CHANGING THE EQUATION FINAL PROPOSAL

Submitted by
LEEWARD COMMUNITY COLLEGE

July 30, 2010

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Abstract

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)

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

Math 1B = 100 students
Math 22 = 650 students
Math 73 = 975 students
Math 83 = 950 students

The overall DWF rates for these classes were approximately 47%.

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. These low success rates also pose serious resource challenges for the college. With surging enrollments due to the state of our economy, there are classroom and lecturer shortages.

The goal of the planned course redesign is to take the current four courses and reduce it to three courses: Math 9 (Whole Number Operations, 1 credit), Math 18 (Essential Mathematics for Algebra, 3 credits), and Math 82 (Accelerated Algebraic Foundations, 4 credits) utilizing the emporium model and the ALEKS software program. As part of this redesign, the faculty will also 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 for success in subsequent courses will be included in the new courses. 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.

In the redesigned model, each student will be spending at a minimum of three hours "doing" math, one hour under guidance of the student's faculty in the classroom lab, one hour in the math lab with math faculty on hand for assistance, and a third hour either in the math lab or at another location of the student's choosing but using ALEKS. In addition, the ALEKS software will provide student immediate feedback of progress, as well as mediating their learning, to reinforce prior knowledge, while introducing new content. In this way, the student can be in charge of their own progress with clear goals. Finally, faculty will be closely monitoring student progress with weekly classroom interactions as well as reports generated by ALEKS. All of these factors should enhance the quality of the remedial and developmental math program and improve student learning.

Due to the fact that the LCC Math Redesign is restructuring the content of the current four remedial and developmental courses into three 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 the content of each of the new courses can be mapped to the content in legacy courses (Math 9 to Math 1B, Math 18 to Math 22, and Math 82 to Math 73 and 83), the current consideration is to use the comparisons of common content items selected from exams. Finally, as the redesign includes conversations with college level math faculty, the current plan is to measure performance in follow-on courses.

The redesign will involve changes in faculty roles as they will participate in coordinated course development and delivery (including standardized tests), substitution of interactive tutorial software for face-to-face class meetings, the use of automated grading, and substitution of course management software to handle course administration. In addition, each faculty will have more students enrolled in each section, as technology will facilitate course administrative duties. The redesign will primarily produce direct cost savings in two ways. First, the reduction in the number of remedial and developmental courses and credits will produce savings to the college since fewer faculty will be needed to serve comparable numbers of students. Second, larger total class sizes will be established so fewer faculty will be needed to serve comparable numbers of students. These savings far exceed the additional costs involved with providing the technical and tutorial support needed for a successful Emporium redesign.

The $40,000 Changing the Equation funds will be used to purchase computers and furniture needed to convert an existing math classroom to an Emporium computer classroom/lab.

APPLICATION NARRATIVE

Emporium Model Implementation

At this time, due to the limitations of physical space on campus, a single large computer lab will not be created. Instead, current classrooms will be converted to math computer labs resulting in two open computer labs and one computer classrooms. When the computer classrooms are not scheduled for class meeting, they will be available to students as additional lab spaces. The emporium model will be implemented as follows:

Each student will be required to spend a minimum of three hours "doing" math each week. They will attend one scheduled hour-long class in a computer classroom working through ALEKS, but with individualized guidance of their faculty. They will spend a minimum of one additional hour in the open math computer lab working through the ALEKS software. Finally, students will be required to spend at least one additional hour using ALEKS. This third hour does not have to be completed in the computer lab. ALEKS will be utilized to document and monitor these hours as it tracks the time students spend working through the material and reports the time students spend on task, the number of topics attempted and mastered, the rate of learning, and even projects the time needed for students to complete the course if similar learning rates are maintained.

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. The mix of required total and on-campus time on task will be adjusted upward at the first sign that a student is falling behind in the course.

If every redesigned course student spends more than the three required hours working in ALEKS in the on-campus computer math labs, there will be capacity issues at peak times during the day. However, since many students will be able to keep pace with course expectations using only the required three weekly hours. Further, with the increased number of students with laptop computers and wireless internet access available throughout the campus, especially in other study areas, students should not have access issues.
The redesigned courses will be offered in mastery format and restricted to a credit/no-credit (CR/NC) grading option. There will be four scored components necessary to earn CR for the course. The requirements are designed to allow students some flexibility with their schedules and pacing but not so much that they are allowed to fail the course even while abiding by the letter of the requirements.

The first scored component will be attendance and participation. Students must attend the scheduled weekly class meetings and must be engaged in ALEKS during the class session. Students will be cautioned that failure to work through ALEKS during the class session will be treated as an absence and that a student who accumulates more than 4 absences prior to completing the entire course will earn NC for the course.

The next scored component involves the modularization that is described later in this section. To earn credit, students must average 85% or higher on the 13 weekly modules in the course. This allows students some flexibility during weeks where personal or other coursework reduces the time available for working through the course but does not permit students to fall behind in the course.

The third scored component will be the ALEKS comprehensive assessment. To earn CR, a student must score at least 85% overall on an assessment that covers the entire course. The overall percent will be an average of their achievement level while practicing and a proctored, on-campus "final exam" style assessment. The average of the student's "at home" achievement level and the on-campus assessment will be used as the student's overall percent. Thus, a student who masters 100% of the course material while learning and practicing can score 70% on the proctored assessment and meet this requirement. To discourage students from putting course requirements off until the last minute, the on-campus assessment is repeatable only by students who achieve 100% of the course material and only until the last day of instruction.

The final requirement for earning CR in the course will be to successfully complete three or four paper and pencil quizzes that primarily test formatting and notation. These quizzes are necessary in order for students to demonstrate mastery of one of the departmental student learning outcomes: *Select and correctly utilize precise mathematical language and symbols to effectively communicate procedures and results*. These three of four quizzes should not be an undue burden on either the students or the faculty, but provide important documentation of students' recognition of, and ability to use, proper notation. Successful completion is defined as scoring at least 8.5 out of 10 possible points on each quiz. Videos and handouts will be created to show

and explain the correct use of notation so students will not be expected to pick these skills up on their own. Prior to the last day of instruction, these quizzes will be repeatable after an intervention that requires that students view the quiz video and work out one or more problems by showing proper notation.

