such matters as establishing program educational objectives, program outcomes, assessment tools and strategies, making changes in the curriculum, introducing new courses in response to the needs of industry, and incorporating outcomes assessments principles, among others.

2. Purpose of the Plan

The primary purpose and focus of this plan is on the design and implementation of programs or processes to assess student learning outcomes and lead to continuous quality improvement (CQI). The intention is to begin the assessment process by building and documenting on existing practices. Although some of the processes established in this plan are new, most are simply formalizations of procedures we have followed for many years.

It is important to recognize, however, that this student learning assessment plan will undoubtedly evolve, as academic programs evolve. Additionally, the plan is intended to be a source of guidance without constraining experimentation or alternate approaches that may be developed by the faculty or have already been proven effective elsewhere.

3. Applicability

This plan applies to all student-credit-generating academic units of the Department of CE&S at UPRM, its faculty, students and support staff.

4. Key Terms Definitions

For the purpose of avoiding confusion between our main professional accreditation agency (ABET), the Department of CE&S, and the Institution, and for the equal interpretation of key terms in the development of student learning assessment plans throughout UPRM, ***the following definitions shall be adhered to:***

- **Program Educational Objectives (PEOs):** Statements that describe the expected accomplishments or performance of graduates during the first few (5) years after graduation.

- **Program Outcomes (POs) = Program Student Learning Outcomes/Goals:** Statements that describe what students are expected to know and be able to do by the time of graduation.

- **Course Learning Outcomes/Goals (CLOs):** Statements that describe what students are expected to know and be able to do by the end of the course.

5. Constituencies

The main four constituencies of the Department of CE&S are current ***students, faculty, alumni,*** and the ***employers***/supervisors/managers of our alumni. On a less regular basis the department will seek input from other constituencies, such as: graduate schools, the CIAPR (College of Engineers and Land Surveyors of Puerto Rico), government agencies, parents, local community members, the UPR system administrators, and anyone who is willing to share experiences and needs. Each group plays an important role in establishing and evaluating the success of the program outcomes and educational objectives, and in providing direction for the department's future. Nevertheless, the emphasis will be on the main four.

6. Mission Statements

The Department's most recent vision and mission statements are the result of extensive review by faculty, students, and other members of our constituency. These versions were approved at a Faculty Meeting on 29 March 2001.

VISION

We provide society with people serving, problem solving professionals in civil engineering and surveying.

MISSION

Provide our society with high quality professionals having a strong education in civil engineering and/or land surveying; with rich cultural, ethical, environmental, and social sensitivities; capacity for critical thinking; and the entrepreneurial skills to solve civil infrastructure problems. Search for and disseminate new knowledge. Provide services to solve engineering problems as members of interdisciplinary teams.

In line with the vision and mission statements, a departmental ***Slogan*** was developed to motivate our students around their service to society and their problem solving responsibilities:

CES = (PS)^2 ➔ ***(Civil Engineers and Surveyors = People-Serving, Problem-Solvers).***

The CE&S curriculum is designed to meet the needs of all students within the context of this vision and mission. This mission statement served as the basis for the development of specific program educational objectives and program outcomes and for the selection of evaluation and assessment methods and tools to determine whether the outcomes and objectives are being met. These will all be discussed in the sections ahead.

The Civil Engineering Program's mission and objectives are clearly consistent with the mission of the UPRM College of Engineering (CoE), as approved by the College's faculty on 8 May 2001. It reads as follows:

"Provide Puerto Rico, our neighbors, and the rest of the world with professionals having a strong education in engineering and related areas, with rich environmental, ethical, cultural, and social sensitivities; with capacity for critical thinking and for becoming leaders on their fields.

It is also our mission to conduct research, expand and disseminate knowledge, promote an entrepreneurial spirit, provide service to the community, and pursue the innovation and application of technology for the benefit of our global society, with particular emphasis on Puerto Rico."

And in turn, the CoE's mission statement is consonant with the UPRM's Institutional Mission Statement, which clearly describes our institutional academic product or outcome, as follows:

"Within the philosophical framework established by the University of Puerto Rico Act, the Mayagüez campus directs its efforts towards the development of educated, cultured citizens, *capable of critical thinking*, and *professionally qualified in the fields of agricultural, social, and natural sciences, engineering, humanities and business administration.* They should be *able to contribute in an efficient manner to the cultural, social, and economic development of the Puerto Rican and international community.* This process is aimed at endowing our alumni with a *strong technical and professional background* and to instill a *strong commitment to Puerto Rico and our hemisphere.* Our alumni should have the necessary *skills and knowledge to participate effectively in the search for solutions to the problems facing us,* to *promote the enrichment of the arts and culture*, the *development and transfer of technology* as well as to *uphold the essential attitudes and values of a democratic society*."

The structure and scope of all UPRM's student learning assessment plans must flow from this mission. Thus, these mission statements and the student learning assessment program at the Department of CE&S are clearly interdependent – each more clearly defined and understood in light of the other.

7. Program Educational Objectives (PEOs)

The Department of CE&S has developed and published **Program Educational Objectives (PEOs)** that are consistent with the institutional mission and goals of the UPR, with ABET's General Criteria for Engineering Accreditation in the United States, with ASCE's Program Criteria for Civil Engineering Programs, and with the expressed needs of its constituencies. The department's faculty approved the following six (6) **PEOs** on **29 March 2001.**

Our Department graduates will be able to:

1. ***Address the challenges that they will face in their careers.***
2. ***Pursue life-long learning and continue to develop their problem-solving skills.***
3. ***Exhibit leadership and team-building skills in a bilingual setting.***
4. ***Provide quality service to the profession, to our government, and to our society.***
5. ***Function as effective members of interdisciplinary teams.***
6. ***Apply current and innovative engineering technologies and criteria.***

8. Program Outcomes (POs)

Goals or outcomes for student learning are the foundation of meaningful assessment. The Department of CE&S has developed and published **Program Outcomes (POs)** that resulted from an extensive outreach effort and analysis, and based on our program educational objectives. These student learning outcomes are consistent with the previously stated program objectives and with the mission of the institution, the college, and the program. They are also directly linked to the minimum learning outcomes defined in ABET Engineering Criteria 2000 (Criterion 3), and to the **Program Criteria** established for the practice of the profession by the American Society of Civil Engineers (ASCE). The department's faculty approved the following eleven (11) **POs** on **29 March 2001**.

By the time of their graduation, our student will develop:

1. ***Ability to understand and apply fundamental knowledge of mathematics through differential equations, probability and statistics; science (calculus based physics and general chemistry); and engineering sciences.***
2. ***Proficiency in a minimum of four (4) recognized major civil engineering areas, such as; construction management, environmental, geotechnical, structural, transportation, and water resources.***
3. ***Ability to conduct experiments and to critically analyze and interpret data in more than one of the major civil engineering areas.***
4. ***Ability to perform civil engineering integrated design of systems, components, or processes by means of practical experiences throughout the professional component of the curriculum.***
5. ***Ability to identify, formulate, and solve civil engineering problems using modern engineering tools, techniques, and skills.***
6. ***Play an effective role in multidisciplinary professional work groups solving engineering problems.***
7. ***Ability to communicate effectively in English and Spanish.***
8. ***Understand the importance of compliance with professional practice and ethical issues, such as: bidding; procurement; professional interaction; and professional licensure, among others.***

9. ***Broad education necessary to understand the impact of civil engineering solutions on health, general welfare, safety, environmental quality and economy in a global context.***
10. ***Commitment to engage in lifelong learning.***
11. ***Awareness of contemporary social, cultural, economic, artistic, aesthetic, environmental and engineering issues.***

9. Course Learning Outcomes/Goals (CLOs)

The Department of CE&S has developed and published ***Course Learning Outcomes/Goals (CLOs)*** for each and every course taught within the department. These CLOs are consistent with the previously stated program objectives and student learning outcomes, and are published within the individual ***Course Syllabuses***. The syllabi of individual courses also specify which educational objectives and outcomes each course contributes to. An example of such a Syllabus is presented in ***Appendix 1.***

10. Conceptual Relationship of Learning Outcomes at Different Levels

a. Conceptual Approach: Students learn specific content and skills in each ***course.*** In aggregate, those courses, together with other program experiences such as academic advising, internships, and research should result in the desired student learning outcomes at the ***department/program*** level. Similarly, outcomes at the program level combine with general education goals and other goals to create ***institutional*** outcomes. In other words, learning outcomes at the institution, department (or program), and course (or activity) levels are interconnected, complimentary, and reciprocal.

The relationship between our program outcomes and our program educational objectives is very direct, as shown in ***Tables 1, 2*** and ***3*** ahead. Therefore, by nature of their direct association with the same ABET (a-k) outcomes, our own program outcomes and program educational objectives are implicitly related. We placed most effort and care to ensure a precise relationship among them and to include the requirements of established Program Criteria within our program outcomes.

Ideally, a better approach would be to first design the objectives and outcomes of the program, and then design the curriculum based on that information. Clearly we could not do this since we already had a full curriculum in place long before we drafted the first statement of objectives and outcomes for our programs and courses under the new ABET EC2000 Outcomes Assessments Criteria. What the department did therefore was to ask professors involved in each particular course for their consensus on what contribution that particular course makes to each of our objectives and outcomes. These results are presented in the form of matrixes in ***Tables 4, 5, and 6*** further ahead. Having a clear understanding of the relation between the courses and the various program objectives and outcomes ensures that all required skills and outcomes are covered in the 5-year program curriculum.

b. Program Outcomes vs. Institutional Outcomes: The UPRM directs that every department/program within the institution shall develop and include in their Student Learning Assessment Plans a matrix depicting the relationship or connection of their program outcomes

with these institutional learning outcomes. ***Table 1*** reflects this relationship for the Department of CE&S.

c. Program Educational Objectives vs. Engineering (ABET's) Outcomes: ***Table 2*** reflects the relationship between our program educational objectives and **ABET's Criterion 3 Engineering (a-k) Outcomes.** This table shows multiple links between objectives and outcomes. The matrix is a result of a participatory process with departmental consensus.

d. Program Outcomes vs. Engineering (ABET's) Outcomes: ***Table 3*** reflects the relationship between our program outcomes and **ABET's Criterion 3 Engineering (a-k) Outcomes.** These outcomes are consistent with the previously stated program objectives and with the mission of the Institution, the College of Engineering, and the department/program. They are also directly linked to the **Program Criteria** established for the practice of civil engineering by the ASCE. This table shows multiple links between the two sets of outcomes. The matrix is a result of a participatory process with departmental consensus.

e. Curriculum Courses vs. Program Outcomes & Educational Objectives: The Department of CE&S examined all core curriculum courses and main civil engineering elective courses to ensure total coverage of proposed student learning outcomes and of ABET's EC2000 outcomes criteria. This coverage is reflected on each individual syllabus and on various matrixes. ***Table 4*** provides a mapping of the program objectives and learning outcomes to the ***required core curriculum*** courses in the Civil Engineering Program. ***Table 5*** does the same for all ***civil engineering electives***. All ***other core curriculum courses*** are mapped in ***Table 6.*** These three tables demonstrate that all outcomes and objectives are addressed in numerous courses, although often to different degrees.

