C2R Final Report
Cosumnes River College
February 2008

A. Impact on Student Learning

1. Improving the Quality of Student Learning

   During Fall 07, Cosumnes River College implemented two pilot sections of Course Redesign in Elementary Algebra by converting five hours of instructor-driven traditional lecture into a mixed mode of computer-based instruction accompanied by instructor/student class "workshops." The redesigned courses substituted outside of class computer assignments using MyMathLab to reduce the number of scheduled class meetings from 5 hours per week to 3 hours per week. MyMathLab was chosen because it provided course-specific interactive student-focused instruction including online textbook, video lectures, online exercises, practice quizzes and mastery quizzes. The accompanying in-class workshop sessions allowed faculty to re-enforce the computer-delivered instruction with in-class collaborative activities focused on critical thinking, synthesis and reinforcement of course topics.

   As in any learning environment, students committed to their own learning tend to excel, while those who are unfocused and lackadaisical make little or no progress. The hope of course redesign at Cosumnes River College (CRC) is to use technology to increase the students' ***involvement with*** and ***commitment to*** their own learning.

   Our numerical analysis of the results of course redesign focused on two measurable outcomes: (1) success on core competency measures embedded in common final exam questions, and (2) overall course success rates (passing grade of C or better). Prior to initiating our pilot courses in Fall 07, the redesign team worked with the math department faculty to identify a set of "core competencies" for the Elementary Algebra course and aligned these competencies with specific student learning outcomes as listed in our course curriculum. Once the core concepts were identified, a consistent "common" final exam was developed to measure student success according to the identified learning outcomes. Under redesign, the average final exam score of 69.52% (n=38) was only slightly higher than the 67.7% (n=101) for students who took the final in a parallel non-redesign Elementary Algebra courses during the same semester. However, when we define minimum competency as a score of 70% or higher on the core concepts final exam, the proportion of students who reached minimum competency was significantly higher in redesign pilot courses. In redesign, 51.2% of students who completed the course reached or exceeded minimum competency, compared to only 39.7% of students completing non-redesign courses during the same semester.

Improved student learning was also evidenced by higher overall course success rates. In redesign courses, 42.2% (n=64) of students passed the course with C's or better, while traditional course showed only 35.5% success (n=183).

In addition to comparison of parallel sections, redesign versus traditional, during the same semester, data was also gathered to compare results focused on the redesign pilot instructors as "controls." Since the core concept final exam was developed in the semester prior to launching redesign, piloting instructors collected data on course success, retention and non-repeat rates in their classes, before and after redesign. Comparing their pre-redesign classes in the previous spring semester to the redesign pilot classes in the fall, the piloting instructors saw similar student success, 44.4% traditional versus 42.2% in redesign, but found much higher student retention, from 55.6% traditional to 64.1% redesign. The most statistically significant comparison was the reduction in overall DFW rates from 77.8% traditional to 65.4% in redesign. This correlated to a significantly higher proportion of "non-repeat" students (students who do not need to repeat their course enrollment.)

While quantitative measures showed improved student learning numerically, qualitative measures from students in the redesign courses also showed that student attitudes showed evidence of stronger preparation and higher confidence. In midsemester surveys, 41.2% of students in the redesign courses said they felt "more confident" about their learning and in post-semester surveys, 65.5% of the students rated their overall learning as "better" than previous math courses (80.8% rated their learning as equal or better).

2. Improved Retention

At CRC, students can withdraw from a course in two different ways. A student who drops a class prior to the beginning of the 4th week is withdrawn from the class roster without a W notation recorded on the student's transcript. After the 4th week, students who withdraw from a class must have the W recorded on their semester transcript. The redesign pilots saw several interesting results related to retention, withdrawal, and overall "non-repeat" rates.

