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PREPARATION, PROBLEMS, AND PRACTICES OF MATHEMATICS TEACHERS IN THE NORTH CENTRAL HIGH SCHOOLS OF OKLAHOMA

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VIVIAN NEMECEK

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PREPARATION, PROBLEMS, AND PRACTICES OF MATHEMATICS TEACHERS IN THE NORTH CENTRAL HIGH SCHOOLS OF OKLAHOMA

APPROVED BY

F. A. Balyeat

Arthur Bernhart

W. N. Huff

Carl Shannon

Glenn R. Snider

THESIS COMMITTEE

To Valda, Stephen, Sydney, and Douglas, whose patience and endurance were important contributions to the completion of this study.

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CHAPTER I

INTRODUCTION

Knowledge of certain characteristics of a professional group is necessary for improvement of members of that group and for increasing the qualifications of their replacements. Considering secondary mathematics teachers as one part of a professional group given the responsibility for educating the adolescent youth of a locality, it is important that periodic studies be made of certain of their characteristics to the end that improvements of the group may be suggested. If suggested improvements are not feasible for that group, then consideration should be given to providing conditions which will permit those entering that professional group the opportunity to take advantage of those suggestions and to become aware of the status of the present members of the group. Measured by the above criteria the problem, outlined below, became one worthy of consideration by the writer.

Statement of the Problem

Broadly stated, the problem was to determine the status of mathematics teachers in the North Central Association high schools of Oklahoma with respect to their preparation for teaching secondary mathematics and some of the conditions and practices attendant to their teaching. Specifically the problem is threefold:

1. To determine the nature, extent, and adequacy of the preparation of the selected group of mathematics teachers in terms of college mathematics, professional education courses and related fields.
2. To determine the nature of the problems which they presently experience and which appear to interfere with their efficiency as teachers.
3. To determine the nature of their practices with respect to selected areas of teaching.

Need for the Study

In addition to furnishing the writer with considerable knowledge and experience, the study may be justified to the degree that it will furnish the following groups or individuals with a few facts and suggestions concerning teachers of secondary mathematics:

1. Agencies and individuals concerned with the preparation of secondary mathematics teachers of the future, such as departments of mathematics, schools of

education, and related divisions of colleges.

2. Certification personnel and agencies, whether located in a college or in the State Department of Education.
3. Accrediting agencies, such as the state authority or the North Central Association of Colleges and Secondary Schools.
4. Professional groups, either in the specific field of mathematics education or in the more general secondary education field.
5. Present teachers of secondary mathematics.
6. Prospective teachers of mathematics, their advisers, and their probable supervisors.

Delimitation and Scope of the Study

The investigation was limited to mathematics teachers of the high schools of Oklahoma which were accredited by the North Central Association of Colleges and Secondary Schools[1] for the school year 1953-54. An attempt was made to obtain responses to a checklist type of questionnaire from all the teachers who were teaching secondary mathematics in these schools during that year.[2] It was the intent of the study to reflect the characteristics of the problems and practices of this group of teachers for that school year only. Of course,

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[1]Subsequent reference to the North Central Association of Colleges and Secondary Schools will appear as the North Central Association.

[2]See checklist, Appendix B.

the preparation aspect of the study must necessarily be considered as reflecting the past, as well as the status of the teachers at the time of the study. The choice of this select group of schools was made on the assumption that accreditation by the North Central Association would, to some degree, at least, provide a sample of the best schools of the State of Oklahoma. A further assumption was made that aspects and characteristics of a sample of teachers not accredited by the North Central Association may not be on as high a plane as those of the selected group. This limitation prohibited any comparison with Oklahoma high schools not accredited by the North Central Association, but in some instances provoked questions concerning the mathematics teachers of those schools.

A second delimitation is that prescribed by the nature of the investigation. As implied above and explained below, the primary data were obtained by means of a checklist to which the teachers responded. Since it was physically impossible to make the checklist completely comprehensive, the study is limited to those areas included in the checklist.

A third delimitation, inherent in investigations of this nature which depend on voluntary responses, was the failure of one-fourth of the teachers to respond. Incomplete data, due to this cause, may have introduced bias in the findings because of the failure of the following categories of teachers to complete and return the checklist: (1) teachers not sympathetic to this type of investigation who may have possessed similar characteristics, (2) teachers who felt that their preparation was relatively inadequate and did not wish to reveal it, and (3) the busy teachers who may have had much to contribute, but who considered that the study was not relatively as important as their immediate tasks.

Definition of Terms

The following definitions are supplied in order to provide a common basis of understanding when the terms appear in the context of the study.

Preparation. The status of the mathematics teachers in the selected schools with respect to the following characteristics is intended to be the connotation of the term in this study.

1. Baccalaureate and graduate degrees held or in progress at the time of the study.
2. Course work in mathematics at the college level as to amount and kind.
3. Course work in the teaching of mathematics.
4. Professional (education) courses.
5. Courses in the related fields of science.

Problem. A particular difficulty which, in the opinions of the teachers, appeared to interfere with their efficiency as teachers is defined as a problem.

Practice. The teachers' activities with respect to the following items constitute the practices considered in in this study.

1. Professional activities.

2. Planning for instruction.

3. Use of tests.

4. Providing for the individual differences of the students.

5. Use of instructional materials.

Sources of Data

The names of all teachers, who were listed by the schools' academic schedules as being teachers of secondary mathematics in the North Central Association high schools of Oklahoma during the first semester of the school year 1953-54, were obtained from the files of the Secondary Division of the State Department of Education. These teachers were considered to be the population for the study.

The checklist, prepared to conform in part with those used in studies by Karnes,[1] von Rosenberg,[2] and Wahlstrom,[3] and drawn in part from observation and experience of the

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[1]Houston T. Karnes, "The Professional Preparation of Teachers of Secondary Mathematics." Unpublished Ph.D. dissertation, George Peabody College for Teachers, 1940.

[2]Mary Edna von Rosenberg, "The Status of Teachers and Teaching of Secondary School Mathematics in Texas for the Academic Year 1942-43." Unpublished Ph.D. dissertation, The University of Texas, 1943.

[3]Lawrence Ferdinand Wahlstrom, "The Status of Teaching of High School Mathematics in the State of Wisconsin." Unpublished Ph.D. dissertation, The University of Wisconsin, 1950.

writer, was mailed, on April 15, 1954, to each of the teachers, together with a letter inviting their cooperation.[1] Two weeks later a follow-up letter, requesting a response, was sent to each of the teachers not replying within that period.[2]

Table 1 shows the number and distribution of the schools in which the population group and the sample group of teachers were employed during that school year, as well as a complete picture of the number, size, and type of schools accredited in Oklahoma by the North Central Association during the school year 1953-54.[3] A public school is defined as one which is supported by public funds partly derived from tax levies in the district in which it is located. A non-public school is one which is not supported by taxes locally levied; they are, in this study, two laboratory schools, a military school, and two parochial schools. Separate schools are those attended by the minority race in a school district; in this study they were all negro.