Six Principles of Successful Course Redesign

Principle #1: Redesign the whole course

Though departmental syllabi exist for each of the legacy courses, departmental exit exams based on the syllabi and expectations of the next course in the sequence are only in their pilot stages. There has been some measure of resistance to these exit exams and student scores in the pilot project have ranged from unexpectedly good to quite disappointing. This suggests that there is some measure of compliance drift in the coverage and expectations of the legacy courses. This variance has a negative impact on students, some of whom find themselves repeat a course even though they mastered the skills needed for the next course while others receive a passing grade in a course only to find themselves lost from day one in the next course. The emporium redesign model provides students with a common set of materials and expectations regardless of the individual instructor of record.

Duplication of faculty efforts is less of a concern since Lead Instructors of legacy courses authored guides for teaching from the textbook and master courses in the accompanying computerized homework management system. Still, each faculty member still must create their own set of lecture notes, classroom activities, quizzes and exams for each course they are assigned to teach. Emporium redesign will reduce faculty workload, though to a lesser extent than if there were no Lead Instructors.

Rather than redesigning any of the legacy sequence of four 3-credit courses, the collective material is being reorganized into three new courses. The three new courses will all be offered only as redesigned Emporium Model courses and will completely replace the legacy sequence starting in fall 2011, when full implementation of the Emporium Model redesign begins.

The legacy 3-credit basic math course is being replaced by a 1-credit course covering whole numbers. The prealgebra, elementary algebra, and intermediate algebra courses are being replaced with two courses that rearrange and replicate the essential content in modular form so students are allowed to test out of the material that they are already proficient in and concentrate on only those topics that are new to them. This modularization in the Emporium Model provides a realistic avenue for willing students to meet the prerequisite to transfer-level courses in a single semester even when their initial placement put them into one of the lower-level developmental courses in the legacy sequence. In addition, the compression of the sequence from four courses to three can shorten the time to college mathematics course readiness by at least one semester even for students who do not take advantage of the acceleration that modularization in the Emporium Model allows.

Principles #2 and #3: Encourage active learning and Provide students with individualized assistance

The Emporium Model, as it is being implemented, requires that students be actively engaged in studying and practicing mathematics for a bare minimum of three hours per week, including a minimum of at least two hours per week on campus in a math computer lab. The role of the instructor will migrate from a demonstrator to a facilitator of learning. By helping students quickly and on exactly those techniques that they are having trouble with, faculty will enable students to get through the material far more efficiently than in the traditional model, where students might have to wait until minute 40 of a 50 minute presentation to address the particular difficulty they are having.

In addition to having faculty and tutor assistance readily available in the campus computer lab, students will also have ample access to just-in-time assistance from the ALEKS software and tutorial videos. Like most other instructional software, ALEKS will provide assistance upon student request. Publisher-created videos and pdf sections from an appropriate textbook are also available to students at the click of a button. In addition to the publisher-created videos, Leeward CC faculty will produce over 200 tutorial videos that provide "live" explanations of problems and techniques. Unlike publisher-provided videos that cover many learning objectives, these videos will be created to address the individual techniques that are included in the redesigned courses so once again, students will receive assistance on exactly the material they might have difficulty with. This encourages them to tackle the material that challenges them and move on, rather than stop in discouragement.

Principle #4: Build in ongoing assessment and prompt (automated) feedback

In the traditional model at Leeward CC, developmental math faculty do not generally collect homework but give quizzes on a daily or weekly basis. These quizzes are graded manually and returned at the next class meeting. Too often, students barely look at their errors or the comments on the quizzes and focus instead on the score and its potential affect on their course grade. One reason for this apathy toward their work is the two or more day delay between when the students do their work and when they receive feedback for the work. In contrast, the ALEKS software provides instant feedback. Students know immediately when they master a topic and receive immediate and supportively presented feedback when they have difficulties.

In the traditional model, redundant quizzes are not often used by faculty due to the time involved in correcting duplicate quizzes covering the same material as the prior quiz and because many students will not need the additional incentive to go back and study topics they did not quite "get" the first time. ALEKS will provide such reinforcement in two ways. First, a student who has difficulties with a topic will automatically be asked to work on more of that particular type of problem. In addition, ALEKS will automatically assign assessments covering the material a student has most recently worked on (as well as the prerequisite topics). This prevents a student from moving on unprepared. ALEKS will call for additional practice in any topics that might have been forgotten or not completely mastered the first time through.

Principle #5: Ensure sufficient time on task and monitor student progress

As described above, with full implantation of the redesign, students will be required to attend one scheduled hour-long class meeting each week and will be required to spend at least one additional documented hour working through ALEKS in a computer lab. In addition, students will be required to complete a weekly schedule in which they will budget additional study time

both on- and off-campus. Students will then be required to maintain a time sheet of their actual study time in ALEKS. Forms will also be provided to students for them to record and track their weekly module scores and quiz completions. While ALEKS software provides instructors with a variety of summary and detailed reports of students' time and progress, having students complete the schedule and ongoing time sheet makes them active participants in monitoring their work and progress in the course.

Tracking the additional required lab hour will be done in one of two ways. Due to cost concerns, manual tracking through the use of sign-in sheets is planned. While seemingly out-dated, this is the method that is currently used to track usage of the existing Math Lab and thus should not be as burdensome as it might first appear. However, if the planned computer lab renovations and equipment can be completed under budget, or if funding can be secured through existing budget reallocation, tracking software will be purchased to automate tracking of the required lab hours.

Principle #6: Modularize the student experience

The four legacy courses will be reorganized into three new courses. Content from the basic math, prealgebra, elementary algebra, and intermediate algebra courses will have a sequence of cumulative modules created using ALEKS' intermediate objectives feature will be used to measure students' rates of progress. 13 modules will be defined with one module being due at the end of each of the second through fourteen weeks of the semester. Students who complete a module early earn a score of 100% and can immediately begin working on the next and students who do not complete a weekly module will receive a score based on the portion of the module that the student mastered by the due date. Passing the course will require that a student's average of all intermediate objective module scores be at least 85%, which allows some leeway if a student has some trying weeks during the semester but does not encourage or allow a student to fall too far behind.

