

A STUDY OF MATHEMATICS PROGRAMS
IN CERTAIN LOWER KENTUCKY COUNTIES

A Research Paper
Presented to
the Graduate Council of
Austin Peay State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts in Education

by
Audrey Dady Williams
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To the Graduate Council:

I am submitting herewith a Research Paper written by Audrey Williams entitled "A Study of Mathematics Programs in Certain Lower Kentucky Counties." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts in Education with a major in Mathematics.

William G. Stokes
Major Professor

Accepted for the Council:

Wayne E. Stamps
Dean of the Graduate School

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CHAPTER I

NATURE AND SCOPE OF THE PROBLEM

Introduction. During the past decade committees and study groups, composed of college and university mathematicians, teachers of mathematics at all levels, experts in education and representatives of science and technology have been active in developing more mathematics and in searching for better procedures for teaching it. Their recommendations have been subjected to national, state, and local experimentation and evaluation. Now, ten years later, it is appropriate to study the mathematics programs in specific locales as administrators and teachers seek to implement the goals set forth by these study groups.

Statement of the problem. The purpose of this study was to evaluate the mathematics programs in certain lower Kentucky counties in regard to the extent of change in curriculum and in mathematics instructional procedure, the professional preparation of teachers, and teachers' attitudes toward professional growth as recommended by the Commission on Mathematics of the College Entrance Examination Board, the Secondary School Curriculum Committee of the National Council of Teachers of Mathematics, and the Mathematical Association of America.

Importance of the study. Because our society leans more and more heavily on science and technology, today's world demands more mathematical knowledge on the part of more people than ever before. A knowledge of contemporary mathematics can be gained only through an improved curriculum which will offer students a deeper understanding of the basic concepts and structure of mathematics, through improved instructional techniques.

The assessment of the current status of the mathematics program in a particular school should have relevance to individual and professional evaluation on the part of teachers and administrators and serve as an incentive for planning and development of an improved mathematics curriculum. This is the first study of this type in this particular locale.

Background of the study. Recent study groups have had a significant influence upon the authors of textbooks as well as other groups developing materials for use in mathematics programs. Their emphasis on the conceptual aspects of the subject has also had tremendous influences upon teaching techniques.

One such study group, the Commission on Mathematics of the College Entrance Examination Board,¹ founded in 1900

¹Report of Commission on Mathematics, College Entrance Examination Board, Program for College Preparatory Mathematics (New York, 1959), pp. 21-47.

to help facilitate the transition of students from high school to college, operates primarily through CEEB examinations. Their recommendations regarding the contents of the mathematics program was published in the report of 1959. They recommended at that time that the ninth year program should be primarily concerned with the properties of rational numbers and be taught with new emphasis upon the understanding of fundamental ideas and concepts of the subject such as the basic laws for multiplication and addition. The tenth year program, based upon geometry, should have three objectives: (1) the acquisition of information about geometric figures in the plane and in space; (2) the development of an understanding of the deductive method as a way of thinking; (3) the provision of opportunities for original and creative thinking by students. The eleventh year program should emphasize properties of real numbers and complex numbers in topics studied in second year algebra. Deductive reasoning should be taught in algebra as well as in all school mathematics. Trigonometry, studied in both the eleventh and twelfth grades, should be reorganized to meet contemporary needs. Computational emphasis should be shifted from triangles to vectors, and analytic emphasis from identities to functional properties. Solid geometry would be introduced in the tenth grade and applied in eleventh and twelfth grade. The twelfth grade program should consist of any two of the following three

courses: elementary functions, introductory probability with statistical inference, and introduction to modern algebra.

