Developmental Math program
CSU-Monterey Bay

Abstract
CSU-Monterey Bay has developed an innovative and effective program designed to increase the success of students who are required to take and complete developmental math in the first year of college. This program is particularly effective with the student population at CSUMB which is strongly first generation and often coming from educational disadvantaged backgrounds. To accomplish this, the department worked collaboratively to build a coordinated, unified program organized around activities and student work rather than standard lecture formats. Key to this program is its cost effectiveness with large class sizes reducing the need of multiple sections, each with its own faculty member and student assistants. Technology plays a key role in this program, being used for enhancing class presentation and discussion; coordination of communications between faculty and between faculty, students assistants and students.

Introduction
The challenge:
1. 55% of freshmen need remediation in Math at CSUMB
2. Students who fail the two-semester remedial math are dis-enrolled
3. 51% of our students are first generation
4. 35% of students at CSUMB are Latino
5. Only 65% freshmen were retained in the fall 2006

In 2007, math faculty at CSUMB came together to seek an innovative solution to the problem of high remediation needs of incoming freshmen combined with low success rates which in turn led to lower retention to the second year of college. In doing so, Math faculty re-designed the developmental math curriculum consisting of 2 courses: Math 98 and Math 99. Each course section is supported by an instructor and two student assistants. To engage with students, Math 98/99 instructors use a Tablet PC which projects on large screens in the classroom. The Tablet PC’s portability acts as communication and collaboration tools within and between teams.

Methods
Interactive Classroom
1. A typical day in class address specific content areas. Student work together on activities. Individual and/or group quizzes are embedded in every class.
2. Engaging with Students: All Math 98/99 instructors use a Tablet PC which projects on large screens in the classroom. The Tablet PC’s portability acts as communication and collaboration tools within and between teams.
3. Peer Tutors serve in classrooms/Labs to provide immediate assistance to students; each tutor is personally responsible for tracking 15-20 students.

Outside class support
1. Open Lab: There are two hours of open lab every day, staffed by teaching assistants, to help students work on their daily assignments and address any other questions they might have
2. Tutoring Center: University Tutoring Center provided semester-long, one-to-one help or drop in help every day of the week.
3. Student Success Center: Early Warning System, keep track of student progress regularly & identifying students at risk early in the term

Discussion
Key to Student success is an individualized approach which occurs despite class size of 50-95. These elements increase the chances of student success:
1. A collaborative learning environment: Instructors and student assistants actively move through the classroom during exercises to answer questions
2. A personal approach that does not permit anonymity: Students are given individual instruction both in and out of class.
3. Outside class support: Beyond class work, students can access one-to-one tutoring, drop-in open lab help and online quizzes.
4. Technology support

Materials & Methods

Results
This model has been implemented since Fall 2007.
1. Passing percentage for all the sections has been between 85% to 95% over the past seven years.
2. Retention Data shows that students who completed MA/98/99 are retained at a higher rate than general freshmen population.
3. Overall, freshmen retention at CSUMB has been improved to 80% (2014) from 65% in 2006.

Freshmen to Sophomore Retention Rates 06-13

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<th>Year</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
<th>Total</th>
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<td>2013</td>
<td>120</td>
<td>100</td>
<td>110</td>
<td>330</td>
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<tr>
<td>2012</td>
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<td>2011</td>
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<td>80</td>
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<tr>
<td>2010</td>
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<td>40</td>
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<tr>
<td>2009</td>
<td>30</td>
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</tr>
<tr>
<td>2008</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>30</td>
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Math Remediation - Cost Comparison

<table>
<thead>
<tr>
<th>Type</th>
<th>Cost</th>
<th># Students</th>
<th>Cost per student</th>
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<tbody>
<tr>
<td>Traditional</td>
<td>$27,000</td>
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<td>$1,080</td>
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<td>CSUMB Model</td>
<td>$9,000</td>
<td>25</td>
<td>$360</td>
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Conclusion
At the current time, the next set of changes that are planned can be described as continuation of a successful pedagogy, increased use of technology and expansion wherever possible. The near-term changes include:
1. Continued evaluation of the current program in Math 98 and 99 using feedback from activity and test results, the CSUMB directors efforts in online tutoring and supplemental instruction to see if those new practices are resulting in increased success rates.
2. Evaluation of the new back-up success pathways to determine how many students are taking advantage of those and to determine success rates.
3. Evaluation of the use of tablets in the classroom and a determination of what other technologies might be used to increase faculty-student communication.
4. Evaluation of the use of this pedagogy for non-developmental courses to see if student success rates have increased and failure or repeat has decreased.

Expected changes over the longer term include:
1. Increased expansion to other math non-developmental math courses within CSUMB.
2. Increased use of technology, particularly video.
3. Increased outreach to the local middle and high schools (Monterey Peninsula Unified School District) for ultimate adoption in their math programs.
4. Initiation of outreach to schools districts beyond the local area to get more middle and high schools to adopt this pedagogical platform. Some 60% of CSUMB undergraduates come from geographical areas outside of the immediately surrounding three-county area.

Partners & Networks
Pre-College Academy with K-12 & Professional Development for math teachers:
- Graniterock Algebra Academy for middle school students
- Imagine College Summer Enrichment Program for high school students

Professional Development Institutes with the K-12 schools & Community Colleges:
- Expand the model to GE MATH/STAT Courses

Acknowledgements
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Limitations
This developmental math program works most efficiently with large class sizes but eventually campus facility could become a factor since the campus has limited numbers of classrooms of that size currently

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