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ABSTRACT

The Mathematics and Computer Science Learning Center (MLC) was established in the Department of Mathematics at North Carolina Central University during the fall semester of the 1982-83 academic year. The initial operations of the MLC were supported by grants to the University from the Burroughs-Wellcome Company and the Kenan Charitable Trust Fund. The Center houses a math library, tutorial lab, video lab, computer science lab, and a computer lab for Critical Foundations in Arts and Sciences (CFAS). All math and computer science students use and benefit from the Center. The MLC also helps faculty members develop special tutorial programs, implement the programs, and evaluate their effectiveness. Computers and/or audio visual equipment are used in developing, implementing, and evaluating the programs. Services provided by the MLC include: (1) developing and administering self-paced improvement programs (SIP) for students whose scores on diagnostic tests show deficiencies in mathematics; (2) providing tutorial services in mathematics and computer science courses at all levels; and (3) providing review sessions for all freshman mathematics courses. This paper highlights the self-paced improvement program, describing its development, implementation, and evaluation. (Author/SWC)

The Mathematics and Computer Science Learning Center (MLC)

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Abstract:

The MLC was established in the Department of Mathematics during the fall semester of the 1982-83 academic year. The initial operations of the MLC were supported by grants to the University from the Burroughs-Wellcome Company and the Kenan Charitable Trust Fund. The Center houses a Math Library, a Tutorial Lab, a Video Lab, a Computer Science Lab, and a computer lab for Critical Foundations in Arts and Sciences (CFAS). All math and computer science students use and benefit from the Center. The MLC also helps faculty members develop special tutorial programs, implement the programs, and evaluate their effectiveness. Computers and/or audio visual equipment are used in developing, implementing, and evaluating the programs.

Overview

The Mathematics and Computer Science Learning Center was established in the Department of Mathematics and Computer Science in the early 1980's as a resource and facility for providing a variety of teaching and learning support services and programs. These services and programs include:

1. developing and administering self-paced improvement programs (SIP) for students whose scores on diagnostic tests show deficiencies in mathematics;
2. providing tutorial services in mathematics and computer science courses at all levels;
3. providing review sessions for all freshman mathematics courses.

The Mathematics and Computer Science Learning Center (MLC) houses a variety of resource media materials including micro-computers, books, journals, mini-modules, CAI materials, a video library, and other learning resources. These resource materials are used by students for drill and practice exercises that give immediate feedback on mastery of a variety of mathematical rules, formula, algorithms, and techniques. The MLC and its resources are also used by the faculty as a supplementary instruction center.

The Self-Paced Improvement Program (SIP)

The SIP is offered twice a semester: once at the beginning of the semester and once after mid-semester. Three courses are involved in the two sessions of the SIP.

The focus of the first part of the SIP is to help students, who have inadequate mathematical background, to overcome their short comings as soon as possible so that they can successfully complete the courses in which they are enrolled. This program is designed to not duplicate or reproduce the regular course work, but to reinforce the pre-requisites for each course. The second part of the SIP is designed to supplement class work and class lectures. This helps improve students' comprehension of the various concepts encountered in their classes and the textbook.

Procedures for the First SIP

At the beginning of each semester (usually by the third week), all students in the Intermediate Algebra (Math 0900) and College Algebra and Trigonometry I (Math 1100) courses are given diagnostic tests to evaluate each student's mathematical preparedness to successfully complete the course in which they are enrolled. The diagnostic test questions are carefully designed to assess student's background in four general areas needed to successfully complete each course. The targeted areas for Intermidiate Algebra (Math 0900) SIP are;

(1) Whole Number Operations
(2) Fractions
(3) Decimals
(4) Percents.

The targeted areas for the College Algebra (Math 1100) SIP are;

(1) Signed Numbers,
(2) Equations and Word Problems,
(3) Exponents and Polynomial, and
(4) Factoring and Division of Polynomials.

If a student scores below 70% in one or more of the areas on the pre-test, he/she is assigned to the MLC for SIP work in those areas.