Another study group, The Secondary School Curriculum Committee of the National Council of Teachers of Mathematics, concerns itself with implementation of the curriculum, organization of the program, preparation of, and professional growth of teachers. In regard to implementation and organization of the curriculum, the Committee² recommended (1) a four year sequence available to all pupils in grades nine through twelve, (2) at least two years of mathematics required for graduation from all secondary schools, (3) ability grouping with classes limited to a maximum of twenty pupils for below average pupils, (4) provision for remedial instruction within the classroom, (5) flexible grouping to allow pupils who show sufficient promise and growth to move into the program for more able pupils, and (6) special classes for the gifted. According to the Committee, teachers of mathematics in grades seven through twelve will need competence in the following:

(1) analysis-trigonometry, plane and solid analytic geometry, and calculus; (2) foundations of mathematics - theory of sets, mathematical or symbolic logic, postulation systems, real and complex

²Secondary School Curriculum Committee, National Council of Teachers of Mathematics, "The Secondary Mathematic Curriculum," The Mathematics Teacher, LII (May, 1959), 409-410.

number systems; (3) algebra-matrices and determinants, theory of numbers, theory of equations, and structure of algebra; (4) geometry - Euclidean and non-Euclidean, metric and projective, synthetic and analytic; (5) statistics-probability and statistical inference; (6) applications-mechanics, theory of games, linear programming, and operations research.³

The Secondary School Committee further stated that every teacher of secondary mathematics should have completed successfully a five year program emphasizing the above areas and culminating in the Master's degree. Also as a minimum, teachers of mathematics in grades nine through twelve should have completed successfully a program of at least twenty-four semester hours, including a full year of calculus, in courses selected from the above areas. Both programs should contain fundamental treatment of topics from the foundations of mathematics and probability and statistics. The Committee further recommended that these programs in mathematics should be supplemented by a basic program in education and psychology. "As a minimum, a teacher should have completed eighteen semester hours, including student teaching in mathematics, in such courses as: a methods course in the teaching of mathematics; psychology of learning (with particular reference to adolescents); psychology of adjustment (mental hygiene); and tests and measurements."⁴ In order to keep currently

³Ibid., pp. 414-415.

⁴Ibid., p. 415.

informed through proper publications and professional meetings the Committee recommended that teachers affiliate with at least one organization such as the National Council of Teachers of Mathematics, the Central Association of Science and Mathematics Teachers, the Mathematical Association of America, and state and regional educational associations.

The Committee on the Undergraduate Program in Mathematics (CUPM), a committee of the Mathematical Association of America,⁵ established a Panel on Teacher Training instructed to prepare a set of recommendations of minimum standards for the training of teachers on all levels. As a result, five levels were defined as follows: Level I, teachers of elementary school mathematics for grades kindergarten through six; Level II, teachers of the elements of algebra and geometry for courses now commonly taught in grades seven through ten; Level III, teachers of high school mathematics qualified to teach a modern high school mathematics sequence in grades nine through twelve; Level IV, teachers of the elements of calculus, linear algebra, probability, etc., who qualify to present a modern two-year college mathematics program; Level V, teachers of college mathematics who qualify to teach all basic courses offered in a strong undergraduate college curriculum.

⁵Recommendations of the Mathematical Association of America for the Training of Teachers of Mathematics. 1960, pp. 1-8.

Recommendations for Level II include (1) three courses in elementary analysis, (2) three other courses; a course in abstract algebra, a course in geometry, a course in probability from a set-theoretic point of view, and one elective. One of these courses should contain an introduction to the language of logic and sets. Recommendations for Level III consist of the following: (1) three courses in analysis, (2) two courses in abstract algebra, (3) two courses in geometry beyond analytic geometry, (4) two courses in probability and statistics, (5) two upper class elective courses, e.g., introduction to real variables, number theory, topology, history of mathematics, or numerical analysis. Recommendations for Level IV consisted of a Master's degree with at least two-thirds of the courses being in mathematics, and for which an undergraduate program at least as strong as Level III training is a prerequisite. Recommendations for Level V were not specified by the panel.

