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LINCOLN PUBLIC SCHOOLS--A STUDY OF ACHIEVEMENT  
AND ATTITUDE TOWARD MATHEMATICS.

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CONTINUOUS PROGRESS ADVANCED ALGEBRA IN THE LINCOLN  
PUBLIC SCHOOLS--A STUDY OF ACHIEVEMENT  
AND ATTITUDE TOWARD MATHEMATICS

by

Buren G. Thomas

A DISSERTATION

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The Graduate College in the University of Nebraska  
In Partial Fulfillment of Requirements  
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Under the Supervision of Professor Milton W. Beckmann

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## CHAPTER I

### INTRODUCTION

#### BACKGROUND FOR STUDY

When reading educational publications today one can not help but notice the number of different articles dealing with individualized instruction. A concern for the individual is not new in secondary education. The current individualized instruction movement began in the late nineteenth century when Search not only advocated but carried out a program of individualized instruction within the graded school system.<sup>1</sup>

Between 1900 and 1930, disciples of Frederick Burk devised and implemented several laboratory-type plans for self-instruction in the lower schools. One of these, the Winnetka plan, was reported to save time, especially for the more able students and those who would normally be repeaters, and allowed for a broader and deeper education. Difficulties were noted in securing suitable textbook materials, in the proper training of teachers, and because of its newness, in

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<sup>1</sup>P. W. Search, "Individual Teaching: The Pueblo Plan," Education Review, (February, 1894), pp. 154-70.

establishing the program.<sup>2</sup> During this period additional impetus for the interest in individualization stemmed from the mental testing movement, beginning with the work of Binet.<sup>3</sup> Early intelligence tests clearly showed differences in speed of task completion among pupils. A great deal of individualization also took place in rural America's one-room schools.

During the 1930s there was a shift of emphasis in the school from the subject-centered curriculum to the child-centered curriculum. This change hampered the continued efforts made during the 1920s to individualize instruction in subject areas. Population increases and school consolidation caused many schools to look like rigidly graded city schools. These factors also hampered the efforts to individualize instruction.

In the 1950s interest in the individual surged when Skinner advocated an educational technology built around the use of rather crude teaching machines.<sup>4</sup> His ideas led to

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<sup>2</sup>Carleton Washburne, "Burk's Individual System as Developed at Winnetka," Adapting The Schools To Fit Individual Differences, Twenty-fourth Yearbook of the National Society for the Study of Education, Part II, (Bloomington, Ill.: Public School Publishing Co., 1925).

<sup>3</sup>A. Binet and T. Simon, The Development of Intelligence in Children, trans. Elizabeth S. Kite, (Vineland, N.J.: The Training School, 1916).

<sup>4</sup>B. F. Skinner, "The Science of Learning and the Art of Teaching," Harvard Educational Review, (Spring, 1954), pp. 86-97.

the extensive development of programmed instructional materials. During the 1950s and 1960s there were several mathematics projects started that were concerned with the improvement of mathematics programs. The materials developed by the participants of these mathematics projects as well as the materials developed by other individuals focused attention on content, enrichment activities, variations in computational techniques, teaching guides, supplementary materials, programmed materials, and mathematics laboratories. Each of these has helped the teacher in providing for individual differences in students.

Several factors have combined to intensify the concern for human individuality during the past twenty years. Shane identifies the following:

1. Vigorous debates over the quality of mass education and complaints with respect to the rising cost of education.
2. The rapid growth of pupil population at all levels.
3. The increasing use and impact of educational media which have facilitated mass instruction without as yet having offered comparably effective approaches to individual differences.
4. Federal funds for the improvement of schools.
5. Educational proposals relevant to more personalized teaching which include attention-capturing ideas for school organization, staff assignment, diversified class size, and individual programs of study by secondary school students.
6. Greater recognition and acceptance of the view

that the United States can no longer afford the uneducated man.<sup>5</sup>

The Lincoln Public Schools, Lincoln, Nebraska, were interested in experimenting with an individualized instructional program and during the 1968-1969 school year had experimental courses in Continuous Progress Advanced Algebra and Geometry. Seven secondary mathematics teachers from the Lincoln Public Schools participated in a workshop during the summer of 1969 in which continuous progress materials that had been developed earlier were refined and expanded. Some of the junior and senior high schools used the continuous progress materials produced in the summer workshop during the 1969-1970 school year. The courses involved were beginning and advanced algebra and geometry.

#### STATEMENT OF PROBLEM

The first purpose of this study was to compare the achievement of students in continuous progress advanced algebra classes with the achievement of students in the traditional advanced algebra classes.

