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Fundamentals for Assessment Success: A Sustainable Data Organization Strategy within a Construction Management Technology Program

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Abstract

Few events within a successful academic program are as administratively demanding as an on-site accreditation assessment visit. It is a particularly stressful period where a program must fully account for itself by presenting evidence to external evaluators that its students, faculty, alumni, administrators, curriculum, policies, resources, and facilities satisfy a rigorous criteria established by an accrediting body. To accomplish this, the program must retrieve all of the relevant data, compile it into a prodigious report and organize it in a manner that is both profoundly clear and obvious while simultaneously complying with the report format requirements prescribed by the accrediting institution. Anyone who has experienced an on-site accreditation visit is very familiar with these daunting challenges.

A number of factors seem to conspire against the successful execution of this documentation process. One of the most fundamental is the complexity associated with the ongoing, sustainable, semester-to-semester compilation of data from a myriad of different sources. Of these various sources, faculty is one of the most critical. It is the faculty after all, that is the origin of the assessment data that forms the bedrock of any program's assessment regimen. This challenge is compounded if the program is heavily dependent on adjunct faculty. Many educational institutions that offer a technology-based curriculum are particularly reliant on adjunct faculty. Clearly adjunct faculty is highly valued in technology programs for its course – specific expertise and industry correlation. However this faculty is typically teaching as a supplement to a separate full time career and therefore does not have the resources available to devote to a protracted or confusing assessment routine.

In order to compile a successful assessment report, a sustainable assessment program must be established that distills the complex requirements into components that can be easily and efficiently executed by its faculty. The reporting system must be sufficiently clear and unambiguous such that it becomes a part of the semester close-out routine. Additionally, a reporting system must be developed that efficiently captures crucial assessment data, making it available for systematic review at the conclusion of every semester and ultimately for inclusion in the accreditation report.

This paper documents the process of a construction management technology program as it developed its own ultimately successful assessment structure by focusing on the methods and the tools. The tools described include:

- Simplified, unambiguous forms that capture assessment data
- A reporting system to facilitate data dissemination
- A formalized process that ensures collaboration through the utilization of the captured data on a regular, end-of-semester routine
- Implementation of an assessment routine that clearly links course data to outcomes to program.

Literature review

The importance of executing a well-designed assessment program is critical to its successful adoption because the very act of assessment can face considerable faculty resistance. Indeed, Palomba and Banta reference national surveys that identify faculty resistance "…as among the most important challenges facing assessment."(1999, p. 70) The authors reference a number of misconceptions that are commonly cited by faculty resistant to assessment. They include:

1. Assessment data is valueless to faculty because it is intended for use exclusively outside the program.
2. The assessment process consumes an excessive amount of time and resources.
3. Data quality is inherently poor thereby making its acquisition unimportant.
4. Assessment data is not used to make real program improvements.
5. Assessment data is used as a kind of job performance evaluation, ultimately threatening career advancement, job security and/or academic freedom. (Palomba & Banta, 1999, p. 71)

All of these points only emphasize the importance of a well-designed assessment program with workable tools that are easy and efficient to use. As will be demonstrated later in this paper, a number of these concerns were directly addressed in the development of a number of assessment processes. Palomba and Banta validate this approach by noting faculty fears will be diminished provided they are given "… responsibility, resources and rewards for participating in assessment."(1999, p. 71)

The importance of adjunct faculty – particularly to a technology program – cannot be overstated. Charlier and Williams (2011) indicated that the virtues of adjunct faculty include their flexibility, practical experience, technical specialization, and reduced fiscal impact. These benefits make it easy to understand their phenomenal growth within the college environment. Indeed, the authors cite a statistic that use of part time faculty has more than doubled in the past three decades resulting in 68% of all faculty are now functionally part-time. (2011, p. 2). Within the program referenced in this study, 72% of the total faculty are adjunct / part time.