Methods and procedures. Information for the study was gathered from the county high schools of Christian, Todd and Trigg counties by means of personal interview and survey sheets during February and March of 1969. The plan and purpose of the study were discussed first with the superintendent of the respective county or his assistant. After the interview with the superintendent, the principal or supervisor was asked to supply information relative to

administration of the programs and content of courses. Teachers supplied information concerned with professional preparation, professional growth, and instructional media and techniques. Survey sheets used may be found in Appendixes A and B. Data was collected from two principals, one supervisor, and eighteen teachers in three county high schools in lower Kentucky. Enrollment ranged from 550 to 1,800. Only the high schools with grades nine through twelve were studied. Because of the wide variation in enrollment, schools were categorized accordingly. The high school with an enrollment greater than 1,000 was placed in category I. The high schools with enrollments less than 1,000 were placed in category II. Findings were evaluated in keeping with the recommendations of the Commission on Mathematics of the College Entrance Examination Board, the Secondary School Curriculum Committee of the National Council of Teachers of Mathematics, and the Mathematical Association of America for the Training of Teachers of Mathematics.

Response from the interviews and survey sheets. All superintendents were very willing to have the study made in their school. The supervisor interviewed spoke of the need for more study of this nature. All eighteen teachers, representing 100 per cent of the mathematics teachers, completed and returned the survey sheets.

CHAPTER II

RELATED LITERATURE

There have been few studies made within the past decade of curriculum revision and preparation of teachers of secondary mathematics.

Perel⁶ reports a study made during the academic year 1965-1966 while directing an In-service Institute for teachers of secondary mathematics. The Institute, supported by the National Science Foundation, was held on the campus of the University of North Carolina at Charlotte. The applications of the sixty-four teachers who applied for membership in the Institute were examined. Only one person was in his first year of teaching and only five had more than fifteen years experience. Only slightly more than half had undergraduate majors in mathematics and only one out of eleven teachers with a graduate degree had it in the field of mathematics. Twenty-eight per cent had not studied calculus, 44 per cent had no course work above the calculus sequence, and only 25 per cent had more than two courses above calculus.

⁶W. M. Perel and Phillip D. Vairo, "Mathematics Teachers in the Market Place," Clearing House, XLI (January, 1967), 288-291.

Only twenty-nine, or less than half of the teachers, read the Mathematics Teacher, five read the Arithmetic Teacher, but half read no periodical related to mathematics. Thirteen, or about 20 per cent were members of the National Council of Teachers of Mathematics while none belonged to the Mathematical Association of America.

Dessart⁷ reports on a survey conducted by the American Association for the Advancement of Science and the National Association of State Directors of Teacher Education and Certification. The study showed that four out of ten mathematics teachers had thirty or more semester hours in their major field whereas one out of ten teachers of physics had comparable training. Almost half the teachers of mathematics, chemistry or physics received their bachelor's degree since 1950. Of the teachers who received their bachelor's degree before 1950, 34 per cent of mathematics teachers of grades 9-12 had updated their mathematical training since that time.

Schaefer⁸ states the implications of a study of the mathematics programs of selected Catholic secondary schools in a seven state area. Considering the favorable attitudes

⁷Donald J. Dessart, "Characteristics and Service Loads of Mathematics and Science Teachers," The American Mathematical Monthly, LXXI (May, 1964), 550-552.

⁸Sister Mary Geralda Schaefer, "Revision of Secondary Mathematics in a Selected Number of Schools," The Mathematics Teacher, LXI (February, 1968), 157-161.

which appeared to exist among mathematics teachers and administrators, it was concluded that improvement of the quality of the mathematics programs under study would not be difficult to achieve.

Studies of secondary science programs and preparation of secondary science teachers brought to light the need for improved curriculum and further training of teachers in the field of science as well as in the field of mathematics.

Anderson⁹ analyzed the preparation programs for secondary science teachers at seventy-eight institutions. Programs in most of the schools did not provide breadth and depth of science experience for prospective teachers. The majority of the preservice teachers took less than 50 per cent of their course work in science.

Nicolette¹⁰ tells of a course developed after a poll of college instructors in science was taken in five colleges and two universities, namely in the chemistry and biology departments. Suggestions from the replies led to the conclusions that there is a need for a fourth year of science in high school.

Rentschler,¹¹ who limited his survey to general science teachers in Indiana, concluded that many teachers

⁹Patricia E. Blosser and Robert W. Howe, "An Analysis of Research Related to the Education of Secondary School Science Teachers," The Science Teacher, XXXVI, 91.

¹⁰Archie Nicolette, The American Biology Teacher, XXIV (April, 1962), 256-258.