Lab Component Description

During the spring 2011 semester, the pilot project will be run using only the existing Math Lab computer room (henceforth called the computer lab) that will serve as both classroom and as an open lab. This computer room includes 25 computers. During class meeting times, 15 of the computers will be used for the weekly class meeting and the remaining 10 computers will be available for open lab use. This single facility is adequate for the 16 redesigned sections with 15 students each that are planned.

The computer lab will be open during the same hours as the Math Lab: 8:30 am to 7:30 pm from Monday to Thursday and 8:30 am to 3:00 pm on Friday for a total of 50.5 hours per week. An internal request has been submitted that would provide funding to staff the lab with tutors on Saturday mornings (9:00 am to noon), which would increase computer lab availability to 53.5 hours per week.

The computer lab will be staffed by one instructional faculty member and one student tutor from 8:30 am to 4:30 pm, Monday to Thursday, and 9:00 am to 3:00 pm on Friday. During other hours, the computer lab will be staffed by one paraprofessional and one student tutor.

Full implementation will see the creation of two additional computer classrooms. One of these classrooms, whose renovation is already funded internally the University of Hawaii System, will

be used strictly for the scheduled weekly class meetings. The other will be used in much the same way that the existing Math Lab computer lab will be used during the pilot semester: partially for scheduled class meetings and the remainder of the time for open lab.

Staffing of the computer classrooms will change slightly. The computer classroom that is dedicated to scheduled weekly use will be staffed by two instructors who will each oversee their section of 15 students. The second computer classroom will be staffed either by one instructor and one or more student tutors or by one paraprofessional and one or more student tutors. With full redesign implementation, the existing Math Lab computer lab will be used strictly for open lab and will be staffed by one paraprofessional and one or more student tutors. The number of student tutors required and scheduled will likely vary by day and time depending on lab usage patterns.

In both the pilot semester and upon full implementation, testing will be done in the campus Testing Center, which is open from 8:00 am to 4:00 pm, Monday to Friday. Special arrangements for after-hours and Saturday testing are possible but not encouraged since off-hour staffing and room capacity are rather limited.

Learning Materials Description

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 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.

While ALEKS topic sequencing can be based strictly on mastery of prerequisite topics, students might not get full benefit if they jump between several unrelated topics in sequence. To remedy this and to give students a better understanding of expected progress, each course has been divided into thirteen sequential intermediate objectives (modules). One module will be "due" on Saturday of the second through the fourteenth weeks of the semester.

These modules guide students in their learning by grouping a manageable number of related topics together whenever possible. Students are expected to master one module's topics before progressing to the next. In this way, students will work on related material and see the conceptual progression within the courses. But these modules do not interfere with the fundamental nature of ALEKS: students will still spend their time working only on those topics they are unsure of.

Students who master all of the topics in a module by the due date will be awarded a 100% score. Students who do not will be given a lesser score but will be allowed to proceed in the course. This procedure encourages students to do as well as they can and to finish the last few topics in a module before the due date but does not hold the student up forever if there is a less-important topic that the student just gets "stuck" 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.

ALEKS meets the suggested guidelines for software selection presented at the *Changing the Equation Workshop* in the following ways (much of which was provided by ALEKS to assist in completing this proposal):

Development of Program: ALEKS is not a publisher developed product. ALEKS is a ground-breaking technology developed from research at New York University and the University of California, Irvine, by a team of software engineers, mathematicians, and cognitive scientists with the support of a multi-million-dollar grant from the National Science Foundation. ALEKS is

fundamentally different from previous educational software. At the heart of ALEKS is an artificial intelligence engine that assesses each student individually and continuously.

ALEKS is based upon original theoretical work in a field of study called "Knowledge Space Theory." Work in Knowledge Space Theory was begun in the early 1980s by Dr. Jean-Claude Falmagne, an internationally renowned mathematician and Professor of Cognitive Sciences who is the Chairman and founder of ALEKS Corporation.

Ease of installation – ALEKS runs off a basic Java Plug-in and works efficiently on both Mac and PC computers. Students who do not have the ALEKS plug-in installed on their computers need only click on "download" after logging to initiate an automatic download and installation of the plug-in. If the computer or browser does not meet the minimum system requirements, students will be given appropriate warning.

Cost to student - ALEKS is integrated with every major mathematics publishing textbook. As a stand-alone product, ALEKS is $67. The use of a textbook is not required for use with the ALEKS program. If using a textbook within your program, McGraw-Hill would add $30 to the cost of a new text.

Cost to institution – None.

Quality and accessibility of tech support- ALEKS support is available by phone from 7:00 AM to 10:00 PM (Eastern Time) on weekdays. Email support is also available and usually has a less than one business day turnaround.

Willingness to provide training – ALEKS, through its partnership with McGraw-Hill Publishing, offers trainings in many formats: live and in-person, live-online, canned tours, and online courses. In addition to the McGraw-Hill support, ALEKS also provides a detailed training guide, and video walk trough of using the ALEKS program on their web site.

Browser restrictions – ALEKS works on all commercial web browsers.

Platform restrictions – ALEKS works on Windows® and Macintosh® operating systems without any additional downloads beyond the ALEKS plug-in.

Communication with students capability – Instructors can contact students through in-course announcements or via email. They can also contact particular students who might be performing below expectations with particular topics.

Algorithmic exercises available –100% of the exercises, applications, and graphing problems are algorithmic in nature, and in a free-response format. ALEKS does not use multiple choice exercises. ALEKS uses artificial intelligence to provide a true individualized study plan. In addition to the exercises being algorithmic and free response in nature, ALEKS questions are also adaptive in determining the exact knowledge state of each student.

Tutorial features – Unlike other homework systems which are based on a computerized test bank questions, ALEKS provides individualized learning based on the students particular knowledge state, not based on the topics within a given chapter of course that the student may or may not be ready to learn.

