

# Assessment And Its Role In Accreditation

**Frances Bailie**  
**Iona College**  
**New Rochelle, NY 10801**

**Deborah Whitfield**  
**Slippery Rock University**  
**Slippery Rock, PA 16057**

**Adel Abunawass**  
**University of West Georgia**  
**Carrollton, GA 30118**

*Abstract – The assessment process and three applications of the process in computer science programs accredited by the Computing Accreditation Commission (CAC) of ABET are described. Assessment is a vital component of the CAC/ABET criteria to evaluate how programs assess their objectives and use this information to improve their programs. The paper offers guidelines for successful assessment systems as well as sound advice on how to avoid some of the problems that may arise.*

**Keywords: Computer Science, Assessment, Accreditation, CAC/ABET.**

## 1.0 Introduction

The mere mention of the word “assessment” can elicit varying degrees of sighing, grunting, and eye-rolling among faculty. It can even top root canal on a list of items to be avoided at all costs. Yet, the amount of paper and ink expended on this topic in the last several years has been prodigious. So, we might legitimately ask, “Why assess?” There are, of course, numerous answers. First is accountability to the various stakeholders in higher education. For example, parents and administrators want to be assured that faculty are doing their jobs and delivering a quality education to students. Another is to strengthen the program to improve its reputation and to attract excellent students. In reality, however, the main reasons that departments embark upon the assessment process is coercion by the institution, by a regional accrediting body or by a discipline-specific accrediting organization such as ABET [7]. This paper considers some general principles of assessment and its role in the ABET accreditation process of Computer Science programs. It also outlines the assessment plans at three different institutions, all of which are ABET accredited.

## 2.0 The Assessment Process

Assessment is not a “one size fits all” endeavor. In fact, it would be difficult to find two assessment plans that are identical. However, there are a few basic elements that are common to most plans [2, 5, 6, 7].

1. *Goals.* The starting point of most plans is to establish a set of goals, based upon the mission statement of the department and institution. Goals are generally high level statements of what the program should accomplish. These goals must be clearly stated and agreed upon as representative of the program.
2. *Objectives for each goal.* The next step is to break each goal into more detailed objectives that will accomplish the goals. These objectives must be specific and measurable.
3. *Assessment tools.* Determine which instruments will most effectively measure the objectives. They may be standardized tests (such as the ETS major Field Achievement Test), locally designed comprehensive examinations, student surveys, focus groups, exit interviews, alumni surveys, employer surveys, advisory boards or any other appropriate measures. It is generally advisable to have more than one measure for each objective.
4. *Timetable.* Decide when each of the instruments should be administered and how often. Some instruments, such as student evaluation forms, might be administered at the end of each semester while others, such as alumni surveys, might be administered every three to five years.

5. *Process.* Determine how each instrument will be analyzed, what will be done with the results of the data, and how it will be used as feedback to improve the program. This step is crucial. Collecting data is only the beginning; unless the data is evaluated it is useless.
6. *Responsibility.* Assign responsibility for each of the steps in the plan to one or more persons who will be accountable to the department. In many cases, responsibility lies with faculty members. Faculty must be part of the process or it is doomed to failure. Some programs have developed interesting and effective techniques to accomplish this end. One example is the concept of an assessment day in which faculty spend a day as a group at the end of each semester writing assessment reports and recommendations [3].
7. *Assess the Assessment.* Periodically, it is necessary to look at the assessment plan to be certain that it is working and to see how it can be improved to better serve the needs of the department.

These steps are given only as an example of commonly identified elements of an assessment plan and are not an exhaustive list. There are many variations that might be effectively used for different institutions.