¹¹Blosser and Howe, op. cit., p. 90.

did not have adequate preparation in areas of science basic to the teaching of general science. In his study, many teachers had majored in a subject other than science at an undergraduate level. Many were teaching science on a part time rather than a full time assignment and preferred to teach a subject other than general science.

CHAPTER III

RESULTS FROM THE STUDY

Content and organization of mathematics courses. All schools involved in the study employ a track system, or some ability grouping procedure for classes. Textbooks used in all schools surveyed have been copyrighted since 1960. All schools offer geometry, a second course in algebra, and trigonometry above the ninth grade level. No school offered statistics and probability.

One school in category II, while complying with recommendations of the Commission on Mathematics, College Entrance Examination Board, with respect to offerings for tenth, eleventh and twelfth grade students, does not offer a course primarily concerned with the structure of the set of rational numbers for ninth grade students.

The other school in category II complies with recommendations of the Commission on Mathematics with respect to ninth, tenth, and eleventh grade offerings, but does not offer a course in either elementary functions, introductory probability with statistical inference, or introduction to modern algebra.

The school studied in category I has provided for college preparatory students in grades nine through twelve

as recommended by the Commission on Mathematics, College Entrance Examination Board. Materials prepared by the School Mathematics Study Group serve as the textbook for Level I students, the college capable who are likely to pursue courses in college which require a rich mathematical background. These materials are used by Level I students studying algebra I, algebra II, and geometry. Level II students, those capable of formal training in mathematics which does not require depth of understanding beyond high school, are offered a course in algebra I primarily concerned with the set of rational numbers. Level III students, the non-college bound, and Level II students have adequate offerings should they not choose to take algebra.

Many instructional techniques and media have been introduced into the mathematics programs studied. Most teachers indicated that they use supplementary teaching material, either teacher made or commercially prepared materials. Ten teachers use films to implement their teaching; twelve use filmstrips, six use overhead projectors, four make use of figures and models, one uses mathematical games and puzzles, and one indicated use of the bulletin board as a means of emphasis and instruction. New and different teaching techniques were indicated by the respondents: one uses group instruction, and one who teaches elementary functions uses the discovery method. Ten teachers indicated they make use of the library in connection with

mathematics courses taught.

Professional preparation of mathematics teachers. Of the eighteen teachers interviewed in the three schools all held at least a bachelor's degree with 66.6 per cent having majored in mathematics. Four majored in biology, one in physics, and one in physical education. Four teachers, or 22.2 per cent, held master's degrees, three of which have fulfilled the recommendation of the National Council of Teachers of Mathematics that every teacher of secondary mathematics should have completed successfully a five-year program in mathematics culminating in the master's degree.¹² One such teacher fulfilling this recommendation was on the teaching staff in each school studied.

Of the eighteen teachers interviewed 61.1 per cent had earned a minimum of twenty-four semester hours in mathematics. Only one had completed courses in each of the areas specified by the National Council of Teachers of Mathematics.¹³ Six teachers indicated completion of work in the first five areas, thirteen in the first four areas, fourteen in the first three areas, and seventeen in the first area. Courses in analysis were taken by all teachers

¹²Secondary School Curriculum Committee, National Council of Teachers of Mathematics, "The Secondary Mathematics Curriculum," The Mathematics Teacher, LXII, 414-415.

¹³Ibid., 415.

with semester hours in mathematics, with calculus making the strongest showing. Algebra ranked second as the most studied subject while statistics and applications were the least studied subjects in teacher preparation as shown by Table I.

TABLE I

NUMBER AND PER CENT OF MATHEMATICS TEACHERS IN SELECTED COUNTIES OF LOWER KENTUCKY WHO HAVE COMPLETED SPECIFIC MATHEMATICS COURSES

COURSES	Category II		Category II		Category I		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Calculus	3	75	3	75	10	100	16	88.8
Analysis	4	100	3	75	10	100	17	94.4
Foundations	4	100	3	75	8	80	15	83.3
Algebra	4	100	3	75	8	80	15	83.3
Geometry	4	100	3	75	7	70	14	77.7
Statistics	2	50	1	25	4	40	7	38.8
Applications	0	0	1	25	1	10	2	11.1

The study showed that no teacher met the qualifications for either Level IV or Level III and only one teacher met the qualifications for Level II according to the recommendations of the Mathematical Association of America.¹⁴

¹⁴Recommendations of the Mathematical Association of America for the Training of Teachers of Mathematics (December 1960), pp. 4-7.