Assessment and **L**earning in **K**nowledge **S**paces is a Web-based, artificially intelligent assessment and learning system. ALEKS uses adaptive questioning to quickly and accurately determine exactly what a student knows and doesn't know in a course. ALEKS then instructs the student on the topics she is most ready to learn. As a student works through a course, ALEKS periodically reassesses the student to ensure that topics learned are also retained. ALEKS courses are very complete in their topic coverage and ALEKS avoids multiple-choice questions. A student who shows a high level of mastery of an ALEKS course will be successful in the actual course she is taking.

Textbook and videos – ALEKS content can be correlated to sections in supported textbooks. These correlations are shown to the student and students can view, download, and print the relevant sections of the textbook in pdf format. Students also have the benefit of accessing any additional learning aids, such as textbook publisher-created videos, from the ALEKS Explain pages as they work in Learning Mode and when they are using ALEKS with a McGraw-Hill textbook. Though these textbook options exist to help students learn, the combination of ALEKS explanations and the instructional videos produced by faculty in the Primary Redesign Team will probably be the primary learning vehicles for the majority of students.

English & Spanish Capabilities – ALEKS is available in both English and Spanish with the click of a button for all students. Publisher-created videos are subtitled in both English and Spanish.

Individual credit for multi-part questions – ALEKS offers partial credit for multi-part questions.

ALEKS, Homework, Testing: ALEKS offers the most flexible program in mathematics. Instructors have the option of allowing students to learn on their own allowing ALEKS to do what it does best, which is assess students and provide individualized learning. ALEKS can also be used in a traditional homework manner if the instructor or tutor feels their students need additional help with particular topics. ALEKS can also be used as a final exam or test for students for validation of their mastery of topics.

Administrative course capability – ALEKS allows for an administrator or coordinator to develop a particular course that could be cascaded down to other full time or part time instructors. This feature allows for consistency from one course to another on a single campus.

Gradebook features – ALEKS provides instructors with detailed diagnostics on individual student and course progress. Automated reports are dynamic and provide instructors and administrators with an accurate assessment of the institution’s student body. ALEKS reports enable instructors to tailor their lectures to what their students are ready to learn next, which in turn increases the students’ success and retention rates.

Instructors don't have enough time to spend with each student to make sure s/he is on the right track or to fill in their unique gaps. The reporting features in ALEKS provide instructors with detailed information on what each student is learning, how quickly they're progressing, and where they need specific help. Most online homework systems only provide information about what's correct and incorrect on any given assignment, which typically isn't nearly sufficient to truly address individual students' needs.

Ease of ability to export grades – All ALEKS grades can be exported into an excel grid, saved, or exported into the institutions database.

Multiple attempts allowed on assignments – In ALEKS, if a student enters an incorrect answer, they are told there is a problem and offered a chance to change their response. After receiving help, a new algorithmically generated problem is presented for the student to work on. In order for ALEKS to initially classify a topic as learned, a student must correctly solve the exercise type a minimum of 2 times. After learning around 20 topics the student will be reassessed, and if the student truly learned those topics, they will be considered mastered and the student's learning plan will be adjusted accordingly. If a student has difficulty in the assessment, the student is reassigned exercises to get more practice and the cycle repeats itself.

Cost Reduction Strategy

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

Math 1B = 100 students
Math 22 = 650 students
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If students progress at the rate of previous semesters, then the overall DWF rates for these classes will be approximately 47%.

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. These low success rates also pose resource challenges for the college. 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 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 use 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 three 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 cost savings is estimated to be over $136,000, which is a 16% reduction.

Five Critical Implementation Issues

Issue #1: Prepare students (and their parents) and the campus for changes in the course. Preparing students for a shift to computerized learning started several semesters ago when developmental math faculty began requiring that homework be done in homework management systems. In spring 2010, more than half of the sections of developmental mathematics offered at Leeward CC required online homework.

Student response to the introduction of online homework has been mostly positive. The unhappy students have generally been those whose lack of homework was made painfully obvious by the homework management software. Many of these students actually had substantial familiarity with the material at the beginning of the semester and ended up passing their courses but with lower grades than they would have if homework was not counted and tracked. Such students would actually benefit greatly from the chosen software and redesign model since they would be required to work only on the topics they actually needed to.

Recognizing that completing and accepting the move to full redesign is a much larger step for students, plans have already been made and implementation started to familiarize administrators, counselors and instructional faculty to the benefits of redesign then follow up by publicizing the benefits to the students on a wide scale.

The faculty Developmental Math Coordinator initiated the redesign project preparations in spring 2009. He recruited the three full-time faculty members for the Primary Redesign Team and who will be the instructors of record during the pilot semester. During meetings of the developmental math faculty and the math and sciences division, the Primary Redesign Team shared the many advantages of redesign as well as how those advantages could be implemented and leveraged. The Primary Redesign Team also met with counselors to share the benefits of redesign. Though some registration-related potential difficulties were brought up during these meetings, the counselors left with a sense of excitement and optimism.

The Vice Chancellor and Dean of Arts and Sciences are similarly excited over the prospect of improving student learning and success in developmental math through course redesign. Their deep commitment to the redesign process is evidenced in large part by their support of internal

funding proposals course redesign, their funding travel for members of the primary redesign team to attend the NCAT conference and Dallas CTE workshop, and the Dean of Arts and Sciences attending the Dallas workshop in person.

Issue #2: Train instructors, graduate teaching assistants (GTAs), and undergraduate peer tutors

Instructors who are not part of the Primary Redesign Team will be introduced to the redesign model during the pilot semester during developmental math faculty meetings. Workshops will be scheduled where the faculty will be able to work through the ALEKS instructional software from both a student's and an instructor's perspectives. Emporium classroom and lab visits will also be scheduled. Dry runs with additional training will be offered during the summer and duty period prior to the first day of instruction. Faculty assigned to redesign sections will be expected to participate in at least one session of each activity: training, observation, and dry run.

Despite these efforts, there will undoubtedly be some difficulties. The developmental math coordinator and the Primary Redesign Team lead instructor will receive reassigned time in part to assist faculty with any difficulties they might encounter transitioning from the traditional lecture format to redesign teaching.