### 3.0 Accreditation

A Computer Science program considers accreditation for various reasons. One might be to distinguish itself among other institutions as a center of excellence. There is a certain distinction that comes with being accredited because it indicates that your department has met rigorous external standards and thus, prospective students might be attracted to your program for the credentials it would supply when seeking employment or entry to graduate school. Another reason might be pressure from the administration that would like its programs accredited to enhance the reputation of the institution as a whole. Third, regional accreditation boards (e.g., Middle States) now require institutions to demonstrate that assessment processes are in place. Applying for accreditation is a time-consuming and expensive process, so the decision is not to be undertaken lightly. However, once the commitment has been made, one of the issues that loom large over the process is assessment. In the recently revised procedures for computer science accreditation, the Computing Accreditation Commission (CAC) which operates under ABET, has outlined seven accreditation criteria, the first of which is Objectives and Assessments. This places assessment at the forefront of the accreditation process and suggests a strong focus on outcome-based learning [5]. It is fortunate that the CAC allows Computer Science programs to formulate their own objectives to be assessed. This flexibility affords departments the opportunity to establish objectives that best align with the intent of their specific program.

In the 2009-2010 CAC/ABET accreditation cycle, the proposed criteria explicitly include student attributes for institutions to assess (for the 2008-2009 cycle, institutions may voluntarily elect to follow the new criteria). Nine attributes of graduates are defined for all of CAC, and additional attributes are given for individual programs: two attributes for Computer Science, one for Information Systems, and five for Information Technology [4]. The attributes include communication abilities, ethical and professional abilities, critical thinking abilities, technical abilities, and continuing professionally. There is no mention of guidelines for the types of assessment methods, for the constituents that should be involved, nor for how frequently the assessment methods should be applied. Several years ago, the CAC discontinued explicitly enumerating items within the criteria to provide institutions with flexibility and the ability to maintain their unique characteristics.

### 4.0 Examples Of Assessment Plans

Here we present assessment plans from three very different institutions. Their common thread is that all have received ABET accreditation for their Computer Science programs.

#### 4.1 Iona College

Iona College is a small suburban college located in New Rochelle, NY just outside New York City. The Department of Computer Science is housed in the School of Arts and Science. The development of its assessment plan was motivated by several factors. To meet the requirements of Middle States, the Provost required systematic assessment plans from all areas of the College. In addition, the department had made the decision to apply for ABET accreditation and assessment is a major component of the criteria. Because

Iona is a small institution without the benefit of an office of assessment, the responsibility for the development and implementation of this plan lay squarely on the shoulders of the department faculty.

#### *Assessment Plan*

1. Establish the structure of our system. Stakeholders were identified: students, faculty, alumni, employers and an advisory board composed of members from higher education, industry and alumni. The department already had a system of course coordinators, each of whom was responsible for three to four courses (creating syllabi, setting course objectives, etc.). An Assessment Committee was appointed to develop and administer instruments, coordinate individual course assessment, and analyze assessment results. It was decided that assessment results would be referred to the full department to determine if any curricular or policy changes were needed based on the assessment results.
2. Determine goals and objectives. From the Iona College Mission statement, a mission statement for our department was developed and then a set of goals and objectives for our BS program. The course coordinators then worked on revising course objectives that would map to the program objectives.
3. Identify data sources and develop instruments. The assessment committee was charged with this step. The committee chose to collect data from the traditional sources (tests, projects, programs, reports, GPAs) as well as through various instruments such as surveys, interviews and meetings. Data would be derived from:
  - a. Students (course evaluations, exit surveys, exit interviews)
  - b. Faculty (course assessments)
  - c. Alumni (surveys)
  - d. Employers (surveys and internship evaluations)
  - e. Advisory Board (meetings and surveys)
4. Perform the assessment. The above steps describe the formulation of the assessment plan. On a regular basis, the assessment committee arranges for the administration of the instruments, collects the data and analyzes the results. These results are referred to the entire department. Since all the objectives are measured through various methods, problems that are reported from more than one source are identified as potential areas of concern. If the department deems that a particular issue is a problem that needs correction, it is added to our problem tracking system. This system monitors a problem, its solution and its results in the next round of assessment to see if the solution proposed has been effective. Thus Iona attempts to “close the loop” and use assessment results for the betterment of the program.

