Work In Progress - An Evidence-Based Intervention System to Enhance Engineering Education

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Abstract - **A major difficulty in assessment is the problem known as 'closing the loop' –ensuring that assessment data is used effectively for program improvement and to enhance student learning. There are a number of reasons why current assessment procedures do not always succeed at this necessary phase of the process. First and foremost is that assessment has been tied to accreditation and viewed by many faculty and administrators as a necessary evil to be dealt with as little expenditure of time and effort as possible. As long as some program changes can be linked to the assessment process –thus satisfying the external accreditors—the bulk of the data being collected can be safely ignored. A second factor is the data itself. In order for the assessment process to be effective, the right kind of data must be collected in the right amount. However, there seems little consensus as to the kind and amount of data to collect. Finally, the nature of faculty instruction in higher education can itself be an impediment. Faculty instructors are often unaware of how their particular courses fit into the overall curriculum, beyond vague knowledge of what pre-requisite courses should have been taught.**

A partial solution to these problems is currently under development through a partnership between Drexel University and Untra Academic Management Solutions, LLC. The proposed solution is the development of an Instructional Decision Support System (IDSS). We define an IDSS as an interactive computer-based information system which links student characteristics, student performance, instructor characteristics, learning outcomes, and instructional methods to inform faculty decisions on the appropriate educational pedagogy to improve student learning. As envisioned, the IDSS provides student and course data in context to each faculty instructor as he or she teaches their course.

I. INTRODUCTION

Assessment practices have become necessary evils in academia which result in inefficient methods of data collection and application. Programs often collect too much data and are unable to properly manage it—or collect data that seems only remotely related to the instructional process or student learning. Additionally, because assessment is linked to accreditation, and accreditation is recognized as an administrative issue, assessment data management often becomes overly bureaucratic. Data is collected, organized, stored, occasionally scrutinized by a program administrator or committee, analyzed, reanalyzed, suggestions may be made concerning possible improvements, then such suggestions undergo a similarly complex process. By the time decisions are made about how to improve the program using the collected data, the information is no longer relevant. The loss of immediacy in data impact decreases the relevance of the assessment process for both faculty and students, thus decreasing the level of care with which both groups treat the process.

Drexel University School of Biomedical Engineering, Science and Health Systems has been working in collaboration with Untra Academic Management Solutions, LLC since 2003 to develop the Academic Evaluation, Feedback and Intervention System—AEFIS. AEFIS is the web-based academic assessment management solution that automates best practices in assessment and evaluation in order to enhance curriculum development and streamline accreditation processes. AEFIS serves as the platform for the development of the Instructional Decision Support System (IDSS). The implementation of three tools will support this system in its earliest deployments:
1. Incoming Student/Course Profile (ISCP)
2. Course Rationale and History Profile (CRHP)
3. Evaluation Results, Notes and Recommendations (ERNR)
These tools apply the real-time assessment data organized in AEFIS to program, curricula, and course planning.

II. EXPECTED OUTCOMES

The three tools cited above are applied to the Syllabi Manager of AEFIS. Faculty developing course content view the details within these tools to be applied to their courses' syllabi directly. The **Incoming Student/Course Profile (ISCP)** delivers relevant student characteristics—learning styles [1,2], course load, work load, lifestyle, etc. to the syllabus

development process. Additionally, it provides current performance data to show achievement on performance metrics in previous courses related to the current course's materials. With this data the IDSS will be able to provide suggestions for instructional approaches, to include definitions of terms (what is meant by global or visual learning, etc.) and links to possible instructional approaches for students with such characteristics.

The **Course Rationale and History Profiles (CRHP)** best explains how courses fit into programs' curricula. These profiles link pertinent course information including performance criteria and/or student learning outcomes associated with the course. More so than a listing of prerequisite courses or course numbers, which faculty may be accustomed to, the IDSS will provide information regarding students' educational experiences prior to current class and what students can expect to encounter in courses to follow. Bringing together this data will demonstrate the value of the course to explain how learning course material will facilitate program goals—more importantly how such course materials will facilitate student goals. Furthermore, the system will provide information from industry. Introducing feedback from alumni and industry professionals will integrate academic approaches and practical information from the field to syllabi development.

The IDSS is based on continuous data entry and application. The longer the system is used the stronger the evidence bank will become. As such, surveys and course evaluation data procured each term will be added to the syllabus development process. **Evaluation Results, Notes and Recommendations (ERNR)** summarize the assessment data for courses. Plus, first hand feedback from faculty and students will be shared term after term with incoming faculty instructors. Any direct measures of performance of previous students will be shared as well. This data can be group to demonstrate correlations with student characteristics and instructional approaches. Recommendations and faculty notes may be as simple as thoughts on using the required textbook to more complex notes on assessment findings. The data shared among faculty will be searchable and properly archived to be applied most appropriately.

These tools effectively demonstrate the context of courses and students as part of greater programs and curricula.

III. IMPORTANCE TO THE EDUCATIONAL COMMUNITY

The concept of the Instructional Decision Support System is new and will have wide-spread applicability in education at both the college and K-12 levels. The knowledge management approach being developed will simplify data collection and analysis concerning the effects of student and instructor characteristics on student learning, support additional studies at other institutions and at other educational levels. More so

than adapting to the culture of assessment, the IDSS invites academics into a culture of effective learning. The development of the IDSS Approach improves educational processes for all user groups. The IDSS enables faculty to access to specific information enabling them to create a superior learning environment for their students. Administrators can utilize the embedded assessment protocols and knowledge management necessary for maximizing student productivity and maintaining accreditation. Student education becomes more personalized and effective, learning to a better return on investment for tuition. And finally, business, industry and government benefit from better workers and better citizens resulting from a more personalized learning and effective educational experiences.

The IDSS Approach creates opportunities for shared learning. Educators will have access to notes and profiles that will address past educational experiences—what works and what doesn't work. This sharing of information will demonstrate evidence based decision making processes that will facilitate efficient institution-wide communication to ultimately strengthen student learning.

Real-time data collected and applied over time will result in continuous academic improvement. This is what accrediting and government agencies are seeking from higher education institutions. As institutions feel greater pressure to demonstrate the return on investment for the rising costs of education this evidence finds its appropriate place in the accreditation process. This is the final link necessary to bring together assessment and accreditation practices.

IV. PROJECT STATUS/PRELIMINARY RESULTS

In their earliest forms, these tools will be deployed to Drexel University School of Biomedical Engineering, Science and Health Systems in Summer 2010 with AEFIS 3.0. As a collaborator Drexel University will apply data gathered since January 2009 to the IDSS tools.

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