The institution offers high-quality instructional programs in recognized and emerging fields of study that culminate in identified student learning outcomes leading to degrees, certificates, employment, or transfer to other higher education institutions or programs consistent with its mission. Instructional programs are systematically assessed in order to assure currency, improve teaching and learning, and achieve stated student learning outcomes.” This excerpt from the accreditation standards is a rationale for this work. This program review and planning document will be reviewed by the deans, and become the basis for the FPM/Block Grant, facilities planning, Box 2A and provide evidence for accreditation. Sections of this document will be reviewed by groups such as the Teaching-Learning Project, Curriculum Committee and SGC.

Program  Developmental Mathematics

Submitted on November 2006 by the following faculty lead for the program:

Myra Snell, Jim Cohen
(print name) (signature)

Reviewed and Approved by:

Dean
(print name) (signature)

Sr. Dean
(print name) (signature)
COLLEGE GOALS and INITIATIVES

As you review and prepare plans for your program, keep in mind current goals and initiatives developed for the college’s Master Plan.

COLLEGE GOALS

1. Offer high quality programs that meet the needs of the students and the community.
2. Ensure the fiscal well-being of the college.
3. Enhance a culture of innovation, inclusiveness and collaboration.
4. Improve the learning of students and the achievement of their educational goals.
5. Establish a culture of planning, implementing, assessing and improving.

STRATEGIC INITIATIVES

1. Grow enrollments productively.
2. Improve the image of the college.
3. Increase the number of transfers, degrees and certificates.
I. ANALYSIS and QUESTIONS

Program review begins with the collection and analysis of data by the research office and instructional deans. The questions posed are based on an analysis of enrollment, productivity, success/retention, curriculum, college and community participation and program resources and development. For occupational programs, a copy of the Core Indicators Report is included. To access data, go to http://siren/cognos

1. Overall, enrollments have been consistent. New courses have redirected students in more useful ways. Math 25 and 30 declined in the last two years but have made a strong comeback this Fall. One area of concern is Math 26 during Fall/Spring. Are there ideas regarding this class? PSI courses seem to be dying a slow death. Are there plans to eliminate this mode of instruction?

Math 26: We need to offer Math 26 since it’s a prerequisite for Math 40, but enrollments may be low because most students meet this prerequisite with high school geometry. We offer enough sections to meet current enrollment needs and provide flexible scheduling by alternating day and evening times. In the summer we offer more sections of Math 26 to accommodate the influx of high school students. The new A.A. math degree requirement that will be implemented statewide in 2009 allows any math course with an Elementary Algebra prerequisite to satisfy the degree; this might make Geometry a viable alternative to Intermediate Algebra and thus increase enrollments.

PSI: This mode of instruction is used in Math 1/2/7. Since FA 2003, the MDEC has encouraged the Math Department to decrease self-paced offerings. Currently, the department combines most Math 1/2 sections with Math 7. Math 7 is currently the recommended basic skills option by DSPS and some Voc-Tech programs. The MDEC plans to revamp basic skills offerings in the near future and will reconsider the role of self-paced instruction.

2. Productivity has been higher in the past but it seems the decrease has occurred at CCC and DVC too.

Productivity is an enrollment management issue. Productivity in Developmental Math is lowered by management’s requests for us to offer courses at high schools, on weekends, and for special programs, all of which continue to have poor enrollments.

D.E. courses Math 12, 18, 25, 30 are full and have very high productivity.

We need the following information to be provided in future program reviews if we are to provide an informed response to productivity questions:

• What is the productivity for Math DE courses?
• What is the DE Math Program’s productivity (by course) if we do not include specialized courses such as those being offered at the high school or for special programs?

3. Although retention rates are below the college average there is a sign of improvement. African Americans are noticeably below other ethnic groups. Are there ideas to improve this?

Response to #3 is grouped with #4 below.
4. The same trends apply to success rates. Overall success rates needs to be improved.

Success and retention rates are only part of the information we gather to ascertain our program’s effectiveness. The DE Math Program is following the program evaluation philosophy adopted by the LMC Developmental Education Committee. We conduct formative evaluation based on three types of information: indirect measures (such as retention and success rates), direct measures of student learning, and qualitative measures. The findings from these types of data drive our decision-making and planning processes. See Appendix 1, the Developmental Math Program Update on Evaluation Practices SP 04, for an illustrative subset of examples of how data has been used to make programmatic decisions. Appendix 2 contains the Math DE Program Goals and Evaluation Plan. We encourage management to broaden its list of measures for program effectiveness to include measures of learning.

With that said, we will now respond to the issues raised in questions 3 and 4.

In future program reviews, it would be helpful if management clarified what is meant by “low success rates.” To what are DE Math success rates being compared? Other programs at LMC, DE Math Programs in the district, state averages? In FA 01 and SP 04, we did an extensive comparison of our DE math course success rates to comparable courses at DVC and CCC and found our success rates exceeded those at both colleges for every DE math course. For basic skills/prealgebra courses our success rates consistently hover at the state average and for Elementary Algebra our success rates usually exceed the state average significantly. So it is arguable whether our success rates are low.

Since the establishment of the DE Math Program, we have begun to implement a variety of programmatic approaches to improving student learning and success:

**Assessment/Placement:**
- with the help of the Office of Institutional Research we have conducted studies comparing success rates of students with different levels of preparation in order to determine appropriate prerequisites,
- made changes to the Accuplacer multiple measures questions and validated cut-scores,
- rewritten the questions used during matriculation for math placement advising,
- worked with counselors on norming advising recommendations

**Staff development:** every semester the MDEC offers the following professional development opportunities for DE Math faculty
- a course-specific Teaching Community that meets weekly or bimonthly
- a series of Elementary Algebra retreats
- a variety of flex activities
- updated classroom resources in the Blackboard Classroom for Developmental Math
- individualized orientation, curricular, pedagogical and assessment planning sessions with the DE Lead and peer teaching observations

**Curriculum revision:** the MDEC sponsored Teaching Communities have
- written new course outlines
- designed, piloted, assessed, and revised lots of classroom activities to focus the curriculum on program learning outcomes
- integrated real world problems throughout the DE Math curriculum to make math more relevant and interesting

**Student Support:** the Math Department has experimented with
• increasing contact hours in the classroom,
• supplemental instruction,
• in-class lab hours,
• Learning Communities

Assessment of Learning: every semester we have holistically assessed student learning in our capstone DE math course, Intermediate Algebra. We have seen impressive gains in student performance in problem-solving, use of multiple representations, and communication for students whose instructors use the classroom activities developed by the Teaching Communities.

Our hypothesis is that meaningful, systematic and consistent implementation of these approaches will eventually improve success rates. We are already seeing improvements in success rates for Math 25 since the new course outlines were implemented and staff development began. (Note: the state average hovers around 0.46 for Elementary Algebra)

<table>
<thead>
<tr>
<th></th>
<th>Fall 2002</th>
<th></th>
<th>Fall 2003</th>
<th>Fall 2004</th>
<th>Fall 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 25 success rates</td>
<td>0.508</td>
<td></td>
<td>0.548</td>
<td>0.561</td>
<td>0.634</td>
</tr>
<tr>
<td>Implementation of new prerequisite, new COOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The SGC has provided financial support for the staff development efforts of the MDEC. However, we feel that we need the following support from management if we are to reap full benefit from these interventions:

• Encourage faculty to participate in professional development by enforcing the required flex obligation and publicly acknowledging the participation of faculty in specific professional development activities sponsored by the MDEC
• Require faculty to participate in assessment efforts by using accreditation as a mechanism for making faculty submit student work for assessment purposes (at least act like this is a management prerogative!)
• Schedule campus-wide forums (like College Assemblies) for faculty to share findings from assessment-related projects to help create a culture of assessment
• Provide support for the Office of Institutional Research so that we are able to obtain research results in a timely fashion for decision-making; include persistence data with program review
• Publicly emphasize the use of multiple measures for program evaluation; don’t depend solely on retention and success rates. Ask for and use direct measures of student learning to promote the importance of learning on the institutional radar screen.