The division of the schools into the four indicated sizes, based upon enrollment, was an arbitrary decision of the writer and was done to provide a basis for comparison of

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[1]A copy of the letter, mailed with the checklist, to the mathematics teachers appears in Appendix A.

[2]A copy of the follow-up letter to the mathematics teachers appears in Appendix C.

[3]<u>Oklahoma Educational Directory, 1953, 54</u>, pp. 21-74. Bulletin No. 109-C, issued by The State Superintendent of Public Instruction, Oklahoma City, 1953-54.

characteristics of the teachers according to size of the high schools. Interested readers may combine these groups into two groups (large and small) or into three groups (very small, medium, and large) with respect to certain characteristics, as the see fit.

TABLE 1

DISTRIBUTION OF THE NORTH CENTRAL ASSOCIATION HIGH SCHOOLS IN OKLAHOMA SURVEYED AND REPRESENTED IN THE STUDY ACCORDING TO SIZE AND TYPE

Type of School		Size of High School: Less than 200	200 to 399	400 to 799	800 or more	Total
White Public:	Surveyed	47	36	27	12	122
	Represented	40	31	27	12	110
	Per Cent*	85	86	100	100	90
Separate Public:	Surveyed	11	. .	2	1	14
	Represented	7	. .	2	1	10
	Per Cent*	64	. .	100	100	71
White Non-Public:	Surveyed	5	. .	. .	. .	5
	Represented	4	. .	. .	. .	4
	Per Cent*	80	. .	. .	. .	80
All Types:	Surveyed	63	36	29	13	141
	Represented	51	31	29	13	124
	Per Cent*	81	86	100	100	88

*Indicates per cent of high schools represented by teacher responses based on the number of schools surveyed.

The per cent of schools represented by the teachers' responses ranged from 81 to 100. The response to the study was less percentage-wise in the small schools than in the larger schools because many of the small schools employed only one mathematics teacher and if that teacher failed to respond the school was not represented.

The distribution of the population group and the sample group is presented in Table 2. Characteristics of the teachers according to sex is of interest in many of the subsequent tables, and data will be presented in the fashion of Table 2 in most cases. Detailed characteristics of the sample group will be supplied in Chapter II.

TABLE 2

DISTRIBUTION OF THE MATHEMATICS TEACHERS IN THE NORTH CENTRAL ASSOCIATION HIGH SCHOOLS IN OKLAHOMA ACCORDING TO SEX, THE NUMBER SURVEYED, AND THE NUMBER AND PER CENT RESPONDING

	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M*	W*	M	W	M	W	M	W	Total
Teachers Surveyed	59	20	34	24	43	27	28	30	265
Teachers Responding	44	18	24	16	33	22	18	20	195
Per Cent Responding	75	90	71	67	77	82	64	67	74

*In this and subsequent tables men and women mathematics teachers are indicated by the symbols M and W.

A Review of Related Research and Literature

Studies related to the teaching of secondary mathematics and to the status of teachers of that area of subject matter are numerous in the literature of the past fifty years.

They range from some international in scope to some which are limited to a relatively small geographical area and a comparatively small group of teachers. The following studies are outlined for the purpose of presenting a chronological development of interest in the field and to describe studies which are somewhat related to the present one.

The American Committee study. The first important study related to teachers of secondary mathematics came about as the result of the deliberations of the International Commission on the Teaching of Mathematics created by the Fourth International Congress of Mathematicians held in Rome, Italy in April, 1908. Under the chairmanship of David Eugene Smith, the American Committee of the International Commission met one year later and organized twelve committees and many subcommittees to investigate certain topics and prepare reports in anticipation of the meetings of the Congress in 1912.[1] Two of these topics were (1) the training of elementary and secondary teachers of mathematics and (2) influences tending to improve the work of the teacher.[2] In the report, a general discussion of the organization of secondary schools in the United States, the secondary mathematics curriculum, instruction in secondary mathematics, and the preparation of

[1]Report of the American Commissioners of the International Commission on the Teaching of Mathematics, pp. 5-6. Bulletin 1912, No. 14, United States Bureau of Education. Washington: Government Printing Office, 1912.

[2]Ibid., p. 6.

teachers may be found.[1] Conclusions in terms of two main needs were stated thus:

> . . .the need for better preparation of teachers and the need to reduce, if not eliminate, the waste of effort involved in independent and often inadequate treatment of fundamental and broad questions by separate schools, colleges, or local systems.[2]

With reference to the first need, a statement was made which might be equally appropriate today.

> The first of these needs must be met by gradual development; perhaps all that can be done by individuals is that each should take special pains to stimulate progress on this line whenever and however possible. It will not suffice merely to raise the requirements for appointment [of teachers]; there must be an accompanying guarantee of adequate remuneration and suitable working conditions. To secure this guarantee is mainly an administrative problem, often a political one, and must, at present, be dealt with as may be possible through these channels.[3]

With respect to the average preparation of teachers of secondary mathematics in this country at that time, it was stated that:

> The average newly appointed teacher of mathematics is a college graduate who has had only about one year's work (from 90 to 180 class hours) of mathematics beyond the work of the school in which he teaches. . . . A typical combination would be trigonometry, college algebra, and analytical geometry. The average preparation includes no strictly professional training, no course in the teaching of mathematics to initiate the candidate into the teacher's mode of viewing the events of the classroom. . . . He is essentially a former pupil, somewhat matured by the general experience of his college studies and life come back to teach his quondam fellows.[4]

Dissatisfaction with that state of affairs is no doubt one of

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[1] _Ibid._, pp. 25-40.

[2] _Ibid._, pp. 39-40.

[3] _Ibid._, p. 40.

[4] _Ibid._, p. 35.

the forces which led to the improvement of the professional preparation of teachers of secondary mathematics as reflected in subsequent studies.

The reports submitted by eighteen countries to the International Commission culminated in a single report by Archibald which described and compared the mathematics curriculum and the teaching of mathematics in the secondary schools of those countries.[1] He concluded that standards then being proposed for the preparation of secondary mathematics teachers in this country were already a matter of course in most of the other countries.[2]

The Sueltz study. In 1928 the interest of the International Committee on the Teaching of Mathematics, having been diverted by the war, was revived. Under the chairmanship of E. R. Hedrick, the American Committee of the International Commission began the work of studying the education of teachers of secondary mathematics of the United States. At the same time the Office of Education, Department of the Interior, was planning an extensive survey of the education of all the teachers of the country. The American Committee sought and obtained the cooperation of the Office of Education

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[1]Raymond Clare Archibald, The Training of Teachers of Mathematics for the Secondary Schools of the Countries Represented in the International Commission on the Teaching of Mathematics, Bureau of Education, Bulletin 1917, No. 27. Washington: Government Printing Office, 1918.

