A distinguishing characteristic of the community college is its open door admission policy and the resulting necessity of offering remedial and developmental courses in order to assure that poorly prepared students will have a reasonable chance of success. The students enrolled in these courses vary greatly in academic and economic background, motivation, attitude toward college, study skills, and ability in basic academic skills. Most are drawn from the bottom half of their high school graduating classes. Most share a background of educational neglect and failure.

Among these students the attrition rate is very high and grade point averages are very low. Many withdraw during the first term of college without having completed a single course. Others complete the first term and fail to reenroll. A large number of these students manage to complete a few courses with barely passing grades but are so inadequately prepared that they are unable to succeed in subsequent courses. When they find their career goals receding, they gradually withdraw from college work.

The increased enrollment of students from economically and educationally disadvantaged backgrounds in two and four-year colleges during the past decade has led to an increase in the need for effective programs in basic academic skills. The basic mathematics course at Santa Barbara City College is very similar in student population, background, and instructional objectives to equivalent courses offered in other community colleges as described by Beal, Kipps, and Medin. It differs significantly from most other programs in the instructional format employed.

Basic Mathematics at Santa Barbara City College includes the following topics:
1. Arithmetic of whole numbers
2. Operations with fractions
3. Arithmetic of decimal numbers
4. Percent

Students may choose to study two additional optional topics:
5. Measurement and the metric system
6. Introduction to algebra

Students completing this course meet the minimum requirements for entering elementary algebra, physical and life science courses, many courses in vocational, technical, and occupational programs, and many general education courses in the college. In addition, this course satisfies the minimum mathematics requirement for the Associate of Arts and Associate of Science degrees.
BASIC MATHEMATICS (Continued)

Students enter the course as a result of referral by counselors and instructors in response to low scores on the Scholastic Aptitude Test taken on admission to the college or inadequate performance in other courses either in high school or college. All students scoring below the 30th percentile on the Scholastic Aptitude Test are required to enroll in this course.

In a recent study of students enrolled in the Basic Mathematics course the following descriptive statistics were obtained.

Sex Almost two-thirds (66.1%) of the students enrolled in Basic Mathematics were male. This is in reasonable agreement with the fraction of male day students in the college as a whole, approximately 62% in 1972.

Age The average age of the students enrolled in Basic Mathematics is 25.8 years, with 38.4% under age 21. A survey of enrollees in the college from 1968 through 1972 indicated that from 33.6 to 44.3% were under age 21 years.

Ethnic and Racial Background The distribution of students in Basic Mathematics and in the college as a whole in 1972 in ethnic and racial background is shown in the following table:

<table>
<thead>
<tr>
<th>Basic Math</th>
<th>All College</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>73%</td>
</tr>
<tr>
<td>Mexican-American</td>
<td>16%</td>
</tr>
<tr>
<td>Black</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>4%</td>
</tr>
</tbody>
</table>

Students from ethnic and racial minority backgrounds are represented in the Basic Mathematics course in greater numbers than their relative distribution in the college population generally.

SATQ Scores The mean percentile rank on the Scholastic Aptitude Test (Quantitative) of students enrolled in Basic Mathematics was 17.5, as compared with 31.4 for all students enrolled in the college in 1972.

Financial Aid Approximately 20% of the students enrolled in Basic Mathematics were receiving financial aid of some sort. In a 1971 study at Santa Barbara City College it was found that 26.6% of all students had a family income less than the $6000 hardship level.

Outside Employment Students enrolled in Basic Mathematics reported that 67.8% were employed at some outside gainful activity, compared with 62.9% employed in the college as a whole. More than 37% of the students enrolled in Basic Mathematics worked more than 20 hours per week, and only 32% were not employed at an outside job.

The following basic assumptions have been used to guide
BASIC MATHEMATICS (Continued)

the development and design of the Basic Mathematics course at Santa Barbara City College.

1. The course format must allow students to progress at their own pace in order to take account for student diversity in learning styles, academic background, mathematics aptitude, and needs. The format should allow students to enter the course at any time and exit when they have completed it, without the artificial constraints of semester divisions.

2. The course must be designed to teach basic mathematics computation concepts and skills rather than the structure of arithmetic or the axiomatic basis of mathematics.

3. Grading must be based on mastery of the mathematics concepts and skills as demonstrated on written examinations on each of the sections of the course. Letter grades should be assigned for successful work only. D and F grades should not be used since they have no positive value in terms of student achievement.

4. Testing should be on an ad lib basis, students requesting a test of mastery of given material when they are ready for it.

5. Instruction should be based on individual tutoring rather than on group instruction such as lectures or recitation sessions. The goal is to provide students with highly personalized, meaningful contacts with sources of academic assistance. Tutoring assistance should be designed to recognize the pervasive psychological problems and inadequate academic skills that characterize most students who enroll in Basic Mathematics. Tutoring should be available from a required minimum number of hours per week to the maximum the student needs or can profit from.

6. All instruction and student contact should be designed with the whole person in mind rather than with the person only in his or her role as a mathematics student.