With respect to the observation about African-American students, we noticed that success rates for African Americans in developmental math are up 6% whereas the college is down 1%. But we acknowledge that though success and retention rates for African Americans are improving, the year-to-year rates fluctuate and are usually below the college average.

We request the following information be included in future program review data to inform our action plans for improving the success of African-American students:

• Breakdown success rates within ethnicity groups by age and gender (anecdotal evidence suggests that other ethnic groups have a larger percentage of returning, older students and women. We are wondering if part of the explanation is that African American students are predominantly young and male, which are two groups that anecdotally have lower success and persistence.)
• Compare our success rates for different ethnic groups to district and state averages for comparable programs (This will help us determine if the problem is within LMC or due to other societal factors beyond our control.)
• Give us math placement and persistence data by ethnicity (Are lower overall success rates for African-Americans in DE Math explained by lower basic skills and prealgebra course success rates?)

5. There has been a lot of good work with curriculum. You are to be commended for your efforts! Thank you.

6. How are relations with high schools and colleges? Are there plans to increase outreach/articulation with other institutions?

High School outreach: In Fall 2003 and Spring 2004, teams consisting of the Senior Dean of Academic Affairs and a management-chosen department designee (typically the department chair, co-coordinator of the Developmental Education Program, or math lead) visited each of our feeder high schools and met with math faculty and counselors to discuss issues related to developmental education (placement and prerequisites, DE program goals, high school student registration policies, etc.) In Fall 2006 the CCCCD joined CalPASS, which will provide the opportunity for data-sharing that will facilitate seamless transitions from high school to college.

Other colleges: Through the Carnegie grant, we have had periodic contact with developmental education faculty at ten other CA community colleges. In Fall 2006, we made presentations at Laney, City College of SF, and at the Strengthening Student Success Conference on our developmental math program. We have not had contact with 4-year colleges since none of our math developmental courses articulate with 4-year institutions.

7. Is the lab effective for developmental courses? The program should develop and implement a plan for improving the effectiveness of the math lab for DE classes.

The MDEC has worked for the last year on developing a process for evaluating the effectiveness of lab services for developmental students. At this point we do not have enough information to draw any conclusions as we are still working on the methodology. Here is what we have accomplished:
• The Math Lab Coordinator attended a Math Lab Conference in Fall 2005 with the goal of learning about best practices in lab evaluation; unfortunately, it appears that this is new territory with no best practices yet established in the field. Some labs are conducting studies of the correlation of lab attendance and course grades.
• We investigated different ways to mine the sign-in computer for measures based on lab attendance. We are working to establish a systematic (and hopefully time efficient) process for gathering and examining this data.
• A part-time instructor conducted a focus group with two sections of Intermediate Algebra students to ascertain student views of the services offered in the lab. The main finding was that students do not use the lab because they are too busy with work and family. An indirect implication is that instructors may not be requiring lab attendance and designing activities that must be completed in the lab.
• We designed and piloted an assessment project last spring to try to measure the impact of lab tutoring on helping students attain problem-solving skills. Preliminary results were encouraging.
• We continue to conduct comprehensive student satisfaction surveys every two years. Results are very positive.

PLAN See Section VII for our plan
III. STUDENT LEARNING OUTCOMES

PROGRAM LEVEL STUDENT LEARNING OUTCOMES
At the completion of the DE Math program,

**Outcome 1**: Students will read, write, listen to, and speak mathematics with understanding.

**Outcome 2**: Students will use mathematical reasoning to solve problems and a generalized problem solving process to work word problems.

**Outcome 3**: Students will demonstrate the ability to use verbal, graphical, numerical, and symbolic representations of mathematical ideas to solve problems.

**Outcome 4**: Students will recognize and apply math concepts in a variety of relevant settings and demonstrate the math skills and knowledge necessary to succeed in subsequent courses.

**Outcome 5**: Students will demonstrate the characteristics of an effective learner.

**REVIEW**
For action plans based on assessment results, see Appendix 3 for sample assessment reports for Math 25 (Fall 2003) and Math 30 (spring 2006).

**PLAN**
Each semester assess a subset of the DE Program SLOs for one DE course chosen by the MDEC. Results will inform curriculum development, student support services, and professional development activities. Every two years assess the outcomes 1-3 for the capstone DE course, Intermediate Algebra, and use results for overall program improvement.

**Sampling design**: Every semester require that all DE instructors submit student work. Students who were failing the course prior to the final will be excluded from the pool. Select a random sample of student papers from each section or each semester (depending upon the goals of the assessment).

**Method**: Use communal problems from the required common final exam that are aligned with the DE Program Outcomes and course SLOs. Holistically assess student work using at least two problems to ascertain student performance on each outcome. Invite all DE instructors to participate in the assessment.

**Technique**: For each final exam in the sample, assess the student work holistically relative to each outcome using a rubric written by a Teaching Community or MDEC.

**Results and action plans**: Disseminate results to all DE instructors and develop actions plans. Use actions plans to inform program improvement activities sponsored by the MDEC.
IV. CURRICULUM

REVIEW

1. Accreditation standard II.A.2.c. states that “High-quality instruction and appropriate breadth, depth, rigor, sequencing, time to completion, and synthesis of learning characterize all programs.” Explain how the program meets this standard, evaluating the extent to which it is coherent, comprehensive and also meets the needs of the students and community.

“breadth” of the program: We offer a wider range of developmental math courses than is typical in community colleges. For example, we offer non-algebra options for the AA degree, namely Liberal Arts math (Math 15) and Nursing math (Math 18). We offer a larger selection of options for the basic skills student than is typical (self-paced, computer-based, variable unit, with and without study skills, voc-tech focused)

“depth, rigor” across sections of a course: Maintaining consistent standards across sections of the same courses is a difficult task. We currently use the following strategies in an attempt to norm standards across sections:

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Theory behind the strategy</th>
<th>Problems we have encountered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear student learning outcomes in course outlines</td>
<td>Instructors have freedom in teaching style, but we all must get students to the same point by the end of the course. SLOs clearly define what students should know and be able to do.</td>
<td>Instructors are not use to teaching to broad SLOs. They typically teach straight through their texts so that the text defines the learning outcomes and standards of difficulty for the course. Since they are using different texts, equity among sections is undermined.</td>
</tr>
<tr>
<td>Communal final exam questions</td>
<td>Common final exam problems are aligned with the SLOs. So these problems should help instructors understand the SLOs and set a standard for the level of difficulty required.</td>
<td>The department does not enforce or even monitor the use of the common final exam questions. We need the department chair and the developmental math lead to work together to communicate departmental expectations about using common final exam problems.</td>
</tr>
<tr>
<td>Course-specific professional development</td>
<td>Teaching Communities, Math 25 retreats, and flex activities are designed around course SLOs. These venues provide an opportunity for faculty to come to a common understanding of what students should know and be able to do at the end of the course and to share teaching strategies.</td>
<td>For the last few years the majority of our part-time faculty have not had a flex obligation, so many have not participated in staff development. Scheduling policies in the math department have made scheduling weekly Teaching Community meetings difficult. In addition our scheduling policy makes it difficult for an instructor to subsequently implement their course-specific professional development because of reverse-seniority scheduling and lack of scheduling priority for those who have specialized and done professional development in a course. Math 25 retreats (offered on Friday afternoons) tend to be well attended.</td>
</tr>
</tbody>
</table>
Assessment of student learning

Student work collected across sections of the same course is assessed holistically at the end of the semester to determine how well students are achieving course and program SLOs. Assessment sessions provide the opportunity for instructors to discuss how they evaluate student work and to norm their expectations for student performance.

