Choosing a Web Based Homework Delivery System

Nancy Leveille
University of Houston-Downtown
leveillen@uhd.edu

Abstract

This study presents the implementation process, using best practices, for choosing a web based homework delivery system undergone by one department at a wireless, diverse, mid-sized, urban, open-admissions university in the southwestern United States. The topics in College Algebra are similar to those in courses taught worldwide. Though changes were mandated by outside forces, choices were made by the faculty at the department level. Many aspects of the changes were data driven. The process of implementation was developed over several years due to the necessity of making refinements as well as to the desire of including all stakeholders in the collaborative effort. The successful implementation of homework assignments transitioning from hardcopy format to a web based format are expected to have at least two worthwhile outcomes: (a) students will be more successful in the course due to the continuous availability of online assistance, and (b) faculty workload will be decreased due to a reduction in the amount of homework grading.

Introduction

Several departments at The University, a pseudonym, have recently adopted web based homework delivery systems. More particularly, several courses in the mathematics department at The University have recently offered faculty the option of assigning student homework in a hardcopy or in a web based format. The process undergone for choosing the web based homework delivery system for the College Algebra course will here be discussed in detail. The change in the homework process was part of a major redesign effort to modernize the course and include best practices from current research literature. In order to increase the time and effort students spend on homework, study for tests, and work on the course in general, the use of a publisher's online materials is being incorporated into the course.

Problem

College Algebra, or our alternate College Mathematics for Liberal Arts, is the Math 1314 minimum core curriculum requirement for baccalaureate degrees in the state's public colleges and universities. During January 1999 the university administration informed the department that the pass rates for the foundations courses, known elsewhere

as remedial or developmental, needed to increase to at least 60%. The pass rates for the courses were not known by the faculty in the department. Some, but not all, individual teachers calculate their own pass rates for the sections they teach. However, in order to know the pass rates, they needed to be calculated. The College Algebra pass rates were investigated along with the two foundation courses pass rates (See Table 1 for the known College Algebra Pass Rates). When the pass rates were reported (Waller, 2004, 2006)

Table 1
College Algebra Pass Rates

Fall 1998	Spring 1999	Fall 1999	Spring 2000	Fall 2000	Spring 2001	Fall 2001
37%	37%	35%	29%	39%	33%	37%
N=908	N=786	N=977	N=595	N=976	N=809	N=1036

Spring 2002	Fall 2002	Spring 2003	Fall 2003	Fall 2004	Fall 2005
32%	36%	35%	39%	38%	44%
N=801	N=962	N=832	N=1035	N=1053	N=1023

there was great concern. There were fluctuations in the pass rate for College Algebra, but with such low pass rates, it was acting as a gatekeeper course.

The Process Leading to Change

Two faculty members, unhappy about the general lack of student success in their College Algebra sections, had started to investigate the problem in 1994. They concluded that a minor change such as a change in the textbook would not be sufficient because the available textbooks at the time were all very similar and just repeated high school curriculum. They undertook the task of devising a new college algebra curriculum. Some of their criteria were: (a) a conceptual orientation, (b) real world applications, and (c) meaningful incorporation of technology as an integral part of the course. They wrote new college algebra materials with a unifying functions approach and continuously revised them over several years teaching College Algebra. Discussing their materials with others in the department, over time they were able to recruit more faculty members to utilize their materials. Statistically significantly higher pass rates were consistently obtained in the sections using these modern curriculum materials compared to those whose teachers used a traditional approach. For example, a 55% pass rate with n=29 was achieved in the spring 2005 semester by one section using the newly developed curriculum.

As part of The University accreditation process, in the Spring 2006, a Quality Enhancement Plan (QEP) was developed that identified College Algebra as one of the three "key 'bottleneck' courses, i. e. high enrolment, high-attrition courses that have a significant impact on student success" (Waller, 2006). In the summer of 2006, a College Algebra Textbook Selection Sub-committee was formed by a department Assistant Chairperson. The committee was charged with selecting a book that would meet the needs of new learning objectives outlined in the QEP documents (The University, 2006).

