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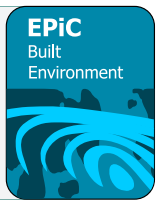

Integrating Learning Management Systems and Faculty Performance Evaluation for Continuous Program Assessment and Improvement

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The use of technology and learning management systems (LMS) has significantly advanced program assessment in higher education. Accreditors and researchers have affirmed that systematic approaches to program assessment are paramount for improving student learning and making strategic decisions in academic units. These structured approaches contribute to providing consistent and reliable data that can be used to make more informed decisions for planning and determining resource allocations. One of the challenges institutions face is creating a system that is adaptable and can be used across academic units and accrediting bodies. Another challenge is finding new ways to encourage or incentivize faculty to actively engage in assessment related activities. This study focusses on the development and implementation of an assessment framework for three construction related degree programs. The system was designed to be adaptable to accommodate the reporting needs of multiple accrediting bodies and to encourage faculty engagement in the process. The framework has been implemented and used in writing an accreditation self-study. The system has undergone a complete implementation cycle with most courses in the curriculum and this study can be viewed as ongoing in nature.

Key Words: Program Assessment, Accreditation, Construction Education

Introduction

The advancement of education software and curriculum design practices in higher education are enhancing the means by which academic programs are developed and assessed. Digitized rubrics, learning management systems (LMS) and outcome measurement software are now widely used in higher education. The dynamic nature of software and the increasing need for colleges and universities to be responsive to market demands has emphasized the need for program assessment frameworks that are adaptable and versatile for two key reasons. First, the dynamic nature of software has emphasized the need for assessment frameworks that are capable of adapting to changes and upgrades made by software vendors. Changes in software can impact data exchange and analytics,

publication of reports, system functionality and user interface. Second, as colleges and universities seek to be more responsive to the demands of higher education markets there is a need for a framework that is versatile across disciplines and increases the speed at which information may be accessed for strategic decisions. Program changes may need to be adopted quickly without impacting established assessment systems.

Programs such as construction management which frequently have external accrediting agencies also need assessment systems that are responsive to the data collection, analysis and reporting needs of the accrediting body. Furthermore, assessment must be valued internally which can be accomplished by adding assessment contributions to annual faculty performance evaluations. The focus of this study is on the development and deployment of an assessment framework for an undergraduate construction management program that utilizes LMS software, is flexible and adaptable to the three main accrediting agencies for construction management programs and is embedded in annual performance evaluations for faculty.

Literature Review

Assessment

Program and student achievement assessment has been a vital responsibility of academic administrators for years. While assessment is an important part of what administrators are charged to manage and an integral component of regional and professional accreditation, the underlying purpose of assessment is continuous program improvement and better student learning (Jankowski et al, 2018). Having effective assessment systems in place is empowering and provides valuable information for administrators to make decisions related to program offerings, curriculum design course rigor and teaching/learning effectiveness (Jacobsen et al, 2018). If assessment becomes a matter of compliance with accreditation requirements the benefits of assessment will be compromised. Advantages of having effective assessment are maximized when there is accurate, intuitive, and timely data within a flexible, responsive system.

Accurate reporting provides assurance that the data is reliable and that decisions may be made confidently based on the analysis and interpretation of that data. Intuitive reporting ensures there is clarity and the people who need the data for decision making and compliance reports can easily understand the system. Timely reporting ensures the information can be accessed when it is needed and when it can have the greatest impact. Consistently measuring objectives with regard to reporting is paramount for ensuring the information can be put to best use for improving the student learning experience.

Assessment systems vary widely among academic institutions and can also vary widely among units within a single institution. The differences among practices may make it difficult for individual academic units to learn from one another. As new software emerges, best practices are identified, leadership changes and assessment responsibilities shift, the system that was initially designed will no longer look the way it once did, and it can be difficult to generate the reports needed to make decisions regarding program improvements and student learning. Another complicating factor relates to changes that are made to assessment procedures as responsibilities shift from one role or person to another. These challenges are further complicated if the management of the university assessment procedures are decentralized. Having a centralized process for directing assessment procedures is one of the most effective safeguards for preserving the integrity of the assessment procedures and protocols (Dandan et al, 2017).

Faculty Performance Evaluation

Conflicting demands of using performance evaluations to make salary and promotion decisions as well as identify professional development needs diminish their usefulness (Murphy, 2020). Performance evaluation systems for faculty typically use some type of categorical assessment (e.g., needs improvement, meets expectations, exceeds expectations), with several subcategories of evidence used to determine the appropriate category in research, teaching and service. In systems which allow merit pay increases for top performing faculty, the average salary increase ends up virtually identical to average performers or poor performers. This is especially true if pay increases are split between across-the board market adjustments and discretionary increases from a merit pool. Such systems breed more cynicism than motivation (Murphy et al, 2018).