[2]Ibid., p. 226.

and its sponsorship of a supplementary but more intensive survey of a smaller sample of that population. The National Survey[1] yielded data on approximately 12,000 teachers of secondary mathematics employed during the school year of 1930-31. By choosing every third teacher the sample was reduced to 4,000. These data, combined with the data on 1,032 teachers, employed during the school year 1931-32, obtained by means of the second but more detailed instrument, was reported by Sueltz.[2]

The combined study sought "to determine certain factors or elements of status of the present group of teachers of secondary mathematics, to study those elements critically, and to formulate some guiding principles for the future." One portion of the study was concerned with the general characteristics of the teachers, their training, the positions they occupied, and the relationships between those characteristics based upon the data obtained from the National Survey.[3] Another portion of the study presents a detailed description of the preparation, tenure, and experience of the smaller sample.[4] Certification of teachers is a third consideration

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[1] National Survey of the Education of Teachers, Office of Education, Bulletin 1937, No. 10, I-VI. Washington: Government Printing Office, 1935.

[2] Ben A. Sueltz, The Status of Teachers of Secondary Mathematics in the United States. Cortland, New York, 1934.

[3] Ibid., pp. 19-48

[4] Ibid., pp. 49-101.

in the study.[1] In his conclusions and recommendation, Sueltz concerned himself with the nature and purposes of secondary mathematics, and the certification of teachers.[2] With respect to the specific preparation of mathematics teachers, his recommended program of study for mathematics majors and minors who plan to teach in that field is quoted:

COLLEGE MAJOR IN MATHEMATICS[3]

Academic Courses	Credit in semester hours minimum	desirable
Mathematical analysis or general mathematics (1st yr.)	6	6
Analytic geometry	3	6
College geometry	3	3
Modern geometry	3	6
Calculus	6	8
Fundamental concepts of math.	3	5
Applied and Related Courses		
History of mathematics	3	3
Statistical method	3	6
Mathematics in modern life	3	3
Total Mathematics Courses	32	46

COLLEGE MINOR IN MATHEMATICS

Academic and Related Courses	Minimum credit in semester hours
Mathematical analysis or general mathematics (1st yr.)	6
Analytic geometry	3
Calculus	6
Elective with college geometry or statistical method recommended	3
Total Mathematics Courses	18

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[1] Ibid., pp. 102-117.

[2] Ibid., p. 119.

[3] Ibid., pp. 132-133.

THEORETICAL AND APPLIED COURSES IN "EDUCATION"

Courses in Education	Math. majors	Math. minors
Introduction to educational concepts	3	3
The teaching of mathematics (Professional treatment of materials)	6	3
Observation and practice-teaching	3	2
Psychology, measurements, and others in educational theory	9	9
Total Credit in Education for Majors	21	
Additional Education in Minors		5

The minimum of 32 semester hours for mathematics majors was visualized as being included in a typical four year college course. The desirable amount (46 hours) was thought of as the amount to be taken when "the training period for high school teachers is raised from four to five years of collegiate preparation."

Perhaps a word concerning the course called "Mathematics in Modern Life" is appropriate. Sueltz's conception was that it should be a course to "acquaint the prospective teacher with actual and potential uses of mathematics in such diverse fields as the physical and natural sciences, astronomy, geodesy, finance, industry, the fine arts, aesthetics, and philosophy."[1] To the knowledge of the present writer, this recommendation has received very little attention.

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[1] *Ibid.*, p. 134.

Another recommendation worthy of note was that which expressed the desirability of teachers being adequately prepared in at least two related fields, one as a major field of college study and the other a minor field of about 18 semester hours.[1]

Further discussion of Sueltz's study and his conclusions and recommendations are not pertinent here. Comparisons with reference to his study will be made at various points in the present study.

The North Central Association study. Another study carried on from 1934 to 1938 is particularly important to the present study, since it involved North Central Association high schools.[2] The report of the study was divided into two parts. Part I[3] included a summary of generalizations, an interpretation of the inadequacies in subject matter preparation of secondary teachers in general, and a discussion of specific reforms needed. Part II[4] contained data on which Part I was based.

The scope of the investigation and findings may be shown by the following summary of generalizations, as stated in the report:

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[1] *Ibid.*, pp. 134-135.

[2] F. E. Henzlik, et al., "Subject Matter Preparation of Secondary School Teachers," *North Central Association Quarterly*, XII (April, 1938), 439-539.

[3] *Ibid.*, pp. 439-455.

[4] *Ibid.*, pp. 456-539.

1. Assignment of teachers chaotic.
2. Teacher preparation inadequate.
3. Certification and accrediting regulations add to chaos.
4. High school curriculum is changing.
5. College preparation of teachers is also changing.
6. Good teaching depends on adequate preparation.
7. Learned societies recommend better teaching preparation.
8. College faculty members suggest reforms.
9. High school teachers suggest reforms.[1]

Basic principles which evolved from the study were as follows:

1. Unless reforms in the subject-matter preparation of secondary school teachers are based on realistic understanding of the high school and its problem, there is no assurance that these reforms will lead to placing of better qualified teachers in the high schools.

2. A broad general education is basic to the sound preparation of high school teachers.

3. Subject-matter specialization is equally essential to the sound preparation of prospective high school teachers but, for teachers, such preparation should be in broad fields rather than the traditional limited subject divisions.

4. Cooperative study and action among several agencies interested in the education of prospective high school teachers is necessary if the problem of securing more effective subject-matter preparation is to be solved in accordance with the basic principle cited above.[2]

The Turner study. Noting certain questions left unanswered by the studies referred to above, and others similar to them, Turner undertook the task of seeking answers to those questions.[3] His interest was confined geographically

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[1] _Ibid_., pp. 432-451. [2] _Ibid_., pp. 451-452.

[3] Ivan Stewart Turner, _The Training of Mathematics_

to England, Wales, and the United States. His effort was devoted to a study of the nature of secondary schools, academic preparation of the mathematics teachers, and the professional preparation of the mathematics teachers in those three countries.[1] The training of mathematics teachers was considered in the light of nine principles[2] and the strengths and weaknesses[3] of the teacher training for secondary mathematics were pointed out using those criteria.

The Joint Report. Common interest in the problems of secondary mathematics and its teaching led the National Council of Teachers of Mathematics, and the Mathematical Association of America, to form, in 1935, a Joint Commission to study those problems. In its Joint Report some attention is paid to education of teachers.[4] General characteristics desirable in mathematics teachers, the professional education of the teachers, their training in mathematics, and specific programs for teachers of mathematics along with a second teaching subject are discussed.[5]

The Karnes study. In 1940 Karnes reported on a study

Teachers. The Fourteenth Yearbook of The National Council of Teachers of Mathematics. New York: Bureau of Publications, Teachers College, Columbia University, 1939.

[1] Ibid. [2] Ibid., pp. 7-24. [3] Ibid., pp. 218-225.

[4] The Place of Mathematics in Secondary Education. Fifteenth Yearbook of The National Council of Teachers of Mathematics. New York: Bureau of Publications, Teachers College, Columbia University, 1940.