GTAs (and other paraprofessional tutors) as well as student tutors for redesigned courses will be carefully screened not just for mathematical ability but also for a demonstrated eagerness to learn the ALEKS software and course procedures. Those able and willing to attend training sessions conducted by the Primary Redesign Team lead instructor will receive first priority for hiring and scheduling. Ongoing training will be provided as new tutors are hired or as unexpected issues arise.

Issue #3: Ensure an adequate technological infrastructure to support the redesign as planned

During the summer session between the spring 2011 pilot semester and fall 2011 full redesign implementation, CTE and in-house funding will be used to convert existing two mathematics classrooms to Emporium classrooms/labs. Based on student/computer ratios previously quoted by NCAT redesign scholars, these two labs, combined with the existing Math Lab computer room, should be sufficient to accommodate the redesigned course students.

One concern is peak hour demand. If students concentrate lab usage during a small number of hours during the week, they will outnumber the planned computers. There are several remedies that are currently under discussion. One is to encourage peer tutoring and mentoring and to allow documented lab time to be completed at other locations on campus where groups of students in the same redesigned course can work at the same time. One such location is the campus Halau. Another is the campus Learning Resource Center. Another down the line will be the Learning Commons that is currently in late planning stages.

Issue #4: Achieve initial and ongoing faculty consensus about the redesign

Initial consensus has been achieved in two ways. First, the Primary Redesign Team, including the Developmental Math Coordinator, discusses all issues before coming to a tentative decision. This tentative decision is discussed with administrators, including the Director of Academic Technology Services, and the Math Discipline Coordinator, before being opened to the faculty at

large. To date, there have been few objections since the process of achieving consensus among the Primary Redesign Team, administrators, and Math Coordinator is quite rigorous and most objections are anticipated and addressed prior to the proposal being shared with the rest of the developmental math faculty.

Historically, this is the same process that has been used at Leeward CC for at least 20 years to make departmental decisions. As such, ongoing consensus is expected to be developed in similar fashion for the foreseeable future.

Issue #5: Avoid backsliding by building ongoing institutional commitment to the redesign
Institutional commitment to redesign appears to be assured. The Developmental Math and Math Discipline Coordinators fully support the effort. The Dean of Arts and Sciences and Chief Academic Officer are fully committed to redesign as are administrators at the University of Hawaii System level up to and including the Vice President for Community Colleges.

The administrative commitment is far more than just moral support. Curricular proposals have been expedited to approval. Funding for travel to redesign related conferences and workshops has been provided. Substantial campus- and system-level funding requests specifically targeted to implementing math course redesign have been supported and approved. Facilities and support personnel have been provided for in-house creation of multimedia instructional materials that will be used for the redesigned courses. Over $100,000 in internal University of Hawaii System funding was awarded to Leeward CC on June 25, 2010 specifically to facilitate developmental course redesign. These actions speak far louder than mere words in demonstrating the college's and University of Hawaii System's support of redesign.

Timeline

Spring 2009

- Attended University of Hawaii Math Summit 2, where Drs. Carol Twigg and Uri Treisman presented advantages and basic methods of course redesign
- Secured preliminary approvals and funding to investigate the feasibility of piloting then implementing course redesign at Leeward Community College
- Formed the Primary Redesign Team
- Studied and compared the available instructional software; decided on ALEKS
- Decided on creating a shorter sequence of courses with streamlined content rather than redesigning existing courses

Summer 2009

- Scripted and recorded instructional videos keyed to ALEKS topics for the new streamlined course sequence
- Began discussions of course requirements and procedures

2009-2010 Academic Year

- Submitted course proposals (approved in February, 2010) for Math 18 and Math 82 to the Curriculum Committee

- Presented the planned new course sequence and redesign format to the math & science division faculty, counselors, and sister system CC campuses to generate support and input
- Discussed testing arrangements and requirements with the campus Test Center
- Attended Tennessee Board of Regents Workshop, *Increasing Student Success in Developmental Math*
- Continued discussions of course requirements and procedures
- Adjusted and modularized the curriculum for both courses based on input received and a scheduled ALEKS software upgrade
- Submitted proposals (approved in June, 2010) for intramural system funding to support redesign, including supplementary tutors during the pilot semester and a computer classroom
- Submitted NCAT Changing the Equation Preliminary Readiness Responses
- Attended *The Redesign Alliance Fourth Annual Conference*
- Attended *Changing the Equation Workshop* in Dallas
- Submitted a proposal (still pending) for supplementary campus funding for an additional computer classroom/lab that will be required for full redesign implementation

Summer 2010

- Continue to solicit and discuss input from stakeholders
- Submit the *Changing the Equation* Final Proposal

Fall 2010

- Submit course proposal for Math 9 to the Curriculum Committee
- Finalize course procedures to be used in the pilot semester
- Finalize testing arrangements with the campus Test Center
- Continue sharing course content and procedural updates with discipline and division instructional faculty and counselors
- Publicize redesign and its benefits to students and parents
- Interview and hire additional lab tutors to support the redesigned courses
- Conduct tutor training

Spring 2011

- Implement Redesign Pilot of Math 18 and Math 82: Primary Redesign Team faculty will be the instructors of record
- Collect lab usage data to optimize tutor coverage and lab hours
- Collect qualitative data concerning student reaction to redesign and plan procedural improvements
- Collect quantitative data for assessment and comparison to traditionally-taught courses
- Identify transfer-level courses that could be responsibly offered starting mid-semester to accommodate students who complete the developmental sequence early
- Discuss and decide whether a small number of sections of the final legacy developmental course will be offered in fall 2011 for students who choose to complete the developmental sequence in a legacy course
- Schedule general math faculty visitation of redesign class sessions and training sessions covering the ALEKS software and course procedures

Summer 2011

- Renovate two existing math classrooms for use as redesign computer classrooms/labs
- Analyze qualitative and quantitative data gathered in the pilot semester and make appropriate changes to curriculum, course procedures and lab hours
- Compare student performance in comparable redesign and legacy courses
- Schedule instructor training sessions for new faculty and faculty unable to attend spring 2010