The accreditation committee's required changes were based upon current research reports such as "Connecting the Dots: Multifaceted Analysis of the Relationship between Student Engagement Results from the NSSE, and the Institutional Practices and Conditions That Foster Student Success" (Kuh, Kinzie, Cruce, Shoup and Gonyea, 2007).

Changes required by the accreditation agency and proponents for change within the mathematics department were in agreement. The process of changing College Algebra, though mandated for accreditation, met some resistance in the department. The four-member College Algebra Textbook Selection Sub-committee proceeded carefully.

The Change Process

The change process itself had really begun years before the charge to change the textbook. However, the new sub-committee was looking for a textbook with features that support the official learning objectives, mandated in the QEP documents, such as: (a) modeling with functions, (b) reasoning appropriately, and (c) interpreting and using function notation. A textbook with a modern approach that promotes active learning in college algebra was needed. Suggestions for textbook to be considered were solicited from all department faculty members.

The response to the sub-committee's request for faculty to volunteer for a pilot study using new books was very positive. In the fall 2006 semester, four new books were used by a total of six different faculty members in a total of nine different sections. That left about two-thirds of the sections to use the traditional, official department textbook. In the spring 2007 semester, six new books were used by a total of eight different faculty members in a total of 13 sections which was about half of the total sections offered. The committee reviewed the 31 textbooks on the official October 30, 2006 list and several added in the spring semester. The listed books came from eight different publishers. The sub-committee chairperson, and others, attended presentations of the publishers' on-line products at several conferences and reported back to the committee. Meanwhile, several publishers presented their books and on-line products to the faculty at department meetings throughout the year.

There were two main concerns from the Instructional Technology Department. First, personnel were neither available nor trained to support the potentially large number of new students who might require IT support due to the availability of a new online homework system for College Algebra. Second, the publisher would have full control over student data and thus there were confidentiality and records retention issues. The first concern was alleviated because all the publishers under final consideration were willing to provide training for mathematics department faculty and staff. The mathematics department agreed to support and update its computer labs as needed. The second concern was resolved because the publishers upgraded their access and security procedures.

Results

The College Algebra pass rates during the year of pilot-testing new textbooks showed dramatic differences (See Table 2). With one section of College Algebra per semester listed in the course offerings as a Computer Based Section, most students randomly select their course sections. Though students may prefer to study with a teacher

Table 2
College Algebra Pass Rates During Pilot Study

Fall 2006		Spring 2007	
56 %		52%	
On-line Homework	Traditional	On-line Homework	Traditional
63%	51%	57%	50%

they have been successful with in previous courses, the choices are made with consideration mainly for their work and family commitments. Faculty rotate through the departments course offerings with a few specializing in College Algebra as one of their courses.

This was an especially successful year due to either a strong student population, the Hawthorn effect, or some other factors that have not yet been investigated. A more detailed look at the pass rates show a statistically significant difference (α=0.05) for one textbook in particular (See Table 3). With a pass rate of 65%, sections using the Rockswold textbook with MyMathLab Homework assignments were 3.9 standard

Table 3
Rockswold with MyMathLab Comparison for Spring 2007

	Number of Students Passing	% Passing
Rockswold Sections	109/168	65%
Non-Rockswold Sections	248/518	43%

deviations above the 50% mean of the pass rates. This result was not known at the time of the sub-committees' decision.

The choice of department text book was made before the spring semester course results were known in order to place the book order for the fall 2007 semester. Department members were solicited for input via an *On-line Mathematics Materials Comfort Survey* and all current College Algebra faculty were asked for input through the *Math 1301 Textbook Questionnaire 200720.* The sub-committee met at the end of the academic year and agreed to narrow the list for final consideration to those books that

had been pilot-tested. It was from this list that the sub-committee unanimously voted for the Rockswold book to become the department textbook starting in the fall of 2007. Their decision was made after careful consideration of input from the department, the QEP Committee, and current research literature (American Association of Two-Year Colleges, 2006; Koller & Baumert, 2001; National Council of Teachers of Mathematics, 2000).

Faculty, staff, and Supplemental Instruction Leaders attended various training sessions in order to become familiar with the new on line homework system for the fall semester. The department coordinator course is being copied and utilized in 23 of the 27 sections of College Algebra offered this semester. The future will show if the department has truly utilized a sustainable approach (Hargreaves, 2007).

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