[5] Ibid., pp. 187-203.

which had a two-fold purpose, namely:

1. To determine, in the light of certain findings, a program for the preparation of teachers of secondary mathematics.

2. To interpret, in the perspective of this program, the present situation with regard to the training of teachers within the bounds of the Southern Association of Colleges and Secondary Schools.[1]

The first purpose was consummated by a survey of a sample of state superintendents of instruction, state high school supervisors of secondary education, administrators of secondary education, college teachers of secondary education, college teachers of educational psychology, heads of college departments of mathematics, secondary teachers of mathematics (to include junior high school, senior high school, and junior college teachers), and junior college administrators. The total number surveyed was 633; the number of teachers surveyed was 291, 166 of whom were teachers of mathematics in senior high schools, the same type of high schools of primary concern in the present study.

With respect to the first purpose, the following general findings were obtained. The combined group was decidely in favor of a broad general education for all teachers of secondary mathematics. More than fifty per cent of the combined group voted for the following fields to be included in a broad general education: physical science, biological

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[1]Houston T. Karnes, "Professional Preparation of Teachers of Secondary Mathematics." Unpublished Ph.D. dissertation, Peabody College for Teachers, 1940.

science, social science, psychology, literature, and education. The average amount of credit in professional knowledge recommended for the bachelor's degree was 26 semester hours. The average amount of mathematics recommended for the bachelor's degree was 35 hours. The only mathematics courses that received a fifty per cent vote, or better, to be included in the minimum program for prospective mathematics teachers in the secondary schools, were those commonly included in the freshman year. Seventy-six per cent thought the professional courses should be taken at the senior college and graduate levels. Almost one-half of the respondents thought that the applied phase of mathematics should be emphasized in the training of teachers. Sixty-three per cent of the college teachers thought that a "liaison professor" (one who works in both the mathematics and education departments) would be beneficial in providing prospective teachers with professional training. Twenty-four per cent of the mathematics departments surveyed already had a "liaison professor."[1]

Using the criteria established by the opinions of the entire group of respondents, Karnes determined the status of the three groups of teachers represented, i.e., junior high school mathematics teachers, senior high school mathematics teachers, and junior college mathematics teachers.[2] Reference and comparisons will be made to that status in this

[1] *Ibid.*, pp. 119-122. [2] *Ibid.*, pp. 123-177.

study.

In conclusion, Karnes made certain recommendations with respect to the training of secondary mathematics teachers along the line of general knowledge, specialized knowledge (mathematics), and professional knowledge (education). Two types of programs were suggested for the bachelor's degree, one of which permits the student to spend one-half of his time in the acquisition of general knowledge, the other allowing him two-thirds of his time for that purpose. Specialized knowledge and professional knowledge receive less emphasis in the latter suggestion. A general description of a doctoral degree program for teachers of secondary mathematics was included in his recommendations.[1]

The von Rosenberg study. A similar study to Karnes' with respect to status of teachers of secondary mathematics in a limited locality was reported by von Rosenberg.[2] A checklist was sent to 1,270 teachers of mathematics employed in 385 junior and senior high schools of the State of Texas during the school year 1942-43. The 608 responses were analyzed to determine if their preparation was adequate, if they had sufficient experience and training to meet the demands of the war emergency, and if their methods were

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[1]*Ibid.*, pp. 205-212.

[2]Mary Edna von Rosenberg, "The Status of Teachers and Teaching of Secondary School Mathematics in Texas for the Academic Year 1942-43." Unpublished Ph.D. dissertation, The University of Texas, 1943.

sound. Reference will be made to the study when appropriate comparisons may be made to the present study.

The Second Report of the Commission on Post-War Plans. During World War II there was much criticism of the mathematical training of American youth accepted by the Armed Forces.[1] Stimulated by that criticism and other considerations of long standing, the National Council of Teachers of Mathematics formed a committee to formulate some basic principles as suggestions for improving instruction in mathematics from the first grade through junior college. The committee, in its Second Report,[2] proposed 34 principles or theses, the first of which provided a broad basis for the remainder by stating, "The school should guarantee functional competence in mathematics to all who can possibly achieve it." Twenty-eight competencies were listed to amplify the thesis.[3]

Secondary mathematics was treated in two parts; theses 12 and 13 were devoted to ninth grade mathematics, while theses 14 through 20 were concerned with mathematics in grades 10 through 12.

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[1] "The Importance of Mathematics in the War Effort," The Mathematics Teacher, XXXV (February, 1942), 88.

[2] Commission on Post-War Plans, National Council of Teachers of Mathematics, "Second Report of the Commission on Post-War Plans," The Mathematics Teacher, XXXVIII (May, 1945), 195-221.

[3] Ibid., p. 196.

The education of teachers of mathematics was treated in a similar manner, except that teachers of mathematics in grades nine through twelve were considered together.[1] Theses 26 through 32 are quoted to show the general nature of the proposals.

> Thesis 26. The teacher of mathematics should have a a wide background in the subjects he will be called upon to teach. . . .
>
> Thesis 27. The mathematics teacher should have a sound background in related fields. . .physics, mechanics, astronomy, navigation, economics, business problems, and the like. . .
>
> Thesis 28. The mathematics teacher should have adequate training in the teaching of mathematics, including arithmetic. . . .
>
> Thesis 29. The courses in mathematical subject matter should be professionalized. . . .
>
> Thesis 30. It is desirable that a mathematics teacher acquire a background of experience in practical experience in fields where mathematics is used. . . .
>
> Thesis 31. The minimum training for mathematics teachers in small high schools should be a college minor in mathematics. . . .
>
> Thesis 32. Provision should be made for the continuous training of teachers in service. . . .[2]

To supplement the above major premises the Commission made certain specific proposals and recommendations. In subject matter training the following courses were recommended: trigonometry, solid geometry, analytic geometry, calculus, college geometry beyond the secondary course, theory of equations, spherical trigonometry (with applications to global

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[1] *Ibid.*, pp. 217-220. [2] *Ibid.*, pp. 218-219.

geometry, astronomy, and mapping), history of mathematics (with emphasis on historical development of computation and of elementary mathematics), foundations of mathematics (included, perhaps, in college algebra and college geometry), and applications of mathematics (especially problems of the transit, sextant, slide rule, and other mechanical computers). Other desirable courses listed were elementary statistics (to include educational measurements), elements of non-Euclidean geometry, projective or descriptive geometry, and mathematics of finance.[1]

Specific proposals for the training of teachers in the teaching of mathematics placed some emphases upon special training in the teaching of arithmetic, methods courses in one or more mathematics subjects, and acquaintance with commercial multi-sensory teaching aids as well as attention to construction of aids by the teacher.[2]

The Commission's proposal that subject matter should be professionalized specifically states that:

> College instructors in mathematics should be closely connected with the teaching of mathematics in secondary schools, should have an intimate knowledge of problems that teachers in such schools meet, and should be able to tie in the college courses with problems in secondary teaching.[3]

The problems of teaching mathematics in small schools were recognized, especially the common requirement to teach

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[1] Ibid., p. 219.

[2] Ibid., pp. 218-219.