Folders are prepared for each assignee and ready for use during the third week of classes. Each folder contains: (1) procedures on use of the Center, (2) assignments (modules to be done) tailored to the assignee's needs, (3) deadlines for each assigned area. Upon successful completion of all the modules for an assigned area, the student takes a computerized test before moving on to the next assigned area.

At the completion of the first SIP activity, post-tests are administered for the two courses and results of the pre-tests and post-tests are analyzed. Each SIP student's progress report specifies the number of modules completed, area test results, and pre-test and post-test results. A report is prepared for each section of Math 0900 and Math 1100.

Development of the First SIP

A committee composed of the Mathematics and Computer Science Department faculty members is responsible for the development, assessment, and improvement of the First SIP. The main charges of the committee include the following:

* Develop appropriate test banks for the diagnostic pre-test and post-test for Math 0900 and Math 1100.
* Develop test banks for each of the four areas for each of the two courses. There are a total of eight different test banks.
* Customize "OMNIS" software to:
  - grade pre-test and post-test;
  - assign students who scored below the cut-off point on the pre-test to the SIP;
  - create progress sheet for each SIP student;
  - create notices and folder labels for assigned students;
  - prepare report and analysis for each section of both courses as well as an assessment of the SIP program for the session.
* Develop four step-by-step self-taught modules for each area of the two courses. There are sixteen modules for each course.
* Develop an effective and efficient mechanism to implement the program.
* Evaluate and review the program every year and make appropriate changes/modifications of the software, modules, and procedures as needed.

Implementation of the First SIP

The implementation of the First SIP is carried out by the MLC Director, three faculty members with one quarter release-time each, two graduate assistants, and three upper class undergraduate student assistants. Pre-tests are graded, analyzed, and all necessary materials are prepared to start SIP work within two days of the tests. Folders with assignments for each SIP student are prepared. Inside each folder is a progress sheet with the following information:

1. Areas assigned for SIP, (it ranges from one to four);
2. Name of the modules to be completed for each assigned area;
3. Deadline for the completion of each assigned area.

All testing, analysis, and assignment schedules are computerized. Deadlines to complete each area are staggered by course section to avoid a "bottle-neck" and to use the time of students, student assistants, and faculty efficiently.

The maximum time to complete an assigned area, i.e. to complete all modules and take the area test, is one week. Thus, a SIP student may have up to four weeks of SIP assignments to complete in the MLC.

Evaluation of the First SIP

At the end of the program, the SIP's effectiveness is evaluated in two ways.

(1) Results of the pre-tests and post-tests are compared for the SIP students who completed at least half of their assigned work ("attended"). Comparison of the pre-test and post-test scores for four combined semesters, (Spring 1995 - Fall 1996), for the two courses are as follows:

The average Pre-test score for Math 0900 SIP students who completed at least half the assigned work is 55.0%, and their post-test average is 71.4%.

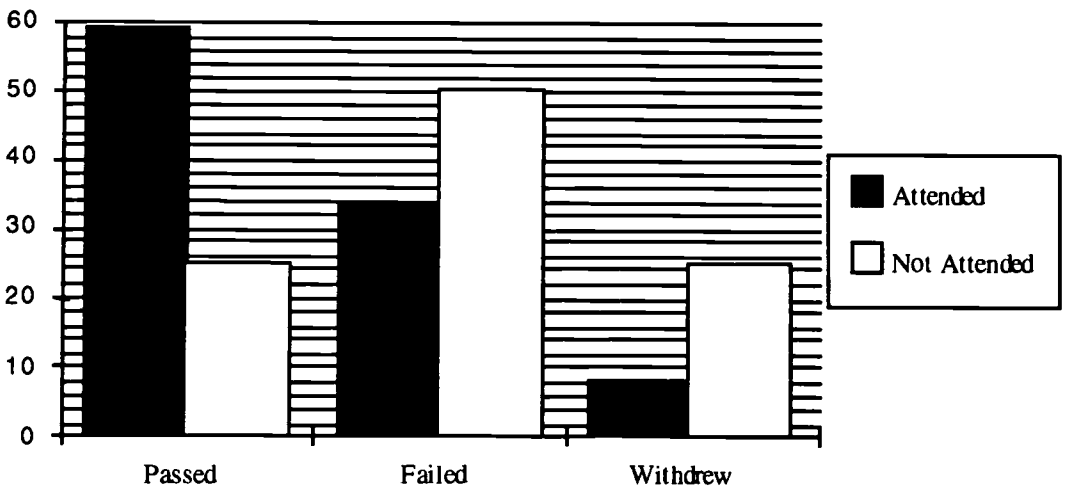
The average Pre-test score for Math 1100 SIP students who completed at least half the assigned work is 55.2%, and their post-test average is 72.3%.