The second purpose of this study was to compare the attitude toward mathematics of students in continuous progress

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<sup>5</sup>Harold G. Shane, "The School and Individual Differences." Individualizing Instruction, Sixty-first Yearbook of the National Society for the Study of Education, Part I, (Chicago: University of Chicago Press, 1962), pp. 44-45.

advanced algebra classes with the attitude toward mathematics of students in the traditional advanced algebra classes.

#### DEFINITION OF TERMS

1. Achievement--determined by Cooperative Mathematics Tests, Algebra II, Form A.<sup>6</sup>

2. Advanced Algebra--second year algebra.

3. Continuous Progress Mathematics--a model designed to facilitate the task of the classroom teacher in providing for individualized instruction and learning. It offers an opportunity for each student to proceed at his own rate of speed, commensurate with ability, interest, and motivation. The heart of the program is the learning unit or package which is a self-contained set of teaching-learning materials designed to teach a single concept and structured for individual and independent use. The learning packages used in the Lincoln Public Schools contain the following:

1. A set of behavioral objectives.
2. Learning activities.
3. Additional resources and activities.
4. A self-test which the student uses to help him determine his achievement of the stated objectives.

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<sup>6</sup>Cooperative Mathematics Tests: Algebra II, Form A,  
(New Jersey: Cooperative Test Division, Educational Testing Service, 1962).

5. A posttest to determine the student's progress in meeting the stated objectives.

The learning packets coincide with the textbook used in the traditional course. The content of the continuous progress advanced algebra courses and the traditional courses are identical. Students in a continuous progress class are assigned to a teacher one period a day, five days a week, the same procedure that is followed in a traditional class.

4. Course--a specific subject offered in the curriculum such as geometry, physics, advanced algebra.

5. Class--a group of students assigned to a teacher a specific period of the day for a particular course.

6. Attitude Toward Mathematics--determined by the Mathematics Inventory.<sup>7</sup>

7. Traditional Course--a course as it is typically taught in secondary schools--a basic text is used, a teacher lectures and discusses, and specific assignments are given.

#### HYPOTHESES TO BE TESTED

1. There is no significant difference between the attitude toward mathematics pretest and posttest means of the continuous progress advanced algebra classes.

2. There is no significant difference between the attitude toward mathematics pretest and posttest means of

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<sup>7</sup>Cyril J. Hoyt and Donald G. MacEachern, Mathematics Inventory, (St. Paul: Minnesota Test Publishers, 1963).

the traditional advanced algebra classes.

3. There is no significant difference between the achievement posttest mean of the continuous progress advanced algebra classes and the achievement posttest mean of the traditional advanced algebra classes.

4. There is no significant difference between the attitude toward mathematics posttest mean of the continuous progress advanced algebra classes and the attitude toward mathematics posttest mean of the traditional advanced algebra classes.

#### SCOPE AND DELIMITATION

The extent to which the results of this study can be generalized is limited by the setting. However, it is hoped that by using several classes, two different schools, and several teachers, the conclusions reached will be valuable to other school districts interested in continuous progress curriculums.

1. Total number of teachers: five.
2. Total number of classes: ten.
3. Total number of continuous progress advanced algebra classes: five.
4. Total number of traditional advanced algebra classes: five.
5. Total number of students: 280.
6. Type of schools: public senior high schools.



7. Location of schools: Lincoln, Nebraska.
8. Total number of different schools: two--Northeast and East.
9. Type of course: advanced algebra.
10. Duration of study: September, 1969, through June, 1971.
11. Make-up of classes: non-accelerated students assigned by computer to advanced algebra classes. Students were given a choice to be in a traditional or continuous progress class.

#### OVERALL PLAN

The Cooperative Mathematics Test, Algebra II, Form A, published by the Educational Testing Service of Princeton, New Jersey, was administered to all of the students who participated in the study. The Mathematics Inventory, which was developed at the University of Minnesota, was also administered. Both of these tests were given during the first week of school in September, 1969. All of the students were given the same two tests again when they finished advanced algebra. The traditional classes were given the two tests in May, 1970, and the students in the continuous progress classes were given the two tests whenever each individual student finished the course.

The achievement was measured by a standardized test, Cooperative Mathematics Test, Algebra II, Form A, and a statistical comparison between the continuous progress classes and the traditional classes was made. The attitude toward

mathematics was measured by the Mathematics Inventory and a statistical comparison between the two groups was made. The experimental design was a pretest/posttest control group design. According to Campbell and Stanley this design is a true experimental design that controls all factors of internal validity.<sup>8</sup>

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<sup>8</sup>Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs for Research, (Chicago: Rand McNally and Company, 1963), p. 8.