All teachers lacked the required number of courses in the area of geometry and/or probability and statistics as specified by Level IV and Level III.¹⁵ The one teacher who qualified with regard to required number of courses in geometry did not qualify in the area of probability-statistics; the teacher who qualified in the area of probability-statistics did not qualify in regard to the required number of courses in geometry. Eleven teachers met the requirements for Level IV in the area of analysis, eleven in the area of algebra, one in the area of geometry, and one in the area of probability-statistics. Fifteen teachers qualified for Level III in the area of analysis, eleven in the area of algebra, one in the area of geometry, and one in the area of probability-statistics. Fifteen qualified for Level II in the area of analysis, thirteen in the area of algebra, five in the area of geometry, and three in the area of probability-statistics as shown by Table II.

Analysis of the data resulted in the following findings in regard to pedagogical preparation of teachers. Nine of the eighteen respondents have completed a minimum of eighteen hours in courses in education and psychology as recommended by the Secondary Curriculum Committee of the

¹⁵Ibid., p. 4.

National Council of Teachers of Mathematics.¹⁶ One school in category I showed seven teachers properly trained in this regard; category II showed one per school. Eleven teachers, or 61.1 per cent, have completed student teaching in mathematics. The mean score representing the hours of education and psychology from the recommended areas was fourteen semester hours.

TABLE II

NUMBER AND PER CENT OF SECONDARY MATHEMATICS TEACHERS IN SELECTED COUNTIES OF LOWER KENTUCKY WHO HAVE COMPLETED THE REQUIRED NUMBER OF COURSES SPECIFIED BY THE COMMITTEE ON THE UNDERGRADUATE PROGRAM IN MATHEMATICS OF THE MATHEMATICAL ASSOCIATION OF AMERICA

Level	Analysis		Algebra		Geometry		Probability-Statistics	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
II	15	83.3	13	72.2	5	27.2	3	16.7
III	15	83.3	11	61.1	1	.55	1	.55
IV	11	61.1	11	61.1	1	.55	1	.55

As shown by Table III, at least half of the respondents have studied all courses specified by the Secondary School Curriculum Committee of the National Council of Teachers of Mathematics.¹⁷

¹⁶Secondary School Curriculum Committee, National Council of Teachers of Mathematics, "The Secondary Mathematics Curriculum," The Mathematics Teacher, LXII, 415.

¹⁷Ibid.

TABLE III

NUMBER AND PER CENT OF MATHEMATICS TEACHERS IN SELECTED
SECONDARY COUNTY SCHOOLS OF LOWER KENTUCKY
WHO HAVE COMPLETED SPECIFIED
EDUCATION COURSES

COURSES	Category II		Category II		Category I		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Student teaching in mathematics	2	50	2	50	7	70	11	61.1
Methods courses in mathematics	2	50	1	25	6	60	9	50
Psychology of learning	4	100	4	100	8	80	16	88.8
Mental hygiene	3	75	1	25	7	70	11	61.1
Tests and measurements	2	50	3	75	6	60	11	61.1

The distribution of years in which the baccalaureate degrees possessed by teachers were granted ranged from 1948 to 1968. More than 22 per cent had earned master's degrees and 75.5 per cent of those with master's degrees majored in mathematics.

The number of years of teaching experience ranged from two to thirty-one with a range from one to thirty-one years experience in teaching mathematics. The mean score representing years of teaching experience is seven years and the mean for number of years experience teaching mathematics

is 6.6 years. All of those with more than ten years experience have completed their master's degree within the past decade.