(2) The overall course performance of SIP students who completed at least half of their assigned work is compared to those who did not attend the MLC to complete their assigned work. The results for Spring 1995 are summarized in the following graphs.

Percentage of Math 0900 Students by SIP Attendance and Course Outcome

Nearly 40% of the Math 0900 SIP students who completed or attended the MLC passed their course. On the other hand less than 10% of those who were assigned for SIP but did not attend the Center passed their course.

Percentage of Math 1100 Students by SIP Attendance and Course Outcome

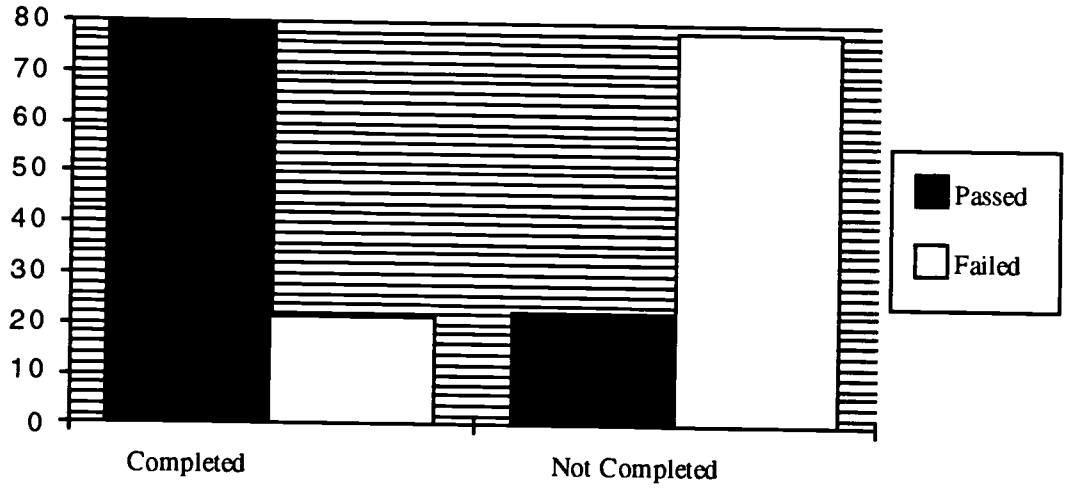


For Math 1100, fifty nine percent (59%) of the SIP students who completed or attempted their assignments in the MLC passed their course with grades of D or better. On the other hand only 25% of the SIP students who never attended the Lab passed their course.

Procedures for the Post Mid-Semester SIP

The SIP for the second half of the semester involves Math 0900 and Math 1140 (Mathematics for the Liberal Arts). Unlike the SIP of the first half of the semester, students in the two courses are assigned to the MLC for SIP based on their mid-semester grade reports by their instructors. This program gives students who earn a grade of D or less for their mid-semester report an opportunity to master specific topics and areas that have been diagnosed as weaknesses, and improve their grade. Instructors in these courses are responsible for the development of the program. This program also has its modules and testing procedures. Its implementation, analysis, and organization is carried out in the MLC by the instructors of the courses, the MLC Director, some members of the MLC Committee and student assistants. The effectiveness of this program is evaluated by comparing the overall course performance of SIP students who completed the assignment against the performance of those who were assigned but did not complete the assignment. The following two graphs summarize the results for Spring 1995.