[3] Ibid., p. 219.

in several fields. However, a minor in mathematics was recommended as a minimum for such teachers; it was not regarded as a satisfactory standard.[1]

<u>The Wahlstrom study</u>. Another study, similar to those by Karnes and von Rosenberg, was undertaken by Wahlstrom in Wisconsin in the school year 1949-50.[2] The particular questions concerning mathematics teachers for which answers were sought were:

1. What was their preparation like?
2. What was the nature and extent of their experience?
3. What were the curricular offerings in Wisconsin at that time?

A checklist sent to 1,071 teachers of secondary mathematics yielded 552 returns which were studied to approximate the status of the teachers with respect to the first two questions above. Appropriate reference will be made to the study as opportunity occurs.

The research and literature included in this chapter provided the necessary and, perhaps, sufficient background for the present study. They reflect an increasing interest, through the years, of various individuals and groups in the desirability and necessity for continued improvement in the teaching of secondary mathematics through improvement of the teachers. It is the desire of the writer that this interest be maintained; to that end this study was initiated.

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[1] <u>Ibid</u>., p. 220.

[2] Lawrence Ferdinand Wahlstrom, "The Status of the Teaching of High School Mathematics in the State of Wisconsin." Unpublished Ph.D. dissertation, The University of Wisconsin, 1950.

CHAPTER II

PREPARATION OF THE MATHEMATICS TEACHERS

It is the primary purpose of this chapter to present a composite picture of the preparation of the mathematics teachers in the North Central high schools of Oklahoma as indicated by their responses to the checklist. Initially, certain general characteristics with respect to official status, age, etc., will be presented. With respect to their preparation, the following general characteristics will be exhibited and discussed: (1) preparation in terms of degrees earned and degrees in progress, (2) preparation in terms of majors and minors, (3) amounts of academic credit in college mathematics, in professional courses (education), and in courses in the teaching of mathematics, and (4) certain opinions expressed by the teachers with regard to their preparation.

Selected Characteristics of the Mathematics Teachers

Official status of the teachers. Since many of the high schools were relatively small, it was felt that a number of the teachers would be engaged in activities other than those usually done by a classroom teacher. The teachers were asked to indicate their official status, that is, if they were a superintendent, principal, department head, or primarily a teacher. Table 3 shows, as was expected, that a number of the mathematics teachers in the smaller schools were also superintendents and principals. Approximately one-third of the men in the smallest group of schools were superintendents and principals. Of the entire sample approximately 75 per cent classified themselves as classroom teachers.

TABLE 3

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO OFFICIAL STATUS

Official Status	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		Total
	M 44*	W 18*	M 24*	W 16*	M 33*	W 22*	M 18*	W 20*	195*
Superintendent	5	..	..	..	..	..	..	..	5
Principal	9	..	2	..	..	..	..	..	11
Department Head	5	1	3	5	5	4	1	4	28
Teacher	25	17	19	11	28	18	17	16	151

*In this table and in subsequent tables these numbers indicate the number of mathematics teachers responding in each group.

Marital status. Table 4 shows the number of teachers who were married, single, or single with dependents. Ninety-two per cent of the men and 46 per cent of the women were married. In a nation-wide sample of mathematics teachers, teaching in the school year 1930-31, it was found by Sueltz[1] that 11 per cent of the women were married, while von Rosenberg[2] found that 33 per cent of the sample in Texas, for the school year 1942-43, were married. This comparison is indicative of a trend away from discrimination against married women teachers, possibly occasioned by a developing shortage of teachers.

TABLE 4

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO MARITAL STATUS

Marital Status	Size of High School								Total		
	Less than 200		200 to 399		400 to 799		800 or more		Total		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	M 119	W 76	Total 195
Married	35	9	22	10	29	9	16	5	102	33	135
Single	2	6	2	5	1	7	2	13	7	31	38
Single with dependents	1	1	..	..	1	6	..	1	2	8	10
No Response	6	2	..	1	2	..	..	1	8	4	12

<u>Age of the teachers</u>. An interesting comparison is possible in Table 5. The difference in the median ages of the men and women teachers in the various sizes of the high schools varies from four years to 14 years. Only in the

[1]Sueltz, <u>op. cit</u>., p. 22.

[2]von Rosenberg, <u>op. cit</u>., p. 48.

largest schools are the men and the women relatively the same age. On the whole, the men teachers are considerably younger than the women. The median of 41 years indicates that the group as a whole is an experienced one, at least in terms of age. Sueltz[1] reported a median age of 29 years for his sample, while von Rosenberg[2] reported a median age of 38 years.

TABLE 5

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO AGE

Age	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		Total		Total
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	M 119	W 76	195
21 - 25	3	3	..	1	3	1	1	..	7	5	12
26 - 30	10	..	7	..	9	1	2	2	28	3	31
31 - 35	14	1	4	1	4	1	4	1	26	4	30
36 - 40	3	3	4	1	4	3	1	2	12	9	21
41 - 45	3	4	4	2	5	3	1	1	13	10	23
46 - 50	7	3	4	3	2	10	5	5	18	21	39
51 - 55	3	1	1	5	2	1	3	5	9	12	21
56 - 60	..	1	..	..	1	1	..	3	1	5	6
61 - 65	..	..	..	1	2	1	1	1	3	3	6
Above 65	..	..	..	2	1	..	..	..	1	2	3
No Response	1	2	..	..	..	..	..	..	1	2	3
Medians	34	43	37	51	37	47	46	50	35	47	41

[1]Sueltz, op. cit., p. 23.

[2]von Rosenberg, op. cit., p. 49.

<u>Tenure in present position</u>. Table 6 presents another interesting comparison between the men and women teachers, and among the teachers in the smaller and larger schools.

TABLE 6

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO THE NUMBER OF YEARS THEY HAVE BEEN IN THEIR PRESENT POSITION

Number of Years	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
1 - 5	28	7	13	2	18	4	7	5	84
6 - 10	6	3	6	9	8	9	5	3	49
11 - 15	3	3	1	2	2	4	1	2	18
16 - 20	2	..	1	..	2	1	1	2	9
21 - 25	1	1	..	1	..	1	1	2	7
26 - 30	..	..	..	1	1	..	1	1	4
31 - 35	..	..	..	..	..	..	1	3	4
36 - 40	..	..	..	..	..	..	..	1	1
No Response	4	4	3	1	2	3	1	1	19
Medians	3.0	5.5	5.0	8.0	4.0	10.0	7.0	15.0	6.0

The reported medians show that the women teachers tend to remain in one position longer if tenure in their present positions is any indication, and that the larger schools manage to keep their mathematics teachers employed longer than the smaller schools. However, tenure in their present positions is a function of age. Table 5 has shown that the teachers in the larger schools tend to be older than those in smaller schools, and that the women in each size of school tend to be older than the men. The only inference that can be drawn is that if these data should remain constant during subsequent years, then the women mathematics teachers would definitely be an older group and tend to remain in one position longer than the men.

