2006-446: OUTCOME ASSESSMENT AND ACCREDITATION

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Outcome Assessment and Accreditation

Abstract

The ideas presented in this paper are designed to assist faculty in technical areas accredited by the Accreditation Board for Engineering and Technology (ABET) to develop an effective assessment program. This paper focuses on common means of assessment that can be used as essential elements for continuous improvement of curriculum to meet accreditation standards. Advantages and disadvantages of these methods are presented to allow readers to determine which methods are most appropriate for their situation. The authors also provide their own experiences with many of these assessment methods. The paper concludes with a summary and lessons learned.

Introduction

Program assessment, quality assurance, and continuous improvement have become essential elements of the accreditation process. National higher education associations, such as The Higher Learning Commission of the North Central Association, mandate ongoing evaluation and assessment as a "core component" of the institution.[1] The Commission further noted the "need to create a culture of evidence[2]" based on quality improvement principles to drive institutional assessment.

Some institutions still struggle when it comes to meeting the assessment standards even after years of effort by regional and programmatic accrediting agencies to improve the assessment process[3]. Assessment measures should correspond as closely as possible to "real world" student experiences. Assessment plans should seek to answer the following:
-   Are our students learning what we think we are teaching?
-   How do we know our program is meeting its objectives for student learning?
-   What are the indicators that our program is effective?
-   Can we find areas for improvement in our degree program?[4]

There are numerous step-by-step or phase models of assessment that help address the questions that should be answered in this process. Two examples are illustrated. Sarapin[5] recommends a five phase assessment program comprised of: (1) Review program goals and objectives, (2) Identify student outcomes, (3) Validate student outcomes, (4) Administer assessment instruments, and (5) Revise program, revise courses, revise assessment methods. Strong et al.[6] developed an assessment model with the following steps: (1) Agree on the mission of the program, (2) Identify the program outcomes, (3) Articulate the outcomes and the curriculum, (4) Brainstorm, evaluate and select appropriate measures of student learning for each outcome, (5) Develop an assessment plan for collecting the data, (6) Collect and analyze data which documents student achievement of these outcomes, (7) Use data to improve curriculum and program processes to improve student learning, and (8) Communicate results of outcomes assessment process.

All of the steps in the two assessment models described in the previous paragraph are very important, but for the purposes of this paper the main focus will be on the advantages and disadvantages of direct and indirect assessment measures that are frequently used in the process. A secondary emphasis of this paper is how to ascertain if the program outcomes are being met once the goals and outcomes have been established. In other words, are appropriate measures of student learning being matched to program outcomes?

Results from direct and indirect assessment can be triangulated to provide multiple measures for each learning outcome. The authors' department uses a matrix that lists the learning outcomes and the direct and indirect measures used to assess the outcomes. Results are entered into intersecting cells and compared to pre-established benchmarks. Substandard performance on two of the three measures would trigger corrective action.

Figure 1 provides the framework that guides the assessment program. Both direct and indirect measures are utilized for assessment of student learning outcomes. The "Program Quality Outcomes" section of the figure are presented to illustrate the complete assessment process in the department, but will not be discussed in this paper. The following sections will address advantages and disadvantages of direct and indirect measures of learning outcomes.

Direct Measures of Assessment

Direct measures of assessment consist of such instruments as written exams, oral exams, embedded questions in exams and assignments, portfolio analysis, papers/writing samples, simulated activities/case-studies, capstone projects, videotapes of student's skills, inside/outside examiners, and internship experiences.[7] With all of these instruments, the student's knowledge and skill can be directly measured. Since it would be beyond the scope of this paper to provide an analysis of all the direct measures of assessment that are available, the focus will be on those that were used at the authors' department.

Course tests and examinations are perhaps the most commonly used direct assessment measure. Most courses use tests to measure student progress, therefore they are readily available. Assuming that the tests are well constructed to measure the course learning outcomes, then the results can be used for evaluation and curriculum improvement purposes.