Of course there are potential liabilities as well. According to author Frederick Jacobs, adjunct faculty are typically either simultaneously teaching at more than one institution or are hoping to use the adjunct position as an entrée to a full time teaching opportunity. (1998, p. 14) This multiple institution workload presents the possibility that instructional focus may be diminished. Jacobs continues by noting other potential weaknesses: inaccessibility to students, unfamiliarity with institutional services and a sense of being disconnected from the program and its full time faculty. In his conclusion, Jacobs offers a number of solutions to correct these challenges. He states, "Part-time faculty can be helped to be more effective in their work if they understand the values and norms of the institution. It is not that part-time faculty should be made part of the culture because it would make them feel good; rather, they need to be included so they can understand what is valued, what is expected, and what they should value and expect." (1998, p. 17) Clearly, imparting the institution's values would be particularly beneficial in overcoming assessment resistance, ultimately improving its implementation and sustainability as well.

Program background

The construction management technology program that is documented in this paper consists of four full time faculty (one program director, one assistant professor and two instructors) and 13 adjunct faculty, most of whom teach one course. Contrary to Jacobs' observations, the adjunct faculty within this program are not teaching at multiple locations or hoping for a full time opportunity. This distinction is important because it suggests our adjunct faculty are already fully engaged with separate, full time occupations. Thus an assessment obligation has the potential of being especially burdensome, particularly to part time instructors unfamiliar with academic documentation. It was therefore imperative that documentation be unambiguous and specific to minimize wasted time during the data gathering process.

During a typical semester 30 courses are offered by the construction management program. It is one of seven programs within a department devoted exclusively to technology. It offers a Bachelor of Science degree and an undergraduate certificate. The department resides within an urban, nonresidential campus with a student enrollment population of 30,690 for the fall of 2014. (Indiana University, 2014) Currently the program's enrollment consists of 135 students.

The program is accredited by ABET. It does not utilize proprietary assessment software nor is there dedicated assessment staff. The program's accreditation plan was developed exclusively by its full time faculty with copious support by experienced faculty residing within the department and by the dean's office. Ultimately the responsibility for assessment implementation and data retrieval rests exclusively with the program's full time faculty.

Of the 30 courses offered within a semester, the actual data collection load consists of 17 courses involving 42 different outcome performance indicators. In all 11 instructors (4 full time, 8 adjunct) are affected. In an effort to distribute the obligation as broadly as possible, adjunct faculty are responsible for 22 indicators with most having only one outcome data obligation. Three full time faculty are responsible for 20 indicators. (Chart 1.) Assessment frequency for most of the data is every semester the targeted course is offered.

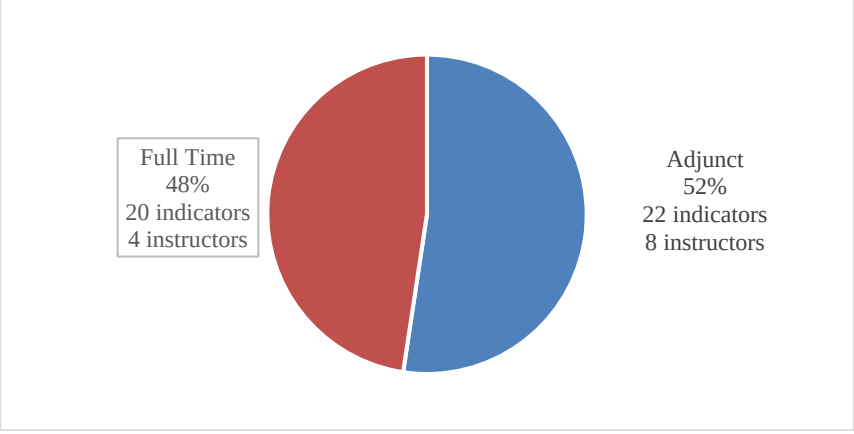

Figure 1. Outcome indicator assignments by full time faculty and adjunct faculty

While this particular construction management had been assessed previously – receiving the maximum time interval to the subsequent assessment – over the years it has undergone fundamental staff changes to such an extent that its assessment practices had lapsed. The documentation that was developed and subsequently described in this paper is the result of an extensive rebuilding effort. Prior to the development of these tools and processes, the academic program faculty went through a period of re-establishing and clarifying a myriad of assessment fundamentals. That is, establishing a sustainable assessment process integrating the program's stakeholders with the curriculum, implementing process review policies, clearly defining course outcomes, and developing appropriate performance indicators. Additionally it came to be understood that the assessment process – no matter how sophisticated or well intentioned it may be – would not stand up to the scrutiny of an on-site assessment without possessing a clarity and transparency that is obvious to the on-site accreditation evaluation team.

