

Leeward Community College Remedial and Developmental Math Redesign

Course Sequence

The seven community colleges of the University of Hawaii have been working collaboratively to address the issues around remedial and developmental classes since 2008. Of the 3,379 June 2008 Hawaii public high school graduates enrolled at the University of Hawaii Community Colleges in Fall 2008, 1680 or 49.7% were enrolled in remedial or developmental math classes. Unfortunately, almost 84% of student placed into remedial or developmental math courses. What was more discouraging was that of the students who enrolled in remedial and developmental math, only 57% successfully completed their courses by earning a letter grade of A, B, or C in their course. While this data represents all seven community colleges, Leeward Community College (LCC) student statistics are not significantly different.

Leeward Community College offers 4 math courses at the remedial and developmental levels that must be taken in sequence (after initial placement):

Math 1B – Basic Math Through Problem Solving (3 credits)

Math 22 – Introductory Algebra with Geometry (3 credits)

Math 73 – Algebraic Foundations I (3 credits)

Math 83 – Algebraic Foundations II (3 credits)

This Spring 2009 and Fall 2009 combined enrollments in these courses are as follows:

Math 1B = 100 students

Math 22 = 650 students

Math 73 = 975 students

Math 83 = 950 students

If students progress at the rate of previous semesters, then the overall DWF rates for these classes will be approximately 46%.

The academic difficulties that these completion rates pose for students are serious. For many students, failure in these courses not only provides barriers in pursuit of their academic goals but also poses financial difficulties associated with repeated enrollments. Finally, for many of these students, the possibility of working toward a major in STEM transferrable programs is almost non-existent.

These low success rates also pose resource challenges for the college as well. With surging enrollments due to the state of the national economy, not only are there classroom shortages but also difficulties in hiring a sufficient number of lecturers.

The goal of the LCC remedial and developmental math sequence is to take the current four courses and reduce it to two courses: Math 18 and Math 82. As part of this redesign, the faculty will work with college level math course faculty to clearly identify what students need to know to be successful in transfer-level math. Only those topics found to be essential will be included in Math 18 and Math 82. Reducing the number of courses will not only reduce the costs to the students and the college but also help to alleviate the compounded DWF attrition that accompanies long remedial/developmental sequences of courses.

Emporium Redesign Model

At this time, due to the limitations of physical space on campus, LCC will not be creating a single large computer lab that will be always available to. However, current classrooms will become additional labs, whose capacities will be added to the one existing math computer lab. The plan for implementation of the emporium model is as follows.

Each student will be required to attend one scheduled hour-long class each week in a computer lab classroom and spend a minimum of one documented hour each week in the math computer lab at the students' convenience working through the ALEKS software. In addition, students will be required to spend at least one additional hour "doing" math each week that does not have to be completed in an on-campus lab. Some students will find a total of three hours per week sufficient to keep on or ahead of a required progress schedule while others may need to spend a total of six or more hours working through the ALEKS software in order to maintain a satisfactory rate of progress.

Using the ALEKS software, progress through the course and the total weekly hours spent "doing" math will be monitored. If a student does not fulfill the minimum of three hours during the week working in ALEKS, then the student will be required to complete all three of the next week's time requirement on campus.

Two of the three proposed computer rooms will be designated as open labs and will be available on a space-available, walk-in basis into the evening. If every redesigned course student spends more than the three required hours working in ALEKS in one of these two on-campus labs, this could be problematic at peak times during the day due to the limited number of computers and space available. However, with the increased number of students with laptops, the math labs will be designed so students can work on their own computers if required or desired.

The weekly scheduled one-hour class meeting will be scheduled accordingly in the LCC Schedule of Courses so that students will have the greatest flexibility in selecting the class time that best meets their schedule. Students will be actively working on the ALEKS software during this mandatory class meeting. In addition, faculty will also use this time to further explain concepts, provide relevant examples and guide students, as well as speak individually with students in monitoring their progress, assist with individual questions and provide encouragement. The amount of time devoted to each of these activities will vary depending on the Math course and the progress of the students in each of these cohorts.

Assessment Plan

Due to the fact that the LCC Math Redesign is restructuring the content of the current four remedial and developmental courses into two courses, while preserving all the necessary components as determined by both the remedial and developmental as well as the college level math faculty, not all of the assessment models are suitable for this redesign. Therefore, data will be collected on the baselines of the "before" and "after" of the redesign. However, in regard to the measurement method, since students who complete Math 18 will be equivalent as students who complete Math 22, and students who complete Math 82 will have covered equivalent content as students who complete Math 83, the current consideration is to either use the comparisons of common content items selected from exams or the comparison of student work using common rubrics.

If using the comparison of common content items is recommended, both the traditional and redesigned courses will change their final examinations so that the common test items can be imbedded in the respective exams. In this way, direct comparisons of these embedded items can be conducted.

If the final recommendation is the comparison of student work using common rubrics, then faculty teaching the traditional and redesigned sections will have to agree in advance on how student performance will be judged. Unfortunately, this may be more difficult as the timing of getting agreement of all faculty might be short due to the time required to redesign four courses into two courses.

In addition, as the redesign includes conversations with college level math faculty, the current plan is to measure performance in follow-on courses.

