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ABSTRACT

The University of Maine at Augusta uses an individualized video-taped mathematics instructional system to eliminate students' math weaknesses before they attempt college math. The course, "1 Mth Developmental Mathematics," is part of the Educational Assistance Program and teaches basic skills and concepts of arithmetic and algebra. The system first administers a diagnostic test in arithmetic which locates the individual's weaknesses and prescribes modules directed at them; students pass through the modules and are post-tested on each. The process is repeated for algebra. Each module consists of a learning packet with: a description of the material to be learned a pre-test with answers, learning objectives and activities to reach them, a video-taped lecture, notes and supplementary materials, and a post-test. Since the tapes are on call, the student can schedule himself, proceed at his own pace, repeat material when necessary, and concentrate on his weakness. Instructors are freed from classroom lectures, and are able to provide individual attention to students. In addition, the learning packets are easily developed and can be made available to other institutions. Due to these advantages, this mode of instruction should be widely adopted. (PB)

VIDEO BASED DEVELOPMENTAL MATHEMATICS LEARNING SYSTEM FOR COMMUNITY COLLEGE STUDENTS

Tyrone D. Gormley

Many students entering community colleges today have weaknesses in arithmetic and algebraic skills. These weaknesses may be in addition of fractions, solving an equation for an unknown, or graphing a function. Whatever the problem might be it should be corrected before the student attempts college level mathematics courses. Some time ago these students were placed directly into a college level mathematics course, forcing them to correct their weaknesses as they learned the material of the course. More recently separate courses were provided to help eliminate the weaknesses of students. These courses were relatively successful, but were often taught in the lecture mode, a mode in which most of these students were unsuccessful in the past. Most often, too, these courses were taught by instructors who would have preferred to teach other "higher level" courses and "better" students.

Clearly, what is needed at community colleges are courses in developmental mathematics which offer alternatives in learning based on the student's own learning style and taught by instructors professionally trained for such levels of mathematics. One answer to this need is a video-based instructional system. The University of Maine at Augusta has such a video learning system.

