Creating a Culture of Assessment Within an Engineering Academic Department

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Abstract - EC2000 changes to ABET accreditation have emphasized outcomes-based assessment in engineering courses and curricula. All faculty in an engineering department have some responsibility for assessment, but few have the time, training or resources to do it as well as we’d like. In this paper, we review the literature on developing a culture of assessment, including characteristics of well-known assessment cultures (e.g., at Alverno and Rose-Hulman). Then, we describe a procedure that departments without a longstanding culture of assessment can use to address local concerns and promote faculty buy-in for new policies. Specifically, we present systematic analysis of faculty interviews using qualitative research data analysis coding procedures. All instructors were asked about assessment priorities and current efforts to collect and pool assessment data. Assessment priorities within the department were identified from this input, and recommendations were made for developing data collection and archiving procedures, updating department policies, and distributing assessment responsibilities across department instructors, administrators and appropriate committees. This paper presents the procedure for gathering input from instructors as a transferable model to other departments and institutions while providing a concrete example of outcomes to expect from it.

Index Terms – assessment, department culture, faculty, interviews

INTRODUCTION

Assessment has an important place in engineering education. As in education, it provides important information on student learning and program progress. In engineering, there is also evidence that it leads to increasingly sophisticated studies [1], and to some extent it can be attributed to rapid growth in the field of engineering education research since 2000 [2]. ABET’s outcomes-based assessment model has motivated many engineering faculty to begin to consider learning outcomes and evidence in support of student achievement [3].

However, there is a pattern to how assessment expertise is brought to engineering education which prevents some of the benefits from being maximized [4]. Assessment expertise is often brought to an engineering education project from the outside, in the form of an individual with education or social science training currently employed at the same institution or elsewhere. Collaboration is a great way for faculty to gain access to new expertise and eventually learn from others [5]. But this assessment expert is traditionally kept at arm’s length in order for him or her to remain objective. Particularly as a project cycles through multiple iterations (such as semester after semester of a specific course offering) it is natural that the assessment expert becomes more intimately involved and begins to draw upon his or her background in making recommendations for improvement. In large projects involving significant funding and/or policy decisions, a high level of objectivity on the part of the evaluators is necessary. But in most other engineering education settings, primary importance is placed upon helping students, and accessing all of the expertise of project personnel is more likely to benefit students. Assessment experts are also trained in approaches to keep the instruments, data collection and results of assessment objective or valid through procedures such as pilot testing and triangulation with multiple sources.

In other words, in engineering education, assessment is viewed as a piece of a project, course, or department that is the responsibility of one peripheral person to be kept separate from the “real business” of teaching and learning. This is a missed opportunity to bring new expertise and invest all personnel in continuous improvement. This paper presents a procedure and initial results for an effort at the department level to begin to build a culture of assessment in which all members are involved and invested in assessment activities.

The purpose of this project is twofold. First, a self-sustaining assessment system with appropriate faculty buy-in is to be developed for an engineering department. Second, the method used to develop this system is generalized as a procedure which others can follow to develop an assessment system which reflects the values and resources of a given department. Research questions guiding the project are:

1. What are the attitudes toward assessment priorities and responsibilities among the faculty in the department?
2. How viable and transferable is the interview approach to characterizing these attitudes?

The term “assessment” is used because it is more common in engineering education, included in its definition (for the purposes of this study) is the entire feedback loop of changes informed by results that is sometimes only associated with evaluation.
LITERATURE REVIEW

Well-known cultures of assessment exist at institutions like Rose-Hulman and Alverno College, but how can other institutions develop a culture of assessment? There is a dearth of literature addressing “culture of assessment” explicitly, but a definition can be built using scholarship of assessment and departmental culture.

Alverno College faculty Marcia Mentkowski and Georgine Loacker describe a collaborative scholarship of assessment [6]. They distinguish scholarship of assessment from scholarly assessment in a manner similar to Hutchings and Shulman’s definitions for teaching [7]. Scholarly assessment is informed by the literature, while scholarship of assessment creates new methods and shares with the outside world, specifically, “a gradually maturing field that challenges the meaning, methods, results, and consequences of assessment.” The authors also apply Diamond’s criteria [8]:

- The activity requires a high level of discipline-related expertise.
- The activity breaks new ground, is innovative.
- The activity can be replicated or elaborated.
- The work and its results can be documented.
- The work and its results can be peer-reviewed.
- The activity has significance or impact.

These parallels can help readers see how assessment can be treated much like teaching in engineering education, with a continuum of applied and innovative activities. Scholarly versions can be made public through conferences like FIE.