Few instructors submit student work for assessment and only a portion of those who might benefit the greatest (current instructors of the course being assessed) show up to grade the papers. We need the department and the college to send a clear message to faculty about expectations for participating in assessment activities. Department chairs and deans can have an impact on establishing a culture of assessment at the college.

• “synthesis of learning” for sequential courses: The DE Math Program has five program-level SLOs, which represent “synthesized” abilities that students will attain by the end of the program. As we update our courses, course SLOs are aligned with these program SLOs. As we write common final exam questions for each course, these problems are designed to measure student ability relative to the program SLOs. When we assess student work at the course level, we look for different levels of performance relative to the program-level SLOs.

• Packaging: We schedule sections of each course to insure a variety of scheduling options for students (morning, afternoon, night, Saturdays). Given the amount of remediation that many of our students need, we plan to investigate packaging options that could accelerate a students’ progress through the developmental math sequence.

2. How does the program ensure that its curriculum is up-to-date with new discoveries and changes in the discipline?

When revising curriculum, the MDEC
• Develops SLOs aligned with the standards of the American Mathematical Association of Two Year Colleges (AMATYC)
• Aligns course SLOs and curriculum with program-level learning outcomes (for example, every activity in the Math 25 and Math 30 classroom packets have objectives that are aligned with the Math DE Program SLOs)
• Responds to assessment results (for example, the Math 30 class activities have been revised three times to address areas of student weakness that surfaced across sections during the assessment of final exams ... and student performance has improved!)
• Incorporates the principles of math education research (for example, see the website developed by the Math 12 Teaching Community in SP 06 where they document the impact of math education research on planning, teaching, and learning. Go to www.carnegiefoundation.org and search on Prealgebra Research Project: Impact of a Teaching Community)

3. Have all program course outlines been updated within the last 5 years?
   We have made a lot of progress updating our course outlines but not all DE Math courses have been updated.

   PLAN See curriculum objective in the planning section VII.
V. PROGRAM RESOURCES and DEVELOPMENT

REVIEW

1. Does the program have sufficient full-time faculty and staff? Refer to the FT/PT trends for FTEF. How does this affect the success of the program?

No, the Math Department does not have sufficient full-time faculty and staff.

Faculty:

- The department currently has 10 full-time faculty, but is offering enough courses to support 14 more full-time loads (based on Spring 2007 Pittsburg offerings).
- From 2002 - 2005 our total FTEF (including Pittsburg and Brentwood) has increased from 23.8 to 25.8, while the number of full-time math faculty decreased by one. Since 2002, we have not hired a full-time professor, and one of our full-time (Pittsburg) professors resigned (effective 01/05).
- The college and district regularly call on our current full timers to assume various leadership positions. The cumulative release time within the department associated with these leadership roles typically exceeds 1.0 FTEF, causing us to rely even more heavily on adjunct faculty.
- We are having an increasingly difficult time finding adjunct faculty who are qualified and competent. In fact, we have been requesting variances each semester so that some of our adjunct faculty can teach loads of up to 1.8. Our only alternative is to cancel classes for lack of professors.
- At the present time, we have 10 classes that are not staffed for Spring 2007.
- Our shortage of full-time faculty has diminished our ability to:
  - Evaluate faculty in a timely fashion;
  - Update our course outlines in a timely fashion;
  - Provide staff development;
  - Complete the process requires to hire adjunct faculty;
  - Provide enough office hours (as a department) for our students.

Staff:

- The number of classified staff for the math department (viz., one) has stayed constant since the college opened in the 1974. Since then, the number of students served by the math department has grown by a factor of about 1.8 (college FTES went from 3700 in 1977-1978 to 6800 in 2005-2006).
- We have three labs but only one classified staff member. The department is not able to proctor students taking tests in the lab for lack of staff.
- The new math building was designed for two classified staff.
2. Describe program faculty/staff participation in staff development. What staff development activities are needed to improve the program?

The MDEC offers the following professional development opportunities for DE Math faculty:

<table>
<thead>
<tr>
<th>Professional Development Activity</th>
<th>Typical number of participants</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>a course-specific Teaching Community that meets weekly or bimonthly (check out the cool website that the Prealgebra Teaching Community produced in SP 06 at <a href="http://www.carnegiefoundation.org">www.carnegiefoundation.org</a>, search on Prealgebra Research Project: Impact of a Teaching Community)</td>
<td>From 3 to 12 instructors teaching the same course</td>
<td>Every semester for the last 3 years</td>
</tr>
<tr>
<td>Elementary Algebra retreats (2 to 4 a semester)</td>
<td>From 5-10 Elementary Algebra instructors</td>
<td>Every semester for the last 2 years</td>
</tr>
<tr>
<td>Flex activities (including assessment sessions)</td>
<td>5-10 DE Math instructors</td>
<td>3 flex activities each semester for the last 4 years</td>
</tr>
<tr>
<td>Individualized orientation, curricular/assessment mentoring</td>
<td>5-7 new DE Math faculty</td>
<td>Every semester for the last two years</td>
</tr>
</tbody>
</table>

In Fall 2006 we are piloting a Scholarship of Teaching and Learning Seminar with the DE English Program. Instructors are conducting classroom-based research projects and producing webpages to document what they have learned.

The goals of our professional development activities are:
- Use the assessment of student work for course/program improvement
- Apply the findings of current math education research to curriculum and pedagogy
- Create greater equity for students and ensure student preparedness for subsequent courses by norming depth and level of difficulty in sections taught by different professors

In the future we plan to continue our current approach to professional development, with an added emphasis on training for new adjunct faculty. The MDEC will continue to define the focus of professional development activities in response to assessment of student learning and other program needs.

3. What additional facilities and equipment is required to maintain or improve the effectiveness of the program?

Additional facilities and equipment that may be required to maintain or improve the effectiveness of the Math program are:

- Additional computer classrooms: as effectiveness and design of computer aided instruction is improved, and its use increases, additional computer classroom(s) may be needed.
- “Smart Classroom” equipment purchased and installed: Assess the need for additional “Smart” Classroom” equipment based on usage and requests from instructors.
• Additional computers in the open Math Lab(s) for student use: assess the use of the computers in the Math Lab to determine if additional computers would be of benefit for students doing their CAI assignments.
• Computers for the Adjunct Faculty’s Office: Determine the need for additional computers in the math Adjunct Faculty’s Office based on their needs and schedules.
• Additional calculators and overhead equipment for calculator use: Determine if additional calculators are needed for use in classrooms; determine the need for additional overhead equipment for calculator use in classroom.

4. Does the program have a sufficient budget? How would budget increases improve the program’s effectiveness?

As a result of the institutionalization of Title III efforts, the MDEC has ongoing funds from the college for its professional development activities and 0.5 load release for a Developmental Math Lead. This support has been instrumental in implementing the innovative changes that characterize our program. As a result of these changes, we have seen improvements in student learning in Math 30 (see Appendix 3) over the last two years. Success rates in Math 25 are slowly improving, though we continue to struggle with the challenge of creating uniform standards across sections, training new adjunct faculty, and implementing best practice in a consistent manner across classrooms.