Professional growth of teachers. This study showed that only five of the respondents read regularly any of the periodicals mentioned by the Secondary School Curriculum Committee of the National Council of Teachers of Mathematics,¹⁸ designed to keep teachers currently informed on important developments and improvement of mathematics. No teacher read American Mathematical Monthly regularly; 5.5 per cent read School Science and Mathematics; 5.5 per cent read The Arithmetic Teacher while the study showed The Mathematics Teacher the most widely read with 27.7 per cent reading it regularly. The mean score representing the number of semester hours earned in mathematics by those who read the periodicals is 39.8 and the median is 42 semester hours, while the mean score for all respondents is 25.8 and the median is 32.

Eleven teachers reported they had read professional books within the previous year. The number of books read ranged from two to fifteen with a mean of 4.7 and a median of two with respect to the eleven teachers indicating books read.

¹⁸Ibid., 416.

Sixteen of the eighteen teachers, representing 88.8 per cent, hold membership in one or more professional organizations; however only two teachers indicated they ever attended national conventions of the professional organizations to which they belong.

Fifteen of the respondents indicated progress in some program to update their mathematical background. Five were studying for a master's degree; two were participating in a well organized in-service program; eight were involved in independent study. Responding to a question concerning choice of subject matter in a refresher course, thirteen indicated their preference of mathematics, one would choose physics, and one was undecided.

CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary and conclusions. This investigation was designed to study progress in revision of mathematics programs in keeping with recommendations of the Commission on Mathematics of the College Entrance Examination Board, the Secondary School Curriculum Committee of the National Council of Teachers of Mathematics, and Recommendations of the Mathematical Association of America for the Training of Teachers of Mathematics. More than half of the combined enrollment was offered a program of study fully in keeping with the recommendations of the College Entrance Examination Board. Provisions were made for individual difference through the track system or ability grouping. Most of the teachers in the area have received their degree within the past decade and come into their profession with a professional preparation meeting with recommendations of the Secondary School Curriculum Committee of the National Council of Teachers of Mathematics. However, survey finding shows lack of preparation on the part of teachers in regard to geometry and probability-statistics according to the recommendations of the Mathematical Association of America for the Training of Teachers of Mathematics. The study

revealed an awareness and interest in professional growth on the part of teachers as shown by their participation in some plan to update their mathematical background.

The results of this study showed that secondary schools in the area studied were undergoing revision in keeping with the recommendations of the Commission on Mathematics of the College Entrance Examination Board, the Secondary School Curriculum Committee of the National Council of Teachers of Mathematics, and the Recommendations of the Mathematical Association of America for the Training of Teachers of Mathematics. This conclusion is based upon recently copyrighted textbooks which reflect the thinking of the stated recommendations, ability grouping, instructional techniques and media used in the schools studied, and the recent training of teachers.

It is apparent that the programs studied are aimed at fulfillment of recommendations of recent study groups, particularly those used as criteria in this study. In regard to curriculum it seems that they are approaching complete fulfillment. In regard to teacher training it appears that the goals set forth can be attained, since there is awareness on the part of most teachers of the need of availing themselves of opportunities for professional growth. It is equally clear that there is much yet to be done before all teachers attain the high level of training set forth by the criteria used to evaluate the programs.

Recommendations. Based on the results of the study the following recommendations are made:

(1) An understanding and appreciation of the structure of mathematics on the part of teachers should be continually cultivated. This should include subscribing to and reading professional journals, and attending meetings sponsored by groups affiliated with the National Council of Teachers of Mathematics.

(2) All mathematics teachers should take advantage of any opportunity to eradicate any shortcoming in their preparation for teaching probability, statistics, and/or geometry.

(3) All schools should offer probability and statistics as a part of their mathematical program for twelfth grade students since these subjects are of principal importance for the modern physicist and engineer.

(4) The administration should encourage teachers to read and study books on modern mathematics by providing a teachers' reading and conference room with books on modern mathematics.

(5) The school schedule should be arranged to allow teachers to participate in professional organization meetings, seminars, curriculum study groups on released time.

(6) New curriculum revision projects should be studied and considered by administrators and supervisors as

well as teachers. These should be evaluated in view of the needs of the school.

(7) Continual study should be made of the curriculum and it should be adjusted as better materials and methods appear.