While much of their argument is focused on why the work is scholarly, Mentkowski and Loacker describe a collaborative consideration called “taking joint responsibility for assessment.” Various stakeholders, including administrators and faculty from various disciplines, form a community of practice. The authors explain [6]:

These various groups may view generating and using assessment data about student learning as (1) a means of communication across campus in the struggle for renewal, (2) a credibility and trust-building exercise that creates public dialogue with outside audiences asking for accountability, and (3) a scholarly activity that leads to new discoveries, connections, applications, and improved teaching and student learning.

The authors then continue with praise for the ways in which their multidisciplinary group worked to apply innovative approaches while adhering to scholarly practices within the disciplines. The collaborative nature of the work not only distributes the workload, but it allows for discussion that leads to innovation and buy-in.

To extend these ideas to a culture of assessment, a definition of culture in a higher education setting is needed. Kuh and Witt explain [9],

“culture in higher education is defined as the collective, mutually shaping patterns of norms, values, practices, beliefs, and assumptions that guide the behavior of individuals and groups in an institute of higher education and provide a frame of reference within which to interpret the meaning of events and actions on and off campus.

Thus, a “culture of assessment” is one in which the norms, values, practices, beliefs and assumptions that guide behavior highly value assessment as an activity to communicate across campus, build trust with outside audiences, and develop new discoveries for improved teaching and learning. The arguments for combining these definitions are that (1) good assessment is integrated into department and program activities from the initial design phase, (2) assessment is the responsibility of everyone in the organization, and (3) organizational values, norms and policies should reflect the value of assessment and the expectations for participation.

The question that remains is how to build this assessment culture from an existing culture. A hierarchical approach (in some ways like that mandated by ABET) will not guarantee genuine buy-in, nor will hiring an outside consultant. The values of the existing culture must be addressed, and any proposed assessment systems should be show to align with that culture. In describing Alverno College’s assessment movement, Loacker and Mentkowski [10] explain:

The educational beliefs and values of the institution reflected in the current curriculum were already present in the late 1960s, when we began raising issues that led to a new curricular design. The faculty had always seen themselves as accountable for what happened to students as a result of their college education and began to ask questions about how to find out whether each student was developing her full potential. In 1973 we set out to improve the way our students learn and the way we teach by articulating and making public the abilities they must demonstrate.

The eight abilities that Alverno faculty identified for their students include communication, analysis, problem-solving, valuing in decision making, interacting, global perspectives, effective citizenship and aesthetic responsiveness [10]. Many of these are similar to the ABET EC2000 criteria [3] and other values described in recent reports [11, 12]. The development of Alverno’s competencies was spurred by a challenge from the president to faculty to consider the challenges in their respective disciplines [10]. Thus, the assessment activities arose as a combination of leadership and faculty involvement in...
developing the competencies from the beginning of the process. The faculty are continually improving and reflecting upon these processes [10]:

We now see our work as constantly creating and recreating a system that provides for ongoing review. This work involves assessment design and curricular development, as well as constant improvement of our teaching through research and redesign of learning experiences.

In a later publication, Mentkowski [13] explains that a shared body of knowledge about learning was developed over many years of joint research and conceptualization among Alverno faculty. At first, faculty compiled their best understanding, based on experience, of how students learn best. Since learning in context was one of these principles, they developed discipline-specific versions of the competencies. Then, three years into the project, a college-wide assessment center was established to validate the assessment processes and support faculty. Faculty and assessment experts work together to develop procedures which reflect good assessment as well as the values of the discipline. Finally, the assessment results are used to inform faculty of what aspects of the curriculum are working well and which others need more work [10].

It is important to note the important role of involving many stakeholders in the process [14]:

Transformation, as we have defined it, does not occur by fiat or by drift. It is constructed out of processes that engage and depend on a high level of participation by faculty and staff. …The transformation took place over a period of time and is ongoing; it is based on and continues to create cooperation, self-reflection, and self-assessment throughout the institution.

In the following sections, a method is presented for collecting data about culture and assessment practices. Sample responses and recommendations are offered. Finally, the method is evaluated for accomplishing the goal of beginning to build a culture of assessment.

METHODS

I. Setting

Data were collected at a large state university within an engineering department with responsibility for teaching all engineering freshmen. Since it does not award any undergraduate degrees, the department’s ABET accreditation responsibilities are limited to support status, and only a few faculty members are directly involved in preparing accreditation materials. At the time of the study, the department employed 15 tenure track faculty and full-time lecturers. Three years ago, the department shifted from an undergraduate (primarily freshman) teaching mission to a teaching and research mission, which was expected to cause disagreements about (re)allocation of resources. (This indeed surfaced repeatedly, but it is specific to this setting, so it is not discussed in detail here.)

The freshman courses are now taught in a typical lecture-discussion format with faculty lecturing once a week and graduate teaching assistants running smaller sessions which also meet once a week. In the previous model, faculty taught several small sections which met twice a week. This new model was implemented in part to free faculty teaching time for research pursuits.