Other than this support, the Math DE Program does not have a separate budget from the Math Department. So the issues raised in the Transfer Math Program Review, relative to budget constraints, are shared by our program. In particular, please see section 5 of the Transfer Math Program Review for an analysis of the budgets for supplies, copying, tutoring, and staffing.

PLAN

Write planning objectives for addressing the review of staff development, and human, facilities and financial resources.

See Section VII for plans about staff development. See the Transfer Math Program Review for plans about addressing human, facilities and financial resources.

VI. OTHER ISSUES

This section is for issues not addressed previously in this report.

REVIEW

Detail other issues or items program faculty and staff have determined to be significant.

PLAN

Write planning objectives to address the additional issues detailed above.
## VII. PROGRAM PRIORITIES

### PROGRAM ACTION PLAN

<table>
<thead>
<tr>
<th>College goal</th>
<th>Objective</th>
<th>Activity/Action</th>
<th>Timeline</th>
</tr>
</thead>
</table>
| College goals #1, 4, 5 | Curriculum Branch: Continue to examine and redesign curriculum in the Math DE Program. In particular, work on Basic Skills, Geometry, and courses affected by the upcoming change to AA degree requirements | **Basic Skills**  
Revise the basic skills offerings (Math 1/2/7, 4, and 9) based on the following information and goals:  
- Determine the target population for each course to address the diversity of student needs (survey of student interest and educational goals)  
- Meet the needs of service programs (survey and retreat with DSPS, Occ. Ed., VN Nursing, etc)  
- Align courses with the DE Math Program SLOs  
- Develop course-level SLOs that balance the role of “drill”/procedural skill acquisition, quantitative literacy skills, and problem-solving in a real world context  
- Address best practice in the field of Developmental Education  
- Investigate the way these courses are packaged (short-term intensive, “boot camp”, online quick review, etc.)  

Use institutional research, program assessment, and math education research to determine which basic skills courses will continue to be offered.  
If self-paced courses remain part of the DE program, redesign these course outlines (Math 1, 2, 7) to incorporate the DE program learning outcomes and align them with the DE program; develop criteria and instruments to assess revisions to course outlines; assess revisions | Spring 2007: information gathering and planning  
Fall 2007: course outline revision |
| Math 15: Determine the role of Math 15 given upcoming changes to the AA |  
If Math 15 continues to be part of the curriculum, revise the course outline, including incorporating the DE program learning outcomes and aligning this course with the DE Program; develop criteria and instruments to assess revisions; assess revisions. | Spring 2007 |
| Math 26: Update COOR to align course learning outcomes with the Math DE Program SLOs and to incorporate findings from the following:  
- Survey of Math 26 students’ educational goals or reasons for taking Math 26  
- Geometry course outlines from other colleges  
- math education research |  
Spring 2007-Fall 2007 |
<table>
<thead>
<tr>
<th>College goals #1, 4, 5</th>
<th>Operational</th>
<th>Student Support Branch: Assess student support services in the Math DE Program</th>
<th>Spring 2007 or Fall 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• Clarify the goals of lab services</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Develop a systematic process for evaluating the effectiveness of lab services,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>including direct, indirect, and qualitative measures</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Work with faculty to meaningfully integrate lab services with classroom instruction</td>
<td></td>
</tr>
<tr>
<td>College goals # 4, 5</td>
<td>Operational</td>
<td>Equity</td>
<td>Fall 2007/ Spring 2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conduct a retention study to understand why students drop their math classes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Revise the DE Math Research agenda to include placement and persistence data</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>broken down by ethnicity</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Research interventions to address equity issues (e.g., MESA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Obtain Title V funds (or other funding) to pilot initiatives identified in the research (e.g., Learning Communities, peer mentoring, tutoring for athletes, )</td>
<td></td>
</tr>
<tr>
<td>College goals #1, 3, 4, 5</td>
<td>Operational</td>
<td>Professional Development Branch: Implement a comprehensive and coherent professional development program for faculty teaching and other staff supporting DE courses</td>
<td>ongoing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Continue to implement a structured orientation for new DE Math faculty</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Continue to offer Teaching Communities (with an initial focus on Prealgebra) and Scholarship of Teaching and Learning Seminars</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Continue to offer Elementary Algebra retreats (with a focus on teaching to the DE Math Program SLOs, norming standards, and assessment of student work)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Continue to offer flex activities (with a focus on assessment of student work for the purpose of program improvement, orientation to the Math DE Program)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Rework scheduling policies so that instructors who participate in extensive staff development efforts connected to specific curriculum are allowed priority in teaching that curriculum.</td>
<td></td>
</tr>
<tr>
<td>College goals #1, 3, 4, 5</td>
<td>Operational</td>
<td>Program Assessment: Conduct ongoing assessment of all three branches of the Math DE Program</td>
<td>ongoing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Continue to conduct assessment of student learning for course/program improvement</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Update the research agenda with Humberto</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Develop a plan for systematically assessing lab services and tutoring using direct, indirect, and qualitative data</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Develop a plan for systematically assessing professional development activities, including direct measures of implementation of program SLOs into teaching and learning</td>
<td></td>
</tr>
</tbody>
</table>

**VIII. ANNUAL PROGRESS**
See Appendix 4, Fall 2006 Progress Report on Developmental Math Program Action Plan from the Math Department’s 2003-04 unit plan
Appendix 1

Update on Evaluation Practices

Los Medanos College
Developmental Math Program

Update on Evaluation Practices
Spring 2004

Background: The following document was written in Spring 2004 at the request of the College President, Peter Garcia, who wanted a summary of how we are monitoring the effectiveness of our Developmental Math program. This document was not intended as an exhaustive summary of the evaluation of the DE Math Program but rather provided a subset of illustrative examples of how data is used to make programmatic decisions.
The DE Math Program is following the program evaluation philosophy adopted by the Developmental Education Committee. We conduct formative evaluation based on three types of information: indirect (institutional) measures, direct measures of student learning, and qualitative measures. The findings from this data drives our decision-making and planning processes.

I. Formative evaluation based on the use of three general types of information

A. Indirect measures
Math DE Research Agenda: negotiated with Humberto to provide success and persistence rates tied to specific research questions (see attached).

Examples from the last two years:

1. Investigation of factors that correlate with higher success rates in self-paced basic skills instruction (4-semester comparison of success rates for sections categorized by instructor, day/time, class size, date of closure due to full enrollment)

2. Investigation of placement factors connected to higher success rates in Elementary Algebra (compared success rates of students grouped by assessment score and prior LMC course success.)

B. Direct measures of student learning
Assessment of student learning outcomes based on holistic assessment of a random sample of common final exams.

Examples from the last two years:


2. Fall 2003: assessment of a random sample of final exams for 8 sections of Elementary Algebra using rubric-scoring for all five of the DE Program Outcomes (results and action plans attached)

C. Qualitative data
Surveys of student satisfaction with lab services and tutoring. Student surveys investigating impact of curriculum and pedagogy on learning. Instructor surveys investigating the impact of the Teaching Communities on teaching.

Examples from the last two years:

1. Survey of student use of and satisfaction with math lab services (474 students SP 2002)

2. Survey of student use of and satisfaction with the Computer Math Lab (264 students SP 2003)
3. Survey of student perception of the impact of curriculum and pedagogy used by instructors participating in the Elementary Algebra Teaching Community (99 students in FA 2003)

4. Survey of instructor perception of the impact of participation in the Elementary Algebra Teaching Community on teaching (8 instructors in Fall 2003)

II. Data-driven decision-making for all components of the DE Math Program: placement, curriculum, professional development, and student support

Decisions and action plans made by the Math DE Committee are informed by indirect, direct, and qualitative information, as well as information derived from the educational literature on ‘best practices’ for Developmental Education and from an analysis of practice in CA.