Sulkowski et al (2020) note that performance appraisals with heavy parameterization of evaluation criteria serve to disenfranchise service-oriented faculty. This can be particularly problematic in universities with a long history of public service missions such as the land grant universities and the old "normal" schools in the United States. As these institutions attempt to adopt modern performance appraisal systems modeled on best business practices, they can demotivate faculty who chose the position out of a sense of public service. The authors review data from interviews with university administrators who note the lack of consequence for poor performance and the demotivation of faculty meeting expectations in teaching and research but not recognized for prosocial behaviors and public service, including service to the institution.

Brown et al (2018) reviewed 230 articles on the subject of performance management and found that 62.6% of the articles investigated Performance Assessment, but only 10% researched the importance of aligning employee goals with the overall institutional goals. They note an overall lack of holistic approaches to performance management with most institutions relying instead on Performance Appraisals that are not clearly linked to non-parametric measures such as ethical behavior, good citizenship, and teamwork. This is an important finding for implementing effective assessment systems. If an institution has a high-priority goal of effective assessment, then performance appraisals should place a high weight on evaluating faculty contributions to assessment.

Based on the literature review (Brown et al, 2018), it appears that performance appraisals in higher education have limited effectiveness in rewarding high performing faculty, may demotivate faculty who embrace a public service motivation and provide no realistic system for attaching negative consequences to poor performance. This is particularly problematic for administrators charged with the assessment of programs in their units. Assessment is a program-level activity that requires a high level of integration between individual classes and instructors. In other words, faculty participation in program assessment is part of the non-parametric evaluation problem alluded to by Brown et al (2018). Therefore, administrators charged with developing and maintaining effective assessment programs need to have systems in place that minimize faculty time, are repeatable over time, and can be easily evaluated and extrinsically rewarded.

The following sections outline an integrated assessment program in an academic unit (the School) with three construction programs. The integrated assessment program utilizes common syllabi, critical course assignments, learning management software, data queries of the gradebook embedded within the course shell housed in the LMS, and formal review of effective assessment as part of the annual performance evaluations of faculty within the School.

Program Description

The School was created in 2016 from the merger of three separate programs, a residential construction management program and a commercial construction management program in the Department of Engineering Technology and the concrete construction management program which was a stand-alone program. The merger required a revision of curricula in all three programs to eliminate duplication of similar courses and develop a more unified set of program goals and School mission. The faculty and staff of the newly formed School developed curriculum change proposals and new structures in academic years 2016/2017 and 2017/2018. The unified curriculum was launched in Fall 2018 with the addition of four new cross-disciplinary courses required for all students along with specialized courses in the individual programs. A significant revision to Program Learning Objectives and Student Learning Objectives was undertaken in 2018 with the following goals:

- Work with Industry Advisory Boards to develop individual PLO's for the programs
- Develop a smaller, more uniform set of SLO's for the programs while retaining some unique SLO's in each program pertinent to the specific disciplines.
- Map the SLO's onto the new curriculum and develop course learning objectives (CLO's) for each course
- Identify Critical Assignments in each course that would be used consistently to measure CLO's
- Track performance on CLO's over time to assess Program/Student Learning Objectives
- Integrate the School assessment plan with the University student objectives
- Develop an assessment plan that would adhere to the requirements of the three main accrediting agencies for construction management programs with only minor modifications.

Figure 1 below is a graphical representation of the process started in 2018:

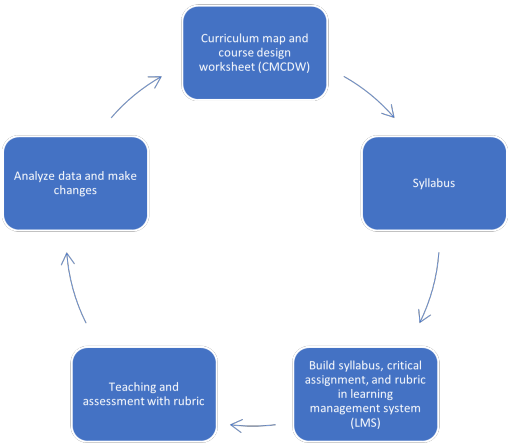

Figure 1: Program Assessment and Continuous Improvement

Curriculum Map and Course Design Worksheet (CMCDW)

The comprehensive assessment program development began by examining the university level outcomes that are developed by administrators at the institutional level. Next, it was imperative to examine outcomes and competencies that are prescribed by the regional and professional accrediting bodies. These requirements guided the development of the Program Goals and Student Learning Outcomes. The overall framework was developed to work across the three most active professional accreditors for construction related programs while simultaneously fulfilling the reporting needs for the regional accreditor for efficiency.