The median tenure of six years for the entire sample in the present study approximates that reported by both von Rosenberg[1] and Wahlstrom.[2]

Factors influencing the teachers to be teachers of secondary mathematics. It was felt by the present writer that it would be of some interest to determine several of the factors that influenced the teachers to teach mathematics. Table 7 shows that the principal factors were, in rank order of importance: personal preference of the teacher, influence of a high school teacher, influence of a college mathematics teacher, being required to teach mathematics and liking it, and the influence of some member of the teacher's family. It is of interest to note that only two teachers appeared to be teaching mathematics temporarily. (See Table 7, page 31.)

Recency of attendance in a college or university. To provide some notion as to the teacher's last contact, in an academic sense, with a college or university the teachers

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[1]von Rosenberg, op. cit., p. 57.

[2]Wahlstrom, op. cit., p. 189.

TABLE 7

FACTORS INFLUENCING THE MATHEMATICS TEACHERS MOST IN THE CHOICE OF MATHEMATICS AS A SUBJECT TO TEACH

Influences	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Personal preference	13	5	7	6	8	8	7	10	64
High school teacher	11	6	6	4	9	11	4	3	54
College math. teacher	8	4	6	5	5	5	1	2	36
Teaching requirement	6	5	4	1	9	1	2	2	30
Family member	7	1	3	4	3	2	2	4	26
Pure chance	1	..	1	1	2	3	..	1	9
Other college teacher	4	1	2	..	..	1	..	..	8
A friend	2	..	..	1	..	..	..	..	3
Teaching mathematics temporarily	..	..	1	..	..	..	1	..	2
Other	2	..	4	..	..	..	..	1	7
Total Responses	54	22	34	22	36	31	17	23	239

were asked to indicate the calendar year of that attendance. Table 8 shows that, of the entire group, 139, or 73 per cent of those responding, have attended a college or university in the last five years prior to 1954. Generally speaking, the men teachers have attended school more recently than the women. Ninety-one per cent of the men teachers and 53 per cent of the women teachers have attended in the last five years previous to 1954.

TABLE 8

RECENCY OF ATTENDANCE BY THE MATHEMATICS TEACHERS IN A COLLEGE OR UNIVERSITY

Years Since Last Attendance	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Attending now	3	..	1	..	3	..	1	1	9
1 - 5	32	12	20	6	27	14	13	6	130
6 - 10	..	2	..	3	1	3	2	3	14
11 - 15	5	3	1	3	1	2	..	5	20
16 - 20	2	..	2	3	1	1	1	4	14
21 or more	1	..	..	..	..	1	..	1	3
No Response	1	1	..	1	..	1	1	..	5
Medians	2	4	2	9	2	3	1	9	3

Preparation of the Mathematics Teachers with Respect to Degrees

Knowledge concerning the highest academic degrees earned is one measure of the preparation of a group of teachers. To cite one example, Sueltz found that of 4,000 teachers of secondary mathematics employed in the United States in the school year 1930-31, seven per cent had not earned bachelor's degrees, and 91 per cent had not earned master's degrees. Converting these data to positive numbers and placing them alongside findings in other studies provides, in Table 9, a means for comparison with each other and with data from the present study.

TABLE 9

PER CENT OF FOUR SAMPLES HAVING BACHELOR'S AND MASTER'S DEGREES

Study	Date	Per Cent of Teachers with: Bachelor's Degree	Master's Degree
Sueltz[a]	1930-31	93	9
Karnes[b]	1939-40	95	35
von Rosenberg[c]	1942-43	98	38
Wahlstrom[d]	1949-50	98	37
The Present Study	1953-54	100	63

[a] Sueltz, *op. cit.*, p. 29.

[b] Karnes, *op. cit.*, p. 153.

[c] von Rosenberg, *op. cit.*, p. 93.

[d] Wahlstrom, *op. cit.*, p. 127.

These percentages indicate the growing acceptance of the bachelor's degree as the minimum requirement for a teacher of secondary mathematics, and a developing trend toward a master's degree as the optimum.

<u>Degrees held by the present sample</u>. Table 10 shows

TABLE 10

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO THE MOST ADVANCED DEGREE HELD OR IN PROGRESS

Most Advanced Degree	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Bachelor's Degree	8	9	1	5	6	2	2	5	38
Master's Degree in Progress	10	2	7	1	8	3	2	1	34
Master's Degree	25	7	12	10	15	17	10	14	110
Professional Diploma in Progress	..	..	..	..	..	..	1	..	1
Doctor's Degree in Progress:									
Ed.D.	1	..	3	..	4	..	1	..	9
Ph.D.	..	..	1	..	..	..	1	..	2
Doctor's Degree (Ph.D.)	..	..	..	..	..	..	1	..	1

that all of the mathematics teachers in this study had earned bachelor's degrees, while 63 per cent had earned master's degrees. Moreover, of the 72 teachers (37 per cent) who had only a bachelor's degree to their credit, almost one-half were working toward a master's degree. A smaller proportion of the men teachers (14 per cent) had only bachelor's degrees than the women teachers (28 per cent). A larger part of the men (23 per cent) were working towards master's degrees than the women (nine per cent). With respect to at least a master's degree, the two sexes were equal--63 per cent of each group. Another interesting fact was the considerable number of men teachers striving for a doctor's degree. The lone earned doctor's degree was in a field other than mathematics.

Sources of bachelor's degrees. A study of Table 11 shows that the principal source of bachelor's degrees for the sample has been the state supported colleges (56 per cent of those responding). The two state supported universities[1] have trained 24 per cent at the baccalaureate level. Thus, the state supported institutions of all types have trained 80 per cent of the teachers, while seven per cent have been trained in private colleges located in the state and 13 per cent have been trained in out-of-state institutions of variour kinds.

Considering sizes of high schools and the training institutions, it was found the state colleges trained only 32 per cent of the teachers in the largest schools (enrollment

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[1]The University of Oklahoma and Oklahoma A. & M. College are referred to, in this study, as the two state universities.

TABLE 11

SOURCES OF BACHELOR'S DEGREES OF THE MATHEMATICS TEACHERS

College or University	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		Total
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	195
State Institutions									
University of Okla.	4	3	2	3	5	5	1	5	28
Oklahoma A. & M. College	3	1	3	1	6	1	3	..	18
Central State College	5	2	2	1	6	3	1	..	20
Northeastern State College	6	1	7	2	2	1	..	..	19
Southwestern State College	4	2	4	3	2	2	..	1	18
Southeastern State College	3	2	2	2	2	..	2	2	15
East Central State College	3	1	2	..	4	2	..	1	13
Langston University	5	2	..	..	2	1	2	1	13
Northwestern State College	1	..	1	..	1	2	1	..	6
Oklahoma College for Women	..	1	..	1	..	..	..	1	3
Panhandle A. & M. College	1	..	..	..	..	..	..	..	1
Phillips University	2	..	..	..	..	..	1	1	4
Oklahoma Baptist University	1	..	..	..	..	2	..	1	4
Oklahoma City University	1	..	..	..	1	..	..	1	3
Benedictine Heights College	..	1	..	..	..	..	..	..	1
Bethany Peniel College	1	..	..	..	..	..	..	..	1
Out-of-State Institutions									
Teachers Colleges	..	..	..	1	..	1	3	2	7
State Universities	..	1	1	1	..	1	1	3	8
Private Universities	2	1	..	..	..	..	1	..	4
Other Colleges	1	..	..	1	2	..	2	1	7
No Response	1	..	..	..	1	..	..	..	2

800 or more) as opposed to 56 per cent of the entire group of teachers trained by the state colleges. Little difference existed in the percentage of teachers trained by the two state universities for the various sizes of schools. Out-of-state institutions trained a considerable number of teachers in the largest size of schools--26 per cent of that group compared to 13 per cent of the entire sample.

