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Case Study: Math Learning Center at Oregon State University

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1 Introduction

Oregon State University is a land grant research university with approximately 25,000 students. Science and engineering are academic strengths and virtually all undergraduate students take at least three mathematics courses. Hence, the mathematics department has enormous responsibility for lower division (freshman/sophomore) mathematics service courses, as well as upper division courses serving its own undergraduate majors and graduate courses serving its Masters and PhD programs.

The Math Learning Center (MLC) has been in existence for over 30 years and serves as an important academic support for all undergraduate students taking lower division mathematics courses, from College Algebra through Differential Equations taken by STEM majors. The mission of the MLC is simply stated: to support student learning of mathematics. Professor Emeritus Gary Musser was the driving force behind creating the original Mathematical Sciences Learning Center (serving both Mathematics and Statistics) after he had visited several other such centers across the country.

The original center included an extensive assessment service, providing for testing (and retesting) for a number of modular algebra courses as well as the foundational courses for students

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preparing to become elementary teachers. After budget cuts in the 1990s, this function of the center was discontinued. The MLC does provide for proctored make-up midterm and final exams.

The Math Learning Center is in the same building as the Mathematics Department. The close proximity of the MLC to faculty and graduate teaching assistant offices has always been considered to be extremely important. It serves to emphasize the connection between the department and the MLC to both students and departmental faculty and staff.

2 Center Organization and Services

The hours of the Math Learning Center (MLC) during the academic year are 9 am – 5 pm on Monday through Thursday, and 9 am – 4 pm on Friday from the second week of the term through the last week of classes. The MLC also supplies tutors for an evening study area in the university library that is shared with tutors from the learning centers for Chemistry and Writing. (The library tutoring is available on Sunday through Thursday evenings during the term). For each of the nine large residence halls on campus, one tutor is made available one night a week in a designated common study area in the hall.

The services offered by the MLC are:

- a well-lit study area with tables and chairs,
- free drop-in tutoring (provided by GTA's, faculty volunteers, and a few hired undergraduate tutors).
- resources (textbooks, solution manuals, a few graphing calculators, etc.) to check out for use in the MLC.
- make-up testing (faculty or TA's can leave make-up tests in a secure file cabinet at the MLC reception desk; clerks administer and refile the completed test to be picked up at the instructor's convenience),
- a mathematics education resource classroom - used by mathematics classes for prospective elementary/middle school mathematics teachers as well as our Math Excel (Emerging Scholars Workshop) program,
- a computer lab that is available to undergraduate math majors, math graduate students, and faculty teaching classes using computers.

At the evening “satellite” sites (library and residence halls), only tutoring is provided.

3 Staffing, Hiring, and Training

A tenured faculty member serves as the faculty director for the MLC. The faculty director oversees the modest budget, coordinates scheduling of the Emerging Scholars workshops (Math Excel program, described in more detail below), and serves as communication liaison with other

units on campus (library, registrar, first-year student programs, and other academic units). Day-to-day oversight responsibilities of the MLC are an explicit part of the position descriptions of three fixed term (year-to-year contract) senior instructors, representing 25 – 50% of their full-time load, the remainder of their responsibilities being regular classroom teaching. Their duties include hiring/scheduling tutors and helpers.

The front reception area desk of the MLC is staffed by work-study undergraduates. The clerks check out resource materials to students, monitor the small (25 seat) instructional computing laboratory in the MLC, and proctor make-up examinations in a special partitioned area of the MLC.

The primary function of the MLC is to provide drop-in tutoring assistance across all of our lower division mathematics courses. Usually 4–5 tutors are available each hour. Approximately 55 graduate students having teaching assistantships are required to put in three hours per week tutoring in the MLC as part of their regular responsibilities. Faculty tutors are volunteers, and 10–12 faculty tutors volunteer one hour a week in the MLC each term. Faculty are encouraged to view an hour in the MLC as an “office hour away from the office,” where it is perfectly acceptable for them to let their own students go to the “front of their line” during their MLC hour.

There is a small budget to hire a few undergraduate tutors (5–10 per term), and these students are expected to have completed at least first-year calculus. If undergraduate tutors are interested in earning general course credit instead of pay, they may register for an upper division variable credit “projects” course, with 1 credit awarded for every 3 regularly scheduled weekly hours worked in the MLC throughout the term. For example, if an undergraduate works 6 hours per week as a tutor in the MLC, he or she would earn 2 credits through the projects course.

Students are limited to 10 minutes with a tutor if there is a line of students waiting, but they can simply go back to the end of the line. There are lines of students waiting to see tutors, especially during weeks when courses are having midterms.

There is no special training for tutors. As part of our regular teaching orientation for new Graduate Teaching Assistants (GTAs), we do provide some instructions on interacting with students during their scheduled MLC tutoring hours.

MLC helpers are instructed to:

- 1) start out by asking what course the student is taking (so the tutor will have some sense of what mathematical techniques are appropriate for example, a student in College Algebra should not be shown how to use calculus to find the vertex of a parabola);
- 2) ask the students to talk through their thinking and to describe their progress on a mathematical problem up to the point where they feel they are “stuck” this talking process gives the tutor not only a chance to diagnose the student’s difficulty, but also helps the student to articulate the mathematics (remarkably, this “talk through your thinking” instruction often

results in students recognizing an error themselves);

- 3) refrain from the urge to simply work through a problem for the student, but rather to talk them through it (“don’t use your pencil – let them use theirs!”).

The MLC front desk clerks (undergraduate work study students) do gather hourly statistics on usage of the center by noting the number of tutors available as well as the number of students in the MLC at that time. Normally, 20–40 students are in the MLC every hour with 4–6 tutors available. This provides us with a rough measure of usage that we might call “student-hours” in the MLC, and we estimate our usage at 12,000 student-hours per quarter term, or 36,000 student-hours per academic year.

4 Special program: Math Excel (Emerging Scholars Workshop)

The Math Excel program at Oregon State University began in 1998 with initial seed funding from OCEPT (Oregon Collaborative for Excellence in the Preparation of Teachers). It is based on Uri Treisman’s Emerging Scholars Workshop model, which has been implemented on many college campuses over the last thirty years. Treisman’s Emerging Scholars model is based on groups of students meeting regularly in a social atmosphere to work collaboratively in solving mathematics problems related to their introductory coursework. Oregon State University’s implementation of the Emerging Scholars Programs was patterned closely on (and named after) the University of Kentucky implementation - Math Excel. The Math Excel program has been sustained long past its initial seed funding, and the assignment of graduate teaching assistants as Math Excel workshop leaders is simply considered a particular type of GTA assignment.

The primary responsibilities of a workshop leader include the design of a session’s worksheet, as well as the facilitation of students’ problem solving efforts during the workshop session itself. Math Excel workshop sessions at Oregon State University are offered twice a week for selected lower division courses, including College Algebra, Precalculus, Differential Calculus, and Integral Calculus, and on occasion, Multivariable Calculus and Differential Equations. Duncan and Dick [1] documented the success of the program relative to student achievement, averaging approximately half a grade point higher than predicted (by mathematics SAT scores) over 19 different sections of Math Excel during the first two years of the program (see [2] and [3] for additional discussion of the experiences of our Math Excel program).

5 Bibliography

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