Assessment tools

In the development of every tool and process, consideration was given to the extensive complement of adjunct faculty residing in this program. Every effort was made to simplify the data acquisition process by combining clear and unambiguous instructions with convenient accessibility from virtually any computer with an Internet connection. This approach also offers the collateral benefits of facilitating last-minute personnel changes and reducing the time and resource commitment required of the faculty to execute their assessment obligations.

Performance Assessment Form

Utilizing an assessment document that is clear in its intent and meaning is crucial to ensuring objective and consistent data collection. The value of a clear assessment document is particularly important when a program relies heavily on adjunct faculty. To assist all faculty in the execution of its assessment responsibilities, an outcome documentation form was created that simplified execution while simultaneously clarifying the data acquisition process. The form is composed of three parts: 1) a description of the outcome including a detailed description of the target indicator and the frequency of its collection; 2) data as collected from the particular class with an optional space for faculty comments and 3) an area dedicated to specifying what work is evaluated. In Figure 2, Part 3 displays an example of the work that is being utilized as the source of the data. There is no mistaking exactly what type of work is required to assess a given outcome. In Figure 3, Part 3 displays a grading rubric which is utilized to evaluate student work. The distinction between the two different Part 3's is important to note. Some courses utilize coursework that demands objective evaluation. Other courses utilize work that must be subjectively graded. The inclusion of rubrics is critical in ensuring a consistent grading effort when evaluating subjective material.

It is important to note that the form has only four entries that are editable by the faculty: the number of students engaged in the assessment, the number of students satisfying the performance target, the percentage equivalent and faculty comments. These editable variables were carefully considered in the design of the form. Because outcomes are created at the program level by the program's full time faculty, individual course instructors cannot alter the outcomes or the

performance targets. If faculty determines that a target must be revised, a preliminary / proposal form is submitted. This form permits the individual course instructor to make his/her recommendations while clearly alerting the program faculty that the submitted data is not in compliance with the established outcomes and that further review is required during the program's annual assessment meeting.