Once the Program Goals and Student Learning Outcomes were identified, the first step in developing the School's assessment plan was to develop course learning outcomes (CLO) that aligned with University Student Outcomes, Program Goals, and the Student Learning Objectives of each CM program. Next, each course was assigned a "lead faculty" who was charged with identifying and assigning required resources, texts, and materials. The lead faculty was also asked to develop a learning activity matrix that included a critical assignment and assessment rubric with at least one grading dimension for every course learning outcome.

Syllabus

Once the Course Design Worksheet was completed for each class, the lead faculty developed a course syllabus that included course ID, course title, units, catalog course description, course learning outcomes, course resources, course prerequisites, course co-requisites, and course assignments from using a common template for all classes in the School. The syllabus identified point values and due dates for assignments, projects, and required learning activities, including the critical assignments that were to be used for assessment purposes. Lastly, a weekly course schedule was added noting which topics would be covered during the fifteen week semester and the class rotation for an academic year. The template provided consistency for student learning, but also enhanced the process for faculty as they seek to update syllabi each semester and occasionally need to add standard language implemented by the institution.

Build syllabus, critical assignment, and rubric in the Learning Management System

After the course structure and syllabus were developed, the course material needed to be loaded into the LMS. The master course template in LMS used placeholder entries for generic information such as instructor, office hours, and for due dates on the assignment breakdown and course schedule. Course sections in LMS can be generated from the master course template to specific course sections each semester. This allows for sections to be taught by various faculty with a common syllabus and more importantly, a common critical assignment for assessment. Create an entry in the LMS gradebook for the critical assignment and attach a rubric from the model that was developed in the CMCDW. This process also creates efficiencies for faculty as they update courses each semester. Rather than building courses each semester faculty now update the master template and copy that template to their course sections each semester.

Teaching and assessment with rubric

Once the course was set up in the LMS, the course was offered for instruction. The critical assignment was distributed, collected and evaluated using the assessment rubric in the LMS.

Analyze data and make changes

After all courses have been delivered at least once, the faculty member assigned responsibility for assessment generated reports using LMS rubric analytics. This data was analyzed and evaluated to determine student performance in the Learning Outcome areas for both the School and the University. These findings were reported in the university's assessment program and in the self-study report for the accrediting body, along with action plans for enhancing the student learning experience. The data reports are created by the LMS and downloaded into Excel files. From these files the student data is organized by concentration so data can be tracked in this manner for assessment reporting purposes. Breaking assessment data down by concentration allows for a more detailed analysis to determine how well students are being served by the curriculum and whether modifications need to be made at the course or program level.

Implementation

Since Fall of 2018, the faculty and staff at the School have been working on implementation of the integrated assessment plan described above. The framework has been fully implemented and the courses in this system have all gone through a complete cycle. Approximately half of the classes are fully integrated into the new assessment plan with critical assignment rubrics being incorporated into LMS grading shells or formulas for converting student performance data into the assessment metric. One of the goals is to have a rubric embedded in class offerings within the LMS to reduce faculty burden. Such efficiencies should lead to a more sustainable assessment process over time and reduce data loss associated with faculty attrition and replacement.

The system is robust with assessments integrated into regular class offerings and standard assignments. Faculty grade and assess the critical assignment as part of the standard teaching duties. Embedding the graded and assessed critical assignment into the course gradebook housed in the LMS eliminates the need for separate archiving of assessment data. The gradebook in the LMS can be queried to extract student performance on the the critical assignment and sort it by declared major for reporting in the individual programs. The query language can also analyze the data to determine if Student Learning Objectives (performance targets) have been met. The standard 1-4 assessment rubric that is developed for each critical assignment can be transformed from however many points are assigned by the instructor. Class learning objectives and critical assignments do not vary by instructor or over time, allowing for stable and accurate scoring, intuitive reporting, and timely data analysis. A redacted example of a portion of extracted assessment data is provided in Table 1 below.

	Excel Schedule (CLO 1) 75% will score above 3	**Network Diagram (CLO 2) 75% will score above 3**	**MS Project schedule (CLO 3) 75% will score above 3**	**Master format ID Quiz (CLO 4) 75% will score above 3**
CCM	3.00	4.00	1.00	3.00
CCM	4.00	3.00	4.00	4.00
CCM	3.00	4.00	2.00	3.00
CCM	4.00	3.00	3.00	2.00
CCM	2.00	3.00	2.00	4.00

CCM	2.00	2.00	4.00	4.00
% above 3	67%	83%	50%	83%
Meet Target?	**NO**	**YES**	**NO**	**YES**
LDRB	4.00	4.00	3.00	4.00
LDRB	3.00	1.00	1.00	2.00
LDRB	4.00	3.00	4.00	4.00
LDRB	1.00	3.00	2.00	3.00
LDRB	4.00	1.00	1.00	3.00
% above 3	80%	60%	40%	80%
Meet Target?	**YES**	**NO**	**NO**	**YES**

