Mathematics & Computer Science Department Assessment Summary April, 2007

Overview

A summary of assessment efforts and results for the four department degree programs follows. The last section of this report discusses revisions to the assessment process itself over the past decade. The process is becoming more clearly defined while being more regularly scheduled and documented. Analysis of results has enabled us to improve curriculum and student learning.

Master of Science in Computer Science (MSCS) with an Emphasis in Distributed Systems

Since the inception of the Master of Science in Computer Science (MSCS) with an Emphasis in Distributed Systems (MSCS) program (1996-1997) the department has collected and retained student projects from the capstone course. Examining both the capstone course and the resulting student work products has provided many insights into both successful and problematic areas of the MSCS program. A formal program review involving a team of full-time faculty was carried out in the summer of 2002. Given the small scale of the program, this approach has been feasible and generated some significant refinements to the MSCS curriculum. Student difficulties in implementing a client/server solution for the capstone project lead to the development of a new course on Distributed Applications Development. After changing the curriculum a significant improvement in student performance was noted in subsequent capstone courses. Some of the revisions are evident in changes to the graduate catalog that are summarized in a separate exhibit. See HLC3.a_Assessment_Catalog_Changes_M&CS_Dept_SBT

Formal data collection procedures consistent with the evolving School of Business and Technology processes were implemented beginning in 2004. The new procedures involve collecting several kinds of data including: course summary forms for program learning outcomes; samples of student work products; samples of scored student work; and course documents prepared by the instructor for student use. The procedures are being applied to several courses on a rotation basis.

Overall, the analysis of data supports effective student learning, mastery of important concepts and a demonstrated ability to apply knowledge and skills. We also noted several problems. Students struggled while applying a conceptual design tool known as the Unified Modeling Language (UML) in the capstone course. After making adjustments to the curriculum, student performance in applying UML improved dramatically. Review of Data Communications revealed a section using materials that were not consistent with the intended course content. This finding confirms the importance of advocating for consistency across sections. Implementation of the sample syllabi, faculty course guides and section summaries will assist us in communicating and monitoring the curriculum. A summary of data collection and evaluation results is provided in a separate exhibit. See HLC3.a_Assessment_Data_ Collection_&_ Eval_ Recap_M&CS_Dept_SBT and HLC3.a_Assessment_ Data_Collection_Recap_M&CS_Dept_SBT

Bachelor of Science in Computer Science

Early and ongoing assessment efforts focus on several pairs of capstone courses. In 2004, four faculty members meet weekly to coordinate learning outcomes and evaluation criteria for student projects in the database courses. We learned a great deal from the process and generated more learning outcomes, common project specifications and detailed evaluation rubrics. Analysis of the resulting rubrics indicated less variability across sections and identified several topics to strengthen including normalization.

The evaluation rubrics served as the model for the next wave of data collection via course summary forms. During pilots involving two capstone course pairs, over 80% of students met or exceeded expectations.

In 2006 the pilot was expanded to the full program with data collection from selected courses scheduled on a rotating basis. Initial results, while limited, are positive for students completing operating systems and data structures. The faculty is discussing issues related to students that are not able to complete Data Structures II.

Bachelor of Science in Mathematics and Bachelor of Arts in Mathematics

Pilot assessment results in the Mathematics programs have been extremely positive and provide evidence that the department's approach to content mastery is successful. Efforts have focused on Calculus I because students must successfully master the first course in the sequence to succeed in later courses. Another motivation for the focus is that Calculus I is a required course for science majors. Each student takes over 50 quizzes per semester that provide a meticulous view of student learning that is both comprehensive and itemized by topic. While this analysis has always been part of Calculus I, formal reports were prepared beginning in 2004. Analysis indicates that each year 85 – 89% of all quizzes are completed successfully. Additional upper-division courses have been added to the assessment cycle for 2006-2007.

Departmental Assessment Processes

The very tools we, as a department, use to assess student learning have also been considered. We have noted problems with existing processes and systems. Revisions have been implemented with mixed outcomes and further modifications applied. In this way our collection and analysis systems have continued to evolve over the past decade. In turn, the systems help us affirm or make changes to the curriculum to improve student mastery of learning outcomes.

The department of Mathematics and Computer Science has long relied on students demonstrating mastery through the practical application of knowledge. Programs require students to demonstrate proficiency by completing real-world tasks or building projects. Sizeable archives of student work products have been maintained over the past decade. Such authentic assessment activities are embedded in the curriculum. Most often this is implemented via capstone courses with detailed project specifications and evaluation criteria. The faculty continually examine student performance, update course content and refine project requirements. The results over time indicate more effective communication with students and more successful completions of projects.

Similarly, curriculum revision has been a continuous process in which adjustments are made typically every academic year and more often when needed. Changes were communicated to instructors at first by informal communication and later by annual adjunct meetings. In 2001, the department began developing systems to document and share syllabi and course guidelines with our instructors. This system has been revised many times evolving into the school's Faculty Course Information portal. We found the improved communication with instructors increased the consistency of course content and helped to identify problems areas in student learning and curriculum. An exhibit details some of the changes to the university's academic catalog. See HLC3.a_Assessment_Catalog_Changes_M&CS_Dept_SBT

Beginning in 2004, we started implementing a formal and more structured approach to collecting and analyzing data about student learning. Our first effort at defining and documenting a formal assessment process was cumbersome with several confusing areas. After experience with the process we streamlined the 10 step process, reducing it to a six step process. We also improved the logical flow from program learning outcomes through to the data collection and analysis.

While we still value the qualitative data and dynamic processes of the past, new processes bring benefits including regular data collection schedules, more effective communication with instructors about goals and outcomes, and better ways to document both problems and successes.

Conclusion

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The results from the assessment process have helped us identify and resolve several problems, improved student learning and confirmed that students are mastering program learning outcomes.