

**THE MATHEMATICS LEARNING RESOURCE CENTER
AT OKLAHOMA STATE UNIVERSITY**

Experiences with a Large Scale Mathematics Laboratory

by Pamala Çemen and Jerry Johnson

Department of Mathematics

Oklahoma State University

Stillwater, Oklahoma 74078

Oklahoma State University is a comprehensive land grant institution with a College of Engineering and an enrollment of approximately 21,000. The Mathematics Learning Resource Center (MLRC) was established here in 1984 as a comprehensive center featuring both electronic technology and conventional tutoring for supplementing and enriching the mathematics curriculum. The center occupies 4,354 square feet, has a full time director (Dr. Pamala Çemen) and a staff of 30 undergraduate and graduate student assistants. It is available to students 59 hours each week. Included in the MLRC are:

- 40 networked Texas Instruments Professional microcomputers,
- 12 networked IBM compatible Texas Instruments Business Pro microcomputers,
- 5 TI printers,
- 2 Control Data microcomputers,
- 19 combination VCR - television learning stations, and
- 5 caramate slide-tape players.

The two Control Data machines mentioned above are used for Plato algebra, precalculus, and calculus tutorial packages obtained as part of a beta test site agreement.

A wide range of commercial software is available for the Texas Instruments microcomputers including technical word processing, programming in the common computer languages, spread sheets, and a computer algebra system called *muMATH™ Soft Warehouse* used largely by students in linear algebra and differential equations. In addition, there are elaborate graphing packages and menu driven utilities that were written by faculty and graduate students here at OSU. One of them illustrates various concepts in differential equations such as direction fields and dependence of solutions on parameters.

Every attempt has been made to assure that a first time visitor to the MLRC with no knowledge of computers can quickly begin using much of the educational software. Everything from logging onto the Novell Network to calling up a program is done by simply following a sequence of menus. In addition, succinct documentation and on-line help has been provided.

Available for use on the VCRs are approximately 300 studio quality videos of mathematics lectures. Many were produced by Oklahoma State University faculty members through small grants and some were purchased from the Ohio Mathematics Association of Two Year Colleges. For the slide caramates there are similar sets of slides. The video tapes and slide sequences review the full range of topics covered in elementary mathematics through Calculus and Differential Equations.

In addition, the MLRC provides several support services such as conventional tutoring, a copy machine, electronic paper grading, placement testing, and a provision for instructors to place materials on reserve.

The problems of setting up and operating such a facility are enormous, but integrating it into the undergraduate mathematics curriculum is also difficult and we have made a vigorous attempt to do this.

Almost every student enrolled in mathematics from intermediate algebra through calculus, differential equations and linear algebra is assessed an \$10 per semester fee for MLRC use. This semester (Fall 1988) that comes to about 5,800 students. Any other student at OSU may use the MLRC provided they pay the fee. On their first visit students fill out a card on which is kept a log of how they used the MLRC and what materials or software they checked out. The cards of students enrolled in a course requiring an MLRC fee are filed under the instructor's name so he or she may check a student's attendance if desired.

It is important to emphasize that the MLRC is strictly a supplement to the curriculum. No regularly scheduled classes meet there and no given amount of attendance is required. That is why the large number of clients we serve is manageable.

It is a fact of life that most students will do little academically that does not impinge on their grades. Therefore, ensuring that the MLRC is integrated into the curriculum requires the cooperation of individual instructors in giving graded assignments. While some are enthusiastic, others are less so. Part of the reluctance of the latter group comes from unfamiliarity with computers and part from philosophical disagreement with the whole idea, but most of it is simply due to the fact that OSU is a research institution where demands on the faculty's time make them unwilling to spend it in this way. It is therefore important that the instructor be required to exert very little effort in cooperating with the program. To guarantee this, the following steps have been taken:

At the beginning of each semester instructors are issued handouts for their students that describe the MLRC and provide a directory of the software and videotapes available. This directory is keyed not only to the subject matter but to the current textbook as well. Thus, if a student wants supplementary instruction on the material in section 5.3 of the text, appropriate videotapes and software are listed in the directory.

Throughout the rest of the semester instructors are issued self-contained MLRC assignments over various topics as they arise in the course syllabus. They may be used as the individual teacher wishes but every faculty member and teaching assistant is *strongly* encouraged to make them a part of the course.

Most of the exercises are designed to be fairly easy to grade and are self-explanatory with

step-by-step computer instructions provided. Should the student require assistance there is always a staff member on duty at the MLRC to help. All this ensures that the instructor need know nothing about the computers and that little of his or her time is required to make the MLRC a part of the course.

While the program we have just described has been successful in most respects, there are improvements that still need to be made. One of the problems is creating *good* exercises. Most of the those mentioned above have been written by the first author and MLRC staff members in their "spare" time. It is very time consuming to design really meaningful assignments that teach concepts and reinforce ideas without the intervention of an instructor. A good way for a department to accomplish this is to provide interested faculty with release time to create such exercises, but this is not always a high priority.

Another aspect of this difficulty is that most of our assignments have only one version so that plagiarism is quite probable. It is likely that a student in a large section could copy all the MLRC assignments from a friend and never set foot in the lab.

The rapid change of technology is an inevitable companion in such an endeavor as well and the expense of staying up-to-date can be considerable.

Even with all its problems, we feel that the program is worthwhile. Without it there would be a lack of contact with the technology that is constantly changing our approach to teaching and learning.