#### *Assessment Reflections*

The Assessment Plan is a blueprint of what should happen. It is not perfect and it does not always operate as intended. Various problems have been encountered. For example, it is sometimes difficult to assess the meaning of results. Assessments need to be administered several times to see if the same problem is occurring. The process requires patience and perseverance. In addition, not all faculty members are prompt and thorough in submitting assessment materials. The process generates a lot of data that does not translate easily into information. On the other hand, the process has had many positive outcomes. It allows the identification of weaknesses in the program, it heightens faculty awareness of meeting program objectives, it fosters a proactive approach to program improvement and it attempts to solve problems before they become major crises. In all, the advantages outweigh the disadvantages. Our program was awarded accreditation from ABET in 2005. It is most likely time for us to examine our procedures and refine some of our policies to assure that our assessment plan continues to track problems and provide solutions to improve the quality of Computer Science education Iona offers its students.

## **4.2 Slippery Rock University**

Slippery Rock University (SRU) has over 8,000 students and is located an hour north of Pittsburgh. The Department of Computer Science is in the College of Information, Business, and Social Sciences and offers degrees in Computer Science, Information Systems, and Information Technology. The Computer Science and Information Systems programs were awarded accreditation in 2005 and the Information Technology program will be included in the next application for ABET accreditation from the CAC. Although individual courses had departmentally approved objectives in 1995, assessment in the department was earnestly begun as a response to a University-wide, faculty-led assessment committee that was created in 1998.

### *The Assessment Framework*

Each course has identified objectives that are mapped to the objectives for the degree. The degree objectives are grouped into three goal categories: Critical Thinking and Problem Solving, Communication and Interpersonal Skills, and Ethical and Professional Responsibilities. Each goal has a brief description and contains five objectives that students are expected to achieve (to some level) by the time the student graduates from the degree program. Degree goals are in turn mapped to University Wide Outcomes. Three assessment methods, each with a different stakeholder as the assessor are utilized in the assessment process: student surveys (assessor: student), course embedded assessment (assessor: faculty), and internship appraisals (assessor: employer). Student surveys are administered on Blackboard; internship appraisals are collected from employers by the internship coordinator; and faculty utilize rubrics in designated courses to assess program assignments, oral presentations, written papers, and ethics assignments.

### *The Assessment Process and Timetable*

The data is collected, maintained, and charted by a graduate assistant. The student surveys are administered the first day of the semester in designated “gate-keeper” courses that students take when they are sophomores, juniors, and seniors. The internships appraisals are performed for every student that opts to take an internship. Course embedded assessment is performed in courses such that critical thinking skills are assessed on programming assignments throughout the semester in two courses and then once in a capstone course; oral and written communication is assessed in three and two courses, respectively; and ethical and professional responsibilities are assessed in three courses. The assessment committee, consisting of three faculty members, analyzes the data and produces a report. The report is provided to three stakeholders (students, faculty, and advisory board) and each stakeholder has an opportunity to respond to the report and make recommendations for areas of excellence and areas of improvement. The affected groups/individuals then incorporate changes such as:

- internship advisor modifies survey to more accurately track outcomes,
- curriculum committee makes recommendation to faculty to increase the number of credit hours in CS1
- faculty change the language in CS0 to Alice
- assessment committee and curriculum committee identifies courses to include ethics and assess ethical and professional responsibilities

### *Tribulations and Successes*

Assessment requires a lot of faculty members’ time and often introduces questions that inevitably lead to a discussion of academic freedom. At SRU, we are fortunate to have an administration that supports assessment and accreditation. One faculty member is given a reduced load to lead the effort and chair the assessment committee. Also, the department is provided with a graduate assistant to perform the secretarial-like tasks (implementing student surveys on Blackboard, collecting data from faculty, generating charts from the data). However, every faculty member teaches at least one course in which some type of course embedded assessment is performed. Course embedded assessment requires that a faculty member provide data for the course objectives that are identified for assessment. When first implemented, this was a tremendous amount of work. However, the format and some of the content of the rubrics for programming assignments can be re-used for all assignments in the course. The same is true for written papers and oral presentations.

Assessment has assisted in more open discussion of course content among the faculty and improved teaching and learning. The students find that knowing up front what the objectives of a particular assignment are make it easier for them to see what they are supposed to learn from doing the assignment. Also, assessment made it easy for the administration to permit the increase of credit hours in courses and the major (and potentially increase in faculty resources). And, assessment was the key to a favorable accreditation visit.