Table 1: Assessment Data Extracted From Gradebook in Learning Management System

The example above is for the Scheduling class taught to all construction management students in Commercial Construction Management (CCM) and Land Development and Residential Building (LDRB). There are four critical assignments in the scheduling class that are used for both class assignments and program assessment. The scheduling class addresses several Student Learning Outcomes:

- Students will be able to demonstrate the ability to apply mathematical concepts to the interpretation and analysis of quantitative information in order to solve a wide range of problems. This SLO is assessed by two critical assignments, the Excel Schedule assignment and the Network Diagram assignment.
- Students will be able to recognize when information is needed and have the ability to locate, evaluate, and use the needed information for a wide range of purposes. This SLO is assessed by one critical assignment, the MS Project Schedule assignment.
- Students will be able to think in a way that is clear, reasoned, and reflective, informed by evidence and aimed at deciding what to believe or do. This SLO is assessed by one critical assignment, the CSI MasterFormat Quiz.

In the gradebook set up in the LMS, each of these assignments was given a set number of points based on the difficulty and time required to complete the assignment. For instance, the CSI quiz is worth 40 points, and the MSProject schedule is worth 150 points. These two critical assignments were both extracted from the gradebook and converted to a common 1-4 scoring rubric based on ranges. For the CSI quiz, students scoring 35-40 were placed in category 4, students scoring 25-34 were in category 3, those scoring 15-24 were in in category 2, and those scoring 0-14 were in category 1. The target criteria for success was that 75% of the students achieved a category score of 3 or higher.

For each CM class in the curriculum, the query language extracts scores for critical assignments from the gradebook in the LMS, categorizes the student grade into a category 1-4 corresponding to a uniform assessment rubric, sorts the scores by major (residential or commercial), calculates the percentage of students achieving the target, and creates simple YES/NO cells on whether targets were met or not by major. This system allows administrators to quickly determine which SLO's are being met for each of the programs in the School and develop a continuous improvement plan to address deficiencies.

To facilitate implementation of the new assessment program at the School, assessment performance was made part of the annual performance review for all instructional faculty. The annual review asks

faculty to provide the Director a copy of their syllabus, which is reviewed to make sure class learning objectives are clearly identified, the critical assignment is included in the syllabus as a graded assignment worth an appropriate amount of points to motivate student performance, and the syllabus conforms to the School's standard template. In some cases, the Director is added as a reviewer to the LMS course shell in order to review the set-up of the gradebook to allow for data extraction. Spring 2021 was the first time assessment performance was included in the annual performance review. The next step in the performance review will be to set up a series of extrinsic and intrinsic rewards for completing the critical assignment, maintaining a conforming syllabus and participating in the analysis of the data. Some of the rewards under consideration include making additional travel funds available to faculty who fully participate in assessment, recognizing faculty who participate fully at an "assessment appreciation lunch" as well as through newsletters, updates to the Dean, and at faculty meetings. The inclusion of assessment performance in the annual review also allows the Director to note needs for improvement in the review letters of all faculty who do not fully participate in assessment and to set up professional development action plans to reduce deficiencies.

Conclusion

Challenges remain to implementation of the integrated assessment system at the School. One of the biggest challenges is explaining the system to new faculty and to adjuncts. The assessment system will be added to the on-boarding protocol for new hires starting next year. Embedding the assessment in regular course assignments is a good first step in motivating students to perform well, but student motivation remains a concern. Many of the critical assignments come near the end of the term in several classes, and student performance on the assignment may not be a robust measure of learning due to student fatigue, satisfaction with anticipated course grade or conflicting priorities in other classes. The faculty are asked to explain the importance of best efforts on the critical assignments to mitigate these concerns. Another challenge is to get faculty to fully commit to using the LMS and to participate in university training programs to become better at utilizing course shells to deliver content and archive performance data.

Approximately 100% of full-time non-tenure track and tenure-track faculty have fully implemented the system in their courses. Interestingly, approximately 33% of tenured faculty have fully implemented the system. There is optimism that seeing the benefits of the system with regard to curriculum enhancements (for the betterment of student learning) and implications for performance reviews and funding will increase engagement among tenured faculty. Administrative support for the extrinsic rewards will remain challenging in times of tight budgets, but aligning faculty performance in assessment to the School's goals requires that scarce resources be allocated where they can have the most impact in achieving effective assessment and continuous program improvement. This study is ongoing in nature and future papers will build on this work by providing comparative analyses to the legacy system – highlighting challenges and program related enhancements.

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