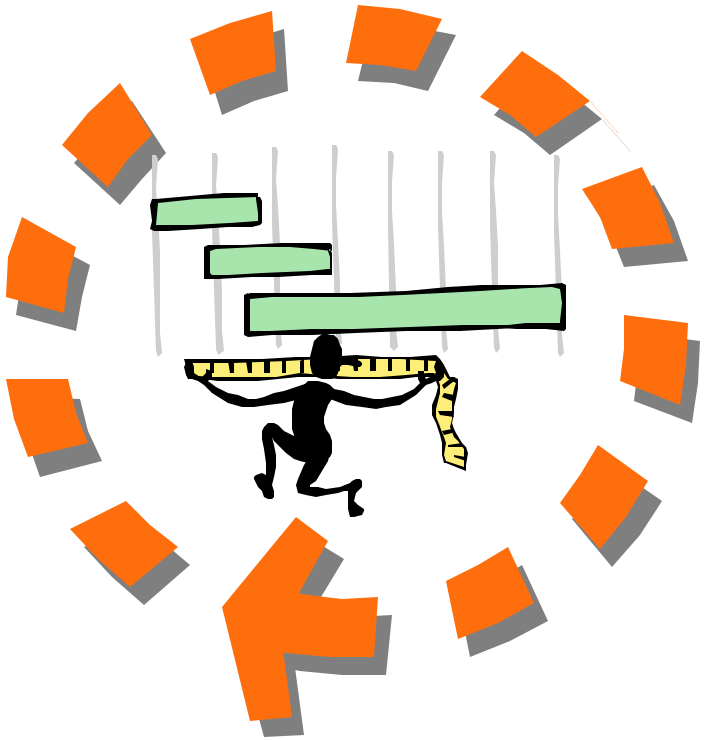

TABLE 1

PROGRAM OUTCOMES vs. INSTITUTIONAL OUTCOMES

[Pending Final Approval of Institutional Outcomes]

(What we expect to develop in our students by time of their graduation)

1. ***Ability to understand and apply fundamental knowledge of mathematics through differential equations, probability and statistics; science (calculus based physics and general chemistry); and engineering sciences.***
2. ***Proficiency in a minimum of four (4) recognized major civil engineering areas, such as; construction management, environmental, geotechnical, structural, transportation, and water resources.***
3. ***Ability to conduct experiments and to critically analyze and interpret data in more than one of the major civil engineering areas.***
4. ***Ability to perform civil engineering integrated design of systems, components, or processes by means of practical experiences throughout the professional component of the curriculum.***
5. ***Ability to identify, formulate, and solve civil engineering problems using modern engineering tools, techniques, and skills.***
6. ***Play an effective role in multidisciplinary professional work groups solving engineering problems.***
7. ***Ability to communicate effectively in English and Spanish.***
8. ***Understand the importance of compliance with professional practice and ethical issues, such as: bidding; procurement; professional interaction; and professional licensure, among others.***
9. ***Broad education necessary to understand the impact of civil engineering solutions on health, general welfare, safety, environmental quality and economy in a global context.***
10. ***Commitment to engage in lifelong learning.***
11. ***Awareness of contemporary social, cultural, economic, artistic, aesthetic, environmental and engineering issues.***

	Program Outcomes										
Institutional Outcomes	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***
a. Be able to think critically …											
b. Be able to integrate and synthesize knowledge …											
c. Demonstrate literacy in reading, writing, and oral communication											
d. Understand science and scientific inquiry …											
e. Have a historical consciousness, with an understanding of own heritage …											
f. Have an appreciation for the arts											
g. Be familiar with ethics & the various branches of human understanding …											
h. Be professionally qualified in field of study											

TABLE 2

PROGRAM EDUCATIONAL OBJECTIVES vs. ENGINEERING OUTCOMES

Our Civil Engineering graduates will …

1. ***Address the challenges that they will face in their careers.***
2. ***Pursue life-long learning and continue to develop their problem-solving skills.***
3. ***Exhibit leadership and team-building skills in a bilingual setting.***
4. ***Provide quality service to the profession, to our government, and to our society.***
5. ***Function as effective members of interdisciplinary teams.***
6. ***Apply current and innovative engineering technologies and criteria.***

	Program Educational Objectives					
Criterion 3 (a-k Outcomes)	***1***	***2***	***3***	***4***	***5***	***6***
a. math/science/engineering …	X	X	X	X	X	X
b. conduct experiments …	X	X				X
c. engineering design …	X	X		X	X	X
d. multi-disciplinary teamwork...		X	X		X	
e. problem solving …	X	X			X	X
f. professionalism & ethics …	X			X	X	
g. communication skills …			X		X	
h. broad educ & global impact...	X			X	X	X
i. lifelong learning …				X		X
j. contemporary issues …	X		X	X	X	X
k. modern tools & techniques …	X		X	X		X

TABLE 3

PROGRAM OUTCOMES vs. ENGINEERING OUTCOMES

(What we expect to develop in our students by time of their graduation)

1. ***Ability to understand and apply fundamental knowledge of mathematics through differential equations, probability and statistics; science (calculus based physics and general chemistry); and engineering sciences.***
2. ***Proficiency in a minimum of four (4) recognized major civil engineering areas, such as; construction management, environmental, geotechnical, structural, transportation, and water resources.***
3. ***Ability to conduct experiments and to critically analyze and interpret data in more than one of the major civil engineering areas.***
4. ***Ability to perform civil engineering integrated design of systems, components, or processes by means of practical experiences throughout the professional component of the curriculum.***
5. ***Ability to identify, formulate, and solve civil engineering problems using modern engineering tools, techniques, and skills.***
6. ***Play an effective role in multidisciplinary professional work groups solving engineering problems.***
7. ***Ability to communicate effectively in English and Spanish.***
8. ***Understand the importance of compliance with professional practice and ethical issues, such as: bidding; procurement; professional interaction; and professional licensure, among others.***
9. ***Broad education necessary to understand the impact of civil engineering solutions on health, general welfare, safety, environmental quality and economy in a global context.***
10. ***Commitment to engage in lifelong learning.***
11. ***Awareness of contemporary social, cultural, economic, artistic, aesthetic, environmental and engineering issues.***

	Program Outcomes										
Criterion 3 (a-k Outcomes)	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***
a. math/science/engineering …	X	X	X	X	X						
b. conduct experiments …	X	X	X	X							
c. engineering design …	X	X	X	X	X						
d. multi-disciplinary teamwork...				X		X		X	X		
e. problem solving …	X	X	X	X	X		X	X	X		X
f. professionalism & ethics …				X		X		X	X	X	X
g. communication skills …						X		X	X	X	X
h. broad educ & global impact...							X	X	X	X	X
i. lifelong learning …									X	X	X
j. contemporary issues …					X		X	X	X	X	X
k. modern tools & techniques …	X	X	X	X	X	X	X			X	X

TABLE 4

PROGRAM OBJECTIVES and OUTCOMES vs. REQUIRED CIVIL ENGINEERING COURSES

	Program (a-k) Outcomes Engineering Criteria ABET 2000 (Criterion 3)											Program Educational Objectives					
Course	*a*	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*1*	*2*	*3*	*4*	*5*	*6*
INCI 4001	x	x	x	x	x	x	x			x	x	x		x	x	x	x
INCI 4002	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
INCI 4007	x	x	x	x	x	x	x	x			x	x		x	x		x
INCI 4008	x		x	x	x	x	x	x		x	x	x	x	x	x	x	x
INCI 4011	x	x	x	x	x	x	x	x		x	x	x			x	x	x
INCI 4012	x		x		x	x		x		x		x	x		x		x
INCI 4019	x		x		x		x	x	x		x	x	x				x
INCI 4021	x				x						x				x		
INCI 4022	x		x		x		x				x	x	x				
INCI 4026	x	x		x	x	x	x	x		x	x	x	x	x	x		x
INCI 4035	x	x		x	x	x	x	x		x	x	x		x	x		x
INCI 4049	x		x		x	x			x		x		x		x		x
INCI 4055	x		x		x	x	x	x	x	x	x	x	x	x	x		x
INCI 4095	x	x			x		x				x		x				x
INCI 4136	x				x						x		x				x
INCI 4137	x	x	x	x	x	x	x	x	x	x	x	x	x		x		x
INCI 4138	x	x	x		x			x			x	x	x		x		x
INCI 4139	x	x		x	x	x	x	x		x	x	x	x	x	x		x
INCI 4145	x		x		x	x	x	x			x	x	x		x	x	
INCI 4950	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

TABLE 5

PROGRAM OBJECTIVES and OUTCOMES vs. ELECTIVE CIVIL ENGINEERING COURSES

	Program (a-k) Outcomes Engineering Criteria ABET 2000 (Criterion 3)											Program Educational Objectives					
Course	a	b	c	d	e	f	g	h	i	j	k	1	2	3	4	5	6
INCI 4000	x		x		x	x	x	x		x	x	x	x	x	x		x
INCI 4006	x	x		x	x	x	x	x		x	x	x	x	x	x	x	x
INCI 4013	x		x		x						x	x		x	x		
INCI 4028	x	x		x	x	x	x	x		x	x	x	x	x	x		x
INCI 4032	x		x		x			x			x	x	x				x
INCI 4056	x		x		x		x			x	x	x			x		x
INCI 4057	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x
INCI 4061						x	x	x	x			x			x		
INCI 4062						x	x	x	x			x			x		
INCI 4995	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
INCI 4998	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
INCI 5005	x		x	x	x	x	x		x	x	x	x		x	x	x	x
INCI 5006	x		x		x		x				x	x					x
INCI 5007	x		x		x		x	x		x	x	x			x		x
INCI 5008	x	x	x	x	x	x		x			x	x			x	x	x
INCI 5009	x	x			x	x		x		x	x	x	x		x		x
INCI 5012	x	x		x			x				x	x		x	x	x	x
INCI 5015	x		x		x	x	x	x		x	x	x		x	x		x
INCI 5017	x	x		x	x	x	x	x		x	x	x	x	x	x		
INCI 5018	x		x		x	x	x		x	x	x	x	x		x		x
INCI 5026	x	x		x	x	x	x	x		x	x	x	x	x	x		
INCI 5027	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x
INCI 5029	x		x		x	x	x	x	x	x	x	x	x	x	x		x
INCI 5049	x		x		x		x	x	x		x		x		x		x
INCI 5055	x	x	x		x	x	x	x		x	x	x			x		x
INCI 5056	x	x	x	x	x	x	x		x		x	x	x	x		x	x
INCI 5065	x	x		x	x	x	x	x		x	x	x	x	x	x		x
INCI 5075	x		x		x	x	x	x		x	x	x	x				x
INCI 5146	x	x	x		x	x	x	x	x	x	x	x	x	x	x		x
INCI 5995	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
INCI 5996	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