Sources of master's degrees. Table 10 has shown that 123 (63 per cent) of the teachers had at least completed a master's degree and that 34 (17 per cent) were working toward a master's degree. Table 12 exhibits the sources of those degrees of the teachers in the two stages.

In both categories Oklahoma institutions were the principal source (74 per cent and 77 per cent, respectively). With respect to Oklahoma institutions, it appears that the University of Oklahoma has led in the number of master's degrees already conferred while Oklahoma A. & M. College appears to lead in the number of degrees in progress. However, the numbers involved in the case of degrees in progress are so small that little significance can be attached to the latter statement. Another interesting fact is that two of the state colleges, recently authorized to prepare teachers at the master's level, appeared as a source for three teachers working toward a master's degree.

Undergraduate and Graduate Major and Minor Subjects

It is the purpose of this section to show the status of the teachers with respect to their undergraduate majors

TABLE 12

SOURCES OF MASTER'S DEGREES OF THE MATHEMATICS TEACHERS COMPLETED AND IN PROGRESS

Institutions	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Master's Completed									
Oklahoma Institutions									
Oklahoma University	9	5	6	4	6	10	4	5	49
Oklahoma A. & M.	9	2	6	4	7	2	3	..	33
Phillips University	3	..	2	..	1	..	..	1	7
Out-of-State Inst.									
Teachers Colleges	2	..	..	..	1	..	1	1	5
State Universities	1	..	2	2	4	3	4	1	17
Other Universities	2	..	..	..	..	2	1	4	9
No Response	..	..	..	..	..	..	1	2	3
Totals	26	7	16	10	19	17	14	14	123
Master's in Progress									
Oklahoma Institutions									
Oklahoma University	1	..	1	..	3	1	..	1	7
Oklahoma A. &. M.	5	1	2	..	3	..	1	..	12
Southeastern	1	..	1	..	..	..	..	..	2
Central	..	..	..	..	1	..	..	..	1
Tulsa University	..	..	..	..	1	..	..	..	1
Out-of-State Inst.									
Teachers Colleges	..	..	1	..	..	..	..	..	1
State University	..	..	1	..	..	..	1	..	2
Other University	1	1	..	..	..	..	..	..	2
No Response	2	..	1	1	..	2	..	..	6
Totals	10	2	7	1	8	3	2	1	34

and minors, especially in mathematics, and the graduate majors of those with an undergraduate major or minor in mathematics.

<u>Undergraduate majors and minors</u>. Table 13 shows the undergraduate majors of the entire sample. Of the 195 teachers, 110 have a single major in mathematics and 13 have a double major in mathematics and another subject, making a total of 123 majors in mathematics, or 64 per cent of those responding. Of the remainder, education and chemistry are the most numerous. Seventy-four per cent of the women have a mathematics major compared to 58 per cent of the men. The percentages for the sizes of schools ranged from 59 per cent in the 400-to-799 size to 68 per cent in the largest size.

At this point it may be appropriate to consider the bias that might have been introduced by the failure of 70 of the teachers to respond. Several assumptions could be made regarding that group, one of which might be that their preparation for teaching of mathematics was of such a limited nature that they hesitated to respond for fear of revealing that inadequate preparation. If it is assumed that none of that group had a major in mathematics then the percentage for the population (265 teachers) would be 46 per cent. von Rosenberg[1] and Wahlstrom,[2] both with approximately 50 per

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[1]von Rosenberg, <u>op. cit</u>., p. 118.

[2]Wahlstrom, <u>op. cit</u>., p. 129.

TABLE 13

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO THEIR UNDERGRADUATE MAJORS

Undergraduate Major	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Single Majors:									
Mathematics	17	15	13	10	15	16	11	13	110
Education	5	2	2	1	5	..	2	4	21
Chemistry	1	..	1	2	4	..	3	1	12
Social Studies	2	1	3	..	..	..	..	1	7
Industrial Arts	3	..	..	..	1	..	..	..	4
Biology	3	..	1	..	..	..	..	..	4
Physics	1	..	..	..	1	..	1	..	3
English	..	..	..	..	..	3	..	..	3
Physical Educ.	1	..	1	..	1	..	..	..	3
Business Educ.	1	..	..	1	..	..	..	..	2
Foreign Lang.	..	..	..	..	1	1	..	..	2
Business Adm.	..	..	..	..	2	..	..	..	2
School Adm.	..	..	..	..	1	..	..	..	1
Home Economics	..	..	..	1	..	..	..	..	1
Engineering	1	..	..	..	..	..	..	..	1
Double Majors:									
Mathematics and									
Physics	1	..	..	..	..	..	..	..	1
Chemistry	2	..	..	..	..	..	..	..	2
Biology	..	..	2	..	..	..	..	..	2
Education	..	..	..	..	..	..	..	1	1
Social Studies	1	..	..	..	..	..	1	..	2
English	1	..	..	..	1	..	..	..	2
Industrial Arts	1	..	..	..	..	..	..	..	1
Business Educ.	1	..	..	..	..	..	..	..	1
Sociology	1	..	..	..	..	..	..	..	1
English & Soc. St.	..	..	1	..	..	..	..	..	1
Physics & Biology	..	..	..	..	1	..	..	..	1
Educ. & Language	..	..	..	..	..	1	..	..	1
No Response	1	..	..	1	..	1	..	..	3
Math. Majors including Double Majors	25	15	15	10	16	16	12	14	123

cent samples, found that 30 per cent and 49 per cent of those samples, respectively, were mathematics majors.

The number of teachers with undergraduate minors in mathematics, as well as those with majors and neither a major nor a minor in mathematics is shown in Table 14. The total for either a major or minor in mathematics was 175 or 90 per cent of the sample.