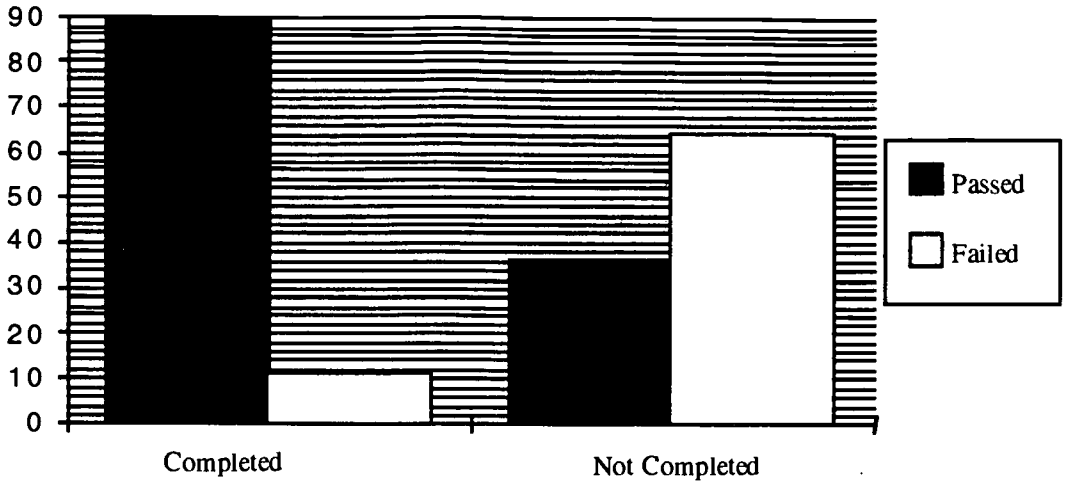
Percentage of Math 0900 Students by Second SIP Completion and Course Outcome



Seventy nine percent (79%) of the students who completed their Lab work passed their course. On the other hand, only 22% of the assigned students who never attended the Lab to work on their self improvement assignment passed the course.

For Math 1140 SIP, 89.5% of the students who completed their assigned work passed their course with grades of D or better. On the other hand, less than 36% of the assigned students who did not complete the Lab work passed the course.

Percentage of Math 1140 Students by Second SIP Completion and Course outcome



Other Services of the MLC

Some of the other services that the MLC offers students throughout the semester are as follows:

1. Tutoring is offered for all mathematics and computer science courses on a first-come-first-serve basis. The MLC is a site for the North Carolina Alliances for Minority Partnership in Sciences and Mathematics (NCAMP). Through grants from this program, the MLC trains graduate students and upper class mathematics and computer science students to help as peer tutors in the Center.

2. Courses in Intermediate Algebra, Algebra and Trigonometry, the Calculus Series, Probability and Statistics, and Finite Mathematics use the video library to supplement class lectures. Some instructors also assign use of tutorial software in their courses.

3. The Center develops final exam review materials for Math 0900 and Math 1100 and conducts coordinated review sessions for theses courses each semester.

4. Individual students may schedule conferences to develop study skills, test taking skills, time management, and for other related assistance. Reading and video materials in these areas are available for students in the Center. A "Student Survival Kit" booklet that provides a quick and easy reference for students who may be experiencing academic difficulty in mathematics, or those who wish other assistance in a variety of other related areas has been prepared and given to students to be used as a reference. The booklet also contains information on services available in the MLC.

5. The Center is open from 9:00 A. M. to 10:00 P. M. Monday through Thursday, 9:00 A. M. to 5:00 P. M. on Friday, 10:00 A. M. to 2:00 P. M. on Saturday, and 2:00 P. M. to 7:00 P. M. on Sunday.

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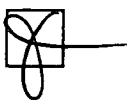

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