One observable trend showed the length of time students stayed in the course before deciding to drop, was longer for students in the redesign than their counterparts in traditional classes—students who withdrew from their classes, dropped out of the traditional courses earlier than students who dropped from redesign classes. In traditional courses only 43.3% of students who dropped the class (n=90) stayed to the 4th week census, where 62.2% of students who dropped from the redesign stayed through the 4th week or beyond. Although a higher 4th week census has negative impact on official retention rates (see below), studies have shown that staying in the course longer provides withdrawing students a

better chance for success when they retake the class because they have been exposed to a larger set of course topics.

Officially, retention at CRC compares the proportion of students who complete a course, earning any letter grade other than W or I, to the total enrollment of the course at the official 4th week census. For Fall 07, redesign courses recorded slightly lower official retention rates than the parallel courses, with 64.1% retention (n=64) in the redesign classes, while the traditional Elementary Algebra courses retained 68.9% of students present at the 4th week census (n=183).

But a different pattern emerges when data for total student enrollment is considered. In particular, "non-repeat" enrollment focuses on the percentage of students who successfully pass the class with C's or better, continue to the next course, and therefore *don't* have to re-enroll in the same course. Because students who drop the course prior to the 4th week census are included in the total number of students who must repeat their enrollment again in a future semester, the "non-repeat" rate compares course success to student enrollment at week one. Redesign courses resulted in a 34.6% non-repeat rate (n=78) compared to the 27.2% non-repeat rate (n=234) for traditional courses. Lower course repetition rates are CRC's primary cost benefit: by increasing student success, course repetition rates are reduced, allowing more students to be served with the same number of course offerings.

3. Other Impacts on Students

Along with improved student learning, students also reported improvements in their self-assessments about math preparation, mathematics learning and mathematical confidence. At midsemester, a significant portion of students in the redesign pilot courses 47.1 % said they ***liked this class more*** than previous math classes, 49.6% said they ***liked the (technology-based) homework more*** than in previous math classes, with 41.2% reporting they felt ***more confident*** than they had in previous math courses. The post-semester survey concluded that 65.5% of the students rated their overall learning as "better" than previous math courses (80.8% rated their learning as equal or better), 74.1% said they would ***choose redesign*** for themselves their next class if it were available, and 75% said they would ***recommend redesign*** to another student.

Selected student feedback: "I like the *(computer-based)* homework cause it has examples and how to do it." "It's good because when I'm responsible for my own learning, I can choose the method that works best for me and use the learning technique that works best for me." "I like that I am able to move ahead at my own pace." "I like that we can always get 100% on homework." "Way too much work for so little time." "Too much homework." "I can't blame others for my success/failure. I will get out of it, what I put in."

Selected Instructor feedback: "The students who are staying up with the topics seem to be more engaged with the material. They ask insightful questions about how topics relate to one another." "In-class workgroups are working really well because all the students in the group are required to have reviewed and attempted the homework. Since all the students in the groups are prepared, concept reinforcement and collaboration within the groups is stronger than ever."

B. Impact on Cost Savings

Because of cost constraints due to union and contractual workload issues that are unique to our campus and our state, CRC cost savings could not be built on combining sections, enlarging class sizes, or by replacing tenured faculty with lower-cost teaching assistants. Our cost analysis expected to reduce the cost-per-student only slightly, from $266 per student to $242 per student. This 9% reduction would have been accomplished by adding 3-4 additional students per section. Because of the collaborative "workshop" environment in the classroom, this increase equated to adding one extra student workgroup of 4 students. Interacting with eleven 4-student workgroups, instead of ten, was expected to be easily manageable. However, this small increase in class enrollment did not materialize because the pilot courses were scheduled in our computerized classroom that had no additional room capacity. Future redesign courses will target some of our larger math classrooms if available.

The primary cost benefits for CRC are in reduced course repetition rates, which over time results in more students served with the same number of course offerings. Additionally, since students who pass the redesign classes were academically better prepared in core competencies, and have proven themselves to be strong, independent learners, it is reasonable to assume that higher success in subsequent courses is likely to be observed as these students continue with future course work. The impact of redesign is therefore an on-going process.