Note: For action plans connected to the assessment of student learning outcomes see attached.

A. Decisions about placement and prerequisites

Recent example: Implementation of a prerequisite for Elementary Algebra

Information and findings:
1. DE Research agenda: a three-semester comparison of success rates in elementary algebra for four groups categorized by “preparedness”: those who assessed into Elementary Algebra, those assessed below Elementary Algebra but enrolled anyway, those who took the LMC Prealgebra course, those who took an LMC basic skills course.

Findings: The only groups who consistently succeeded at rates higher than the state average were those who assessed into Elementary Algebra and those who successfully completed LMC Prealgebra. Those in the last group had significantly higher success rates than any other group.

2. Analysis of prerequisites for Elementary Algebra for a random sample of 26 CA community colleges

Findings:
Percent in the sample with a prerequisite for Elementary Algebra 24/26 = 92%

Out of those CC in the sample with a prerequisite for Elementary Algebra, the percent that allow HS work to satisfy the prerequisite (i.e. “or equivalent course” is part of the prerequisite) 5/24 = 21%

Out of those CC in the sample with a prerequisite for Elementary Algebra, the percent requiring prealgebra (instead of basic skills) 13/24 = 54%

3. Meta-analysis of successful DE programs nationwide

Findings:
There is clearly a consensus in the field of developmental education that mandatory assessment and placement are key components of successful programs (Boylan, 2002; McCabe, 2000; Roueche & Roueche, 1999.) see TLC Formative Evaluation of LMC DE Program

Action we took that is consistent with these findings:
1. Implement a prerequisite for Elementary Algebra with multiple measures that parallels the prerequisite for English 90.

   From the Math 25/25AX/25A COOR: Completion of Math 12 with a grade of "C" or better, or completion of coursework at another college that is comparable to Math 12 with a grade of "C" or better, or demonstration of equivalent prealgebra skills based on our LMC assessment process, or equivalent assessment recommendation from another college.

2. Provide opportunities for pre-testing and review before assessment test.

B. Decisions about curriculum

**Recent example #1:** Decision to phase out self-paced algebra

**Information and findings:**

1. Comparison of 5-years of success rates in self-paced algebra with lecture-based versions at LMC (Fall 1998-Fall 2002)

   Findings: At LMC self-paced algebra (Math 25A) has success rates that are significantly below the success rates for lecture-based versions (Math 25AX and Math 25)

2. Comparison of LMC success rates with the state average

   Findings: At LMC self-paced algebra (Math 25A) has success rates that are significantly below the state average. While the success rates for lecture-based versions (Math 25AX and Math 25) are consistently at or above the state average.

3. Current research on best practice

   Findings: Self-paced instruction is a widely used method of instruction for remedial instruction in CA and nationwide. Mastery-based learning is an integral component of self-paced instruction. Mastery-based learning is listed as a best practice common to successful remedial instruction (Boylan, 2002)

**Action we took that is consistent with these findings:**

1. Remove the self-paced algebra option (Math 25AB) by FA 05.
2. Incorporate mastery-based into the new Elementary Algebra COOR.

**Recent example #2:** Decision to develop lecture-based basic skills options and reduce self-paced basic skills options

**Information and findings:**

1. Investigation of factors that correlate with higher success rates in self-paced basic skills instruction (4-semester comparison of success rates for sections categorized by instructor, day/time, class size, date of closure due to full enrollment)

   Findings:
   - Scheduling issues did not appear to impact success rates.
   - Smaller class size correlated with higher success rates.
   - A few instructors were always in the top half and a few instructors were always in the bottom half of success rates. No instructor was always in the top quartile; one instructor was consistently in the bottom quartile. There were many examples of two sections taught by the same instructor with success rates differing by more than 15%.

2. Comparison of LMC success rates in basic skills with the state average
Findings:
Success rates in self-paced Math 1 and Math 2 are significantly and consistently below the state average. Success rates were not affected by minor changes in grading policy in the COOR (FA 02). Success rates were also not affected by staff development (FA 02) that included a flex activity, three meetings during the semester to discuss best practice, development and dissemination of the PSI Starter Kit (a collection of best practice materials compiled by LMC instructors.)

3. Comparison of success rates in basic skills options at LMC

Findings:
Math 7, a computer-based self-paced option, has very high success rates. But credit for Math 7 is earned a half-unit at a time. Data on the whether students complete the 3 units required for the certificate has not been analyzed. Math 904, which is Math 1 content combined with study skills, has high success rates. But Math 904 has 6 hours of in-class student-instructor contact (compared with 3 hours for Math 1). Data on persistence and success of students after Math 904 has not been collected.

Action we took that is consistent with these findings:

1. Development of new alternatives to self-paced instruction in basic skills (Math 4, 9,18) based on best practice
2. Reduced the number of sections of self-paced options (Math 1 and Math 2) by 37%. Increased the offerings of Math 7 and Math 4.
3. Incorporated computer-aided instruction and study skills into Math 9 and Math 18.

C. Decisions about professional development

Recent example: Structure professional development in the form of course-specific Teaching Communities

Information and findings:

1. Survey of students (n=99) about the impact on their learning of curriculum and pedagogy used by instructors in the Teaching Community

Findings: 74% of students rated learning activities developed by the Teaching Community as a important or very important to their learning; 60-70% of students rated their achievement of Math DE program outcomes at a 4 or 5 (on a scale of 5). See attached survey results for more detailed information about the impact of computer-aided instruction, group work, etc.

2. Survey of instructors (n=9) about the impact on their teaching effectiveness

Findings: 100% of participating instructors said the staff development activities positively impacted their teaching; 91% of instructors participating in outcomes-based assessment of final exams rated the activity as ‘important’ or ‘very important’ to the Math DE Program. See attached survey results for more detailed information.

3. Research in the American Educator comparing the effectiveness of different types of staff development in math

Findings: Only content-specific staff development correlated to improvements in student learning
Action we took that is consistent with these findings:
Continue to offer professional development in the form of Teaching Communities. Submit FPM proposal to support participation.

4. Decisions about student support services

Recent example: Change the scheduling of lab hours by arrangement to in-class lab for Elementary Algebra

Information and findings:

1. An analysis of lab usage by developmental students (n=316)

   Findings: A higher proportion of students enrolled in transfer level math courses utilize the math lab compared to students enrolled in developmental math courses. A survey of lab usage in Spring 2002 showed overwhelmingly that students feel positive about LMC math lab services.