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APPENDIX A

SURVEY SHEET

(Principal or supervisor)

Please complete by filling in or checking the proper blanks below.

1. How many students are enrolled in your school? _____
2. What course offerings in mathematics are available at ninth grade level? _____
3. Which of the following courses are offered for students beyond ninth grade?
 - _____ (a.) General Mathematics or Modern Mathematics
 - _____ (b.) Algebra I
 - _____ (c.) Algebra II
 - _____ (d.) Geometry
 - _____ (e.) Business Arithmetic
 - _____ (f.) Introduction to calculus
 - _____ (g.) Trigonometry
 - _____ (h.) Statistics and Probability
 - _____ (i.) Other (Please indicate) _____
4. Is Algebra I required for graduation? _____
5. Does your school employ a track system or any other ability grouping procedure for classes in mathematics? _____
6. How many mathematics courses does your school require for graduation? _____
7. Have mathematics textbooks in use been copyrighted since 1960? _____

APPENDIX B

SURVEY SHEET

(Teacher)

Please complete by filling in or checking the proper blanks below.

1. How many quarter hours in the following categories of mathematics and education have you completed?

a. Mathematics

(1.) Analysis

- ☐ (a.) Trigonometry
☐ (b.) Plane and solid analytic geometry
☐ (c.) Calculus

(2.) Foundations of Mathematics

- ☐ (a.) Theory of sets
☐ (b.) Mathematical or symbolic logic
☐ (c.) Postulational systems
☐ (d.) Real and complex number systems

(3.) Algebra

- ☐ (a.) Matrices and determinants
☐ (b.) Theory of numbers
☐ (c.) Theory of equations
☐ (d.) Structure of algebra
☐ (e.) Linear algebra

(4.) Geometry

- ☐ (a.) Euclidean
☐ (b.) Non-Euclidean
☐ (c.) Metric and projective
☐ (d.) Synthetic
☐ (e.) Analytic

(5.) Statistics

Probability and statistical inference

(6.) Applications

- ☐ (a.) Mechanics
☐ (b.) Linear programming
☐ (c.) Operations research

(7.) Other courses

- ☐ (a.) _____
☐ (b.) _____
☐ (c.) _____

b. Education

- ☐ (1.) Student teaching in mathematics
☐ (2.) Methods course in the teaching of mathematics
☐ (3.) Psychology of learning (with particular reference to adolescents)

- _____ (4.) Psychology of adjustment (mental hygiene)
 _____ (5.) Tests and measurements
 _____ (6.) Others (Please indicate) _____

2. In what field is your major work? _____
3. In what field is your minor work? _____
4. What courses other than mathematics do you teach?
 _____, _____, _____
5. How many years of teaching experience do you have? _____
6. How many years have you taught at least one course in mathematics? _____
7. If you should choose to take a refresher course, would you study mathematics? _____
8. Which of the following programs are you pursuing to update your mathematical background?
 _____ (a.) Master's
 _____ (b.) Well organized in-service
 _____ (c.) Independent study
9. In which of the following professional organizations do you hold membership?
 _____ (a.) National Council of Teachers of Mathematics
 _____ (b.) Central Association of Science and Mathematics Teachers
 _____ (c.) State and regional educational associations
10. Check the frequency with which you attend national conventions of the professional organizations to which you belong.
 _____ (a.) Often
 _____ (b.) Occasionally
 _____ (c.) Never
11. Which of the following periodicals do you read regularly?
 _____ (a.) The Mathematics Teacher
 _____ (b.) The Arithmetic Teacher
 _____ (c.) School Science and Mathematics
 _____ (d.) American Mathematical Monthly
12. How many professional education books have you read within the past year? _____
13. What degree or degrees do you now possess? Please state year degree was granted.
 _____, _____, _____

14. Do you use supplementary textbooks and/or teacher constructed materials? _____
15. Do you require or encourage use of the library in connection with the mathematics courses you teach? _____
16. Which of the following instructional techniques do you use to implement your teaching?
- _____ (a.) Films
 - _____ (b.) Filmstrips
 - _____ (c.) _____
 - _____ (d.) _____