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ABSTRACT

Students entering Chicago State University with less than the minimal level of competence in performing basic operations are assigned to a special course. The course is based on 34 computational objectives in four categories: (1) operations on counting numbers, decimals, and fractions; (2) conversion among fractions, decimals, and percents; (3) percent problems; and (4) prose problems involving proportions. A student earning a grade of 85% on a test of these topics may exit from the course at any time. The course is individualized in that each student completes instructional units at his/her own pace and in an individually determined sequence. Tutorial help is provided and is tailored to the student. The authors have evaluated the program using both norm-referenced and criterion-referenced instruments. They conclude that it is a valid remediation program. (SD)

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ICIM

INDIVIDUALIZED, COMPETENCY BASED, INSTRUCTION IN MATHEMATICS:
BASIC MATHEMATICAL SKILLS

Chicago State University

Mathematics Remediation Program

devised and supervised

by

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and

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March, 1977

Since the Summer Term of 1974, students entering CSU have been encouraged to take a Mathematics Entrance Examination. Mathematics Entrance Examination results have been used to place students in appropriate mathematics classes. Roughly sixty percent of the students tested have been unable to demonstrate a minimal level of competence in performing basic arithmetical skills. The Mathematics Department recommended that students unable to demonstrate competence, at the required level, enroll in Mathematics 101. Students who enrolled in Mathematics 101 were taught via the ICIM program.

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Students who failed to demonstrate a minimal level of competence and whose first registration was not prior to the Fall Term, 1977 are required to successfully complete Mathematics 101 as a graduation requirement. The three hours credit earned by students required to take Mathematics 101 is over and above the 120 hours required for graduation.

The ICIM program is based upon thirty-four computational behavioral objectives. These objectives comprise the following four categories:

- (1) the operations of addition, subtraction, multiplication, and division performed on counting numbers, decimals, fractions, and mixed numbers;
- (2) conversions among fractions, decimals, percents, and improper fractions;
- (3) percent problems; and
- (4) prose problems involving the solution of proportions.

Students enrolled in the ICIM Program scored less than 50% on a thirty-four item multiple-choice Mathematics Entrance Examination written to measure the thirty-four computational behavioral objectives described above. Fifty percent of the 383 freshman who took the examination, prior to entering CSU in the Fall of 1974, scored 50% or less.

To pass the course, a student must score at least 85% on a thirty-four item multiple-choice proficiency examination equivalent to the Mathematics Entrance Examination. During the term, each student has four opportunities to take alternate forms of the proficiency examination. The highest score which a student earns is used to determine his (her) final grade.

A student may exit from the course any time after obtaining a minimum score of 85% or he (she) may wish to remain and try to obtain a higher mark on a subsequent administration of the examination. Students passing Mathematics 101 (ICIM) are automatically exempt from taking the College of Education's Mathematics Entry Examination (an ICIM test).

Instruction in the ICIM Program is individualized on at least four variables:

- (1) specific instructional units which each student completes;
- (2) sequencing of the instructional units;
- (3) time required for each student to complete "his (her)" units; and
- (4) tutorial techniques employed.

A diagnostic profile, derived from the results of the Mathematics Entrance Examination, is prepared for each student, hopefully before the first class meeting. This instrument indicates specific deficiencies, each corresponding to a behavioral objective. Deficiencies are remediated via twenty-six independent instructional units. Students complete units corresponding to previously identified deficiencies. Each unit consists of a pre-test, problem set, explanatory, and post-tests. In order to successfully complete a unit, a student must miss no more than two items on a pre- or post-test from the unit. Students receive no assistance while taking pre- or post-tests, but may receive tutorial assistance on the problem set and explanatory. If a student passes a unit pre-test, he (she) ~~is given a pre-test from another unit in which~~ he (she) needs remediation. If a student fails a unit pre-test, he (she) is given a problem set, an explanatory, and accompanying tutorial assistance on the unit. Whenever the student feels he (she) is ready, he (she) asks for a

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post-test for the unit. After the student demonstrates proficiency on a post-test, he (she) is given a pre-test in another area. Pre- and post-tests are graded in class to allow for immediate feedback and prescriptions for the next step in a student's instructional sequence. Pre- and post-tests are not used in the assignment of grades but are designed to help students learn specific skills required for passing a proficiency examination. For each student, a progress chart indicating the student's performance on the Entrance Examination, Proficiency Examinations, and pre- and post-tests, is updated daily and is used to sequence instructional materials based upon the student's particular needs.

Every effort is being made to provide an informal classroom atmosphere where students can work at their own rate on objectives they have not met. ICIM personnel frequently provide students with encouraging statements such as, "I know you can do it; keep up the good work!" All students are expected to pass the course and every effort is being made to help students learn required mathematical skills.

Of the 434 grades assigned to students enrolled in the ICIM Program, 229 or 53% have been passing; this percent increases to over 61% whenever inactive students are removed. The rate of passing may seem low, but students passing the course are competent in performing basic arithmetical skills which are at most eighth grade level.

The validity of ICIM as a mathematics remediation program has been established by considering the norm referenced and criterion referenced \ validities of the program. ICIM is norm referenced since students are required to move from the 57th percentile or below to at least the 95th percentile (based on July 1974 Freshman Entrance Examination norm) in order to pass the course. ICIM has criterion referenced validity since each student must

demonstrate proficiency in performing 29 of 34 behavioral objectives in order to exit from Mathematics 101. Students are required to demonstrate a high level of competence while they are "hot" so that after a "cooling off period" they will still be fairly competent in performing basic arithmetical skills.

During the 1975-76 school year, there were 20 sections of Mathematics 101 offered. Each of these sections served a maximum of 30 students. A faculty assistant, assisted by approximately four tutors, was responsible for the direct classroom instruction in each section.

It is anticipated that 25 sections of Mathematics 101 will be offered during the 1976-77 academic year. Two full time lecturers and a faculty assistant (supervised by a regular Mathematics Department member) are responsible for the instruction in these sections. Approximately four tutors assist with the instruction in each class meeting.

Two CSU Professors of Mathematics have shared the responsibility for the administration of the program:

- (1) hiring, training, and supervising faculty assistants and tutors;
- (2) writing and preparing curriculum materials;
- (3) keeping registration records and assigning grades; and
- (4) evaluation of students, personnel, and the program.