## **4.3 University Of West Georgia**

The University of West Georgia (UWG) is located in Carrollton, Georgia, about 50 miles west of Atlanta, Georgia. UWG has more than 10,000 students pursuing graduate and undergraduate degrees. UWG was named by the Princeton Review as one of the Best Southeastern Colleges and one of America’s Best Value Colleges. The Department of Computer Science is housed in the College of Arts & Sciences. The

department offers a Bachelor of Science in Computer Science, and a Master of Science in Applied Computer Science degrees. In addition, the department offers four graduate certificates in computing. The Bachelor of Science in Computer Science program has been CAC/ABET accredited since 2000. UWG is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools (SACS).

*Comprehensive Assessment Plan (COMPASS):*

The Department has created a comprehensive assessment plan (COMPASS) [1]. COMPASS consists of the assessment plan as well as the artifacts used to maintain assessment data and report results. The complete assessment data is maintained via the COMPASS portal in conjunction with our course management system [8]. UWG's Computer Science assessment plan is made of four components: process loop; timeline; assessment input; and assessment output.

1. Process Loop: The process loop indicates the cyclic nature of the assessment process. The process loop is made of the following distinct activities:
  - a. Input: input is gathered from various sources (see Assessment Input below)
  - b. Analysis: input is analyzed and reviewed, and an action plan of appropriate recommendations is created.
  - c. Implementation: recommendations are implemented.
2. Timeline: The timeline is a calendar of events to ensure that assessment is carried out in a timely fashion and on a regular basis. The timeline also ensures that reporting and documentation is generated and maintained periodically.
3. Assessment Input: Input is gathered from several sources. Both formal and informal assessment instruments are used. The sources to collect assessment input include, but are not limited to:
  - a. Mission/Vision statements and guidelines (e.g., Institution, College, Department, etc.)
  - b. CAC/ABET and SACS
  - c. Computing Curriculum 2001 (CC 2001) by the Joint IEEE Computer Society/ACM Task Force on the "Model Curricula for Computing" (CC)
  - d. Students' Input (e.g., various surveys, exit interviews, students' interviews, students' evaluation of instruction, etc.)
  - e. Faculty Input (e.g., various committees, departmental meetings, COMPASS Database, etc.)
  - f. Course Portfolios maintained on the course management systems (e.g., course syllabus, course notes/handouts, assignments, exams, etc.)
  - g. External Input (e.g., alumni, employers, industry advisory board, etc.)
4. Assessment Output: the output of the assessment process, such as recommendations, reports, etc., is stored in the COMPASS database.

*A Culture Shift: Our Experience*

In the beginning, some faculty members were not too enthusiastic about implementing a formal assessment process. In part, the process was seen as an add-on to an existing informal process. Some also felt that the process is an indirect evaluation of their teaching performances. This became a major challenge for the department. When the process began, almost all the faculty contributed to its implementation. Once the faculty realized the benefits of the assessment process, a major shift in the department's culture occurred. Faculty began to speak of measuring students' learning instead of coverage of topics. Faculty began to think of ways to accomplish the course learning outcomes before thinking of what textbooks to use in the course. This notable shift in culture has created a student-centric environment in the department where faculty is dedicated to preparing students for successful careers, life-long learning, and citizenship.

## 5.0 Conclusions

The importance of a comprehensive and formal assessment process to the CAC/ABET accreditation process cannot be over-stated. The assessment process is not a "one size fits all" endeavor. Although our assessment processes vary, we can offer some words of advice that cut across our differences. 1) Keep the design as simple as possible. 2) Design your assessment process to fit your needs and to meet your goals as framed by the missions of the program and institution. 3) Identify your assessment data sources carefully and then design your data collection instruments to capture the data needed for your assessment process. Take care when using technology to collect data. Its ease of use can generate an enormous amount of data

that can be overwhelming to study and document for even the most dedicated of us. (See #1) 4) Ensure that the assessment process is student-centric and faculty-driven. 5) Remember that the goal of assessment is an improved educational experience for our students. A well-designed assessment process may provide evidence needed to advocate for resources which directly impact students' learning.

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