7. Attendance should be required and methods should be devised to help students in pacing themselves through the course.

8. Building student motivation and positive attitudes toward mathematics and enhancing student self-image should be of primary concern in the Basic Mathematics course.
PROCEDURES

Students enrolling in Basic Mathematics at Santa Barbara City College attend small group sessions of from 5 to 20 students meeting with 1 to 5 tutors. During these weekly small group meetings, students work individually on programmed materials under the close supervision and direction of tutors. The course is divided into four separate units of instruction:

1. Arithmetic of Whole Numbers
2. Operations with Fractions
3. Arithmetic of Decimal Numbers
4. Percent

Each of these units involves a diagnostic pretest, specification of performance objectives, programmed explanations, worked examples, practice problems, and self-tests. When the students' self-test score indicates to the tutor that he is ready to do so, he may take a formal examination on the unit of instruction. A score of 80% or higher allows the student to advance to the next unit of instruction. A score of less than 80% requires the student to review his work with the tutor, undertake any needed remedial or supplementary instruction, and take an alternate form of the unit examination.

Orientation During the first week of classes students meet in a large group (130-150) for orientation to the course and a carefully detailed explanation of the operation of the program. All orientation lectures are given separately both in English and Spanish, so that students who prefer to do so may receive all instructions and explanations in Spanish, and may ask questions relating to course procedures in Spanish.

Small Group Meetings Every student selects a small group meeting which he is then required to attend for a minimum of one hour each week. Meetings are scheduled every week Monday through Friday from 9 AM to 8 PM in the Basic Mathematics tutoring center on the main campus of Santa Barbara City College. Small group meetings are also scheduled at several off-campus centers in the community, including the county jail and a local cerebral palsy home. Students are free to select the small group meeting time and place that is most convenient to them in the light of their other course work, work hours, outside obligations, or preferences.

Students not making satisfactory progress through the course may be required to schedule additional hours of tutoring as the course continues. Students are encouraged to attend more than the minimum required number of hours of attendance.

During the small group meetings, students work independently with the programmed materials, undergo diagnostic testing,
and receive tutoring as needed or requested. Tutoring is available in both English and Spanish. Typically, during the first lab session students work through the diagnostic test for the first unit under the close supervision of a tutor. They are assigned work in the programmed text on the basis of the diagnostic test and consultation with the tutor. Tutors work with them at every step of the process, providing alternative explanations, guidance, reassurance, reinforcement, and encouragement.

Attendance  Attendance in the small group sessions is required and students who fail to attend are dropped from the course. When a student is absent a tutor will attempt to locate the student by telephone to determine the reasons for his failure to appear. A record of attendance and achievement is kept for each student using an optical-scan, computer-based management information system.

Grading  A letter grade for each of the four twenty-five question unit examinations is determined on the following basis:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Number of Correct Answers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>24 or 25</td>
<td>96%</td>
</tr>
<tr>
<td>B</td>
<td>22 or 23</td>
<td>88%</td>
</tr>
<tr>
<td>C</td>
<td>20 or 21</td>
<td>80%</td>
</tr>
</tbody>
</table>

The final grade is the average of the four unit exam grades. If a student completes three of the four examinations, and if the student specifically requests it, he is given an Incomplete (I) grade. If a student completes less than four exams successfully, and if he does not request an incomplete grade, he receives a Withdrawn (W) grade. Students not completing the course may reenroll in a subsequent semester and complete the requirements of the course. Students need not retake any of the unit exams previously completed successfully.

Tutor Training  The selection, training, supervision, and evaluation of tutors for the Basic Mathematics course is the joint responsibility of the Director of Tutoring and the faculty member responsible for the Basic Mathematics course. All tutors are under the direct daily supervision of a faculty member and meet weekly to discuss problems arising in the course.

Text  The textbook required in the course is Basic Mathematical Skills by Carman and Carman, John Wiley & Sons, New York, 1975. This text has been designed for use by Community College students in a learning center, tutorial, or other individualized instruction course format. Reading level has been carefully controlled to match the typical level of
BASIC MATHEMATICS (Continued)

students enrolling in developmental mathematics courses. Diagnostic pre-tests and unit self-tests are included.

Analysis of the results of this system of instruction and comparison with alternative instructional formats has been reported in detail elsewhere (Carman 1971, 1975) and will be summarized briefly here.

1. Attrition rates for students enrolled in Basic Mathematics are significantly lower under the present instructional format than for various alternative formats. More students complete the course and more students persist in their other courses in the college than in alternative formats that do not use tutors.

2. Student attitudes toward the course, toward mathematics, and toward the college generally are significantly improved in comparison with non-tutored controls.

3. The fraction of students successfully completing the course is significantly higher with this course format than with alternatives that have been implemented.

4. Tutoring in developmental mathematics has significant long-range effects on student enrollment in the college and on student attitudes.


Carman, Robert A. "Cost-Effectiveness Analysis of Various Methods of Instruction in Developmental Mathematics," Seminar Paper, University of California, Los Angeles, December 1871. ERIC publication ED 057 793


Medin, Julie The Teaching of Developmental Mathematics in Community Colleges, May, 1972. ERIC publication ED 075 197