2. Qualitative student feedback from Elementary Algebra students (n=99) about the impact on their learning of computer-aided instruction and group activities

   Findings: Students rated the following learning experiences as “important” or “very important” to their learning (4 or 5 on a scale of 1-5)
   - computer-aided instruction 58%
   - mastery-based learning 85%
   - group activities 74%
   - ‘effective learning’ assignments 48%

Action we took that is consistent with these findings:
Decrease lab hours by arrangement and increase in-class lab hours for Elementary Algebra. Provide student access to computer-aided instruction and group activities by providing instructors with professional development on CAI and specific curricular materials.
### Appendix 2

### DE Math Program Goals and Evaluation Plan

**MATH DE PROGRAM GOALS AND EVALUATION**

<table>
<thead>
<tr>
<th>LMC DE Program</th>
<th>Math DE Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our mission is to provide students with a coordinated curriculum and comprehensive support services that will engage, challenge and support them as learners.</td>
<td>Our mission is to provide students with a coordinated curriculum that is based on the five Math DE Program Outcomes and facilitated by responsive teaching rooted in assessment. Our mission is also to support students in the achievement of their academic goals by ensuring that they are properly placed and by providing comprehensive and integrated support services.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LMC DE Program Goals</th>
<th>Math DE Program Goals</th>
<th>How to assess</th>
<th>Timeline</th>
<th>Who</th>
</tr>
</thead>
</table>
| 1. Sustain an on-going evaluation (formative and summative) of the curricular component of the developmental education program: assess student learning outcomes in math, …Use information gained from the assessment process to improve teaching and learning, identify problems and challenges, and support innovation that addresses students’ needs. | 1. Conduct course-level assessment of student learning relative to the 5 Math DE Prg. Learning Outcomes. Use assessment results to inform instructional decisions. 2. Systematically collect qualitative data on student perception of factors contributing to their learning | 1. Criteria-based holistic grading of common questions on final exams. Write action plans at course-oriented flex activities. 2. Common student surveys conducted across sections. | FA 04: M12 and M30  
FA05: M30  
FA 06: M25 | TC leads |
| 2. Effectively integrate instruction and academic support services: tutoring, labs, supplemental instruction, …, counseling services, assessment, and learning communities. Make recommendations based on systematic assessment of these services, and periodically report to the college community on their effectiveness. | 1. Conduct course-level assessment of student learning relative to the four Tutoring Program Goals. 2. Use assessment results to make necessary adjustments to the Tutoring Program. 3. Math DEC needs to develop goals for the other student support services (SI, CAI, lab services, counseling partnership) | 1. Use parallel evaluation as done in PSI courses (e.g. by student, by tutor, by instructor) for DE courses that use the Tutoring Program. | FA 04: M12 and M30  
FA05: M30  
FA 06: M25 | Tutor Coordinator  
With input from Math Student Support Committee (if this committee is active) or the MDEC |
| 3. Working with the Office of Institutional Research, implement a comprehensive and on-going research plan to monitor student success, persistence and performance in | 1. Work with the Office of Institutional Research to implement a research cycle to collect data keyed to specific research questions pertinent to issues of student success. 2. Use the data (e.g. student | 1. Timely and consistent interaction with the Office of Institutional Research. 2. Data generated is relevant and answers research questions in | Yearly | 1. Math DE Leads or  
LMC DE Program Coordinator  
2. Math DE Committee |
progressively higher level courses within English, math, and ESL sequences leading to transfer level courses. In addition, research should provide information on students’ achievement of their academic/career goal.

| 4. Provide curriculum-based professional development that supports teachers in creating, sustaining, and assessing learning experiences that are directly linked to explicitly stated student learning outcomes. Provide evidence that students who successfully complete developmental education courses can demonstrate proficiency relative to those learning outcomes. | Provide on-going professional development on • writing course SLO’s that are aligned with Math DE program SLO’s • writing learning experiences to those SLO’s and providing student support to those SLO’s • assessing student learning relative to those SLO’s • using assessment feedback to adapt teaching in a timely fashion | 1. Qualitative faculty feedback 2. Evidence of the development of outcomes-based instructional materials 3. Evidence of each aspect of the assessment cycle described to the left. 4. Holistic grading of final exams with public and common criteria (e.g. rubrics) to document changes in student learning. 5. Holistic grading of final exams with public and common criteria (e.g. rubrics) to document that students have met proficiency relative to the SLO’s. | Each semester we have funding. Cycle through the DE courses. | Math DE leads with support from teaching communities |
Appendix 3

Sample Assessment Reports

Summative Assessment of Math 30 Finals Spring 2006

Background: Math 30 is the capstone course for the DE Math Program; it is the prerequisite for all transfer level math courses. This is the fourth summative assessment of Math 30 finals. The first assessment was completed in Fall 2004. A comparison of results from previous semesters is given below. During Fall 2004 and Spring 2005, an Intermediate Algebra Teaching Community met weekly with the goal of improving student achievement of the outcomes stated in the Math 30 Course Outline.

Sampling design: Two of the ten instructors voluntarily submitted class sets of final exams which comprised 25% (3 out of 12) of the number of sections taught. Both were full-time instructors teaching on the main campus who used extensively the supplementary curriculum developed, class tested, and edited by the Teaching Community in the previous semesters. This is a decrease in participation relative to previous semesters (e.g., FA 04 when 50% (6/12) of the Math 30 instructors submitted student work, one of whom was part-time, SP 05 when 37.5% (3/8) submitted their students’ exams). Students who were failing the course prior to the final were excluded from the pool. From three of the twelve sections of Math 30, we chose a random sample of 28 exams, 9 or 10 exams per section.

Method: The FA 04 Teaching Community wrote problems aligned with the DE Program Outcomes and Math 30 SLO’s. These problems comprised at least 50% of each instructor’s final exam. Three of the five DE Program Outcomes were holistically assessed using from two to four separate items on the final exam.

Technique: Each final exam was assessed holistically relative to each outcome using a rubric written by the FA 04 Teaching Community. For each outcome we conducted a benchmarking exercise in which each instructor graded the same paper. We then discussed the scores and reached consensus. Next, for each outcome each final was assessed independently by two instructors. If the two scores differed by ± 1 on a scale of 5, the scores were averaged. If the two scores differed by more than one level, that student’s work was independently assessed by a third instructor. The closest two scores were then averaged. Six instructors participated in the grading.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Criteria</th>
<th>Final Exam problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Outcome: Students will read, write, listen to, and speak mathematics with understanding.</td>
<td>Clear, organized, and logical work</td>
<td>Health care, waste management parts b and c, women’s earnings part e</td>
</tr>
<tr>
<td></td>
<td>Clear explanations and reasoning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correct use of vocabulary or notation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Defines variables and interprets the meaning of slopes, points, intercepts, and solutions in a context.</td>
<td></td>
</tr>
<tr>
<td>Problem-Solving Outcome: Students will use mathematical reasoning to solve problems and a generalized problem solving process to work</td>
<td>Understanding of problem</td>
<td>Train, waste management</td>
</tr>
<tr>
<td></td>
<td>Estimation and checking answers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Using an appropriate technique</td>
<td></td>
</tr>
</tbody>
</table>
word problems.

| Multiple Representation Outcome: Students will demonstrate the ability to use verbal, graphical, numerical, and symbolic representations of mathematical ideas. | Generating and using a model Use of a general problem solving process | Construction, use and interpretation of tables. Construction, use, and interpretation of coordinate graphs. Construction of EQ’s from tables or graphs. Interpret models’ accuracy/validity Use of technology | Health care part e, waste management part b, women’s earnings parts a, b, c and d, $4^x = 8x + 12$

### Results: See rubric for description of scores

2.5 represents an average score of 2.5 rounded to the tenths

#### Communication Outcome: stemplot of rubric scores

<table>
<thead>
<tr>
<th>FA 04</th>
<th>SP 05</th>
<th>FA 05</th>
<th>SP 06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.5</td>
<td>3.44</td>
<td>3.6</td>
</tr>
<tr>
<td>St. Dev.</td>
<td>1.0</td>
<td>0.85</td>
<td>0.7</td>
</tr>
<tr>
<td>Low</td>
<td>0.5</td>
<td>1.5</td>
<td>2</td>
</tr>
<tr>
<td>1st quartile</td>
<td>3</td>
<td>3</td>
<td>3.25</td>
</tr>
<tr>
<td>2nd quartile</td>
<td>3.5</td>
<td>3.5</td>
<td>3.75</td>
</tr>
<tr>
<td>3rd quartile</td>
<td>4.4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>High</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>% proficient or better</td>
<td>81%</td>
<td>77%</td>
<td>83%</td>
</tr>
</tbody>
</table>