Sewell[8] noted that one of the advantages to using course exams for outcome assessment is that adjustments can be made for occasional poor performance that may be related to issues beyond the student's control. For example, dropping a student's lowest score may produce a grade that constitutes a more reliable measure of the student's overall ability and achievement. This more reliable measure of student's ability can help communicate student achievement to potential employers, graduate schools, and other constituents. Another good feature about using exams as an assessment measure is that they can be a very specific means to helping faculty in identifying student problems or deficiencies (formative assessment). That way improvement can be made in the course rather quickly to address the learning outcomes and improve the program.

Course exams can also provide motivational feedback, which should inspire the student to do their best to progress toward achieving the course objectives.

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                        │   Assessment Program    │
                        └─────────────────────────┘
              ┌────────────────────┐        ┌──────────────────────────────┐
              │  Learning Outcomes │        │   Program Quality Outcomes   │
              └────────────────────┘        │ Teaching, Facilities,        │
                                            │ Equipment, Labs, Advisement  │
                                            └──────────────────────────────┘
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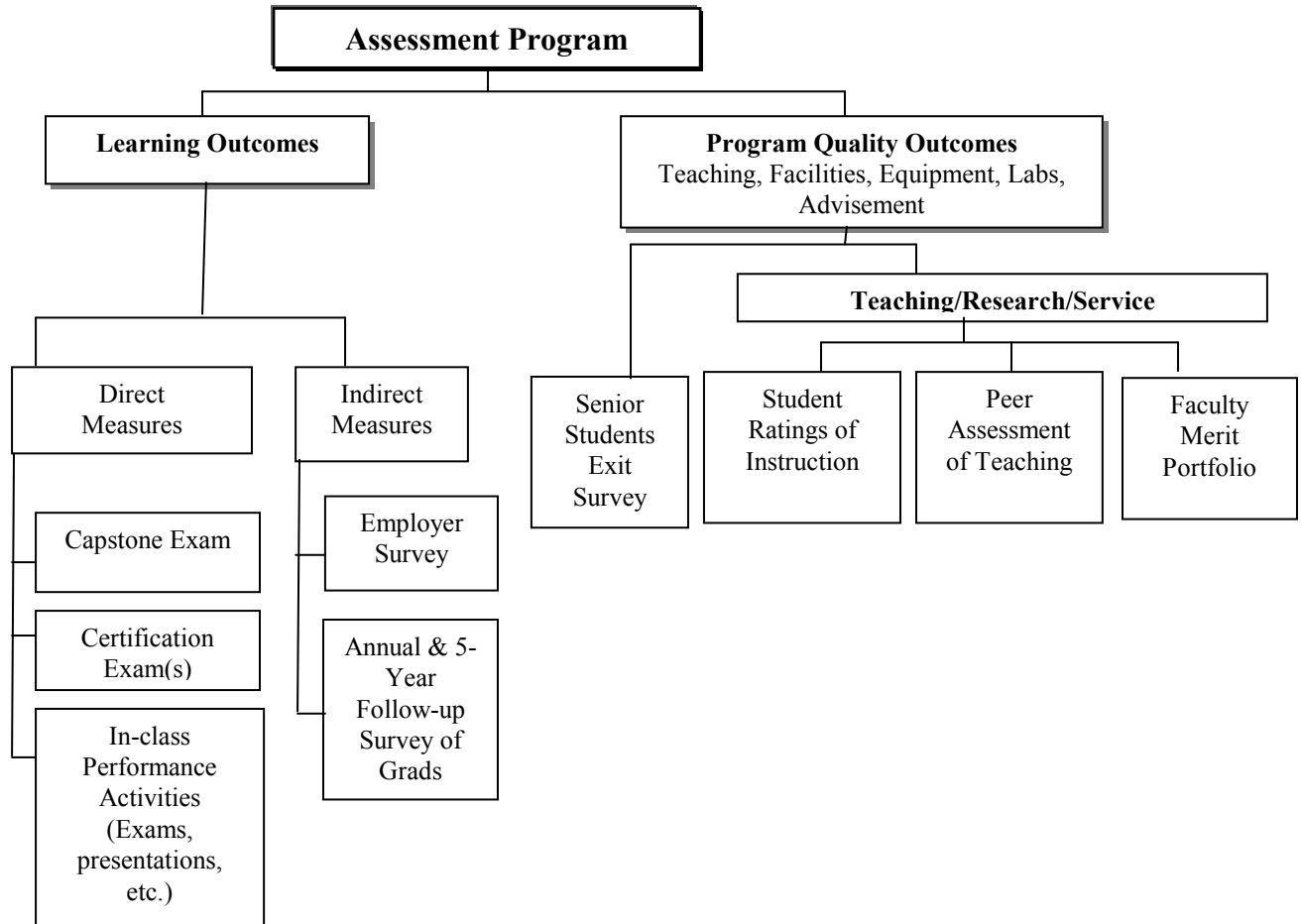
Figure 1 Example Program Assessment Framework