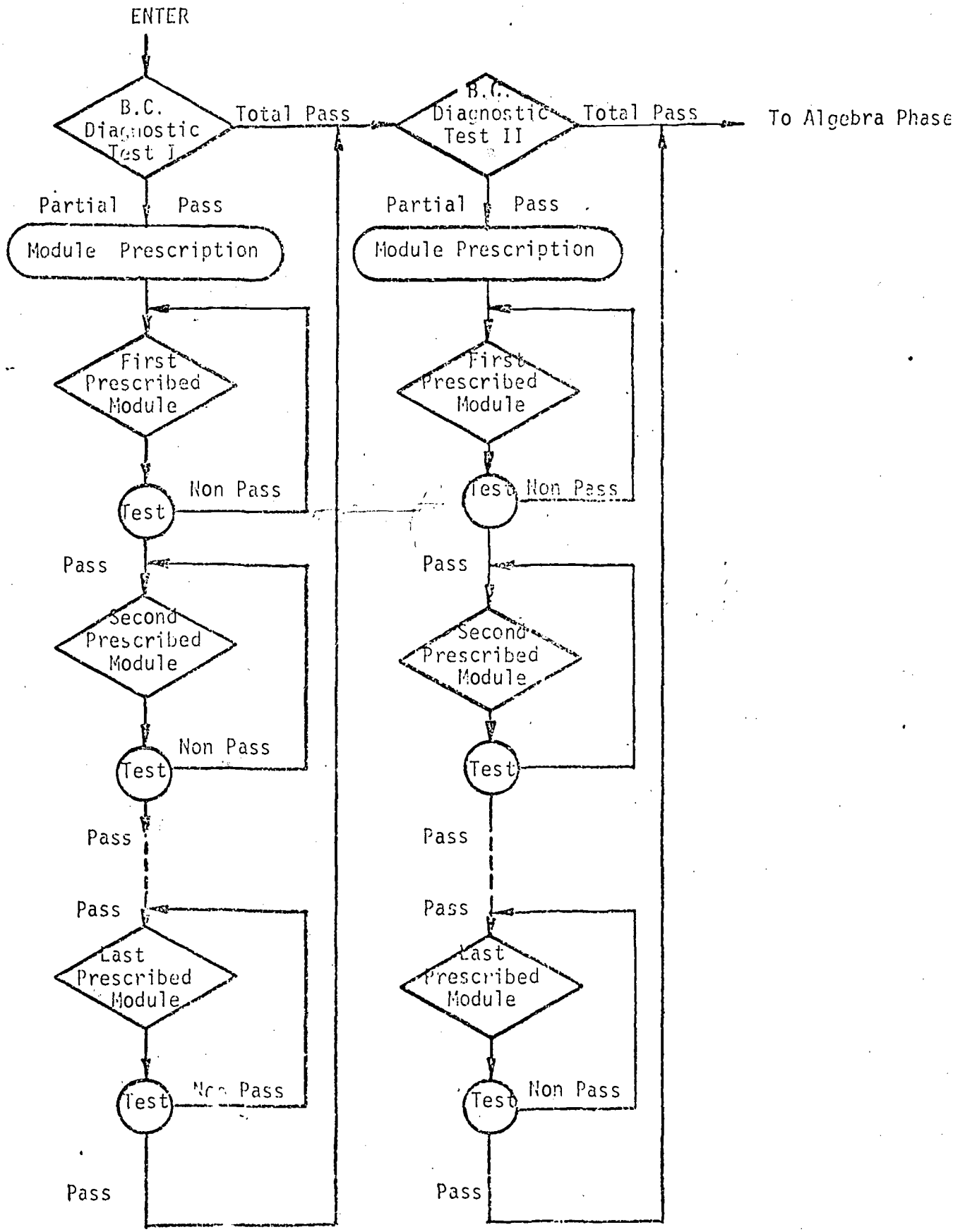
The University of Maine at Augusta is an "open-door" institution of higher learning. As such it has the responsibility to assist any of its students in eliminating any weaknesses in mathematics which exist before the student attempts college level mathematics courses. These weaknesses exist for basically three reasons: (1) The student never learned the material in grade school or high school, (2) The student learned the material at one time but has forgotten it, (3) The student knows some material but is not sure how and when to use it.

To assist these students, the University of Maine at Augusta has created the course "1 Mth Developmental Mathematics" as part of its Educational Assistance Program (EAP). The general course goals of 1 Mth are:

1. To teach the concepts and basic skills of arithmetic.
2. To teach the concepts and basic skills of elementary algebra.
3. To make the student more aware of his mathematical needs to his present and future role as a citizen, wage earner, and parent.

The basic structure of 1 Mth can best be explained through the use of the following:

FLOW CHART



Beginning in the upper left hand corner of the flow chart the student enters 1 Mth by taking a diagnostic test that examines him on the first ten modules of Basic Computations. If this test shows that the student is weak on any material of any module, then that module is prescribed for him. If the results of the test show that work in certain modules is not needed, then those modules are not prescribed. In other words, a student works only in those modules where there is some weakness.

When a student receives his module prescription it is unique to him. His strengths and weaknesses are different from any other student and so his learning program should be different. Having his own module prescription, the student is then ready to pick up the materials corresponding to his module prescription and begin work.

The materials presented to each student consist of learning packets with one packet being obtained for each prescribed module. Corresponding to each module is a video tape which is to be viewed as an essential part of the learning sequence for the module. These video tapes are always available in the learning laboratory for the student to use. This constant availability of video tapes allows the student the freedom to complete modules as quickly as he wants.

When a student has viewed the video tape on a module and has completed other selected activities, he is ready to be tested on that module. If he passes the test, he begins the next module and its activities. If he does not pass the test, the instructor will give additional assistance to aid the student in learning the material so that the test on that module can be passed at a later time.