#### Problem-solving Outcome: stemplot of rubric scores

<table>
<thead>
<tr>
<th>FA 04</th>
<th>SP 05</th>
<th>FA 05</th>
<th>SP 06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.4</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td>St. Dev.</td>
<td>1.1</td>
<td>0.82</td>
<td>1.0</td>
</tr>
<tr>
<td>Low</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1st quartile</td>
<td>2.4</td>
<td>2.75</td>
<td>3.5</td>
</tr>
<tr>
<td>2nd quartile</td>
<td>3.6</td>
<td>3.75</td>
<td>4</td>
</tr>
<tr>
<td>3rd quartile</td>
<td>4.2</td>
<td>4</td>
<td>4.125</td>
</tr>
<tr>
<td>High</td>
<td>5</td>
<td>4.75</td>
<td>4.75</td>
</tr>
<tr>
<td>% proficient or better</td>
<td>69%</td>
<td>73%</td>
<td>90%</td>
</tr>
</tbody>
</table>
Multiple Representations Outcome: stemplot of rubric scores

<table>
<thead>
<tr>
<th></th>
<th>FA 04</th>
<th>SP 05</th>
<th>FA 05</th>
<th>SP 06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.1</td>
<td>3.63</td>
<td>3.5</td>
<td>3.61</td>
</tr>
<tr>
<td>St. Dev.</td>
<td>1.0</td>
<td>0.75</td>
<td>1.0</td>
<td>0.89</td>
</tr>
<tr>
<td>Low</td>
<td>0</td>
<td>1.75</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>1st quartile</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
<td>3.25</td>
</tr>
<tr>
<td>2nd quartile</td>
<td>3.5</td>
<td>3.75</td>
<td>3.375</td>
<td>3.5</td>
</tr>
<tr>
<td>3rd quartile</td>
<td>4</td>
<td>4.25</td>
<td>4.25</td>
<td>4.38</td>
</tr>
<tr>
<td>High</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>% proficient or better</td>
<td>59%</td>
<td>80%</td>
<td>80%</td>
<td>82%</td>
</tr>
</tbody>
</table>

Profile of the “average” Math 30 student based on rubric criteria and mean scores for each outcome:

Communication: Most of the work is neat and organized with answers supported by work shown. Explanations are usually given, but may at times be incomplete. If prompted, defines variables accurately and with appropriate specificity in most cases. Interprets slopes, intercepts, and solutions accurately, though some interpretations lack units.

Problem-Solving: Usually interprets problems correctly with occasional difficulty in understanding. At least 70% of the problems are worked correctly. Strategies are effective, but may not be efficient. Usually able to generate a model, but model may have minor errors. Usually able to use a model to answer a question, though some errors may affect accuracy. Limited and incomplete use of a general problem-solving process; for example, at times estimates are unreasonable, reasoning may be illogical, and does not consistently check answers.

Multiple Representations: Correctly interprets and uses information from tables and graphs in an attempt to answer a question, find an equation, etc. Constructs tables and graphs but organization, scale, or some other difficulty may impede finding a solution. Tables are labeled accurately. Graphs are accurately scaled and labeled. Interprets validity and limitations of tables and graphs though some interpretations lack precision or complete reasoning. Able to use technology to answer questions, though answers may be incomplete.

Analysis:

1. Did previous action plans impact learning?

Action plans from Fall 2004 focused on improving student performance in problem-solving and use of multiple representations. Performance in problem-solving improved slightly in SP 05, followed by impressive gains in FA 05. In the use of multiple representations, performance improved significantly in SP 05 and was maintained in FA 05.

Action plans from Spring 2005 focused on increasing the use of the classroom activities written by the Math 30 Teaching Community since use of these activities correlated with improvements in student performance.
Action plans from Fall 2005 focused on improving instructor access to the classroom activities by making class sets available for students to purchase in the bookstore (by instructor request) and ensuring that all Math 30 instructors have access to the activities on-line through the use of a Blackboard classroom.

<table>
<thead>
<tr>
<th>Summary of Previous Action Plans</th>
<th>Progress on previous action plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on action plans developed after the FA 04 assessment, Math 30 activities, originally written by the Teaching Community, were edited to emphasize the steps in the general problem-solving process (e.g., identifying given and extraneous info, paraphrasing the task, estimating, checking, etc.). Instructors submitting student work for the assessment both in SP 05 and FA 05 used these revised activities.</td>
<td>Relative to FA 04, the mean score on problem-solving has continued to increase in SP 05, FA05, and SP 06. Likewise, the percent rated as proficient or better rose from 69% in FA 04 to 73% in SP 05 with impressive gains in FA 05 to 90%. The gains were maintained in SP 06 with 89% proficient on this outcome. Noteworthy increases in the 1st quartile have been maintained and indicate that students in the bottom 25% of the sample show the most improvement in problem-solving relative to FA 04.</td>
</tr>
<tr>
<td>Math 30 activities, originally written by the Teaching Community, were edited to foster the use of tables and graphs in problem-solving and to improve the critical thinking involved in generating useful tables and graphs. Instructors submitting student work for the assessment both in SP 05 and FA 05 used these revised activities.</td>
<td>Relative to FA 04, there were statistically significant gains in the use of multiple representations in the sample assessed in SP 05, FA 05, and SP 06. The percent rated as proficient or better rose from 59% (FA 04) to 80% (SP 05 and FA 05) to 82% (SP 06) on this outcome. Gains made in SP 05 by the students in the bottom 25% of the sample were maintained in FA 05 and SP 06.</td>
</tr>
<tr>
<td>SP 05 actions plans called for an increase in the use of the classroom activities written by the Math 30 Teaching Community. These activities were posted in the DE Math Blackboard classroom and accounts were created for all Math 30 instructors. In a pre-semester flex activity Math 30 instructors participated in the assessment of FA 05 student papers and were introduced to the TC activities as a way of helping students meet DE Program SLOs.</td>
<td>There was a modest increase in the number of instructors using the Math 30 TC activities, from 3 out of 8 in SP 05 to 5 out of 9 in FA 05. These 5 instructors used at least 90% of the activities. In SP 06 we can only verify that 2 of the 11 instructors used the activities.</td>
</tr>
<tr>
<td>FA 05 action plans suggested we strive to increase access to the classroom activities by encouraging instructors to make them required materials for students to purchase in the bookstore and ensuring that all instructors had access to the activities on-line through a Blackboard classroom.</td>
<td>We posted the classroom activities on Blackboard Board, created accounts for all DE instructors, and discussed the use of activities in pre-semester flex activities. However, use of these activities remains low.</td>
</tr>
<tr>
<td>SP 06 instructors called for revising some components of the assessment process: including more table creation and use on the exam questions, and greater detail about use of the problem solving process in the grading rubric. Additionally, instructors need to better emphasize student communication when using technology (e.g., using graphical techniques to solve an equation) and also finding and interpreting multiple solutions, especially ones that occur outside Quadrant I. Activities could be edited to reflect these needs.</td>
<td></td>
</tr>
</tbody>
</table>

|
2. Did student performance on the three outcomes appear to differ by section? Both instructor and student anonymity are protected in the assessment process. Instructors who submitted student work can request to see the assessment results for their students.

Closing the assessment loop: improving learning

1. Instructors participating in the assessment of Math 30 final exams were generally pleased with the overall student performance on the three Math DE Program Outcomes assessed. Since instructors who submitted student work used the activities written by the FA 04 Math 30 Teaching Community, use of these activities appears to foster proficient performance relative to communication, problem-solving, and use of multiple representations.