TABLE 6

PROGRAM OBJECTIVES and OUTCOMES vs. OTHER CORE CURRICULUM COURSES

	Program (a-k) Outcomes Engineering Criteria ABET 2000 (Criterion 3)											Program Educational Objectives					
Course	*a*	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*1*	*2*	*3*	*4*	*5*	*6*
INGE 3011				X			X				X			X		X	X
INGE 3012				X			X				X			X		X	X
INGE 3016	X				X						X		X				X
INGE 3031	X				X								X				X
INGE 3072	X				X								X				X
INGE 4001	X				X								X				X
INGE 4011	X		X		X								X				X
INGE 4012	X		X		X								X				X
INGE 4015	X				X								X				X
INGE 4016	X	X		X	X		X				X		X				X
MATE 3031	X				X								X				
MATE 3032	X				X								X				
MATE 3063	X				X								X				
MATE 4009	X				X								X				
FISI 3171	X	X			X						X		X				X
FISI 3172	X	X			X						X		X				X
FISI 3173	X	X		X	X		X				X		X	X		X	X
FISI 3174	X	X		X	X		X				X		X	X		X	X
GEOL 4015	X	X		X							X		X			X	X
ECON 3021	X				X						X		X				X
INGL 3101				X			X							X		X	
INGL 3102				X			X							X		X	
INGL 3201				X	X		X							X		X	
ESPA 3101				X			X	X						X		X	
ESPA 3102				X			X	X						X		X	
PHED 3058				X			X							X		X	
PHED 3076				X			X							X		X	
PHED 3077				X			X							X		X	
PHED 3205				X			X							X		X	
PHED 3215				X			X							X		X	
QUIM 3001	X	X			X		X				X		X				X
QUIM 3002	X	X			X		X				X		X				X

11. Assessment Process, Methods, and Tools

a Conceptual Assessment Cycle: The assessment processes at UPRM are cyclical and continuous, as conceptually reflected on ***Figure 1.*** These assessments cycles are repeated after changes have been implemented. The time for completion of a cycle up to implementation, or the ***"closing of the loop",*** as it is commonly referred to, may be different for the different assessment levels. An assessment cycle or loop at the course level will likely take the least time to complete as professors, within their authority, can use assessment results to make positive changes in their courses almost immediately. In the other hand, at the program level, the implementation of a course or curricular change may take months or years, as the approval may take it through various levels of authority within the institution.

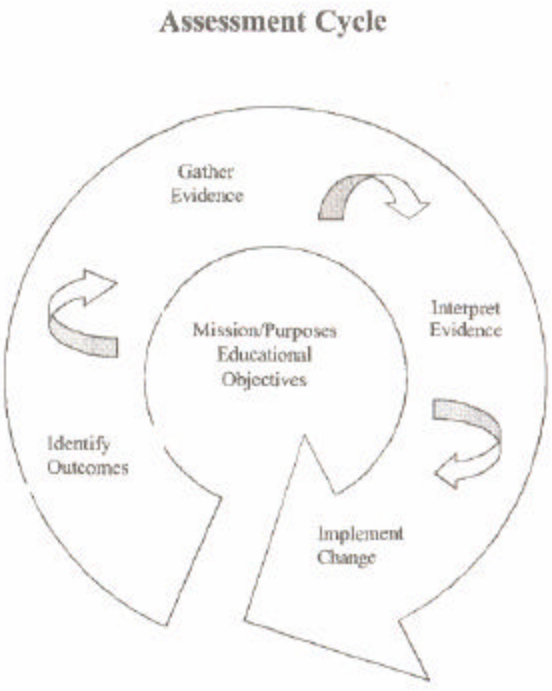

Figure 1. A conceptual assessment cycle or loop

b. Assessment Process: The Department of CE&S put into place a well-defined ***continuous quality improvement (CQI)*** process to ensure that the results of the assessments are used in an on-going manner, to ensure the achievement of our educational objectives and outcomes, and to improve the quality of our programs. ***Figures 2*** and ***3*** complement each other in graphically outlining this process. Although elements of this process are continuous in nature, we have recognized our responsibility to assure that the cycles are completed and documented.

Figure 2 depicts graphically our main ***data gathering mechanisms*** within their place in our assessment process. A detailed listing of assessment tools, with strategies and timing, is presented in ***Tables 7, 8, and 9*** further ahead in this plan.

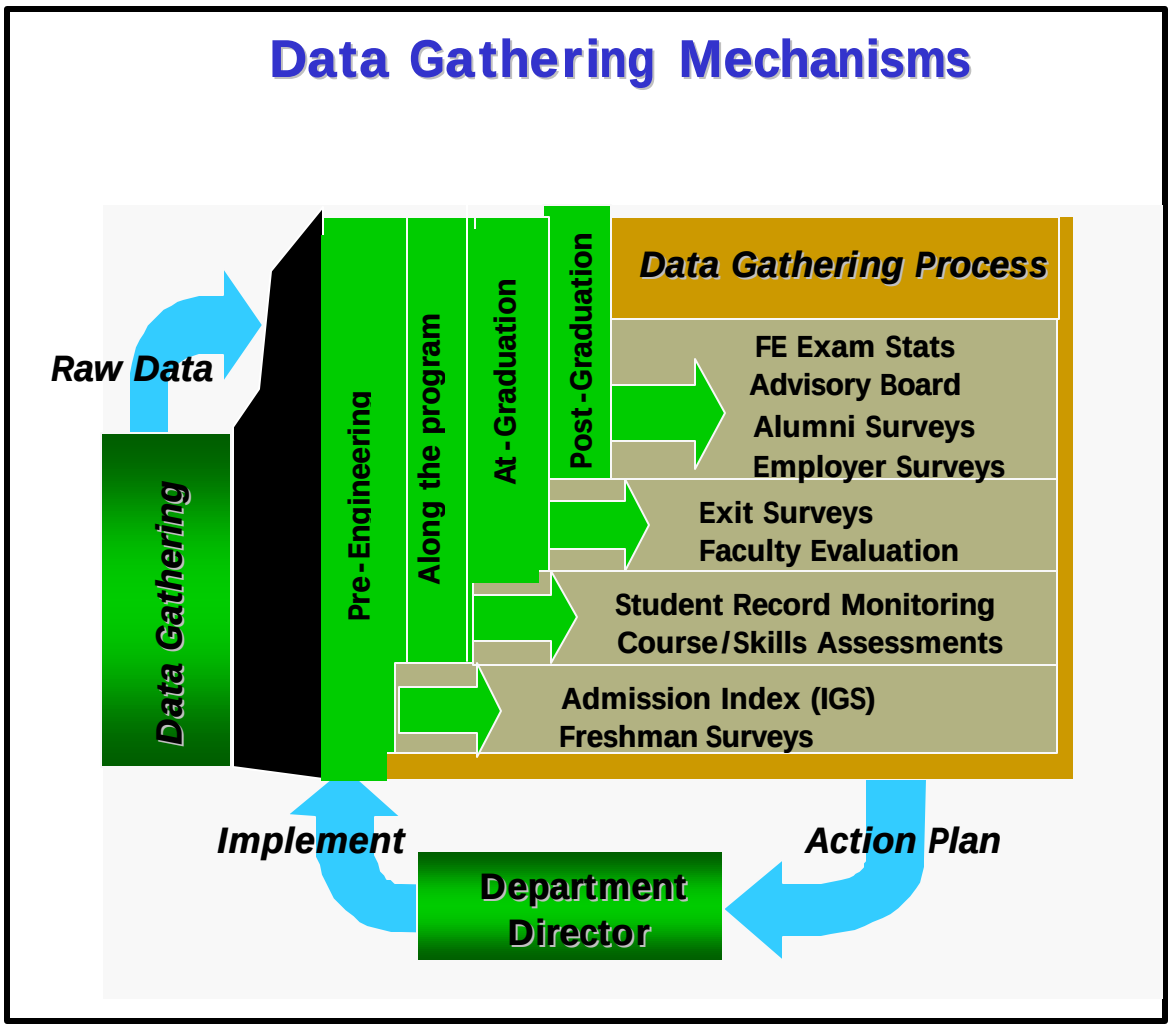

Figure 2. Data Gathering Mechanisms

Good assessment mechanisms or instruments, by themselves, are not of much use. We also need to use the data they provide to identify and implement program improvements. ***Figure 3*** is a graphic depiction of a ***full assessment cycle*** for our program.

c. Assessment Office: For a continuous quality improvement (CQI) process to be effective and "continuous", the process must be institutionalized; it must become part of the formal infrastructure of the department. With that purpose the Department of CE&S developed a new educational research office, namely, ***System for the Evaluation of Education (SEED) Office***, to support the department's outcomes assessment efforts. A conceptual diagram of the Department's SEED Office is depicted in ***Figure 4.***