II. Data Collection

The principal data source for this phase was interviews with faculty and full-time instructors in the department. All 15 were invited, and 14 participated. Faculty were interviewed by a graduate assistant in their offices or another private location. The interview protocol included these questions:

1. Do you feel the department’s published mission is on target?
2. What kinds of assessment do you think the department should be doing?
3. Who should be responsible for collecting and analyzing this data? What expertise do you feel these people should have and should they be trained?
4. What other assessment or research questions regarding the department do you have that you want answered?
5. Do you feel the dept needs a way to share collected data? What suggestions do you have for this?
6. Do you think the new arrangement with larger class size and GTA’s is helping you - freeing up time for research, what is different for you, etc.?
7. What do you feel the culture of [this department] should be?

III. Data Analysis

Interviews were recorded but only used in support of typed notes. For this paper, questions 2 through 5 and 7 were analyzed to address the research questions listed above. Responses were coded into categories, which became individual paragraphs in the results section.

IV. Reporting and Feedback Loop

The results of this phase of the study were reported to department faculty in two formats:

1. This conference paper, written for a wider audience which describes the overall purpose of the interviews along with some results with less detail to respect the privacy of the department, and
2. A more detailed presentation at a department faculty meeting with time reserved afterward to discuss the recommendations for action.

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INTERVIEW RESULTS

I. Kinds of Assessment the Department Should be Doing

Responses to question 2 covered the entire range of activities in which the department is engaged, including undergraduate and graduate programs, advising freshmen, mentoring graduate teaching assistants, conducting research, faculty retention and promotion, and working together as interdisciplinary teams at various levels. Most of these were mentioned by at least two participants, though in a general way as an aspect of the department to be assessed.

The most specific responses elaborated on assessment of the freshman program. Multiple faculty expressed interest in working more closely with stakeholders (including identifying stakeholders) to revisit course learning objectives. Others were interested in the impact of design projects, class size, and the new lecture-discussion format, as well as possibly cohorting students for experiments (i.e., different treatments to different groups) and/or longitudinal studies. In answering this question, many faculty followed good assessment practice of focusing on defining learning objectives or goals before moving on to specific data gathering techniques [15].

Reponses to question 4 were similar, though more elaborate and specific for those that answered. Some were interested in how the current freshman course configuration was impacting faculty productivity, and graduate and undergraduate student employability upon graduation. Another was interested in classroom technologies and their impact on student learning. Themes from above, such as the graduate program, resurfaced here as well.

II. Assessment Personnel, Responsibilities, and Training

Most responses to question 3 advocated a combination of central coordination and buy-in from all department faculty. Some stated that assessment was everyone’s responsibility. Regarding central coordination, participants suggested a committee (such as the department’s undergraduate curriculum committee), the assistant department head, a department faculty member with 50% responsibility for assessment, a graduate assistant, or program director. Some distinguished between various faculty being responsible for collecting assessment data and an expert providing guidance with analysis. A few hinted at coordination of data formats for sharing, which is discussed in the following section.

Objectivity was also mentioned by multiple faculty. One suggested that a faculty member in the department but not teaching the course participate in course assessment to balance understanding the setting with some level of objectivity. While department faculty and administrators can engage in many assessment activities, some stated it was also important for external assessment or evaluation experts who are less biased about the department to also contribute to assessment efforts. Objective experts are also usually better trained in assessment techniques than department faculty, and participants advocated tapping into this expertise through collaboration or formal training for department faculty. One explained that if assessment becomes a new job responsibility for someone like the assistant department head, then training should definitely be offered.

III. Pooling Assessment Data

While the researchers intended the question about sharing data to be internal, most faculty answered it with respect to sharing the department’s data with other institutions or other departments at the same institution. One specifically cited the SUCCEED database, which has been continued as MIDFIELD. In general, faculty were more focused on the potential benefits of comparing across institutions than on access, IRB, and common formatting difficulties. However, several said that there would not be a problem with publishing aggregate (anonymous) student data or sharing data through publications. Some advocated slowly building up a system by starting internally, with initial access granted to department faculty and graduate students. One mentioned this would be a means of finding out more about what other faculty in the department were working on (a theme which reappears in department culture).

IV. Desired Department Culture

Responses to question 7 reflected a strong interest in more collaboration among department faculty while valuing students. The most common adjectives used to describe the desired culture were “collaborative,” “collegial,” “open,” and “mutual respect.” Diversity was also a common theme. Faculty acknowledged that they are working in a dynamic area in which change is necessary and could benefit greatly by utilizing the diverse backgrounds represented in the department. Graduate students were mentioned as an additional group with unique backgrounds which should be integrated into the culture in an appropriate way. A few mentioned different models of collaboration, from actually cooperating on a project to simply bouncing ideas off each other.