When the student has passed the last module in his "first" prescription (lower left of flow chart) he will be given another diagnostic test on the remaining modules of Basic Computations. Upon checking this test a "second" prescription is determined. The student can now continue his study in the same manner and with the same programmed assistance offered in Phase I. Eventually, the last module will be reached and satisfactorily completed. At this time the student will commence the Algebra phase of the program.

The Algebra phase has essentially the same structure as Basic Computations. Two diagnostic tests are administered and two module prescriptions are developed therefrom. When the student has satisfactorily completed the Algebra prescription he has met the requirements of the 1 Mth program.

The two most important parts of the learning system are the module learning packets and the corresponding video tapes. There is a packet for each assigned module in the module prescription. The format for the module learning packets is as follows:

I. TITLE PAGE - Explains what is contained in the module.

II. RATIONALE FOR THE MODULE - Details why the student is learning this material.

III. PRE-TEST WITH ANSWERS - This test gives a student a thorough testing of the material in the module. If a high score (90%+) is achieved, the student may elect to test out of the module by requesting the instructor to administer a module test to him.

IV. LEARNING OBJECTIVES - These objectives are listed as behavioral terms and indicate to the student what is expected of him to successfully complete the module.

V. ACTIVITIES TO ACHIEVE LEARNING OBJECTIVES - This section explains to the student a recommended procedure to follow to successfully complete the module.

VI. T.V. LECTURE PRESENTATION NOTES - This feature gives to the student the exact notes that are on the video tapes. It allows the student to review the notes prior to watching the video tapes and gives the student the freedom to watch and listen to the video tapes without the necessity of having to take notes.

VII. LEARNING MATERIALS AND RESOURCES - Since all students have different learning styles it is important that an instructor provide as many alternatives to learning as possible. This section lists the materials and resources available in the learning laboratory other than the video tapes. These items include carefully selected textbooks, workbooks, programmed books, audio tapes with manuals, and filmstrips. A student is encouraged to become familiar with these alternative learning materials and choose those

which he feels most comfortable with, in the event the video tapes are not suitable.

VIII. EXERCISE WITH ANSWERS - Ample exercises with answers are given to the student for practice.

IX. SELF-TEST WITH ANSWERS - At this point the student may want to know if he is ready to "test out" of the module. This self-test is provided for the student to test himself. A high score (80%+) usually indicates that the student is ready to take the test which allows him to successfully complete the module.

The video tapes of all module lecture presentations are available in the learning laboratory and the student can use them at any time from 8:00 a.m. to 9:00 p.m. on weekdays and from 9:00 a.m. to 12:00 p.m. on Saturdays.

No official attendance is taken because the progress of the student is measured by how many prescribed modules are passed during a determined time period. A student can complete as many modules as quickly as his ability and time permits. The recommended rate is one module per week. If a student falls behind, letters are sent to him requesting an interview to ascertain what the difficulty may be. In this system the responsibility of learning rests primarily upon the student. Every attempt is made to develop the motivation of the student so that his individual progress is assured. If special problems arise, the counseling staff is brought in to give assistance in the matter.

Advantages of This Video Learning System

1. Students can use the video tapes as often as they wish, thus proceeding through their program as quickly as they choose or as slowly as necessary.

2. Students can use the video tapes when they wish. There is no such thing as "missing" a lecture, having to wait for a lecture, or not "feeling like" going to a lecture.

3. If a student is sick and drops behind, it is not necessary to withdraw from the course. Since all lectures are on video tape, what a student must do is continue on at the point where he stopped.

4. A student can begin 1 Mth at any time during a semester and complete the course at any time during a semester.

5. If the instructor is ill or goes to a professional meeting, there is no cancellation of classes or interruption of instruction. The video tapes would be available and the continuity of learning is maintained.

6. If a student does not understand part of the video lecture he just turns the video tape back and replays it. Nothing in a lecture is "missed."