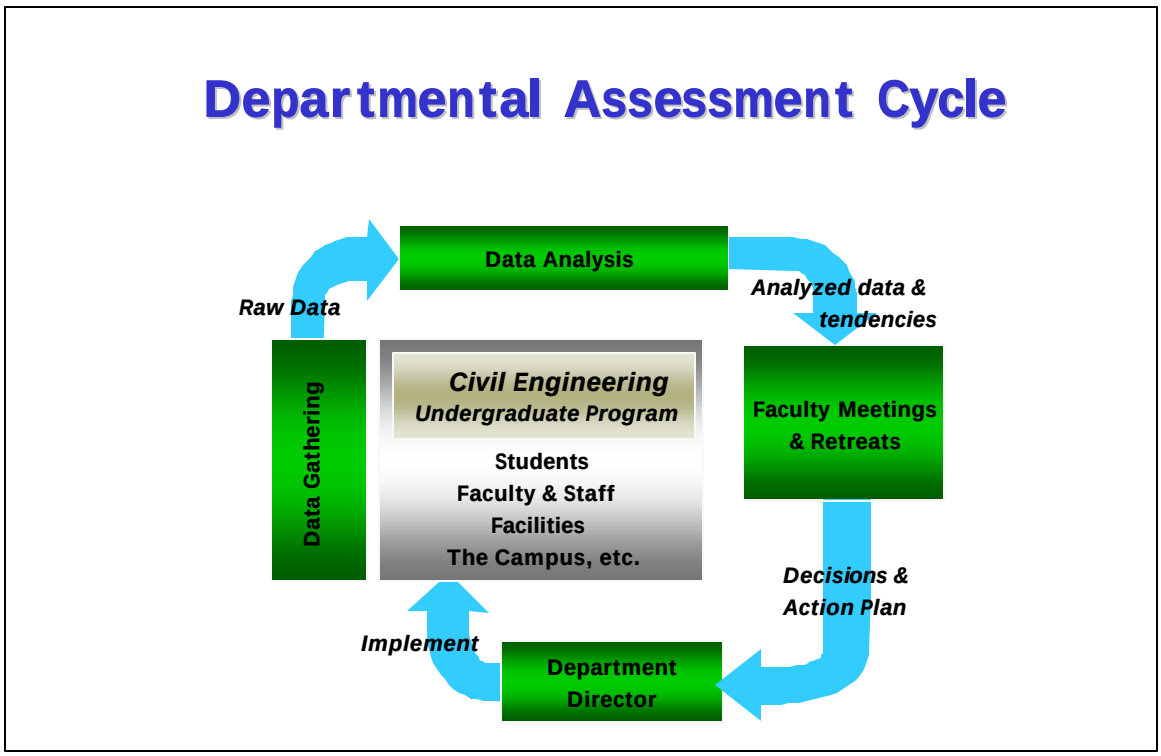

Figure 3. Departmental Assessment Cycle/Process

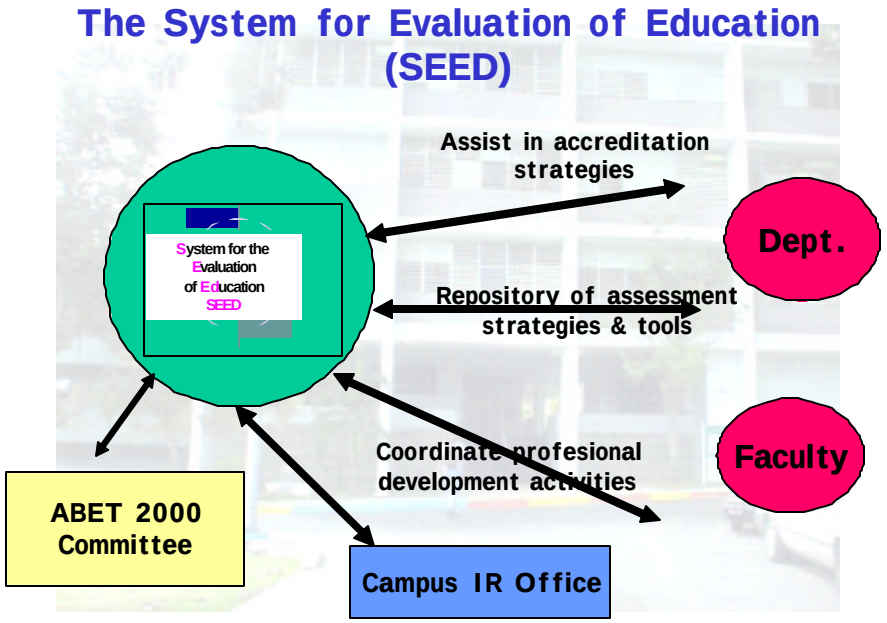

Figure 4. Conceptual Diagram for the Department's SEED Office

d. Assessment Methods/Tools:

The ***primary assessment tools*** used to monitor and to assure achievement of program outcomes and objectives are listed in ***Table 7.*** The assessment tools and procedures set forth in this Student Outcomes Assessment Matrix have been developed in the Department of CE&S through consensus, with great acceptance by all involved. When analyzed closely, most professors execute only one, two, or three of these assessments per semester, on things they are already doing in their courses, which does not necessarily constitute an additional heavy load on the faculty. The actual ***tools, rubrics,*** and ***forms*** chosen are available in ***Appendix 2*** of this plan.

The concept behind the more commonly used is briefly discussed below:

- ***Evaluation of Student Performance in the Classroom (Assignments, Examinations, Quizzes, among others):*** Each course in the program relies heavily on the time-tested method of assignments and examinations. Course grades based on performance on homework, quizzes, exams, and projects remain an important standard evaluation component. The faculty is confident that course evaluation tools are designed so that grades generally provide an accurate measure of the knowledge and skills learned in the course. Course syllabi clearly state the ***metrics*** used in evaluating student performance.

- ***Examples of Student Work:*** Notes, project work, homework assignments, quizzes and exams compiled from students during a course provide evidence and means to monitor student learning of the course material as well as their organizational and communications skills. They will be maintained in individual Course Binders/Portfolios located in the department's SEED Office.

- ***Student Evaluations of Teaching (SET):*** The SET is a standardized assessment tool used throughout the university near the end of every course. The SET form consists of a set of questions for students to rate a whole range of items concerning the course. This includes, for example, the effectiveness of the instructor in communicating the subject matter and stimulating interest in it, and the appropriateness of textbooks, homework and programming labs, and exams. The form also provides space for students to provide general comments on the course material and suggestions for changes. While the assignments and exams often allow instructors to identify a problem in the course, the SETs allow them to also identify the *reason* for the problem.

- ***Placement Data for B.S. Graduates:*** The successful placement of civil engineering graduates in industrial positions, graduate schools, and other professional positions is obviously a key measure of the quality of the program. The data collected by the UPRM Placement Office is useful in assessing our product.

- ***Exit Survey:*** This survey contains several standard sets of questions that are asked in exit surveys performed by other departments in the College, while other questions that are specific to civil engineering students. Perhaps the most useful parts of the survey are the written comments that students provide. Periodically the raw responses are analyzed and the results discussed by the SEED and Academic Affairs Committees as indicated earlier.

TABLE 7

STUDENT OUTCOMES ASSESSMENT MATRIX

Assessment Tools	Program (a-k) Outcomes										
	a	***b***	***c***	***d***	***e***	***f***	***g***	***h***	***i***	***j***	***k***
Pre-Engineering											
Freshman Orientation Questionnaire	X	X		X	X	X	X				
Ethics Integration Assessment Form						X					
Course Assessment											
Laboratory Reports (copies of)	X	X		X	X		X				X
Exams, Quizzes, Homeworks (copies of)	X	X	X		X		X			X	X
EIT Exam Statistical Report	X				X						X
Written Report Evaluation		X		X			X				
Oral Presentation Assessment				X			X				
Teamwork Assessment Form (I)				X							
Teamwork Assessment Form (II)				X							
Peer Evaluation Form				X							
Undergrad Research Exp Assessm. Form		X	X		X		X				
Course/Project Skills Assessment Form	X	X	X	X	X	X	X	X	X	X	X
Student Evaluation of Teaching (SET)	X	X	X		X	X	X	X	X	X	X
Video of Presentations			X	X	X		X			X	X
Program Assessment											
Ethics Integration Assessment Form						X					
Graduating Student Exit Survey (Part I)	X	X	X	X	X	X	X	X	X	X	X
Graduating Student Exit Survey (Part II)	X	X	X	X	X	X	X	X	X	X	X
Internship Assessment Form (Student)				X	X					X	
Internship Assessment Form (Mentor)				X	X					X	
COOP Supervisory Evaluation Form				X	X					X	
COOP Student Evaluation Form				X	X					X	
Student Resume ***(Special Format)*****	X	X	X	X	X	X	X	X	X	X	X
Post Graduation											
Alumni Survey	X	X	X	X	X	X	X	X	X	X	X
Employers Survey	X	X	X	X	X	X	X	X	X	X	X
FE Exam Statistics	X		X		X	X	X	X	X	X	X
Advisory Board Input	X	X	X	X	X	X	X	X	X	X	X

NOTE: *Student* ***RESUME*** ***(Special Format):*** *Students are instructed about this requirement, to maintain up-to-date throughout their time as students in the Civil Engineering Program, and to be turned in on the 1st week of the senior year to the Department's Academic Counselor, who will collect/file them in Resume Binders, for use at employment opportunities and/or for statistical analysis. The Resume will not exceed 2 pages in length, and will include as a minimum:*

- *Name*
- *Mailing Address*
- *Contact Telephone Numbers, emails, etc.*
- *Education*
  - *Schools/Colleges/Universities*
  - *Departmental GPA*
  - *General GPA*
- *Undergrad Research and Work Experiences*
- *Seminars and Workshops Attendance*
- *DESIGN Projects and Engineering Competitions*
- *Special Skills*
- *Membership in Professional Societies*
- *Honors, Recognitions and Awards*

- ***Alumni Survey:*** The Department of CE&S conducts alumni surveys on an annual basis. As stated previously, every year this survey is mailed out to alumni who graduated either one year or five years ago; this allows us to gather input from alumni who graduated relatively recently as well as some who graduated a while ago, without at the same time asking for input from the same group of people year after year. The intent of this survey is to gauge how well the program has prepared our graduates for positions in industry and graduate school

- ***Employer's Survey:*** The department and the UPRM Placement Office will routinely perform employer surveys of supervisors of our graduates to find out how well the program prepared our graduates that they supervise with respect to our learning outcomes.

- ***Course and Skills Assessments:*** On-going course and skills assessments are complete by all students for every course they take. Some of these assessments are performed during the semester at targets of opportunity; i.e., oral presentations, written reports, group (team) experiences, and ethical considerations. Others are performed at the end of the semester, at the same time of the ***SETs***. Faculty will summarize the results, identify areas needing attention, and either take action themselves within their course or bring them to the attention of the faculty for action at the program level. Faculty will maintain completed assessment forms as evidentiary documentation in individual course binders.

- ***Internship/Undergraduate Research/Co-op Surveys:*** The Civil Engineering Co-op, Internship, and Undergraduate Research Programs routinely survey both students and employers. All working students are asked to evaluate their experiences. At the end of each work term, students must also submit a written performance appraisal from their supervisor.

e. Metric Goals:

The initial metric goals for the first two to three years of this implementation are simple. We intend to review them and possibly increase them as we analyze value-added charts throughout the process.

Most of the department' assessment tools rate responses from ***1*** to ***5***, where ***5*** is ***"excellent"*** or ***"extremely satisfied,"*** and ***1*** is ***"poor"*** or ***"extremely dissatisfied."***

For ***Student Evaluations of Training (SETs)***, students anonymously evaluate all

professors in all classes. The professor's score is calculated by averaging the responses to all of the questions on a 5-point scale as the one mentioned above.

On ***Exit, Alumni***, and ***Employer Surveys*** we address all program objectives and outcomes. Responses to each question are averaged. For now the goal is to have averages of ***3.00*** or more for all outcomes, with at least 75% of the answers at 3.00 or higher.

For the ***Course/Skills Assessment Forms***, which are completed by all students in all courses at the end of every semester, they rate classes and level of skills experience, both on content and administration. We analyze these the same way as for the surveys just mentioned, with a goal of ***3.00*** or more for all outcomes, with at least 75% of the answers at 3.00 or higher.

The ***Fundamentals of Engineering Exam (FE/EIT)*** is required to obtain a professional engineering license. Although taking the test before graduation is optional, there seems to be an increase in the number of students taking it. Our goal is to have a ***passing rate at or higher than the national rate,*** and always higher than the passing rate among the civil engineering programs in Puerto Rico.