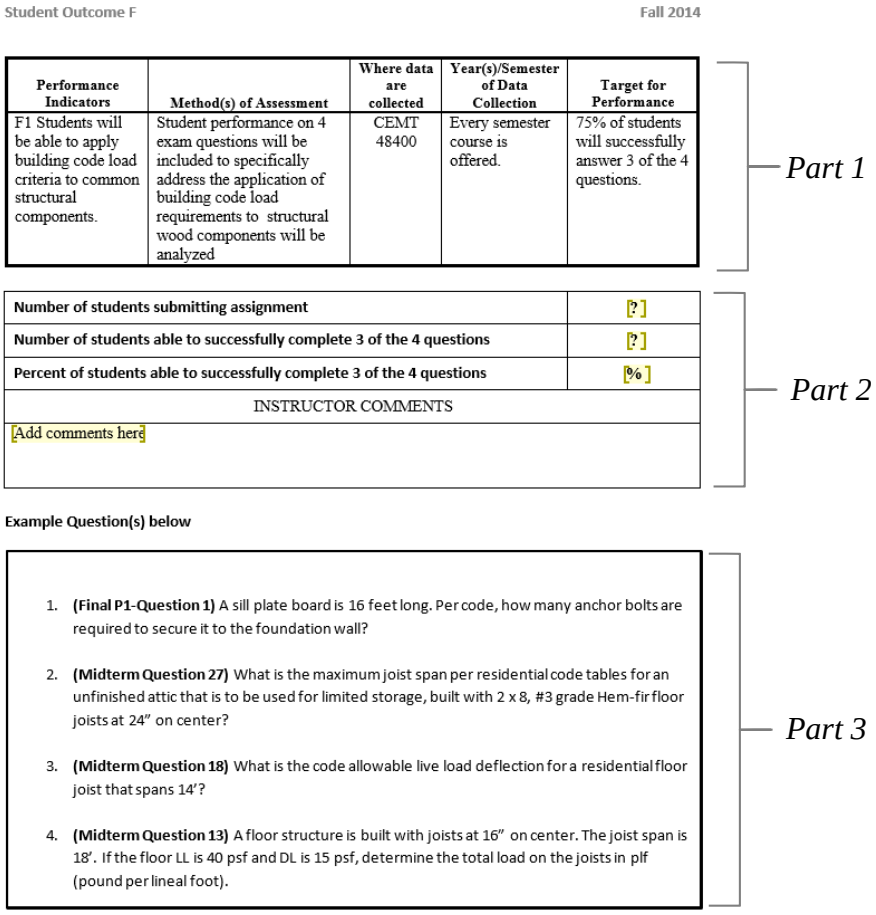

Figure 2. Typical performance indicator report form including prototypical student work.

Student Outcome C | Spring 2014

Performance Indicators	Method(s) of Assessment	Where data are collected	Year(s)/Semester of Data Collection	Target for Performance
C3 Students can create cost estimates and develop a construction bid combining material, labor and equipment.	Students will create a detailed construction bid final project using Excel software and will be assessed using a rubric	CEMT 34200	Every semester course is offered.	75% of students will earn 15 or better out of 20 possible points as indicated on the rubric

Part 1

Number of students submitting assignment	[?]
Number of students able to earn 15 or more points out of 20	[?]
Percent of students able to earn 15 or more points out of 20	[?%]
INSTRUCTOR COMMENTS	
Increased student understanding of RS Means data and its application to pricing.	

Part 2

Semester Project Example Rubric Below

CEMT-342 Construction Cost & Bidding

Semester Project

Student Name: Template | Term: Fall 2013

		Poor = 0	Good = 1	Excellent = 2	Earned
		Student could not successfully perform the required action	Student could perform the required action with some need for improvement	Student could perform the required action	
Apply Pricing To: (including; labor, equipment, material)					
	Concrete & Masonry Reinforcing				
	Concrete				
	Masonry				
	Steel				
Perform Quantity Take-offs for:					
	Concrete & Masonry Reinforcing				
	Concrete				
	Masonry				
	Steel				
+/- 10% of Bid Price (weighted score x2)					
Possible Point Total		20	Total Earned Point		

Number of students submitting assignment =		
Number of students able to earn 15 points or more out of a possible 20 pts =		
Percent of students able to earn 15 points or more out of a possible 18 pts =		

Part 3

Figure 3. Typical performance indicator report form including grading rubric.

Centralized Data Storage

All of the assessment documentation resides electronically within the university's proprietary web based learning management system (LMS). Utilizing the LMS offers a number of benefits to enhance the assessment data gathering process. Benefits include:

- Universal access – Every faculty member is given access to the LMS almost immediately after hiring. Every computer on campus points to the LMS site and accessing it from an off-campus computer is simple and quick. The program's assessment site appears similar to a class that is being taught by the instructor. Additionally, because it resides within the LMS, the faculty member uses the same log-in and pass phrase as is used for course access.
- Controlled views – The resources that are viewed by faculty are dependent on their role in the program. At the instructor level, the adjunct faculty member sees only the course folders that apply directly to him / her. There are no unnecessary folders, files, features or resources visible which greatly simplifies site navigation. At the course coordinator level, course coordinators (typically full time faculty within the program), are assigned 3 – 4 adjunct faculty to provide support and direction. The course coordinators will view their own assessment folders in addition to the folders of the adjunct faculty they've been assigned. System administrators can view every folder within the assessment site for a quick appraisal of contributed content and assessment progress.
- Clear expectations – Residing within the folders that are visible to the instructors are either other folders indicating what is expected to be placed within, e.g., examples of student work, self-assessments or blank files requiring execution e.g., blank performance assessment forms.
- Shared and hidden resources – Made available to every instructor within the program, a folder "Assessment Tools & Forms" contains assessment forms, rubrics, outcome details, etc. all of which serve as an assessment resource. Still another folder, "Assessment Administration" is hidden to all but system administrators. This folder contains templates, original files and official submissions which can conveniently reside with the program's assessment material but remain unavailable to the entire faculty.
- Data upload / download control – The individual course folder permits the faculty member full upload, download and deleting privileges, while other folders (e.g., the Assessment Tools & Forms" folder) permit download only. This feature helps to ensure instructors are unable to inadvertently upload course files into the incorrect folder or delete a shared resource.
- Simplified accreditation documentation – Because all of the assessment data resides in one central location, production of student work, data, rubrics and assorted documentation will facilitate preparation for the on-site accreditation visit. All faculty work is shared and available, eliminating the need to access different computer drives, locations and addresses.