C. Lessons Learned

1. Pedagogical Improvement Techniques

    - **Math Journals**
      The Math Journals required students to record each objective in each section of the book, along with a problem they selected as a "good example" of each objective. The students would read through the examples provided in the text to choose the one (or more) example(s) they felt illustrated each objective. This is a key component because it encouraged the students to engage the material, rather than go directly to the homework assignments. We allowed students to use their journals when working on group activities and in-class quizzes, which

they really appreciated, and which helped motivate them to write complete and well-organized journal entries.

- **Pencil & Paper Assignments**
  The pencil and paper assignments were short list, usually 1-2 problems, from selected homework sections that were required to be turned in "on paper" with complete solutions. This discouraged students from trying to work problems "in their head" which seems to be a natural tendency when students first begin doing online homework. It also gave us an opportunity to see how well students could write up a complete and detailed solution. It enabled us to reinforce common problem areas and to assign problems that were not available in the MyMathLab problem pool for this first edition textbook.

- **Quick Quiz**
  Workshop sessions regularly started with a short 2-question "quick quiz", generally taking approximately 5 -10 minutes. The quick quick motivated the students to come to class (on time!) and was a quick assessment of student learning on key topics from previous assignments. Follow-up discussion of the quick quiz problems provided a starting point for in-class questions and discussion of current topics.

- **Collaborative Groups**
  The group activities were essential to insure that students were seeing the bigger picture and integrating topics they were learning. It also enabled us to give some problems that were more challenging. Students working with similarly-prepared students really enhanced the functioning of the groups.

- **Coach in the Corner**
  This provided extra one-on-one help for students on specific questions that they had missed on a quiz. Once they had completed this process, they were allowed to take the quiz an additional time to improved their score.

- **Experienced Student Aids as "Role-Models"**
  Student aids in the classroom were able to express ideas and approaches in student-to-student terminology with a level of "one who's been there" experience that provided significant credibility to their advise on how to navigate the course requirements. They were a great help in class when there were questions using the computer, since they had often-times experienced the same difficulties.

- **Friday "Work at Home" passes**

These allowed students to opt out of the Friday class meeting if they were caught up at the required level. It was another incentive to the students to keep up.

- **Friday "mini-lectures"**
  Students who wanted help on specific topic areas were able to attend these.

2. Cost Reduction Techniques

   - **Reduced Course Repetition Rate**

3. Implementation Issues

   - **Student Non-participation.**
     Too many students fall into this category. They may show up for the weekly workshops as but haven't done the work. Little can be done for students who do not do the work!

   - **Mathematical Formatting.**
     Typing mathematical results into the computer is very limited in what form it will accept as the correct answer. Students are frustrated by this issue.

   - **Overestimating Acquired Knowledge.**
     Some students over estimate their own understanding of homework concepts because they are relying too heavily on mimicking examples within the technology

   - **Homework Workload Complaints.**
     Students complain about the amount of homework they have to do; it is clear that most of them have never put in very much time on homework in the past.

   - **Condensed Calendar Attitude Changes.**
     Cosumnes' conversion to a condensed calendar (18 weeks to 16 weeks, with no loss of instructional minutes) has negatively impacted student schedules by increasing back to back classes and what they perceive to be extra time for outside jobs. This trend seems to leave with significantly reduced time for completing assigned homework.

   - **Challenges to Learning-Disabled Students.**
     Technology presents time management and learning modality challenges for the learning–disabled students. They find they need to allow more homework time to avail themselves of online support in multiple learning modes.

D. Sustainability

Course redesign in Elementary Algebra is continuing to expand at CRC. During the current Spring 2008 semester, the redesign team increased the number of pilot sections and increased number of piloting instructors. This incremental expansion is expected to continue in the fall semester based on additional faculty who have expressed interest in becoming part of the project. The primary barrier to full implementation on campus is the difficulty of creating department-wide consensus, particularly the ability to embrace "uniformity" in a culture accustomed to "academic freedom."