Passing/approval metrics for each course are clearly stated in each course syllabi. In most cases, an average score of ***70%*** is required for approval of the course, and for continuation into the next level or sequential course.

f. Assessment Strategies and Operational Actions for Achieving Outcomes: To implement these strategies more effectively we came up with this general ***action plan***:

- Maintain regular correspondence with graduates and their employers to know their needs and to evaluate whether modifications to the program are necessary and appropriate.
- Establish an annual process in which a faculty/student committee reviews course and senior design projects to evaluate how well students in the capstone design course are applying material throughout the curriculum.
- Draw upon students' co-op/intern/undergraduate research experiences as a source for interdisciplinary experiences, class problems, and information to other students.
- Require students to prepare written reports and oral presentations targeted to different audiences and topics.
- Make use of available resources to present case studies of actual examples in which the consequences of ethical and safety-related decisions were not properly considered.
- Require a large number of civil engineering courses to have at least one major writing assignment.
- Require students to evaluate peer performance in team settings.
- Document and distribute official department policies on sexual harassment and academic and ethical misconduct.
- Have faculty design research projects appropriate for undergraduate students.
- Establish seminar series for undergraduates to present their research work results.
- Promote the use of programming, spreadsheets and the most modern hardware and

software tools at all levels in the curriculum.

- Have faculty make greater use of informational sources beyond the course textbook.
- Promote student participation in the local student chapter of ASCE and support activities sponsored by this organization. Encourage and provide funds for student participation in local and regional events sponsored by professional and civic organizations.

g. Evidence to Show Achievement of Learning Outcomes: Listed below is the evidentiary documentation that will be filed/maintained (as appropriate for the particular levels) to prove that processes for the Assessment of Student Learning that lead to the continuous improvement of our educational programs are in place.

At Course level -- *COURSE PORTFOLIOS/Binders, for each course, with:*

- *Syllabi with detailed course outlines, descriptions, and course learning outcomes*
- *Examples of student works for required courses, including representative samples of homework assignments, quizzes, exams, and project works.*
- *Copies of completed assessment tools/instruments and summaries of results*
- *Videos of student oral presentations*
- *Any other materials that support student learning outcomes assessment efforts*

At Department/Program level -- *PROGRAM PORTFOLIOS/Binders and/or FILES, with:*

- *Posters/Catalogs/Brochures listing Student Learning Outcomes, Educational Objectives, etc.*
- *Graduation Exit Survey documentation and results*
- *Alumni Survey documentation and results*
- *Employer Survey documentation and results*
- *Stats from Licensing Exam (where applicable)*
- *Copies of minutes of the Department's Faculty Meetings, Academic Affairs Committees, and Advisory Board meetings and recommendations (where applicable)*
- *Copies of curriculum development/revisions*
- *Student transcript samples*
- *Copies of completed assessment instruments and summaries of results*
- *Minutes of faculty meetings where assessment results considered and actions taken*
- *Any other materials that support student learning outcomes assessment efforts*

At Other levels/Offices -- *GOOD FILES, with:*

- *Institutional research results/statistics, with their analysis, recommendations, and actions taken (if any).*
- *Students/Graduates/Alumni/Employer Satisfaction Survey results/statistics, with their analysis, recommendations, and actions taken (if any).*
- *GPA/Grade trends, Graduation Rates, Retention Rates, etc., and any other statistical data gathered throughout the institution, with their analysis, recommendations, and actions taken (if any).*

12. Reporting and Utilization of Assessment Results

All reporting shall be accomplished in upon completion of the assessments at the end of each semester, and in accordance with the Timeline and Strategies presented in ***Section 14*** of this plan. Utilization of assessment results shall be in accordance with guidelines and suggestions presented throughout this plan.

13. Responsibility for Enacting and Maintaining the Plan

The following is a brief listing of the major responsibilities of key personnel as related to the assessment of student learning within the Department of CE&S. This list is not necessarily all encompassing, as additional guidance is presented throughout this plan.

a. Director of the Department:

- Lead the department's development and implementation efforts of a student learning assessment process with documented results.
- Encourage the full participation process of faculty, students, staff, and other stakeholders of the department.
- Ensure that evidence is maintained and that the results of the assessment process are applied to the further development and improvement of the department's programs.
- Provide the support, infrastructure, resources, and constructive leadership to assure the quality and continuity of the continuous quality improvement (CQI) process.
- Lead the academic advising activities of the department.
- Ensure that all of this planning and execution is done in accordance with the general guidelines established throughout this plan.

b. Associate Director of the Department:

- Support the Director's responsibilities and assume them in his absence.
- Supervise the department's centralized ***Academic Advising*** activities, including the efforts of the professional and academic Counselors.
- Conduct the assessment activities in accordance with this plan.

c. Department's SEED Office:

- Be the lead agent of the Director in the development, implementation, and continuous support of the department's outcomes assessment efforts.
- Lead the educational research efforts of the department.
- Send out, receive, and analyze the annual Alumni and Employer's Surveys.
- Prepare the Annual Assessment Summary Reports for the Department.
- Provide clerical and operational support to the Department's SEED Committee.
- Maintain the assessment evidentiary documentation listed in ***Section 11g*** of this plan.

d. Department's SEED Committee (which includes student representatives):

- Initiates discussions on program objectives and outcomes, based on the inputs from the various constituencies.
- Conduct regular Committee meetings, announced in advance and open to all interested students and faculty.
- Analyze and discuss summary data and results from each of the assessment instruments to make recommendations to the Department.

e. Department's Academic Affairs Committee:

- Coordinates all curriculum related processes.
- Following appropriate discussion approves relatively minor changes in individual courses, such as minor changes in prerequisite courses.
- Submits proposals for major changes in course content and for new courses to the appropriate academic authorities.

f. Department's Faculty:

- Support all departmental student learning assessment efforts as outlined in this plan.
- Participate in the assessment efforts review process that leads to its improvement and further development.
- Perform the scheduled assessments and evaluations in accordance with the processes and timelines outlined in this plan.
- Collect and analyze summary data from each of the assessment instruments.
- Based on the assessment results, prepare proposals for changes in courses and for new courses.
- Provide academic and professional advice to students continuously during published office hours.
- Maintain Course Binders (at SEED Office) with up-to-date assessment evidentiary documentation, as suggested in ***Section 11g*** of this plan.
- Use assessment information to make appropriate adjustments on how to present the courses, to suggest changes in courses and prerequisites, and to ensure that program objectives and outcomes are met.

h. Department's Couselors:

- Monitor student learning and academic progress through the program.
- Review student grades at the end of each semester.
- Identify and help students having problems.
- Take steps to correct irregularities in student academic records as soon as possible.
- Conduct thorough reviews of student academic records with the assistance of the Registrar's Office to ensure that students complete all institutional requirements for the degree.

14. Time Line

The Program Educational Objectives ***(PEO)*** system focuses on outcomes the graduates are required to demonstrate, interfaces with external constituencies, and deals mostly with ***long-term*** issues. The Program Outcomes ***(PO)*** system focuses on ***short-term (annual loop),*** day-to-day issues faced by faculty and administration, and interfaces with students.

Although the general timeline for this plan calls for **immediate implementation**, ***Table 8*** sets ***timing*** and ***responsibilities*** for each assessment tool and/or mechanism. ***Table 9*** graphically depicts a typical Annual Student Learning Assessment Schedule for the Department of CE&S.

15. Process for Reviewing the Plan

The Departments of CE&S will review this assessment plan during and, as part of, the cyclic reviews of assessment results. This review should lead to the refinement or improvement of the plan and to the elimination of ineffective assessment practices. Furthermore, the Department's SEED Office shall review this student learning assessment plan on an annual basis.

The process to establish and review the current Program Educational Objectives and Student Learning Outcomes within this plan involves the following steps:

a. A review of the institution's, college's, and department's mission statements;

b. A review of the ABET EC2000 criteria, along with definitions and examples of key terms;

c. The writing of broad program objectives and outcomes that could be linked to the department's mission statement;

d. The identification of Strategies and Actions, i.e., statements that described how the program objective could be achieved;

e. The linking of these outcomes to ABET's EC2000, specifically to Criterion 3 (a-k); and,

f. The identification of effective Assessment ***strategies***, ***methods/tools, metrics,*** and ***benchmarks*** that can measure the impact of the program objectives and outcomes.

TABLE 8

TIMING STRATEGIES for OUTCOMES ASSESSMENT

Assessment Tools	Timing – Utilization Strategy – Responsibility
Pre-Engineering	
Freshman Orientation Questionnaire	at UNIV-0004 Freshman Orientation Course (by Departmental Counselor)
Ethics Integration Assessment Form	at UNIV-0004 Freshman Orientation Course (by Departmental Counselor)
Course Assessment	
Laboratory Reports *(copies of)*	at all Laboratory Courses (by Lab Instructors)
Exams, Quizzes, Homeworks *(copies of)*	retain examples of these tools (by all Professors/Instructors)
EIT Exam Statistical Report	obtain annually from Examining Board (by Department)
Written Report Evaluation	anytime written reports are required (labs, etc) (by all Professors/Instructors)
Oral Presentation Assessment	at all student oral presentations (by all Professors/Instructors)
Teamwork Assessment Form (I)	at end of any semester where work done in groups (Professors/Instructors)
Teamwork Assessment Form (II)	at end of any semester where work done in groups (Professors/Instructors)
Peer Evaluation Form	at end of any semester where work done in groups (Professors/Instructors)
Undergrad Research Exp Assessm. Form	at end of any such experience (by Mentors)
Course/Project Skills Assessment Form	at end of every course (by all Professors/Instructors)
Student Evaluation of Teaching (SET)	at end of every course (by all students)
Video of Presentations	at Design/Project Presentations (by all Professors/Instructors)
Program Assessment	
Ethics Integration Assessment Form	at end of CAPSTONE Courses (by CAPSTONE Professors)
Graduating Student Exit Survey (Part I)	at end of CAPSTONE Courses (by CAPSTONE Professors)
Graduating Student Exit Survey (Part II)	at Graduation time (by Department)
Internship Assessment Form (Student)	at completion of all Internships (by Mentors)
Internship Assessment Form (Mentor)	at completion of all Internships (by Mentors)
COOP Supervisory Evaluation Form	at completion of COOP terms (by Mentors)
COOP Student Evaluation Form	at completion of COOP terms (by Mentors)
Student Resume ***(Special Format)****	start at UNIV-0004 Course; maintain up-to-date thru college years
Post Graduation	
Alumni Survey	mail to 2nd and 5th year alumni, every year, Feb-Apr (by Department)
Employers Survey	mail to employers with 5-yr graduates, every year, Feb-Apr (by Department)
FE Exam Statistics	obtained by CoE every year
Advisory Board Input	obtained at annual meeting, Jun-Jul

TABLE 9

ANNUAL STUDENT LEARNING ASSESSMENT SCHEDULE
Department of Civil Engineering and Surveying

Assessment Action	*Month*											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pre-Engineering												
Freshman Orientation Questionnaire												
Ethics Integration Assessment Form												
Course Assessment												
Laboratory Reports *(copies of)*	(Sample copies of these technical evaluations)											
Exams, Quizzes, Homeworks *(copies of)*	(Sample copies of these technical evaluations)											
EIT Exam Statistical Report												
Written Report Evaluation	(At every possible such experience)											
Oral Presentation Assessment	(At every possible such experience)											
Teamwork Assessment Form (I)												
Teamwork Assessment Form (II)												
Peer Evaluation Form												
Undergrad Research Exp Assessm. Form												
Course/Project Skills Assessment Form												
Student Evaluation of Teaching (SET)												
Video of Presentations	(At every possible such experience)											
Program Assessment												
Ethics Integration Assessment Form												
Graduating Student Exit Survey (Part I)												
Graduating Student Exit Survey (Part II)												
Internship Assessment Form (Student)	(At the end of any such experience)											
Internship Assessment Form (Mentor)	(At the end of any such experience)											
COOP Supervisory Evaluation Form	(At the end of any such experience)											
COOP Student Evaluation Form	(At the end of any such experience)											
Student Resume ***(Special Format)*****												
Post Graduation												
Alumni Survey												
Employers Survey												
FE Exam Statistics												
Advisory Board Input												

16. Provision for Funding and Support Resources

Resources can be generally defined as any input to an educational program that is necessary for the program to succeed, as shown in ***Figure 4***. Adequate resources must be available to the department/program at all times to be successful and have on-going accreditation.