Cost Savings Plan

The University of Hawaii and the Department of Education has been working very diligently over the past year on a joint Math Summit. The goals of the Math Summit have been:

1. Improve math pipeline leading to “career and college ready” math,
2. Improve alignment of courses so that students transition smoothly between institutions and courses, and
3. Prepare more qualified and effective mathematics teachers/instructors.

As part of goal one, the Department of Education has revised their policy to redefine the requirements for the Board of Education Recognition Diploma, effective for the class of 2013. These students will need to have received credit for four years of computational math and meet standards in Algebra 2. While not all public school students will graduate with this new diploma, the hope is that a greater number of students entering the University of Hawaii system will be ready for college level math. Due to this, beginning with the high school graduating class of 2013, LCC does not anticipate growth in enrollment for remedial and developmental math courses. Therefore, the anticipated cost reduction will come in the form of coordinated course development and delivery, substitution of interactive tutorial software for face-to-face class meetings, the substitution of automated grading, and substitution of course management software to handle course administration. In addition, each faculty can have more students enrolled in their course as technology will facilitate much of the time previously required of faculty, especially those dealing with grading and course administration.

In the existing remedial and developmental math sequence, there are four remedial and developmental courses taught each semester. LCC currently offers approximately 107 sections with 25 students in each section annually. Of these sections, around 60% are taught by full-time discipline faculty and 40% by lecturers (non-tenure track faculty on semester or annual contracts), with more sections typically offered in the Fall semester.

In the redesigned model, there will be two remedial and developmental courses taught each semester. Due to the increased class sizes, the coordinated course delivery, the reduction of dependence on lecturers, and replacement of some instructional faculty with paraprofessionals, the anticipated minimum annual cost savings is over \$90,000.

The cost savings will be used initially to improve the redesigned courses as there will be revision issues related to ALEKS upgrades. In addition funds will be used to provide ongoing professional development for the math faculty. This will be especially valuable as professional development funds have been severely reduced due to our current economy. In future years, the college will also look at redesigning college level math courses.

Learning Materials

The remedial and developmental math faculty carefully evaluated a number of interactive learning programs from different sources including ALEKS and MyMathLab. ALEKS was chosen because it meets the needs of the faculty and gives students the best opportunity to complete two courses in one semester.

When students first enter ALEKS, they are given an initial assessment containing around 30 problems that covers all of the topics in the course. This diagnostic test allows ALEKS to generate a customized learning plan for each student. After the initial assessment, students are presented with a “pie”. This pie contains “slices” which modularize the topics included in the entire course syllabus. Since the initial diagnostic assessment covers the entire course rather than a smaller amount of material (such as a chapter), both the faculty and the student get a clearer picture of how many of the course topics the student is familiar with and how many of the course topics the student will need to work on in order to meet the course learning outcomes.

ALEKS analyzes a student’s background and provides them with a menu of topics and problems they are ready to attempt. Students have the option of choosing which topic they would like to practice and master. This ensures that students do not work on material they are not ready for and gives them a more active participation role in their learning. Further, since ALEKS does not sequence topics by chapter, students will not have to plod through material they already are capable of doing just to get to the (possibly few) topics that they need to work on.

Students need to answer a representative problem correctly at least 3 consecutive times before that topic is considered mastered. This ensures that a single lucky guess is not interpreted by the program as mastery of the topic.

Each time a student has mastered approximately 12 topics, ALEKS will automatically call for them to work on a routine assessment, which are usually similar to, but shorter than, the initial assessment. These routine assessments help students retain topics that they have learned and notify them of the topics they may need more practice on. Complete assessments of all of the course material can be called for so that students can get a macro view of what they know and what they are unsure of. The student advantage of these assessments is better use of review their time and reinforcement of long-term learning as opposed to short-term memorization.

In addition to the assessments, ALEKS provides students with explanations, video lectures, step by step animation, the integrated textbook, and supplementary resources that are comparable to those offered in MyMathLab and other competing products.

To personalize the online instruction available on ALEKS and to provide another means of support for students, the faculty will create short (5-10 minute) video tutorials to be embedded in the learning management system to supplement the online tutorials. By providing the “local” face of the remedial and developmental faculties of the campus, it is the hope that as students seek help from faculty who will be staffing the math labs, there will be greater rapport between them.

Departmental Support

The seven community colleges of the University of Hawaii system has been working to realize the goals of the American Diploma Project. As part of this process, both the remedial and developmental Math and English faculty have decided that what we have been doing in the past is not meeting the needs of the underprepared students who arrive at our campuses. As previously noted, all the campuses of the University of Hawaii system have been engaged in conversations around how to help students succeed in the area of math on our campuses, regardless of their prior preparation.

At Leeward Community College, there is a willingness of faculty to take on the remedial and developmental math challenge and to pilot a redesign of these math courses. More importantly, there is recognition and support from the academic department that if the pilot is successful then all remedial and developmental math courses will be redesigned. Proposals to permanently establish the two new courses have been submitted to the faculty senate’s curriculum committee and have thus far been well received.

Finally, there is support from the student affairs personnel to reconsider terms of registration and awarding of credits, since due to the structure of these courses, motivated students could in fact complete all their math remediation work in one semester.