Fall 2011

- Full implementation of redesign except possibly for the aforementioned small number of sections of the final legacy developmental math course
- Offer at least one transfer-level course section that will start mid-semester for students who complete the developmental sequence early.
- Designate a release time funded lead instructor for redesign who will be tasked with coordinating ongoing tutor and instructor training and support
- Collect longitudinal data comparing legacy and redesign course student performances in subsequent courses
- Continue discussions with stakeholders of issues and innovations that arise with full redesign implementation
- Continue collecting and analyzing qualitative and quantitative data to improve students' learning experience

Spring 2012

- Full implementation of redesign with no legacy course sections offered
- Continue to collect and analyze qualitative, quantitative, and longitudinal data to track and improve student learning
- Continue tutor and instructor training and support
- As demand dictates, expand offerings of transfer-level course sections that begin mid-semester

Budget

This redesign project requires the renovation and conversion of two mathematics classrooms into computer lab classrooms. Intramural funding was approved on June 25, 2010 for one classroom's conversion. If approved, the $40,000 Changing the Equation grant will be used to fund the computers and furniture needed to equip the second classroom. The itemized cost breakdown is:

15 computers @ $1,000 = $15,000.00
15 workstations $ $1,000 = $15,000.00
Heavy duty printer and supplies = $1,372.55
Indirect costs to the college (27.5%) = $8,627.45
Total = $40,000.00

PILOT ASSESSMENT PLAN

Institution: **Leeward Community College**
Course Title: **Math 9, comparison to the legacy course Math 1B**

1. Which method of comparing learning outcomes do you intend to use? (Put an X next to all that apply)

	<---Parallel Sections
	# of traditional sections
	# of students in each section
	Total # of students
	# of redesign sections
	# of students in each section
	Total # of students
X	**<---Before and After**
Fall 2010	<---Timeframe for baseline data (e.g. fall 2006 semester, AY 2006-7, five-year average 2001-2006)
2	# of traditional sections
25	# of students in each section
50	Total # of students
2	# of redesign sections
30	# of students in each section
60	Total # of students

2. Which method of obtaining data do you intend to use? (Put an X next to all that apply)

	A - Comparisons of common final exams (internal and external)
X	B - Comparisons of common content items selected from exams
	C - Comparisons of pre- and post-tests
X	D - Comparisons of student work using common rubrics

Describe briefly:
Artifacts will be collected from Math 1B students during the fall 2010 semester. The work will be scored and compared to comparable work collected from Math 9 students. The problems may not be identical to the letter and number but will test the same learning outcome(s) at comparable levels of difficulty and will be scored using common rubrics.

PILOT ASSESSMENT PLAN

Institution: **Leeward Community College**
Course Title: **Math 18, comparison to the legacy course Math 22**

1. Which method of comparing learning outcomes do you intend to use? (Put an X next to all that apply)

X	**<---Parallel Sections**
7	# of traditional sections
25	# of students in each section
175	Total # of students
4	# of redesign sections
30	# of students in each section
120	Total # of students
	<---Before and After
	<---Timeframe for baseline data (e.g. fall 2006 semester, AY 2006-7, five-year average 2001-2006)
	# of traditional sections
	# of students in each section
	Total # of students
	# of redesign sections
	# of students in each section
	Total # of students

2. Which method of obtaining data do you intend to use? (Put an X next to all that apply)

	A - Comparisons of common final exams (internal and external)
X	B - Comparisons of common content items selected from exams
	C - Comparisons of pre- and post-tests
X	D - Comparisons of student work using common rubrics

Describe briefly:
Artifacts will be collected from students in comparable legacy and redesigned courses. in the pilot semester. The problems may not be identical to the letter and number but will test the same learning outcome(s) at comparable levels of difficulty and will be scored using common rubrics.

PILOT ASSESSMENT PLAN

Institution: **Leeward Community College**
Course Title: **Math 82, comparison to the legacy course Math 73 and 83**

1. Which method of comparing learning outcomes do you intend to use? (Put an X next to all that apply)

X	**<---Parallel Sections**
30	# of traditional sections
25	# of students in each section
750	Total # of students
4	# of redesign sections
30	# of students in each section
120	Total # of students
	<---Before and After
	<---Timeframe for baseline data (e.g. fall 2006 semester, AY 2006-7, five-year average 2001-2006)
	# of traditional sections
	# of students in each section
	Total # of students
	# of redesign sections
	# of students in each section
	Total # of students

2. Which method of obtaining data do you intend to use? (Put an X next to all that apply)

	A - Comparisons of common final exams (internal and external)
X	B - Comparisons of common content items selected from exams
	C - Comparisons of pre- and post-tests
X	D - Comparisons of student work using common rubrics

Describe briefly:
Artifacts will be collected from students in comparable legacy and redesigned courses. in the pilot semester. The problems may not be identical to the letter and number but will test the same learning outcome(s) at comparable levels of difficulty and will be scored using common rubrics.

FULL IMPLEMENTATION ASSESSMENT PLAN

Institution: **Leeward Community College**
Course Title: **Math 9, comparison to the legacy Math 1B**

1. Which source of baseline information do you intend to use?

X	**<---an offering "before" the redesign began**
X	**<---parallell sections during the pilot phase**

AY 2010-2011	<---Timeframe (e.g. fall 2006 semester, AY 2006-7, five-year average 2001-2006)
4	# of traditional sections
25	# of students in each section
100	Total # of students

2	# of redesign sections
30	# of students in each section
60	Total # of students

2. Which method of obtaining data do you intend to use?

	A - Comparisons of common final exams (internal and external)
X	B - Comparisons of common content items selected from exams
	C - Comparisons of pre- and post-tests
X	D - Comparisons of student work using common rubrics

Describe briefly:
Artifacts will be collected from students enrolled in the legacy course in the 2010-2011 academic year. Comparable artifacts will be collected from redesign students in the fall 2011 semester, which is the first semester of full redesign implementation. The problems may not be identical to the letter/number but will test common learning outcomes and will represent comparable levels of difficulty. They will be scored with common rubrics.