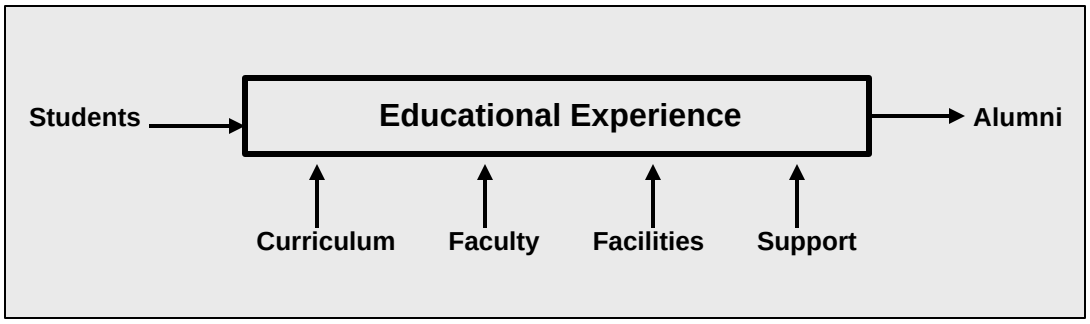

Figure 4. Resource Perspective

The following subsections highlight the major resource categories and the means by which the department will monitor progress in each category.

a. Students:

- The department will evaluate, advice, and monitor students to determine long-term success in meeting learning outcomes.
- The institution will retain responsibility to ensure that students admitted to the departments/programs meet the qualifications needed and that correspond to the expected achievement level.
- Further, the department will have assessment processes and improvement mechanisms in place to monitor the progress of their students. The department will also monitor the progress of its alumni and solicit their input for program improvement.

b. Curriculum:

- The department establishes its uniqueness through its educational objectives, learning outcomes, and curriculum design.
- The institution assumes responsibility to ensure that all departments/programs operate within a certain envelope and to ensure that all graduates matriculate with specific qualifications. Towards this end, the Office of the Dean of Academic Affairs is charged with the responsibility to "Review and approve or disapprove proposals for new courses and proposals for changes in courses and curricula which are recommended by departments."

c. Faculty:

- The faculty must be sufficient number; and must have competencies to cover all of the curricular areas of the program.
- It is the responsibility of the department to assure that no Program of Study is offered or continued unless requirements for faculty are met or exceeded.

d. Facilities:

- Classrooms, laboratories, and associated equipment must be adequate to accomplish the program educational objectives and provide an atmosphere conducive to learning.
- The department assumes the responsibility to periodically assess priorities for equipment purchase and replacement, and to plan for the maintenance of adequate laboratory facilities.
- The institution will support by coordinating the distribution of student computing funding based on the student laboratory fees and matching funds.

e. Institutional Support and Financial Resources:

- Institutional support, financial resources, and constructive leadership must be adequate to assure the quality and continuity of the engineering program.
- To assure that this is monitored, the Department Chairs must keep their faculty informed about resources and expenditures of the departments in all categories, using both internal and external benchmarks.

17. Implementation Deadline

This plan shall be implemented **UPON RECEIPT**.

APPENDICES

1. Course Syllabus (ABET Outline – Short Version) Template and Samples
2. Civil Engineering Program (UPRM) Assessment Tools Package

APPENDIX 1 to CE&S Plan

Course Syllabus (ABET Outline – Short Version) Template and Samples

SYLLABUS OUTLINE (ABET)

Course number & title: INCI _____ - _____

Course catalog description:

Prerequisites: **Corequisite:**

Textbook:

Course objectives and student learning outcomes: *By the end of this course, students will be able to …*

Topics covered:

TOPIC	TEACHING / LEARNING STRATEGIES	ASSESSMENT TOOLS STRATEGY
1.		
2.		
3.		
4.		

Grading Plan (course evaluation metrics):

Partial Exams	Final Exam	Quizzes	Home Works	Lab Works	Class Particip.		TOTAL
							100%

Important Note: A final grade of at least **"C" (=70%)** ***is required*** in order to pass the course

Class/laboratory schedule:

Relationship of course to ABET Criterion 3 (a-k Outcomes): *(applicable a-k criteria)*

a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*

Relationship of course to Program Educational Objectives: *(applicable 1-6 program educational objectives)*

1	*2*	*3*	*4*	*5*	*6*

Person(s) who prepared this description and date of preparation: Hiram Gonzalez, Associate Professor, 5 July 2001

SYLLABUS OUTLINE (ABET)

**********(Template de Instrucciones)**********

Course number & title: INCI _____ - _____

Course catalog description: *(Tiene que ser exactamente lo que está publicado en el Catálogo del Recinto)*

Prerequisites: **Corequisite:**

Textbook: *(Título, Autor, Edición, Año, Casa Publicadora)*

Course objectives and student learning outcomes: *By the end of this course, students will be able to …*
(de aquí en adelante cada profesor completará este párrafo, de acuerdo al taller "Outcomes Assessment Course Syllabus." Sean claros, concisos, y utilicen lo más posible los términos de "Outcomes Assessments Lingo".)

Topics covered: *(Los tópicos incluídos aquí vienen de los Prontuarios existentes. Revisenlos. Para las columnas 2 y 3, vean las listas de "Assessment Tools" desarrollada para la Facultad de Ingeniería, que se acompaña bajo el título "Students Outcomes Assessment Matrix")*

TOPIC	TEACHING / LEARNING STRATEGIES	ASSESSMENT TOOLS STRATEGY
1.		
2.		
3.		
4.		

Grading Plan (course evaluation metrics): *(Importante incluir la métrica de evaluación – cómo se decide la Nota y quién pasa el curso? Ver ejemplo INCI 4139)*

Partial Exams	Final Exam	Quizzes	Home Works	Lab Works	Class Particip.		TOTAL
							100%

Important Note: A final grade of at least **"C" (=70%)** ***is required*** in order to pass the course.

Class/laboratory schedule: *(Ver ejemplo)*

Relationship of course to ABET Criterion 3 (a-k Outcomes): *Colocar "X" bajo los "Learning Outcomes" que se puedan practicar/experimentar y evaluar en este curso. Ver ejemplo adjunto)*

a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*

Relationship of course to Program Educational Objectives: *(Colocar "X" bajo los "Program Educational Ojectives (PEOs)" de nuestro programa, que se puedan practicar/experimentar y evaluar en este curso. Ver ejemplo adjunto)*

1	*2*	*3*	*4*	*5*	*6*

Person(s) who prepared this description and date of preparation: *(Nombre, Rango Acaémico, Fecha en que se completó la revisión del Prontuario)*

SYLLABUS OUTLINE (ABET)

**********Completed Sample**********

Course number & title: INCI 4139 - Introduction to Geotechnical Engineering

Course catalog description: Index properties of soils and classification systems. Clay minerals and soil structure. Soil improvement by compaction. Hydraulic properties of soils, permeability, seepage, and effective stress concept. Consolidation theory and settlement calculations. Stress distribution. Strength theories and Mohr's Circles. Stress-strain properties of soils.

Prerequisites: INGE 4015 **Corequisite:** GEOL 4015.

Textbook: Principles of Geotechnical Engineering, Braja M. Das, 4th Edition, 1998, PWS - Publishing Co., Boston.

Course objectives and student learning outcomes: By the end of this course, students will be able to identify, understand, describe, and discuss the behavior and properties of natural soil deposits, as described in the Course Description, stressing the importance of Geotechnical Engineering in Civil Engineering projects. Students should be able to apply the basic concepts of soil mechanics in the analysis and solution of practical problems in a global perspective and societal context. Participants will identify, comprehend, analyze, predict, imagine, discuss, and evaluate the ethical implications related to the practice of the profession as it pertains to this area. Students working in teams will be able to conduct hands-on experiments and exercises, analyze the data, and effectively communicate their results and recommendations through oral and written means. Cooperative learning will be emphasized to develop teamwork skills.

Topics covered:

TOPIC	TEACHING / LEARNING STRATEGIES	ASSESSMENT TOOLS STRATEGY
1. Introduction to Soil Mechanics. Soil problems in Civil Engineering. (2 classes)	Motivation, Visualization, Cases	Homework, Questions, Interactive discussion, Analysis of cases
2. Index Properties of Soils. Grain size distribution. Mineralogical Composition. Weight-Volume Relationships. (4 classes)	Lecture, Questioning, Discussion, Hands-on Demos, Lab Exercises, Teamwork	Homework, Lab Report, Written Report Evaluation Form, Teamwork Evaluation, Exam I
3. Atterberg Limits. Classification Systems. (4 classes)	(same)	(same)
4. Hydraulic Properties of Soils. Permeability. Effective and Pore water Pressures. Seepage and Flow Nets. (9 classes)	(same)	(same), but Exam II
5. Soil Compaction. (3 classes)	(same) + Field Work	(same)
6. Stresses in a soil mass. (2 classes)	(same)	(same), but Exam III
7. Consolidation Characteristics of Soils. (9 classes)	(same)	(same)

8. Shear Strength Characteristics of Soils. (8 classes)	(same)	(same)+ Peer Evaluation Form, Course/Project Skills & Ethics Integration Assessments & Fin Exam

Grading Plan (course evaluation metrics):

Partial Exams	Final Exam	Quizzes	Home Works	Lab Works	Class Particip.		TOTAL
45%	25%	10%	5%	15%	NA		100%

Important Note: A final grade of at least **"C" (=70%)** ***is required*** in order to pass the course (move to next level).

