

A MENU-DRIVEN DEVELOPMENTAL MATHEMATICS LABORATORY
How to build a better math lab!!!

Do you think that your students should spend more time doing mathematics problems? Should they spend time using calculators, software, manipulatives or some combination of these to learn mathematics? Would you prefer that your students work individually or cooperatively? Should their writing in class be journal entries, reports on famous mathematicians, or descriptions of how to do problems? Do videos have any place in the mathematics classroom? Imagine a situation where you have sixteen extra hours each semester in which to incorporate any enrichment or extra practice activities into your teaching. What would you do?

In order for students and faculty to buy into our new developmental mathematics laboratory, we ask ourselves these questions and others on an ongoing basis. Our collective answers to these questions form the very exciting developmental mathematics laboratory at the University of New Mexico - Valencia Campus. The road to obtaining our developmental mathematics laboratory, however, was a little rocky. Its implementation once we received permission to create it has also been both exciting and problematic. My goal in documenting our curriculum development is to share with other professionals in the field one of the most exciting experiences in my career.

When the University of New Mexico - Valencia Campus surveyed the other post-secondary institutions in the state of New Mexico, we found that the Developmental Mathematics courses at a vast majority of the institutions in our state are four or five credit hour courses. For years we had offered two different three credit hour courses in Developmental Mathematics: Basic Mathematics (arithmetic) and Introductory Algebra. The prospect of adding a required mathematics laboratory to each of our developmental mathematics classes created quite a debate within the Mathematics Department and across the campus.

For years the faction that believed "If it ain't broke, don't fix it" triumphed. They argued that our graduates from the developmental mathematics classes were successful in Intermediate Algebra. Expanding the number of credit hours of each class would only create scheduling problems for both students and faculty. It might even decrease our enrollment, since our nontraditional students would have to arrange their work schedules, their child care, and their other courses around the added requirement. Why put more money into changing a program that already worked? In the face of our limited budget, this was the hardest argument to counter, since other areas in the mathematics program were in dire need of funds.

A patient minority argued for more time to teach. Part of this group lamented that as they incorporated cooperative learning groups, mathematics manipulatives, and other activities into class,

the syllabi became harder and harder to complete. Another part of the group wanted more time to lecture.

For every argument there seemed to be an equally strong counter argument. If developmental courses carried more credit, students could register for full-time status in developmental courses rather than trying to fill out their program of studies with courses for which they might not have adequate academic maturity. On the other hand, if developmental courses carried more credit, students might run out of financial aid before finishing their program of studies.

While the Developmental Studies debate raged, other areas within the Mathematics Department received much needed attention. We acquired mathematics manipulatives, fraction calculators, and video tapes for the pre-service elementary teachers. We purchased classroom sets of graphics calculators for the college algebra and calculus students. In fact, we amassed quite a library of mathematics learning materials. As Coordinator of the Mathematics Program, I dispersed materials using a primitive checkout procedure from the shelves of my office to any faculty member or student who wanted to play with our mathematics toys.

The need for a better place to house our materials became all too evident as I attempted to function in my office. We proposed and were given a classroom with two huge cabinets to house our learning materials: the Mathematics Environment. We filled the room with tables, covered the walls with mathematics posters, and scheduled both Developmental Mathematics courses as well as courses for pre-service elementary teachers in this environment.

To address the needs of the ever increasing number of students in developmental studies at our institution, we formed a Developmental Studies Committee including the faculty who teach Academic Skills, Reading, Developmental English, Developmental Mathematics as well as support personnel from the Library, the Student Enrichment Services, and the Computer services. Combining the talents of the various entities on campus to discuss our mutual concerns enabled us to change our view of developmental studies. We were no longer isolated in our attempts to prepare students for college courses. We were each part of the Developmental Studies Program working together to meet the needs of the students within the program.

The Coordinator of the Language and Letters Program negotiated with the Administration for a computer laboratory set aside for developmental studies students only. This new computer laboratory added fuel to the fire to extend our developmental courses from three credit hours to four. We proposed that Developmental English and Developmental Mathematics classes have a one credit hour corequisite laboratory.

Our request was granted under several conditions. Since additional funding for the Developmental Studies program would provide computers and staffing for the Developmental Studies Computer

Laboratory, faculty would not be fully compensated for the extra hour of laboratory time. Faculty would provide activities for students and assign grades to students for the mathematics laboratory; however, they would not have the extra hour of contact time with students! Computer aides would be available to assist students. While this was not what we expected, it was what we achieved. Rather than scrapping the program, we decided to move forward.

In the Fall 1995, we added one hour of laboratory credit to both Basic Mathematics and Introductory Algebra. As soon as we created the course on paper, implementation became a real problem. We had a fascinating set of challenges. In theory all students enrolled in these classes were required to take the laboratory. Some students, however, had a creative approach to scheduling their classes which bore little resemblance to our concurrent enrollment requirement. Since students receive two different grades for Developmental Mathematics from their instructor, one for the regular course and one for the laboratory, it was critical that students register for the right section.