We suggested improving the wording in the exam problems and grading rubric to emphasize clear communication standards and give students more opportunities to create tables, estimate, and check answers.

2. Instructors participating in the assessment had a variety of recommendations for improving the exam questions and for assessing student performance using multiple measures. See Instructor Feedback on Assessment Activity SP06 for a summary.

Other observations:

How can we get more instructors to submit student work?

<table>
<thead>
<tr>
<th></th>
<th># instructors submitting student work</th>
<th># instructors participating in the assessment session</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA 04</td>
<td>6/12 = 50%</td>
<td>7/9 = 78%</td>
</tr>
<tr>
<td>SP 05</td>
<td>3/8 = 38%</td>
<td>6/8 = 75%</td>
</tr>
<tr>
<td>FA 05</td>
<td>5/9 = 56%</td>
<td>4/9 = 44%</td>
</tr>
<tr>
<td>SP 06</td>
<td>2/10 = 20%</td>
<td>5/10 = 50%</td>
</tr>
</tbody>
</table>

Despite the repeated reminders from the DE Lead, the majority of instructors did not respond to the request for student work. However, participation in the actual assessment session was much better, with 50% (5/10) of the FA 06 Math 30 instructors attending. Looking at student work from the end of the course fostered a good conversation between Math 30 instructors who had just finished teaching the course last spring and instructors preparing to teach it this fall. Since the purpose of assessment is to improve student learning, we want to keep the “forward focus” of the assessment session fostered by scheduling it during flex. The Math DE Committee needs to devise strategies for increasing the number of instructors who submit student work. Perhaps support from the Department Chair, the Academic Dean, and the Teaching and Learning Project would help instructors see the benefit to students that assessment can bring.
Appendix 4


Goal 1: Continue to develop our Comprehensive Program in Developmental Education (DE) in Mathematics.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Activity/Action</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Update the mission, philosophy, and goals for the MDE Program.</td>
<td>Update the mission, philosophy, and goals for the Math DE Program to reflect the motion to establish the developmental math program, adopted in April 2003. Align mission, philosophy, and goals for the Math DE Program with those of the LMC DEC.</td>
<td>Completed Fall 2004</td>
</tr>
<tr>
<td>Develop DE guidelines for hiring faculty</td>
<td>Develop guidelines for determining desirable qualifications and interview questions that will ensure the hiring of faculty, particularly full-time faculty, who demonstrate the competencies to help students achieve DE program outcomes and who will adhere to DE course outlines.</td>
<td>Fall 2005 for FT hiring; added revised desirable qualifications for FT job application, edited essay and interview questions; for PT hiring: revised interview questions. Developed new PT faculty orientation guidelines (Fall 2006)</td>
</tr>
<tr>
<td>Curriculum Branch: Continue to examine and redesign curriculum in the Math DE Program. In particular, work on Intermediate Algebra and Basic</td>
<td>Intermediate Algebra Use institutional research, statewide and national practice, and program considerations to investigate a change in the current prerequisite for Intermediate Algebra. Rewrite the course outline to incorporate the DE program learning outcomes and to align this course with DE program; develop criteria and instruments to assess revisions; assess</td>
<td>New course outline with new prerequisite passed by Curriculum Committee in FA 04; implemented in FA 05 Assessment of student work on common final exam questions conducted SP 05, FA 05, SP 06</td>
</tr>
<tr>
<td>Skills.</td>
<td>revisions.</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>Develop a Math 30AX and BX: write and approve course outlines; develop criteria and instruments to assess a pilot; offer and assess pilot sections.</td>
<td>No progress</td>
<td></td>
</tr>
<tr>
<td>Investigate curricular options for a “hard” and “soft” Intermediate Algebra.</td>
<td>No progress</td>
<td></td>
</tr>
<tr>
<td><strong>Basic Skills</strong>&lt;br&gt;Use information from institutional research and program assessment to determine which basic skills courses will continue to be offered.</td>
<td>OIR research on Math 7 completed FA 05; we plan to address this action plan in SP 07 (as indicated in 2003-2004 Unit Plan)</td>
<td></td>
</tr>
<tr>
<td>If self-paced courses remain part of the DE program, redesign these course outlines (Math 1, 2, 7, 25AB) to incorporate the DE program learning outcomes and align them with the DE program; develop criteria and instruments to assess revisions to course outlines; assess revisions.</td>
<td>Math 25AB inactivated due to low success rates and difficulty aligning self-paced algebra with DE Program Outcomes.</td>
<td></td>
</tr>
<tr>
<td><strong>Math 15:</strong> Revise the course outline, including incorporating the DE program learning outcomes and aligning this course with the DE Program; develop criteria and instruments to assess revisions; assess revisions.</td>
<td>As stated in 2003-2004 Unit Plan, we will revise course outline, criteria, and instruments by Spring 2007</td>
<td></td>
</tr>
<tr>
<td><strong>Student Support Branch: Assess student support services in the Math DE Program</strong>&lt;br&gt;Develop a plan for assessing student support services in the Math DE Program, including the use of computers as instructional support and lab services. Continue to assess tutoring services.&lt;br&gt;<strong>A.</strong> Create a timeline for assessment of student support services.&lt;br&gt;<strong>B.</strong> Write a set of principles for student support assessment based on recommendations from professional organizations (MAA, AMATYC, and NCTM) and best practice.&lt;br&gt;<strong>C.</strong> Write criteria for assessing student support services.&lt;br&gt;<strong>D.</strong> Design a methodology for assessing student support services.&lt;br&gt;<strong>E.</strong> Develop a process to use assessment and institutional research to guide decisions.</td>
<td>in progress:&lt;br&gt;Math Lab Coordinator attended a Math Lab Conference in FA 05 to gather information on best practices in math lab evaluation; in SP 06 MDEC designed and piloted a study of the impact of math lab tutoring on students’ problem-solving abilities and also developed “indirect” measures of math lab effectiveness using lab attendance data.</td>
<td></td>
</tr>
<tr>
<td><strong>Professional Development Branch:</strong> Develop a plan for a comprehensive and coherent professional development program for faculty teaching and other staff supporting DE courses</td>
<td>Develop guidelines for establishing and overseeing Teaching Communities for DE courses</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TC guidelines established in the FPM proposal approved in SP 05 for ongoing funding for MDEC sponsored TCs</td>
<td></td>
</tr>
<tr>
<td><strong>Professional Development Branch:</strong> Develop a plan for a comprehensive and coherent professional development program for faculty teaching and other staff supporting DE courses</td>
<td>Rework scheduling policies so that instructors who participate in extensive staff development efforts connected to specific curriculum are allowed priority in teaching that curriculum.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MDEC motion to revise the department’s scheduling policy did not pass (FA 05)</td>
<td></td>
</tr>
</tbody>
</table>

| **Program Assessment:** Develop a process for assessment of the Math DE Program |
| A. Create a timeline for assessment of courses, professional development activities, and student support services. |
| B. Write a set of principles for DE program assessment based on recommendations from professional organizations (MAA, AMATYC, and NCTM) and best practice. |
| C. Write criteria for assessing the three branches of the DE Math Program: Curriculum and courses, professional development activities, and student support services. |
| D. Design a methodology for assessing the three branches of the DE Math Program |
| E. Develop a process to use program assessment and institutional research to guide program decisions, including decisions about course offerings, scheduling patterns, staff development, lab and tutoring services connected to developmental math. |
| In progress: |
| See MDEC documents (attached): |
| • DE Math Program Goals and Evaluation |
| • Update on Evaluation Practices, SP 04 |