Class/laboratory schedule: Four credit hours total; three hours of lecture and one three-hour laboratory **(*)** per week.

Relationship of course to ABET Criterion 3 (a-k Outcomes):

a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*
X	X		X	X	X	X	X		X	X

Relationship of course to Program Educational Objectives:

1	*2*	*3*	*4*	*5*	*6*
X	X	X	X		X

Person(s) who prepared this description and date of preparation: Hiram Gonzalez, Associate Professor, 5 July 2001

(*) Laboratory projects:

- Identification and Description of Soils.
- Water Content Determination.
- Grain-Size Analysis.
- Liquid and Plastic Atterberg Limits.
- Permeability Tests and Flow Nets.
- Compaction Test
- Field Density Determination.
- Consolidation Test. (2 weeks)
- Unconfined Compression Test.
- Triaxial Tests

APPENDIX 2 to CE&S Plan

Civil Engineering Program (UPRM) Assessment Tools Package

DEPARTMENT OF CIVIL ENGINEERING AND SURVEYING
UNIVERSITY OF PUERTO RICO
MAYAGUEZ CAMPUS

Assessment Tools & Strategies Package

[Omitted; provided separately in hard copy]

ABET
ACCREDITATION

July 1, 2001

System for the Evaluation of Education SEED

APPENDIX 4b

ASSESSMENT PLAN: DEPARTMENT OF MECHANICAL ENGINEERING (OCTOBER 1, 2002)

INTRODUCTION

The Department of Mechanical Engineering at Northern Illinois University is pleased to submit the following assessment plan, subject to the approval of the faculty of the Department, for the baccalaureate program. This plan describes in detail how the department measures and evaluates its effectiveness as defined by the four general standards for program accountability noted below.

1. **Congruence:** the extent to which students report (indirect measurement) and demonstrate (direct measurement) they are learning what the faculty say they are teaching
2. **Improvement:** the set of processes that identify sub-optimal conditions, provide feedback to appropriate constituencies, and implement corrective action plans on a regular basis
3. **Measurement:** the set of indicators and methods employed to assess program performance as it relates to discrete, operationally defined learning outcomes
4. **Synergy:** the extent to which overall departmental performance enhances the attainment of broad educational objectives as defined by the *Illinois Commitment*, and the mission statements of Northern Illinois University and the College of Engineering and Engineering Technology

Statement of Program Goals and Objectives: The overarching goal of the Mechanical engineering Department is to facilitate the development of the undergraduate students of today into the successful practicing engineers of tomorrow. Especially considering the historical placement of the vast majority of CEET graduates in positions in the state, this goal is highly complementary to the current economic development thrust of the *Illinois Commitment* and Northern Illinois University's primary mission of providing liberal, professional, technical, and lifelong education to students in its service area.

DEPARTMENT MISSION STATEMENT

The Department of Mechanical Engineering is dedicated to continual accomplishment of the University mission of the transmission, expansion, and application of knowledge through teaching, research, and professional and public service. The Department subscribes to the College Scope and Mission Statement in executing its mission.

The instructional and research programs of the Department are sharply focused on the inter-related needs of its major clients: the students, the industry, and the scientific community. Students are served by providing them with curricula which are rich in fundamentals of science, engineering, humanities, social sciences, and communication skills and which concurrently provide ample opportunities for application of fundamentals to the solution of real engineering problems. The regional and national industry is served first and foremost by having access to a pool of highly skilled and educated engineering graduates and by having access to the Department as a technical resource. The Department is committed to maintaining a strong link with industry through training of its personnel as well as execution of technical projects through the vehicles of student design projects, graduate thesis projects, faculty research projects, faculty and student internships, and faculty consulting. The Department shall have an active Board of Industrial Advisors to strengthen this link. The scientific community is served by active participation of faculty in scientific research at the forefront of engineering knowledge.

The Department recognizes its faculty as its most valuable resource and will recruit, develop, and retain faculty with proven ability in teaching and research. The faculty, through achieving professional recognition and through continuing involvement in sponsored engineering projects, will act as role models for students. The Department shall be a dynamic resource for the people of Illinois utilizing innovative offerings of its programs at on- and off-campus locations to maximize access to potential students.

The Department has a goal of being nationally and internationally recognized for the excellence of its instructional and research programs through a delicate balance between the fundamental and applied portions of its curricula and through a synergistic mix of teaching and research activities by its faculty.

DETAIL OF LEARNING OUTCOMES, ACTIVITIES, AND METHODS

The Department of Mechanical engineering has adopted the *Accreditation Board of Engineering and Technology* (ABET) learning outcome criteria as educational objectives since the department wishes to maintain its six-year accreditation. Each of the eleven ABET criteria are broken down further into performance criteria (assessment measures) that operationally define all criteria. Multiple measures, both direct and indirect, are employed to evaluate the effectiveness of the department in meeting its objectives and outcomes. The matrix on the following page shows the levels and the linkages.

ABET LEARNING OUTCOME CRITERIA	CRITERION SPECIFIC ASSESSMENT ACTIVITIES	EVALUATIVE METHODS & MODE OF OUTCOME MEASUREMENT
Graduates will possess: **a**) an ability to apply their knowledge of mathematics, science and engineering	Activities like using scientific principles to formulate engineering problems & using mathematical calculations to solve the problems	Capstone (direct) Portfolio (direct) Stand. Test (direct) Student Survey (indirect) Faculty Survey (indirect) Alumni Survey (indirect Employer Survey (indirect) Transcripts (indirect) Placement Info (indirect)
b) an ability to design and conduct experiments, and analyze and interpret data	Activities like setting up experiments from hypotheses to conclusions, using valid procedures & drawing meaning from measurement	Capstone (direct) Portfolio (direct) Stand. Test (direct) Lab Performance (direct) Student Survey (indirect) Faculty Survey (indirect) Alumni Survey (indirect Employer Survey (indirect) Placement Info (indirect)
c) an ability to design a system, component, or process to meet desired ends	Activities like thinking creatively about an engineering objective before defining & following an iterative design procedure to satisfy the need	Capstone (direct) Portfolio (direct) Stand. Test (direct) Student Survey (indirect) Faculty Survey (indirect) Alumni Survey (indirect Employer Survey (indirect) Transcripts (indirect) Placement Info (indirect)
d) an ability to function on multi-disciplinary teams (including work outside of class)	Activities like reconciling differences among team members, integrating the ideas of others & contributing to the overall outcome	Capstone (direct) Portfolio (direct) Student Survey (indirect) Faculty Survey (indirect) Alumni Survey (indirect Employer Survey (indirect) Placement Info (indirect)
e) an ability to identify, formulate, and solve engineering problems	Activities like understanding what is needed, setting-up problems mathematically & applying knowledge to new situations	Capstone (direct) Portfolio (direct) Stand. Test (direct) Student Survey (indirect) Faculty Survey (indirect) Alumni Survey (indirect Employer Survey (indirect) Placement Info (indirect)
f) an ability to understand my professional and ethical responsibilities	Activities like knowing the profession's code of ethics, recognizing ethical dilemmas & incorporating safety issues into design	Capstone (direct) Portfolio (direct) Peer Review (indirect) Student Survey (indirect) Faculty Survey (indirect) Alumni Survey (indirect Employer Survey (indirect) Placement Info (indirect)

g) an ability to communicate effectively	Activities like orally presenting your work, writing clear lab reports or papers, using graphics/presentation software, interviewing etc.	Capstone (direct) Portfolio (direct) Peer Review (indirect) Student Survey (indirect) Faculty Survey (indirect) Alumni Survey (indirect Employer Survey (indirect) Placement Info (indirect)
h) the broad education necessary to understand the impact of engineering solutions in a global and societal context	Activities like learning how different engineering solutions affect the physical environment or socio-economic relations and structure differently	Capstone (direct) Portfolio (direct) Peer Review (indirect) Student Survey (indirect) Faculty Survey (indirect) Alumni Survey (indirect Employer Survey (indirect) Placement Info (indirect)
i) a recognition of the need for and an ability to engage in life-long learning	Activities like learning on your own, keeping up with new technology, student groups, working co-ops or interning, conferences, journal subscribing etc.	Capstone (direct) Portfolio (direct) Peer Review (indirect) Student Survey (indirect) Faculty Survey (indirect) Alumni Survey (indirect Employer Survey (indirect) Placement Info (indirect))
j) a knowledge of contemporary (engineering) issues	Activities like learning about technological issues facing society such as security, efficient resource utilization, supply & demand, etc.	Capstone (direct) Portfolio (direct) Peer Review (indirect) Student Survey (indirect) Faculty Survey (indirect) Alumni Survey (indirect Employer Survey (indirect) Placement Info (indirect)
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	Activities like demonstrating knowledge of technical approaches & computer applications in eng. analysis, design, & experimentation	Capstone (direct) Portfolio (direct) Lab Performance (direct) Peer Review (indirect) Student Survey (indirect) Faculty Survey (indirect) Alumni Survey (indirect Employer Survey (indirect) Transcripts (indirect) Placement Info (indirect)

DESCRIPTION OF METHODS, TIMELINES, RESPONSIBILITIES, AND COVERAGE

The department employs multiple measures to assess the learning of its students. Faculty assessment of the capstone experience, student laboratory performance, and student portfolios are all direct measures of student learning, as is comparing the performance of our students on the Fundamentals of Engineering Examination with state and national benchmarks. In addition to receiving feedback from interested alumni, its Industrial Advisory Board, accrediting bodies, and university peers, the department regularly surveys students, faculty, and the employers of coop and interning students. Transcript analysis and the collection of job placement information are two additional means of gathering indirect evidence of student learning.

ASSESSMENT METHOD	USAGE OF METHOD	TIMELINE	RESPONSIBLE PARTIES	OUTCOMES ADDRESSED
Capstone Experience	Senior design projects evaluated by three-member faculty teams using standard form	Senior year, all students	Designated department faculty	a - k
Portfolio (as pre-post test)	Infrastructure in place to initiate voluntary student portfolio compilation	Beginning with fall 2002 freshmen	Designated department faculty	a - k
Standardized Tests	All graduating seniors are required to take the Fundamentals of Engineering Exam, administered by IL	Senior year, all students	Designated department faculty	a, b, c, e
Lab Performance	Assessment of competence in labs	Every lab course, every semester	Instructional faculty of record	b, k
Peer Review	1) Industrial advisory board 2) Alumni partners	Episodic but ongoing	Deans and chairs	f - k
Student Survey	1) Course-level survey of ABET criteria covered 2) Senior design project day survey 3) Senior exit survey	1) Every course, every semester 2 & 3) First Friday in May	CEET Assessment Coordinator	a - k
Faculty Survey	Course-level survey of ABET criteria covered for usage in curricular planning	Every course, every semester	CEET Assessment Coordinator	a - k
Alumni Survey	1) University Assessment Office 2) Supplemental CEET survey	Both coinciding with university-wide survey administration, one, five, & ten years after graduation	1) NIU Assessment Services Office 2) CEET Assessment Coordinator	a - k
Employer Survey	General & ABET surveys to employers of coop & intern participants	Every semester for coop/internship participants	1) CEET – CEIP collaboration	a - k
Transcripts	Ongoing compilation of student entering characteristics, courses taken, and performance	Every semester, ongoing	Student's academic advisor	a, c, k
Placement Information	Tracking employment & related information of graduates – initial & subsequent	Every semester, ongoing	To be determined	a - k

MATRIX OF ABET LEARNING OUTCOMES BY METHODS

The following matrix displays some of the information presented previously in a more easily accessible manner. An "X" is used to show if the learning outcome (rows) is assessed using the particular method (columns).