FULL IMPLEMENTATION ASSESSMENT PLAN

Institution: **Leeward Community College**
Course Title: **Math 18, comparison to the legacy Math 22**

1. Which source of baseline information do you intend to use?

X	**<---an offering "before" the redesign began**
X	**<---parallell sections during the pilot phase**

AY 2010-2011	<---Timeframe (e.g. fall 2006 semester, AY 2006-7, five-year average 2001-2006)
16	# of traditional sections
25	# of students in each section
400	Total # of students

10	# of redesign sections
30	# of students in each section
300	Total # of students

2. Which method of obtaining data do you intend to use?

	A - Comparisons of common final exams (internal and external)
X	B - Comparisons of common content items selected from exams
	C - Comparisons of pre- and post-tests
X	D - Comparisons of student work using common rubrics

Describe briefly:
Artifacts will be collected from students enrolled in the legacy course in the 2010-2011 academic year. Comparable artifacts will be collected from redesign students in the fall 2011 semester, which is the first semester of full redesign implementation. The problems may not be identical to the letter/number but will test common learning outcomes and will represent comparable levels of difficulty. They will be scored with common rubrics.

FULL IMPLEMENTATION ASSESSMENT PLAN

Institution: **Leeward Community College**
Course Title: **Math 82, comparison to legacy Math 73 and Math 83**

1. Which source of baseline information do you intend to use?

X	**<---an offering "before" the redesign began**
X	**<---parallell sections during the pilot phase**

AY 2010-2011	<---Timeframe (e.g. fall 2006 semester, AY 2006-7, five-year average 2001-2006)
60	# of traditional sections
25	# of students in each section
1500	Total # of students

26	# of redesign sections
30	# of students in each section
780	Total # of students

2. Which method of obtaining data do you intend to use?

	A - Comparisons of common final exams (internal and external)
X	B - Comparisons of common content items selected from exams
	C - Comparisons of pre- and post-tests
X	D - Comparisons of student work using common rubrics

Describe briefly:
Artifacts will be collected from students enrolled in the legacy course in the 2010-2011 academic year. Comparable artifacts will be collected from redesign students in the fall 2011 semester, which is the first semester of full redesign implementation. The problems may not be identical to the letter/number but will test common learning outcomes and will represent comparable levels of difficulty. They will be scored with common rubrics.

PILOT COURSE COMPLETION/RETENTION

Institution: **Leeward Community College**
Course Title: **Math 9, comparison to legacy Math 1B**

Traditional Course
Timeframe: Spring 2008 to Spring 2010 aggregate data

	Number	Percentage
A	55	23.4%
B	55	23.4%
C/CR	33	14.0%
D	19	8.1%
F/N/NC	52	22.1%
W	21	8.9%
DR		
Other:		
Total	**235**	**100%**

Redesigned Course
Timeframe: Spring 2011 (grading option limited to CR/NC only)

	Number	Percentage
A		
B		
C		
D		
F		
W		
DR		
CR		
NC		
Total		**100%**

Your definition of successful completion:
Since the grading option is limited to CR/NC only, successful completion is defined as earning CR for the course.

Your definition of retention:
Retention is defined as receiving a CR or NC grade for the course. Withdrawal from the course would indicate non-retention.

PILOT COURSE COMPLETION/RETENTION

Institution: **Leeward Community College**
Course Title: **Math 18, comparison to legacy Math 22**

Traditional Course
Timeframe: Spring 2008 to Spring 2010 aggregate data

	Number	Percentage
A	248	14.8%
B	287	17.1%
C/CR	293	17.5%
D	145	8.6%
F/N/NC	492	29.3%
W	212	12.6%
DR		
Other:		
Total	**1677**	**100%**

Redesigned Course
Timeframe: Spring 2011 (grading option limited to CR/NC only)

	Number	Percentage
A		
B		
C		
D		
F		
W		
DR		
CR		
NC		
Total		**100%**

Your definition of successful completion:
Since the grading option is limited to CR/NC only, successful completion is defined as earning CR for the course.

Your definition of retention:
Retention is defined as receiving a CR or NC grade for the course. Withdrawal from the course would indicate non-retention.

PILOT COURSE COMPLETION/RETENTION

Institution: **Leeward Community College**
Course Title: **Math 82, comparison to legacy Math 73 and 83**

Traditional Course
Timeframe: Spring 2008 to Spring 2010 aggregate data

	Number	Percentage
A	526	12.2%
B	778	18.0%
C/CR	1005	23.3%
D	466	10.8%
F/N/NC	1008	23.3%
W	536	12.4%
DR		
Other:		
Total	**4319**	**100%**

Redesigned Course
Timeframe: Spring 2011 (grading option limited to CR/NC only)

	Number	Percentage
A		
B		
C		
D		
F		
W		
DR		
CR		
NC		
Total		**100%**

Your definition of successful completion:
Since the grading option is limited to CR/NC only, successful completion is defined as earning CR for the course.

Your definition of retention:
Retention is defined as receiving a CR or NC grade for the course. Withdrawal from the course would indicate non-retention.

FULL IMPLEMENTATION
COURSE COMPLETION/RETENTION

Institution: **Leeward Community College**
Course Title: **Math 9, comparison to legacy Math 1B**

Traditional Course
Timeframe: Spring 2008 to Spring 2010 aggregate data

	Number	Percentage
A	55	23.4%
B	55	23.4%
C/CR	33	14.0%
D	19	8.1%
F/N/NC	52	22.1%
W	21	8.9%
DR		
Other:		
Total	**235**	**100%**

Redesigned Course
Timeframe: Fall 2011

	Number	Percentage
A		
B		
C		
D		
F		
W		
DR		
CR		
NC		
Total		**100%**

Your definition of successful completion:
Since the grading option is limited to CR/NC only, successful completion is defined as earning CR for the course.

Your definition of retention:
Retention is defined as receiving a CR or NC grade for the course. Withdrawal from the course would indicate non-retention.

FULL IMPLEMENTATION
COURSE COMPLETION/RETENTION

Institution: **Leeward Community College**
Course Title: **Math 18, comparison to legacy Math 22**

Traditional Course
Timeframe: Spring 2008 to Spring 2010 aggregate data

	Number	Percentage
A	248	14.8%
B	287	17.1%
C/CR	293	17.5%
D	145	8.6%
F/N/NC	492	29.3%
W	212	12.6%
DR		
Other:		
Total	**1677**	**100%**

Redesigned Course
Timeframe: Fall 2011

	Number	Percentage
A		
B		
C		
D		
F		
W		
DR		
CR		
NC		
Total		**100%**

Your definition of successful completion:
Since the grading option is limited to CR/NC only, successful completion is defined as earning CR for the course.