Course Reflection

A long-standing process initiated by the department, the course reflection form is an important self-appraisal executed by the instructor at the close of every semester. The form is a personal evaluation of how well the semester progressed. It encourages the instructor to consider the changes made, their apparent effectiveness within the classroom and recommendations for future

corrections. This form provides an invaluable tool for the adjunct faculty as it creates a semester by semester history of the course, allowing subsequent instructors to learn from past efforts and understand the class dynamics unique to every course. The form also requires comments by the course coordinators. In this way course coordinators are more closely in-tune with the instruction occurring within the classroom and can share these observations during the year-end assessment review. This process can contribute to "closing the loop" wherein instructors provide input on the courses which in turn informs the program faculty who can then modify the program which in turn modifies the courses.

Assessment Report

Thus far, all of the tools presented facilitate data acquisition at the instructor / course level. However the real value of all these tools is their contribution to program improvement and accreditation evaluation. The Assessment Report was created to compile all of the course level data into a single source enabling an overall program review of course effectiveness as defined by outcome performance. (Figure 4). This document is used at the review meeting occurring at the end of the academic year. Attending are the program's full time faculty, curricula advisor and administrative staff. The faculty, in its role as course coordinators, will have already reviewed the performance assessment forms for all of the courses in their charge.

Updated: March 1, 2014

Performance Indicators	Method(s) of Assessment	Where data are collected	Year(s)/Semester of Data Collection	Target for Performance
A3 Students can use, input and interpret data generated by construction management software.	The Primavera Contract Manager semester project student performance will be analyzed. The student performance on the *Contract Information* section of the scoring rubric will be analyzed.	CEMT 34700	Every semester course is offered.	50% of students will score 72 out of 90 possible points (rating effective or very effective) on the *Contract Information* sub-score of the Semester Project Evaluation rubric.

Performance Indicator A3 Comments

- **Fall 2012:** 27% of students (7/26) satisfied this target. This performance target was not achieved.
- **Spring 2013:** 67% of students (29/43) satisfied this target. This performance target was achieved.
- **Fall 2013:** 38% of student (5/13) satisfied this target. This performance target was not achieved.
- **Spring 2014:** 65% of students (15/23) satisfied this target. This performance target was achieved.

Figure 4. Example of an assessment report for one outcome.

Notable characteristics include:

- Typical of the program's form design, document content is pared down to the minimum information necessary to execute the task. The top portion restates the outcome, the assessment method, the course in which the assessment is taking place, assessment frequency and the specific students' performance target.
- The bottom portion displays the actual performance data as retrieved for every assessment period. This information presents a history of this outcome's performance indicator and as such is invaluable in determining trends within the indicator, the course and the outcome. In this particular example, the pattern appeared where the target was achieved in spring semesters but wasn't achieved in fall semesters. The instructor proposed the possibility that, because the fall course met once per week and occurred in the evening from 6:00 – 10:30 pm, students were more likely to have full time jobs. Meanwhile the spring semester version of the same course met twice weekly during the regular school day, more likely appealing to the traditional student and without the full time job obligations or the stress of a very long day. This consideration can be seen as it was documented during the meeting in the Program Outcome Assessment summary (Figure 5).