However, several factors call into question the reliability of course-based instructor made tests and examinations. According to Sewell[9], non-academic factors such as work schedules, children at home, etc., might adversely affect student performance. Because more affluent college students are less likely to hold demanding jobs or to have children, grading policies may place less affluent and nontraditional students at a disadvantage when it comes to exams according to Sewell. Another factor that can weigh into using exams for assessment is that students may also choose to skip or "write off" a test with a professor who has a lowest-grade drop policy encouraging them to act irresponsibly. Along those same lines, each professor may have different exam policies and vary in their expectations of students' exam taking abilities. Consequently, an "A" in one class may not carry the same meaning as an "A" in another class.

Finally, collecting the exam data to write an assessment report at the end of each year may be cumbersome or difficult. When multiple instructors are involved the data can easily become irrelevant because of errors in the way it was reported. It is important to be clear with instructors as to what data is expected, what format it needs to be in, and when it is due. Although there will always be reliability concerns regarding instructor made assessment instruments, the validity and reliability of these measures can be enhanced by tools such as a table of specifications that documents the learning outcomes, degree of performance required, type of assessment, and the course where the assessment will occur.

Standardized or certification exams is another common direct measure of assessment that may have the advantage of external validity. Programs may elect to use professional certification exams, such as the Society of Manufacturing Engineers Certified Manufacturing Technologist Exam, or the Certified Professional Constructors Exam. Another option is to develop your own cumulative program examination that addresses learning outcomes at the program level and can be used annually to benchmark student performance. Either or both of these examinations could be part of a capstone course at a time in the student's career when they have completed most of the required coursework. These types of exams are easy to administer and less open to subjectivity or bias[10] of typical course based work samples. Certification exams provide employers with a standardized, legitimized, and credible toolset for examining individuals[11]. Since certification exams are nationally normed across institutions, they provide not only a measure of individual performance but an indication of the value of the program and curriculum at preparing students for the examination. Success on certification exams is perhaps the most recognized and respected performance measure by external constituents.

While many faculty and administrators may think that standardized or certification exams may be an excellent assessment measure, there are some disadvantages to this choice. While engineering may have a common body of knowledge for employment, this is not true of many technical programs that have great latitude in topical content. Just because an exam is nationally normed, don't assume the questions are appropriate for your specific program. This was the case for one program that the authors are familiar with. Consequently, the faculty in that program developed an exam that consisted of questions that were unique to the program and the learning outcomes that needed to be assessed. Certification exams also come with a cost[12]. Exam fees may be well over $100 and this expense may be cost prohibitive for some students. These charges help to cover all sorts of overhead costs that an organization may incur with regard to providing the standardized exam. One of these overhead costs is that the exam must be continually updated to stay current with contemporary practice. Keeping the exam current is an essential criterion if the exam is to continue to have acceptance by employers.

Graded course work is also a means to assess learning outcomes. Course work allows for corrective feedback which is important for students with less prior familiarity with a topic. It allows professors to accurately perceive their students' understanding of the content being taught. Homework, student portfolios, capstone projects, laboratory activities, cooperative collaborative learning through a team approach and quizzes are various means to evaluate course work. Some authors suggest a "ten minute" quiz at the beginning of every class to keep students in a continuous study and inquiry mode[13].