	Capstone Exp.	Portfolio	Stand. Tests	Lab Perf.	Peer Review	Student Survey	Faculty Survey	Alumni Survey	Emp. Survey	Trans-cripts	Place-ment
ABET a	X	X	X			X	X	X	X	X	X
ABET b	X	X	X	X		X	X	X	X		X
ABET c	X	X	X			X	X	X	X	X	X
ABET d	X	X				X	X	X	X		X
ABET e	X	X	X			X	X	X	X		X
ABET f	X	X			X	X	X	X	X		X
ABET g	X	X			X	X	X	X	X		X
ABET h	X	X			X	X	X	X	X		X
ABET i	X	X			X	X	X	X	X		X
ABET j	X	X			X	X	X	X	X		X
ABET k	X	X		X	X	X	X	X	X	X	X

For Further Information Visit: Department of Mechanical Engineering Posted 11/02

APPENDIX 4c

ASSESSMENT PLAN
BACHELOR'S DEGREE IN MARKETING
September 30, 2002

1. STUDENT LEARNING OBJECTIVES

Graduates with a Bachelor's degree in Marketing will be prepared for successful careers in the marketing field by demonstrating the following:

A. Application of marketing concepts
B. Written communication skills
C. Oral communication skills
D. Technological expertise
E. Ethical business practice awareness
F. Problem solving and critical thinking skills
G. Analysis of the global business environment

The student learning objectives were derived from the AACSB accreditation requirements, input from alumni, and recommendations from the business community through a survey and boards of advisors.

2. EXPLANATION OF METHODS

The Department of Marketing, to determine if the student learning outcomes identified above are being met, uses the following methods.

LEARNING OUTCOME	ASSESSMENT TOOL (S)	TIMING	RESPONSIBLE PERSON
Application of Marketing Concepts	Capstone course major project Alumni survey Internship performance Employer survey Advisory Board	Every semester Annual Every semester Every 3 years Every semester/year	Faculty teaching course Assessment coordinator Internship coordinator Assessment coordinator Varies/chair
Written Communication Skills	Capstone course major project Alumni survey (Dept. and COB) Internship performance Employer survey Advisory Board	Every semester Annual Every semester Every 3 years Every semester/year	Faculty teaching course Assessment coordinators Internship coordinator Assessment coordinator Varies/chair
Oral Communication Skills	Alumni survey (Dept. and COB) Internship performance Employer survey MKTG 350 course role play video	Annual Every semester Every 3 years Every semester	Assessment coordinators Internship coordinator Assessment coordinator Faculty teaching course
Technological Expertise	Alumni survey (Dept. and COB) Employer survey	Annual Every 3 years	Assessment coordinators Assessment coordinator
Ethical Business Practice Awareness	Capstone course major project Alumni survey (COB)	Every semester One to date	Faculty teaching course COB assessment coordinator
Problem solving/critical thinking Skills	Capstone course major project Internship performance Advisory Board Alumni survey (COB)	Every semester Every semester Every semester/year One to date	Faculty teaching course Internship coordinator Varies/chair COB assessment coordinator
Analysis of Global Business Environment	Alumni survey (Dept. and COB) Employer survey Advisory Board	Annual Every 3 years Every semester/year	Assessment coordinators Assessment coordinator Varies/chair

The Department of Marketing uses a set of assessment tools to evaluate the marketing major's achievement of the student learning outcomes. Each tool is described below.

Capstone Course: All marketing majors take the capstone course, Marketing 495-Marketing Strategy, in their last semester at NIU. This course is designed to emphasize each activity within the total process of marketing, including strategy formulation, planning, programming, and implementation by using some aspect of case analysis (either cases from published sources, individuals creating an in-depth case study of a company, or individuals creating a detailed marketing plan for a company). To successfully complete the course's major project (case analysis), students must demonstrate extensive application of marketing concepts including the relationships between those concepts, strong writing skills, and excellent critical thinking skills. In addition, students are expected to exhibit awareness of ethics in business. Faculty teaching the course uses the course major project to assess student competency.

Alumni Survey (Department): Each year since 1994, the Department of Marketing has participated in the annual assessment opportunity through the assessment office to survey alumni. The department now has longitudinal data on the department's performance on a number of key learning outcomes including knowledge of marketing concepts, written communication skills, oral communications skills, technological expertise, and knowledge of global business issues.

Alumni Survey (COB): The College of Business developed an alumni survey in 2001 to measure graduates from 2000. This alumni survey measures student learning outcomes including written communication skills, oral communications skills, technological expertise, ethical business practice awareness, problem solving skills and knowledge of the global business environment. The results are provided by major area. Thus, marketing student outcomes can be evaluated, compared against other business majors, and compared in some cases of overlap to the department assessment results.

Internship Performance: Internship reports from employers, on-site visitations, and student reports from the internship experience all contribute to the assessment of student learning outcomes for knowledge of marketing concepts, written communication skills, oral communications skills and problem solving/critical thinking skills. The Department has an internship coordinator who reviews all reports to assess the internship experience. The primary disadvantage to this assessment tool is that it only applies to students having internship experiences through the department.

Employer Survey: Employers of marketing graduates were surveyed in 1997. The intent is to repeat an employer survey every three years; however the department failed to conduct the survey in 2000. In summer 2002, the Public Opinion Lab began a project to interview employers of marketing majors to evaluate performance and the current marketing curriculum. The survey project should be completed later in fall, 2002.

Advisory Board(s): Feedback from advisory board members can be used to assess student learning outcomes such as the knowledge of marketing concepts, written communication skills, problem solving skills of students, and knowledge of global business concepts. Board

participants tend to be alumni and/or employers of marketing majors and are in a unique position to provide honest, in-depth assessment of the programs and student outcomes. The Department of Marketing has one full-time board (Sales Advisory Board), one board that met once in the recent three-year period (Interactive Marketing Advisory Board), and participates in the COB Board of Executive Advisors.

Marketing 350 Course: The Marketing 350 course, Principles of Selling, is required of all marketing majors. This course is uniquely designed to, among other things; assess marketing majors' oral communication skills. The course uses videotaped presentations and sales role-plays as tools to evaluate oral communication skills. The videotaped final sales role-play serves as the assessment assignment used to evaluate students' oral communication skills.

For Further Information Visit: Department of Marketing Posted 11/02

APPENDIX 4d

UNDERGRADUATE ASSESSEMENT PLAN
BACHELOR OF SCIENCE DEGREE IN CHEMISTRY
(Approved 06/28/93; Modified 03/31/99)

1. PROGRAM OBJECTIVES

The objective of the Bachelor of Science program in chemistry is to prepare individuals for careers in the chemical sciences. Such careers include research in industrial, government, and academic laboratories, technical positions in scientific sales and management, and teaching at the middle school and high school levels. The program also prepares students to pursue graduate work in chemistry or a closely related field and for admission to professional schools such as Schools of Medicine.

As a result of completing a baccalaureate degree in chemistry, the expected student outcomes include: (1) the ability to engage in scientific inquiry utilizing quantitative problem solving skills and critical reasoning; (2) an understanding of general chemical principles, organic chemistry, inorganic chemistry, physical chemistry, and chemical analysis; (3) laboratory experience in the synthesis and characterization of inorganic and organic compounds, principles of chemical analysis and instrumental methods, and experimental physical chemistry; (4) the ability to plan and execute experiments; and (5) to communicate effectively through oral and written reports. The final outcome is that recipients of a baccalaureate degree in chemistry will (6) achieve either an entry-level position as a chemist, admission to a professional school, or admission to graduate school for advanced study.

2. EXPLANATION OF METHODS

The assessment plan for the undergraduate program in chemistry approved in 1993 consisted to two components: (1) exit interviews with graduating students to assess the student's perception of the extent to which the departmental objectives were met and (2) participation in the university's alumni surveys by providing a departmental assessment questionnaire.

In 1999 the undergraduate assessment plan was modified to include four additional components: (1) objective testing in each course; (2) standardized testing in selected courses; (3) a capstone research project for the two American Chemical Society approved emphases, Emphasis 1 – Professional Chemistry and Emphasis 5 – Biochemistry; and (4) placement information to determine if graduates were achieving either an entry-level position in a chemical profession, admission to a professional school, or admission to a graduate school for advanced study.

These six methods of assessment will allow the department to determine how well the stated outcomes of the baccalaureate program in chemistry as shown in the following table.

Method	Description	Timeline	Person Responsible	Objectives Addressed
Objective Tests	Evaluation of student performance in each course by instructor.	Each semester	Instructor of each course	1,2,4,5
Standardized Testing	Use of standardized exams developed by the ACS to test competency in all major areas of chemistry. Scores will be compared to national norms.	Once every four years	Department chair will request appropriate faculty to conduct testing	1,2
Capstone Research	Evaluation of projects and written reports by faculty adviser and by a panel of other faculty.	Annually	Faculty adviser and Chair	1,2,3,4,5
Exit Interviews	Interviews of graduates to evaluate their perspective on how well the program objectives are being met. A sample questionnaire is appended.	Each semester	Departmental chair	1,2,3,4,5,6
Alumni Survey	In addition to the university alumni survey, alumni will be asked specific questions about their experience at NIU and how well the program prepared them for their careers. A sample questionnaire is appended.	One, five, and ten years after graduation to coincide with university survey	Chair and departmental curriculum committee	1,2,3,4,5,6
Placement Information	Information on employment status and graduate school acceptance will be collected.	Once a year	Department chair	6

OUTCOMES BY METHODS - The table below demonstrates which outcomes are addressed by each method of assessment.

	Objective Standardized Tests	Tests	Capstone Research	Exit Interviews	Alumni Survey	Placement
1. Reasoning	**X**	**X**	**X**	**X**	**X**	
2. Knowledge	**X**	**X**	**X**	**X**	**X**	
3. Laboratory Experience	**X**		**X**	**X**	**X**	
4. Plan and Execute Experiments	**X**		**X**	**X**	**X**	
5. Communication	**X**		**X**	**X**	**X**	
6. Placement				**X**	**X**	**X**

For Further Information Visit: Department of Chemistry Posted 11/02

APPENDIX 5

UPRM's Departmental Plans for the Assessment of Student Learning

***** Under Construction by Academic Departments/Programs*****