As the faculty review meeting proceeds through each of the 42 outcomes, common issues begin to emerge which can apply to specific instructors, similar course topics or outcomes. This analysis is documented in the Program Outcome Assessment form (Figure 5). The summative analysis enables the program faculty to consider revisions to the overall program based on the student performance data provided by the instructors. In this way the results of the course level assessment effort can directly affect the program which in turn may alter execution of the course, in essence, "closing the loop". Additionally, this kind of information can be shared with the program's industry advisory board for comment, paving the way for another valued stakeholder to influence the execution of the program.

Updated: March 1, 2014

CEMT Program Outcome A Assessment

- **May 2014:**
  - **Results**
    Results based on direct measures demonstrated that students successfully achieved targets for 3 of the 4 performance indicators for Outcome A.

    Indicator 1 – 0% (target 90%), Indicator 2 – 75% (target 75%), Indicator 3 65% (target 50%), Indicator 4 – 100% (target 75%)

  - **Evaluation and Actions**
    CEMT 27500 (Indicator 1) Faculty reviewed the appropriateness of a targeted 100% success rate. 0% success rate, based on targeted performance does not reveal that 69% of the students achieved > 80% on the quiz. The method of assessment covers fundamentals, therefore 100% is not unreasonable, although 100% for any assessment seems difficult. Because we've changed the POS, students caught in the transition are arriving in class with different capabilities and may not have the proper prerequisite preparation (CEMT 10400 & CEMT 10500). Variables to consider: Review the target for performance, evaluate assessment itself, and verify student preparation. Further review of the indicator is warranted. Students indicated that CEMT 10400 should be taken in the semester prior to this course. The new POS already requires CEMT 10400 as a prerequisite.
    CEMT 30200 (Indicator 2) Students achieved the target for performance. The instructor based success on 75% of the students earning 75% of the possible points (112.5/150). Faculty members decided to revise the target for performance to include the parameters defining success.
    CEMT 34700 (Indicator 3) Faculty discussed the trend observed in the success of the fall course offering and the spring course offering and the possibility that class schedule is having an impact. The fall class is taught in the evening, once per week, 6:00- 10:30pm. The spring class is taught during the day with 2 lecture periods. Often class composition in the fall semester is disproportionately students working full time during the day. This data will be monitored and the class schedule may be evaluated. Indicator of 50% may be too low of an expectation. Further review of the trend appears warranted, reconsider in Spring 2015.
    CEMT 10500 (Indicator 4) Method of presenting data made interpretation difficult. Faculty's interpretation of data revealed that students satisfied this target; additional instruction to instructor should be offered to clarify the data compilation presented in the Outcome Sheet.

Figure 5. Example of an assessment report outcome summary.

Conclusion

A construction management technology program sought to reconstruct and revitalize its assessment program. The challenges of inherent faculty resistance to assessment and the special needs of its adjunct faculty population were considered as the entire assessment process was reconsidered. New documentation and processes were developed and implemented. Forms were created which distilled assessment to its most essential requirements, an online project site within an LMS was developed to simplify document storage and record keeping and course level documentation was evaluated at the program level via summary forms and the implementation of a year-end faculty assessment meeting. The documentation approach presented within this paper encourages interaction between adjunct faculty, full time faculty, students and industry resulting in a meaningful and effective program assessment.

Bibliography

Charlier, H. D., & Williams, M. R. (2011). The Reliance on and Demand for Adjunct Faculty Members in America's Rurual, Suburban, and Urban Community Colleges. *Communicty College Review*, *XX*(X), 21. doi:10.1177/0091552111405839

Indiana University. (2014, September 3). Indiana University enrollment holds steady despite demographic trends. Retrieved January 24, 2015, from http://news.iu.edu/releases/iu/2014/09/enrollment-fall-2014.shtml

Jacobs, F. (1998). Using Part-Time Faculty More Effectively. New Directions for Higher Education, 1998(104), 9–18. doi:10.1002/he.10401

Palomba, C. A., & Banta, T. W. (1999). Assessment Essentials: Planning, Implementing, and Improving Assessment in Higher Education (1st ed.). San Francisco, CA: Jossey-Bass.