Not all of the faculty in mathematics were enthusiastic about using the extra time for computer activities, and, of course, none of them were paid for developing alternative learning materials. It was clear from conversations with various faculty that they had some very real concerns. Some felt that we did not have enough software on the network in mathematics to support the program. What if we required students to use the computer lab and the network went down? What if all of the developmental studies students chose to use the same peak times to do their work? According to them, using the computer laboratory alone to meet the needs of our students was not only precarious, it did not address the diverse learning styles and time constraints of our adult learners. We had to have alternative activities.

We did agree on some major points. Each faculty member in the Developmental Mathematics Program would require that students complete sixteen laboratory activities, one for each week of the semester. Based on the completion of these tasks, each student would receive a grade. Faculty agreed to assign a grade based on quantity rather than quality of production. If the student completed 90% or more of the activities, the student would receive an A, 80% or more a B, 70% or more a C, and if the student completed less than 70% of the activities, the student would receive NC. Grading options for the course and the laboratory are A, B, C, NC. We also made the difficult decision that students must pass the corequisite mathematics course in order to receive a passing grade in the mathematics laboratory. The choice of appropriate activities is left to the individual faculty member and his or her students.

Since I am one of the faculty in the Developmental Mathematics Program, I designed a syllabus for this course which reflects my teaching philosophy. In my opinion, developmental mathematics

students can discover how they learn mathematics by exploring various activities and deciding which ones work best for them. Therefore, students in my classes select from a variety of activities. They

1. Receive **tutoring** at the Student Enrichment Center.
2. **Write** about mathematics and mathematics learning.
3. Use **computer software** and **calculators** to learn mathematics.
4. Use **manipulatives** to explore pattern recognition and problem solving.
5. Complete practice sheets and **handouts**.
6. View videos and **movies** about education.
7. Propose an activity that works for them.

Listening to students discuss among themselves which activities they prefer is very gratifying. They are becoming educational connoisseurs. Some of the most exciting activities are suggested by the students themselves. They very sheepishly ask if they can have credit for studying with a particular relative or doing extra homework from the textbook because that is what works for them. Students have asked to receive mathematics laboratory credit for

1. Forming study groups that meet on a regular basis.
2. Tutoring their children in mathematics.
3. Receiving tutoring from their children in mathematics.
4. Attending Mathematics Night at their child's school.
5. Watching mathematics classes on television.
6. Closing out the cash register at work every night.
7. Attending mathematics workshops at the Student Enrichment Center.
8. Writing study tests for each other.

I have enclosed a copy of my syllabus from the Basic Mathematics Laboratory for the reader. Syllabi from other faculty within the program are available on request. Any questions or comments should be addressed to Diel@unm.edu.

Math 010 Lab
Developmental Mathematics Lab

Fall 1996

Michele Diel
Office: Academic Building 105
Telephone: 925-8616
Teaching Schedule: MW 10:00-11:15am
 MTWR 11:30-12:45pm

I. Course Description:

Math 010 Lab: Developmental Mathematics Lab (1)
Developmental Mathematics Lab is pre-college mathematics laboratory with emphasis on problem solving using the basic operations, fractions, decimals, percents, ratios, and measurements. Math 010 Lab is a co-requisite for all students currently enrolled in Math 010.

II. Textbook:

None

III. Attendance Policy:

Math Lab is a one credit hour course which is arranged at the discretion of the student and the instructor and the support services at UNM-Valencia Campus. The student will complete one regularly scheduled Math Lab activity each week. Failure to complete six of the sixteen activities will result in failure of the class. Missing four scheduled activities is considered an excessive absence. A student may be dropped from the class for excessive absences at the discretion of the instructor.

IV. Grading Policy:

The student will complete 16 activities from the list of activities given below.

Letter grades will be assigned as follows:

Grades:	A = Completion of 14-16 Activities
	B = Completion of 13 Activities
	C = Completion of 11-12 Activities
	CR = Credit: Completion of 11 or more activities.
	NC = No Credit: Student has not progressed.

V. Study Suggestions:

1. Make a strong effort to do sixteen lab activities.
2. Complete assignments on time.
3. Get a tutor at the Student Enrichment Center.
4. See your tutor from the Student Enrichment Center, the laboratory aid in the Developmental Studies Computer

Laboratory or see your instructor when you need help on the activities you choose.

5. Form a study group with your classmates; trade telephone numbers.
6. Discuss your lab activities with other members in the class.

VI. Support Services:

The Valencia Campus Library provides a quiet atmosphere for study and is an excellent resource for supplementary materials. The Student Enrichment Center offers tutorial and individualized instruction at no cost to the student.

VII. Major Course Objectives and Activities:

The Math Lab provides the student with a selection of pedagogically sound learning experiences. The student will choose and complete a variety of enrichment activities from a menu of possibilities which augment and enhance the learning in the regular classroom. The student will:

1. Receive **tutoring** at the Student Enrichment Center.
2. **Write** about mathematics and mathematics learning.
3. Use **computer software** and **calculators** to learn mathematics.
4. Use **manipulatives** to explore pattern recognition and problem solving.
5. Complete practice sheets and **handouts**.
6. View videos and **movies** about education.