7. A student can utilize his time better. A spare half hour can be used even if only half a tape is viewed, for the rest of the tape can be viewed at a later time.

8. A video tape learning system frees the instructor to work more with students who need personal help.

9. The video tape approach offers the low-achieving student a media to which students can relate.

10. The video tape, along with the available materials and resources in the learning laboratory, offers the student a choice as to how the student can learn according to his learning style.

11. The module "prescriptions" include only those modules on material where the student is weak. The student does not waste valuable time on material that he knows already.

12. The instructor is always available throughout the day to assist students as there are no formally held classes.

13. A larger number of students can be handled in this system than would ordinarily be expected. The system has shown itself to be quite efficient without compromising on quality.

SUMMARY:

The video learning system described above is an important step forward in incorporating available technologies in learning programs. It offers significant alternatives of learning to the student, allows the student to proceed at an individual rate, and frees the instructor to work more closely with those students who need personal help. The video tapes and accompanying modules are relatively easy to make and could be used on a state-wide basis either on a closed video hook-up on each campus or on state-wide educational or cable channels. The system can be easily modified to suit any community college that has need of its services. The possibilities for such a system are almost limitless and it is important that experimentation begin now as many studies have indicated that the video mode of instruction is the Math method of the future.

Designed by Tyrone D. Gormley
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University of Maine at Augusta
December, 1972

MODULE SCHEDULE FOR VIDEO PROGRAM

1 Mth

EDUCATIONAL ASSISTANCE PROGRAM

BASIC COMPUTATIONS

Part I-Modules I-X Part II-Modules XI-XVIII

Module I	Sets and Their Basic Operations
Module II	Reading and Writing Names of Counting Numbers
Module III	Whole Numbers --- Addition and Subtraction, Properties
Module IV	Whole Numbers --- Multiplication and Division, Properties
Module V	Factors, Prime Numbers, Greatest Common Factor, Least Common Multiple
Module VI	The Set of Integers -- Addition and Subtraction, Properties
Module VII	The Set of Integers --- Multiplication and Division, Properties
Module VIII	Fractions --- Like, Mixed, Improper
Module IX	Fractions --- Addition and Subtraction, Properties
Module X	Fractions --- Multiplication and Division, Properties
Module XI	Decimal Fraction --- Decimals
Module XII	Decimals --- Addition and Subtraction
Module XIII	Decimals --- Multiplication and Division
Module XIV	Percentage
Module XV	Ratio and Proportion
Module XVI	Variation
Module XVII	Measurement
Module XVIII	Plane Geometry

MODULE SCHEDULE FOR VIDEO PROGRAM

1 Mth

EDUCATIONAL ASSISTANCE PROGRAM

ALGEBRA

Part I - Modules I - XI

Part II - Modules XII - XXI

Module I	Introduction to Algebra
Module II	Term, Factors, Coefficients, and Grouping
Module III	Numerical and Variable Expressions
Module IV	Simplifying Numerical and Variable Expressions
Module V	Exponents - Positive, Negative, and Zero
Module VI	Polynomials - Addition, Subtraction
Module VII	Polynomials - Multiplication, Division
Module VIII	Factoring
Module IX	Reduction of Algebraic Fraction, Least Common Multiples of Algebraic Expressions
Module X	Algebraic Fractions - Multiplication and Division
Module XI	Algebraic Fractions - Addition and Subtraction
Module XII	Linear Equations in One Variable and Solutions of Such Equations
Module XIII	Word Problems
Module XIV	Linear Equations, Rectangular Coordinate System, Classification of Systems of Linear Equations
Module XV	Solving Systems of Linear Equations
Module XVI	Radicals and Fractional Exponents
Module XVII	Radicals - Addition and Subtraction, Multiplication and Division
Module XVIII	Linear Inequalities
Module XIX	Quadratic Equations, Part 1
Module XX	Quadratic Equations, Part 2
Module XXI	Complex Numbers