College Algebra in an Open Classroom
Connecting Teachers and Technology

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Course Description

College Algebra is a beginning mathematics course which includes solving equations, graphing functions, and developing problem solving skills. The course serves as a prerequisite for statistics, pre-calculus, and calculus courses. It provides the necessary background for mathematical topics in courses offered by other departments. In most class sections, traditional teacher centered lecture methods are used.

Proposed Course and Use of Technology

In this project, interactive instructional computer software, and pedagogical models will be used in an *open classroom* setting. Rather than lectures, class material will be presented in Mathcad m-files. These files contain text, computations, equations, and graphs. The computations, equations, and graphs are *liv*e. Students may change values and immediately see the results. Each example is as many examples as a student wants. Materials encourage students to experiment, and lead them to the discovery of mathematical concepts.

The use of computers to present material to individual or small groups of students provides several benefits. Students work at their own rate. Students are engaged in the material through interaction with computer software and others in their group. Students stay on task exploring questions that occur to them, rather than questions they are not prepared for, have moved beyond, or are otherwise not interested in. The instructor may move among the groups acting as a facilitator/mentor. The use of this type of technology

engages students actively in the material, enables them to build models, and encourages conceptual learning rather than the rote use of formulas and algorithm. The use of computer technology to deliver materials at individual rates and to provide customized interaction is a key element of this course plan.

Reason for Course Selection

College algebra has historically been seen as a gate keeper course. Often students pass this course only after withdrawing from several earlier attempts. This behavior increases costs for the University System. Also, a large population of women and other minorities avoid any further mathematically oriented courses, after completing college algebra. Our philosophy is that college algebra should be a pump not a filter. Improvements in this course can broaden students selection of majors and even remove obstacles to graduation. Not only will students be better able to use mathematical models pertinent to their other studies, but their increased analytic and problem solving skills have broad applications.

Students in elementary and middle school education can be profoundly influenced by the style of instruction experienced in this course. Because of the convergence of curriculum reform in high school mathematics and college calculus courses, this is a most opportune time to make improvements in the college algebra course. In the Fall of 1995, the America Mathematical Association of Two-Year Colleges published "Crossroads in Mathematics: Standards for undergraduate mathematics courses before calculus". Many of the pedagogy, content, and assessment standards of this report are applied in this project. Because of the universality of this course throughout the System, the large number of instructors involved, and the relation of college algebra to other courses, the project will provide an excellent model for demonstrating how technology can be incorporated in other courses.

Replication/Extension

Once the materials and procedures are developed, the proposed course may be offered at any college by CD-ROM, through an internet web site, or from general purpose computing labs. Because of the collaboration on this project between the mathematics and learning support programs faculties, we expect the results to also be adapted for developmental mathematics courses.

A GSAMS course based on this model can demonstrate, for instructors at other sites, the mathematical software and sections, and provide students with choices that best fit their preferred learning styles. Mathcad is ideal in these alternative distance learning settings since it has built in features for communicating electronically through e-mail and the Web. An important question for these alternative delivery systems is how to assess student progress. Development of testing techniques appropriate to these settings is and important part of the proposed project.

Plan and Implementation

During the Fall quarter, 1996, the team will finalize the course syllabus, complete the Matcad m-files, develop the automated test bank, and finalize the project assessment strategies.

In the Winter quarter, 1997, four sections of college algebra using the Mathcad materials in an open classroom setting will be taught. Data collection for project assessment will be conducted and revisions in the material based upon experience will be made.

In the Spring quarter, 1997, the team will teach two sections of college algebra using the revised Mathcad materials in an open classroom setting, continue project assessment and recommend improvements developed in this project.

Evaluation

During the Winter quarter, 1997, four sections of college algebra outside the project will be chosen for comparison with the four sections taught by the project team. The comparisons made will include: a) the success ratios, defined as the number of students who receive a grade of C or better divided by the number of students who receive an grade of F, W or WF; b) Grades in successive mathematics courses for those students who take a mathematics course in the Spring quarter, 1997; and c) Analysis of test materials.

Attitudinal survey's will be conducted to measure students' changes in attitudes toward content and technology. In addition, a report will be prepared suggesting ways to use the results of the project.