These activities will help the student to meet the objectives of Math 010:

1. The student will add, subtract, multiply and divide whole numbers, fractions, decimals, and integers.
2. The student will convert between decimal, fractional, and percent notation.
3. The student will solve problems using whole number, fraction, decimal, and percent skills.
4. The student will calculate averages, medians, and square roots.
5. The student will solve algebraic equations in one unknown using the distributive law, the addition and multiplication principles.

IX. Menu of Activities:

Choose 16 of the activities given below. Some activities, like visiting your tutor, you may do more than once and receive credit for each occasion. There are eight different types of activities listed below. Do a variety of activities.

Report the completion of your work to your instructor on your

Math 010 Lab Activity Form.

- A. **TUTORING:** (If you choose an activity from this set, the Student Enrichment Center will notify the instructor each time you are tutored. If you are unable to schedule a tutoring session, choose an alternative activity.)

Activity 1: See a tutor at the Student Enrichment Center.
(Each tutoring session is one Math Lab activity.)

Activity 2: Attend a math workshop sponsored by the Student Enrichment Center. (When you complete this activity, have the presenter sign your Math Lab Activity Form.)

- B. **WRITING:** (If you choose an activity from this set, turn in your writing to the instructor.)

Activity 3: 1. One of the challenges of taking a mathematics class is finding the time in your busy schedule to do the homework. I want you to take a close look at what works for you... then answer the following questions:

- a. When is the best time for you to study your mathematics?
- b. Where do you study mathematics..where are you the most productive?
- c. Describe the noise level you prefer while doing your homework. Do you prefer doing your homework in silence, in front of the tv, while listening to heavy metal music...?

Activity 4: Write your mathematics autobiography including some of your favorite or your most horrifying experiences with the subject.

Activity 5: Write a two-page report describing the life and work of a famous mathematician. (The UNM-Valencia Campus library is an excellent resource for this assignment.)

- C. **COMPUTER SOFTWARE:** (If you choose an activity from this set, you should schedule an appointment at the Student Enrichment Center or the Developmental Studies Computer Lab (V105.) When you complete the activity, have the aide sign your Math Lab Activity Form. If you are unable to schedule a tutoring session or to schedule time to use your favorite piece of software, choose an alternative activity.)

Activity 6: Tour the Student Enrichment Center and the Developmental Studies Lab.

Activity 7: Play Meteor Multiplication at the Student Enrichment Center.

Activity 8: Play How the West Was 1 + 2 + 3 in the

Developmental Studies Laboratory, V105.

Activity 9: Work through Divide and Conquer in the Developmental Studies Laboratory, V105.

Activity 10: Explore the University of Arizona Software Package particularly the Venn diagrams and logic games.

Activity 11: Work on the practice software which accompanies each section of our textbook. This software provides support for each section of our textbook. You may choose to do this activity as often as you choose.

Activity 12: We continue to receive software for the computer lab. Work on a piece of software not mentioned above.

D. **MANIPULATIVES:** (If you choose an activity from this set, go to the Student Enrichment Center to get your materials. Complete the activity there. When you are done, have a tutor from the Student Enrichment Center sign your Math Lab Activity Form.)

Activity 13: Learn to multiply the 6's, 7's, 8's, and 9's on your fingers.

Activity 14: Complete Pattern Block Activities on fractions.

Activity 15: Complete Two Color Counter Activities on integers.

Activity 16: Complete Cuisenaire Activities on ratio and proportion.

E. **HANDOUTS:** (If you choose an activity from this set, go to the Student Enrichment Center to get your materials. Turn in the completed work to the instructor.)

Activity 17: Complete the handouts on order of operations.

Activity 18: Complete the handouts on fractions.

Activity 19: Complete the handouts on integers.

Activity 20: Complete the handouts on ratio and proportions.

F. **MOVIES, VIDEOS AND AUDIO TAPES:** (A large number of videos are available for you, free of charge, from the UNM-Valencia Library. If you choose an activity from this set, to receive credit for the activity, write a brief reaction paper about what you saw or heard. Turn in the completed work to the instructor.)

Activity 21: See a movie about education; i.e., Goodbye, Mr. Chips, Fame, Stand and Deliver.

Activity 22: See a video about math anxiety.

Activity 23: See Donald in MathMagic Land.

Activity 24: Listen to the audio tapes provided by Addison/Wesley which accompany each section of our textbook.

G. **PROJECTS:** (If you choose an activity from this set, turn in your work to the instructor.)

Activity 25: Interview 12 people using a research question.
Report the raw data.
Report the mean, median, and mode of the data.
Display the results in a bar or a line graph.

Activity 26: Assume you have \$2.50. Describe one meal that you could purchase from each of six fast food restaurants in this area. The meal must include a drink and something to eat and must cost \$2.50 or less.

H. **PROPOSALS:** (If you want to do an activity not mentioned above, have it approved by the instructor. (Thank you, Linda Pope, for this suggestion.))

Activity 27: Complete the work in your proposal.