A possible disadvantage to graded coursework is that pass-fail grading, a policy once popular and designed to encourage students to take courses in unfamiliar subject areas, was shown to reduce effort and time invested in those areas so that students did not perform as well as they did in regularly graded classes. Some students have a tendency to follow the path of least resistance and take the course pass-fail or do the minimal amount of work to an acceptable passing letter grade like a "C". There is always a risk of knowing how valid the evaluation data is when the evaluation is subjective. Student portfolios are an example of one assessment measure that can be very difficult to evaluate[14].

Strong, et al. identified the capstone project as a valuable element of the assessment process.   This is another direct measure of assessment that provides evidence of student progress towards the established learning outcomes for the program. A capstone experience can allow the faculty to assess both behavioral and cognitive performance. It can closely resemble situations that would be similar to what students would experience in their professional career. If done correctly, the capstone experience can provide the student with a bridge between academia and the real world. As such, it can also be used to provide opportunities to work closely with the companies that may hire the students and secure their support[15].

Setting up and facilitating a capstone experience can be big time commitment for faculty. It requires a considerable amount of time for faculty to nurture relationships with companies. Along with that, it can also be difficult to find an appropriate project within an acceptable timeframe for a class that is driven by the academic calendar and class schedule. Often times these industry projects lend themselves better to an independent study or arranged class schedule.

Indirect Measures Of Assessment

Indirect measures of assessment obtain data by second party report or observation. Examples of indirect measures are exit interviews or surveys, focus groups, satisfaction surveys, and reported job performance. Exit interviews are typically conducted one-on-one with the program director or delegate. The topics may range from learning outcomes to program or department services such as quality of teaching or advisement. The obvious disadvantage to one-on-one interviews is the time involved to arrange and conduct these sessions. For larger programs, exit interviews are not likely viable. To get similar information with only minimal decrease in data quality, an exit survey may replace the interview. For ease of administration and to assure adequate participation, exit surveys may be administered in the capstone course.

Table 1 displays the exit survey of graduating seniors used in the author's department. The survey was designed to replace focus group interviews conducted since the early 1990s with quantitative data that can be shared with faculty in a timelier manner. These data can be used as performance benchmarks for "customer service" issues such as quality of instruction, advisement and placement services. It is easy to administer and the results from the follow-up survey and exit survey can be presented in reports and be circulated to faculty, administrators and important constituents of the program.

The main drawback to this indirect measure of assessment is that someone who is a neutral party has to administer it to allow students to provide feedback and express their opinion in an uninhibited fashion. The data then needs to be analyzed and reported, which also involves time to complete.

Alumni follow-up surveys are an indirect measure of assessment mandated by accreditation agencies. This method of assessment can be used to ascertain how well graduates perceived they were prepared for entry level employment and the degree to which learning outcomes were met. Alumni can identify the knowledge and skill areas in which they thought they were under or over prepared. This information, gathered over time, can help faculty to adequately adjust the curriculum to meet the needs of the work force. Alumni can also offer insight to the relevance of their college curriculum to their current job positions. A basis for comparison or improvement is created and longitudinal trends can be plotted. The annual follow-up can also identify interviewing skills, track starting salary, number of job interviews and job offers, and the number of months between graduation and the first position.

A major challenge with follow-up surveys is getting a response rate adequate to draw conclusions. Another disadvantage of alumni follow-up surveys is that the results may be time dependent. Recent graduates may have different perspectives than graduates from years back. What may be important in the short run may not be important in the long run. In addition, the structure of the sample such as sex, ethnicity, and other demographic variables change over the years[16]. All of these challenges can lead to considerable time involvement for the people who are involved with the administration and analysis of follow-up surveys.

Employer follow-up surveys also provide valuable insights into the performance of graduates. They can also offer ideas that can be used in easing the transition from higher education into the work force. This can provide big benefits when seeking support for the program.

Employer surveys have similar challenges to follow-up surveys. It is difficult to get adequate response rates and it requires considerable development and administration time. Further, different employers will have different expectations of their newly hired graduates thus introducing bias into the results. Some employer's expectations of students are beyond the training that they may have received while in college. In spite of the challenges, follow-up and employer surveys are essential to provide an assessment of the program and graduates by external stakeholders.