Faculty also felt that the policies and leadership in the department play an important role and should reflect the desired culture as much as possible. Some specifically cited office hours along with the desire that faculty spend more time in their offices with their doors open to facilitate casual conversations. Another discussed work-life balance in the context of limiting the number of hours colleagues should expect each other to work in a given week. Some felt that teaching (and those that choose to focus on teaching) should be valued as much as research. However, a few also acknowledged that teaching alone is insufficient to earn tenure in the college of engineering and university.

Finally, many acknowledged the chaos of implementing change. Some thought the department should embrace change rather than fear it. Part of an open culture would be talking about change and implementing new ideas. A few mentioned that assessment would be an important tool in helping faculty to focus their innovation.
RECOMMENDATIONS AND NEXT STEPS

Perhaps surprisingly, the main recommendation is not that the department needs to hire a full-time assessment expert. Besides the fact that resources are limited, faculty in this department are already convinced of the need for more assessment, their role in it, and the need for more coordination and training. These faculty need motivation and/or credit for doing what many of them favor doing already: discussing their teaching with others in the department as part of a more collaborative culture.

Specifically, faculty were most interested in assessing the freshman program, particularly revisiting the learning outcomes with respect to various stakeholders as well as what is currently taught in the course. Armed with revised learning objectives, the faculty could begin to add more creative and engaging pedagogies in the course. Given the importance of faculty buy-in, it is most appropriate that working groups of faculty discuss these topics and make self-governance decisions. Everyone has an opinion and if most of these are taken into account, that will increase the investment and buy-in for new systems yet to be implemented. Committees or working groups for which faculty can receive teaching, service and perhaps even research credit seem the best option given competing demands for faculty time.

One area perhaps most in need of personnel would be data pooling and coordination. This includes important issues of IRB, access to detailed student records, data archiving and management, and sharing with outside national student databases to work out. Related to this are important coauthorship issues. Here, we received less detailed suggestions from faculty but still strong opinions and perspectives (esp. instructors, researchers, and collaborating with other databases). A student database would inevitably be expected by various department faculty to serve the dual purposes of program assessment and research data. To navigate the issues of access, IRB, coauthorship and student advocacy (e.g., oversurveying), again requires input from a group of department faculty. However, in this case, the actual work of formatting and compiling the data, as well as researching practices already in place elsewhere, is likely to be significant, and this is where additional department resources should be concentrated, for example, if a GRA is continued.

At this point, it might be useful to revisit some of the ways in which Alverno College resources were reallocated to support a change in focus. These specific “transformative acts,” some of which can be implemented at the department level, include [14]:

- Restructuring the academic schedule to allow for extended periods of time for discussions, workshops and evaluations of progress.
- Developing committees and centers to support and collaborate on assessment projects.
- Funding faculty fellowships for collaborative inquiry.
- Structuring an advising program with professional academic advisors and peer advisors.
- Revised promotion and tenure guidelines based on an evolving understanding of the scholarship of teaching and learning.
- Developing a consortium with other institutions to better define goals, identify and address constraints, and collect evidence.

SUMMARY AND ASSESSMENT OF INTERVIEW PROCEDURE

I was enlisted to coordinate assessment efforts in an engineering academic department. As an outsider unaware of the departmental culture, including assessment knowledge and values, I decided to collect this information through a series of interviews with department faculty. Expecting also that these faculty would be responsible for collecting assessment data if not analyzing and reporting it, it was important to be able to derive recommendations from these interviews and align them with the existing values. Dominant values, practices, and attitudes are important elements of culture in an academic department, so the interview questions are framed around department culture.

The first question served as a warm-up for participants to consider the stated mission of the department and their feelings about the desired mission. Results were not reported above, but responses were vague (as some participants explicitly stated) because a mission statement is necessarily vague. Though the data from question 1 were not particularly useful, this question served the important purpose of focusing on the overall goals of the department. I believe this laid a foundation for more thoughtful responses about assessment priorities that aligned with overarching goals, rather than focusing on details or mechanics of instruction such a class scheduling or staffing. Questions 2 and 4 about assessment and research questions were important from an internal reliability standpoint because they were similar questions. The distinction between research and assessment is neither uniform nor clear in engineering education, so it was important for participants to be able to respond to different questions about topics of interest. That when considering the aggregate data, there were few if any new topics introduced in question 4 attests to the strength of this interview protocol. Question 3 provided an opportunity for faculty to request training for assessment duties faculty felt they should be performing, but were not necessarily prepared for. Finally, wrapping up the interview with what participants think the department culture should be allowed them to look forward positively while linking assessment to other aspects of department operation.

This paper presented a method of gathering assessment definitions and priorities from department faculty to increase buy-in for proposed assessment systems. The literature on collaborative scholarship of assessment and departmental culture guided the interview protocol. Sample results indicate that the interview procedure was successful.
in eliciting desired information. Future work will describe the long-term effectiveness of this approach.

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