From Knowledge to Action: Leveraging Analytics for Mentoring Undergraduate Engineering Students

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INTRODUCTION

Our collaborative research project is currently investigating how academic mentors are analyzing and utilizing real-time data on undergraduate students' academic progress gathered from CTools and other enterprise systems on campus. The context is the M-STEM Academy, an academic support program aimed as increasing success and retention in undergraduate engineering.

Our research lies at the intersection of learning analytics-based interventions and mining Learning Management System (LMS) data, where the use of LMS data has been demonstrated to provide a useful stream of data to support just-in-time decision-making around students' academic performances. Within this realm, we aim to addresses the gap between identification of a problem and defining specific interventions.

RESEARCH QUESTIONS

(1) What types of data are accessible and analyzable?

(2) How do M-STEM mentors integrate the EWS into their regular work practices? What are the barriers?

(3) What interface design elements are meaningful and actionable for academic mentors?

CONTEXT

The M-STEM Academy provides an integrated student development program for **first- and second-year undergraduate engineering students**. M-STEM is aimed at increasing academic success and retention of students.

Students enrolled in M-STEM participate in a variety of core activities including:

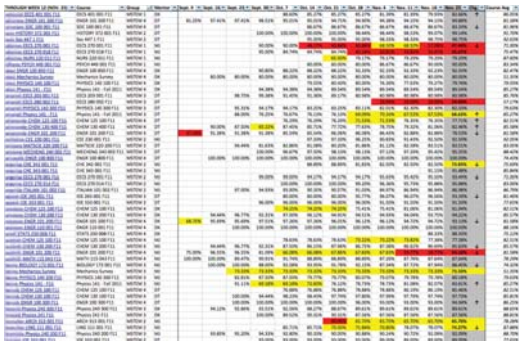
- summer transition program
- program living community
- peer study groups & mentoring
- monthly meetings with their academic mentor

The Early Warning System (EWS) developed in this project provided M-STEM mentors with frequent updates on students' academic progress and streamlined the presentation of data to allow immediate identification of students in need of support.

DESIGNING AN EARLY WARNING SYSTEM

CTools Data Sources

- Gradebook
- Assignments
- Logins / Hits

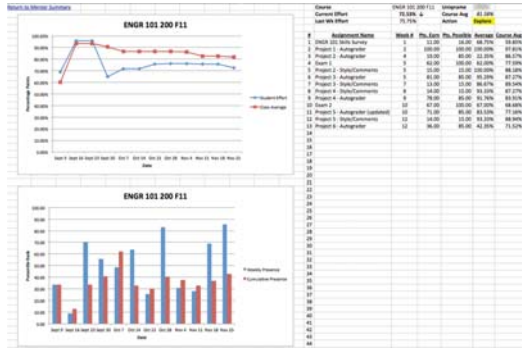


The summary sheets provided a broad overview of all students. Student performance and engagement were classified as:

- encourage
- explore
- engage

Classification Rules

(1) Student performance 〉= 85%, 75%, or 65%
(2) Student performance 5% or 10% 〈 course average
(3) Student logins / hits 〈 25th percentile



The detailed sheets provided figures depicting an individual student's academic progress.

These detailed individual student displays supported mentors in examining students classified as "explore" or "engage".

FUTURE WORK

- Develop student and instructor displays of relevant data in a motivational manner.
- Scale up within the College of Engineering and expand to other STEM "academies" at Michigan.
- Include registrar and admissions data appropriately to add information about which students might have difficulty with particular courses.
- Integrate additional CTools data, as appropriate (e.g., resources downloads).
- Construct tailored messages to students that will supplement mentoring activities and encourage help-seeking behaviors.

A PROXY FOR "EFFORT"

Functional data analysis techniques: explore relationships between students' use of specific LMS tools & their final course grades.

Little evidence found that related frequently utilized course tools to course grades. Rather, **a positive correlation was found between overall site log-ins and final course grades.**

MENTOR EWS USE

Specific patterns of use & informing iterative design:

- Version 1 - Mentors reported that displays were useful for identifying students who no longer participated in regular mentoring activities.
- Version 2 - Mentors liked the ability to view a list of individual scores underlying a student's overall performance; this information was useful for focusing their 1-on-1 interactions with students.
- Version 3 - Arrows added to quickly indicate movement from week-to-week.

WHY FOCUS ON MENTORS?

Mentors provide a manageable audience to explore design features that can later be applied to faculty and student audiences.

Students who fall behind are less likely to engage in help-seeking behavior and can become "stuck" in a pattern they don't know how to confront.

Mentors are uniquely positioned to discuss course requirements with faculty and apply that knowledge when engaging with students.

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M-STEM Academy

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