Your definition of retention:
Retention is defined as receiving a CR or NC grade for the course. Withdrawal from the course would indicate non-retention.

FULL IMPLEMENTATION
COURSE COMPLETION/RETENTION

Institution: **Leeward Community College**
Course Title: **Math 82, comparison to legacy Math 73 and Math 83**

Traditional Course
Timeframe: Spring 2008 to Spring 2010 aggregate data

	Number	Percentage
A	526	12.2%
B	778	18.0%
C/CR	1005	23.3%
D	466	10.8%
F/N/NC	1008	23.3%
W	536	12.4%
DR		
Other:		
Total	**4319**	**100%**

Redesigned Course
Timeframe: Spring 2011 (grading option limited to CR/NC only)

	Number	Percentage
A		
B		
C		
D		
F		
W		
DR		
CR		
NC		
Total		**100%**

Your definition of successful completion:
Since the grading option is limited to CR/NC only, successful completion is defined as earning CR for the course.

Your definition of retention:
Retention is defined as receiving a CR or NC grade for the course. Withdrawal from the course would indicate non-retention.

COST SAVINGS SUMMARY FORM

Institution: Leeward CC, Pearl City, Hawaii
Course(s): Legacy MATH 22/73/83 vs. Redesign MATH 9/18/82

	LEGACY	REDESIGN				NOTES
		TOTAL	MATH 9 1 credit	MATH 18 3 credits	MATH 82 4 credits	
Faculty						
Average FT faculty salary and benefits	$82,200	$82,200				Midpoint C3/4 min +37% fringe
# of CREDITS taught in fall & spring	27	27				
Cost PER CREDIT of FT faculty-taught section	$3,044	$3,044				
Cost PER CREDIT of adjunct-taught section	$2,080	$2,080				B lecturer at + 37% fringe
Cost PER COURSE SECTION (FT)	$9,133		$3,044	$9,133	$12,178	
Cost PER COURSE SECTION (adjunct)	$6,239		$2,080	$6,239	$8,319	
Enrollment						
Total enrollment	2,675	2160	60	660	1,440	The total enrollment is reduced
Enrollment per section	25	30	30	30	30	because of the streamlined
Total # of sections	107	72	2	22	48	course sequence.
# of sections taught by FT faculty in fall & spring	64		2	13	30	
# of sections taught by adjuncts in fall & spring	43		0	9	18	
Cost						
Total cost of sections taught by FT faculty	$584,533	$490,156	$6,089	$118,733	$365,333	
Total cost of sections taught by adjunct faculty	$268,276	$205,886	$0	$56,151	$149,736	
Total cost of course coordination		4728				Redesign coordinator
Total cost of other personnel		15798				Tutorial support
TOTAL COST	$852,809	$716,568	The average cost per enrolled student increases due to the high-enrollement 4-credit course. However, that course replaces			
Cost-per-Student	$319	$332	two, 3-credit courses so fewer sections are needed for the same number of students to successfully qualify for the transfer level.			
Total Savings		$136,242	Since comparable numbers of students are being served, the			
Percent reduction		16.0%	the actual cost per successful student decreases by the indicated 16%.			

FACULTY SCOPE OF EFFORT COMPARISON

Institution: Leeward Community College
Course: Math 1B, 22, 73, or 83 (3 credits)

Traditional Course(s)	**FULL-TIME FACULTY**	**ADJUNCT FACULTY**	Full-time faculty teach 27 credits annually. Figures assume 3 course preparations per year. Adjunct faculty figures are based on 2 course preparations and 18 credits per year.
	# of Hours	**# of Hours**	
Course Preparation			
Curriculum Design/Development			Mostly completed by course lead instructors
Materials Acquisition			Mostly completed by course lead instructors
Materials Development	201	134	5 hours for exam authoring, 10 hours for quiz authoring,
Faculty/Staff Devmt/Training	20	10	10 hours for MML assignments, 42 hours for lecture prep.,
Sub-Total	**221**	**144**	for each course
Course Delivery			
Diagnostics/Placement			
Presentation	405	270	
Interaction	160	96	
Progress monitoring			
Test proctoring	18	12	Only final exams; others included in "presentation" time
Grading	405	270	Assumes 1.5 hours per quiz x 20 quizzes plus 3 hours
Sub-Total	**988**	**648**	for each hour of exam time x 5 exam hours, per course
TOTAL	**1209**	**792**	
Total contact hours	583	378	
Total out-of-class hours	626	414	
Total hours	**1,209**	**792**	
# of weeks in semester/quarter	16	16	
Section size	25	25	

FACULTY SCOPE OF EFFORT COMPARISON

Institution: Leeward Community College
Course: Math 9 (1 credit), 18 (3 credits), and 82 (4 credits)

Redesigned Course(s)	**FULL-TIME FACULTY**	**ADJUNCT FACULTY**	Full-time figures based on 5 sections of Math 82, 2 of Math 18, and 1 of Math 1B. Adjunct figures based on 3 sections of Math 82 and 2 sections of Math18.
	# of Hours	**# of Hours**	
Course Preparation			
Curriculum Design/Development			Completed by Primary Redesign Team
Materials Acquisition			Completed by Primary Redesign Team
Materials Development			Completed by Primary Redesign Team
Faculty/Staff Devmt/Training	15	15	
Sub-Total	**15**	**15**	
Course Delivery			
Diagnostics/Placement			Time included in "interaction"
Presentation			Time included in "interaction"
Interaction	628	416	
Progress monitoring	256	160	2 hours per week per course
Test proctoring			Done by Test Center
Grading	90	60	Only paper quizzes need grading.
Sub-Total	**974**	**636**	
TOTAL	**989**	**651**	
Total contact hours	628	416	
Total out-of-class hours	361	235	
Total hours	**989**	**651**	
# of weeks in semester/quarter	16	16	
Section size	30	30	