Table 1

Exit Survey of Graduating Seniors

Technical Department
Survey of Graduating Seniors

The purpose of this survey is to help faculty continuously improve TEC programs. Graduating seniors have gained many insights into the strengths of the program and areas where the program might be improved. Please answer questions 1 to 24 on the SCANTRON and written comments and employment information on this form. Thanks you for your assistance.

Instructions: Please mark the appropriate bubble on the Opscan.	**1**	**2**	**3**	**4**	**0**
1 Graduation Semester:	Spr / Sum	Fall			
2 Graduation Year	2005	2006	2007		
3 Degree Title	BS IT	BS Tech. Ed			
4 Undergraduate Sequence	CM	GC	CS	MS	
Instructions: For questions 6 – 24, please select the response that best captures your experience in TECH.	Strongly Agree	Agree	Disagree	Strongly Disagree	Does Not Apply
6 Faculty were helpful when I needed assistance.	1	2	3	4	0
7 Overall, the quality of instruction was excellent in TECH courses.	1	2	3	4	0
8 I was treated fairly in my dealings with faculty.	1	2	3	4	0
9 Faculty were experts in their subject matter areas.	1	2	3	4	0
10 The department's computer resources met my needs.	1	2	3	4	0
11 Overall, I was satisfied with the quality of laboratory equipment.	1	2	3	4	0
12 Lab hours provided access to equipment to complete assignments.	1	2	3	4	0
13 I was able to get into TECH courses in a timely manner.	1	2	3	4	0
14 I was satisfied with the help provided by the Academic Advisor(s)	1	2	3	4	0
15 An internship was a valuable part of my education.	1	2	3	4	0
16 Student organizations were a valuable part of my education.	1	2	3	4	0
17 I was treated equitably by other students.	1	2	3	4	0
18 Student Placement Office was helpful in my job search process.	1	2	3	4	0
19 TECH Career day was helpful in my job search process.	1	2	3	4	0
20 eRecruiting was effective in connecting with employers.	1	2	3	4	0
21 My career options have greatly expanded.	1	2	3	4	0
22 The content of TECH courses was state-of-the-art.	1	2	3	4	0
23 Overall, I learned a great deal in my TECH classes.	1	2	3	4	0
24 I would recommend TECH programs to a good friend or family member	1	2	3	4	0

27 Additional comments about your experiences with the TECH Dept at MWU?

27 Optional Information ONLY used for Employer follow-up survey   Name:_____

   Permanent email   :_____

Have you secured a permanent position in your field?   Yes   No   Tentative   Interviewing

If yes to above, Name of Employer:_____

Address of Employer:_____

Thank you for your assistance!

Summary and Lessons Learned

This paper was written to assist faculty in technical areas accredited by the Accreditation Board for Engineering and Technology (ABET) to develop an effective assessment program. It focused on common means of assessment that can be used as essential elements for continuous improvement of curriculum to meet accreditation standards. The common means of assessment were divided into two major categories: direct measures of assessment and indirect measures of assessment.   Direct measures of assessment that were included in the paper were capstone exams, certification exams, classroom exams and other graded coursework. Indirect measures of assessment that were included in the paper were exit survey of graduating seniors, alumni surveys and employer follow-up surveys. Advantages and disadvantages of these methods were presented to allow readers to determine which methods are most appropriate for their situation.

Setting up and facilitating an effective outcomes assessment process can be a big time commitment for administrators and faculty.   The authors suggest that it is important to avoid over assessing for this reason. Instead, focus on the key learning outcomes that every graduate should know and practice. The more complicated the process becomes, the less likely the assessment system developed will have faculty support or chances of successful implementation. For that reason, it is important to begin with selected critical outcomes and then seek consensus with regard the performance measurement methods that should be used to assess student performance.

It is also important to remember that many universities have had their budgets reduced in recent years. As a result faculty are being asked to do more while resources are being reduced. It is more likely that faculty will support a less complicated outcomes assessment process that provides useful feedback based on solid evidence than one that is complicated and burdens their schedule.

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