TABLE 14

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO WHETHER AN UNDERGRADUATE MAJOR OR MINOR IN MATHEMATICS WAS EARNED

Undergraduate Major or Minor	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Major in Mathematics	25	15	15	10	16	16	12	14	123
Minor in Mathematics	14	2	6	3	14	3	4	6	52
Neither Major nor Minor in Mathematics	3	1	3	2	2	2	1	..	14
No Response	2	..	..	1	1	1	1	..	6

Knowing the proportions of the sample with respect to majors and minors in mathematics, it was of some interest to determine what were their minors and majors, respectively. Table 15 shows the minors of the teachers with an undergraduate major in mathematics. Forty-five per cent of them earned a minor in one of the sciences. Physics alone and physics

TABLE 15

DISTRIBUTION OF THE MATHEMATICS TEACHERS WITH AN UNDERGRADUATE MAJOR IN MATHEMATICS ACCORDING TO THEIR UNDERGRADUATE MINORS

Undergraduate Minor	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Science Minors:									
Physics	9	1	..	2	..	2	1	2	17
Biology	2	3	2	1	1	..	2	..	11
Chemistry	..	..	..	..	..	1	..	1	2
Botany	..	..	..	..	..	..	..	2	2
Geography	..	..	1	..	..	..	..	..	1
Chemistry & Other	2	2	1	1	..	1	..	..	7
Physics & Chemistry	1	..	3	..	..	..	1	..	5
Physics & Other	..	..	..	..	1	..	2	1	4
Biology & Other	2	..	1	..	..	..	..	..	3
Physics & Biology	..	..	1	..	..	1	..	..	2
Chemistry & Biology	..	1	..	..	..	..	..	..	1
Education Minors:									
Education	1	2	..	..	1	4	1	2	11
Educ. Psychology	..	..	..	1	..	..	..	1	2
Educ. Guidance	..	..	..	..	1	..	..	..	1
Other Minors:									
History or Soc. St.	4	5	2	..	4	1	2	1	19
Physical Education	2	..	..	..	3	..	..	..	5
English	..	..	..	..	..	1	..	2	3
Industrial Arts	..	..	..	..	..	..	1	..	1
Business Education	..	..	..	..	..	..	1	..	1
Engineering	..	..	1	..	..	..	..	..	1
Modern Language	..	..	..	1	..	..	..	..	1
Music	..	..	..	..	..	..	..	1	1
Speech	..	..	..	..	..	1	..	..	1
Business Adm.	..	..	..	..	..	..	1	..	1
Other Double Minors	..	1	1	3	4	4	..	..	13
No Minor Reported	2	..	2	1	1	..	..	1	7
Total	25	15	15	10	16	16	12	14	123

in combination with some other subject was the most popular choice, with 28 (23 per cent) of the teachers with a mathematics major selecting the subject as a minor. History or social studies was the next most popular choice followed by biology and education, in that order.

The teachers with mathematics as a minor college subject, however, tended to choose education as a major subject. Table 16 shows that, of the 52 teachers in this category, 19 selected education as a major subject, while 15 chose one of the sciences, chemistry leading with nine.

Table 17 provides a recapitulation of the data in Tables 15 and 16. The combined choices of minor or major subjects selected by those with a major or minor, respectively, shows that science was the choice of 40 per cent, followed by education with 19 per cent, history or social studies with 13 per cent.

With respect to majors and minors in mathematics only, Table 18 shows the findings of Karnes,[1] von Rosenberg,[2] and Wahlstrom[3] in their respective samples compared to the present study.

<u>Graduate majors and minors of the teachers with undergraduate concentration in mathematics</u>. Teachers with neither

[1]Karnes, <u>op. cit.</u>, p. 147.

[2]von Rosenberg, <u>op. cit.</u>, pp. 122-125.

[3]Wahlstrom, <u>op. cit.</u>, p. 129.

TABLE 16

DISTRIBUTION OF THE MATHEMATICS TEACHERS WITH AN UNDERGRADUATE MINOR IN MATHEMATICS ACCORDING TO THEIR UNDERGRADUATE MAJORS

Undergraduate Major	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Physics	1	..	..	..	1	..	1	..	3
Chemistry	1	..	..	1	4	..	2	1	9
Biology	3	..	..	..	..	..	..	..	3
Education	4	2	2	1	5	..	1	4	19
History or Soc. St.	1	..	2	..	..	..	..	1	4
English	..	..	..	..	..	3	..	..	3
Industrial Arts	2	..	..	..	1	..	..	..	3
Physical Educ.	1	..	1	..	1	..	..	..	3
Business Educ.	1	..	..	..	..	..	..	..	1
English & Soc. St.	..	..	1	..	..	..	..	..	1
Home Economics	..	..	..	1	..	..	..	..	1
Greek	..	..	..	..	1	..	..	..	1
Business Adm.	..	..	..	..	1	..	..	..	1
Total	14	2	6	3	14	3	4	6	52

an undergraduate major or minor in mathematics could not reasonably be expected to continue extensive study in graduate mathematics. Therefore, the only teachers considered in a study of graduate major and minors are those with an

TABLE 17

DISTRIBUTION OF THE MATHEMATICS TEACHERS WITH AN UNDERGRADUATE MAJOR OR MINOR IN MATHEMATICS ACCORDING TO THEIR UNDERGRADUATE MINOR OR MAJOR

Undergraduate Major or Minor	Number of Teachers with Undergraduate Major in Mathematics	Number of Teachers with Undergraduate Minor in Mathematics	Total
Science[a]	55	15	70
Education[b]	14	19	33
Physical Education	5	3	8
Industrial Arts	1	3	4
Business Education	1	1	2
History or Social Studies	19	4	23
English or Modern Language	4	4	8
Other	17	3	20
No Response	7	..	7
Total	123	52	175

[a]Read this table thus: 55 of those with an undergraduate major in mathematics had a minor in science while 15 of those with an undergraduate minor in mathematics had a major in science.

[b]Education includes elementary and secondary education, educational psychology, and guidance.

undergraduate major or minor in mathematics, with three exceptions to be discussed below.

Tables 19 and 20 give a detailed distribution of graduate majors of those teachers who either had a major or

TABLE 18

PER CENT OF FOUR SAMPLES WITH AN UNDERGRADUATE MAJOR OR MINOR IN MATHEMATICS

Study, Place, & Date	Per Cent Having A Major in Mathematics	Per Cent Having A Minor in Mathematics
Karnes, 12 Southern States, 1939-40	60	29
von Rosenberg, Texas, 1942-43	30	28
Wahlstrom, Wisconsin, 1949-50	49	32
The present study, Oklahoma, 1953-54	65	27

minor in mathematics as an undergraduate. The principal comment that can be made is that very few of the teachers continue extensive study of mathematics at the graduate level. Only 16 of 99 teachers with a major in mathematics at the undergraduate level majored in mathematics at the master's level, while three of the 40 who had a minor in mathematics at the undergraduate level majored in mathematics for the master's degree. The majority of these teachers chose secondary education and school administration, the former being selected by both men and women and the latter almost wholly by men. Of the 139 teachers represented in Tables 19 and 20 as having started or completed a master's degree, 104, or 75 per cent, chose some form of education major, secondary education with 59 teachers (42 per cent) and school administration

TABLE 19

DISTRIBUTION OF THE MATHEMATICS TEACHERS WHOSE UNDERGRADUATE MAJOR WAS MATHEMATICS ACCORDING TO THEIR GRADUATE MAJORS

Graduate Majors	Size of High School: Less than 200 M 44	W 18	200 to 399 M 24	W 16	400 to 799 M 33	W 22	800 or more M 18	W 20	Total 195
Mathematics	1	1	1	2	..	8	1	2	16
Secondary Education	9	4	4	3	6	4	4	7	41
School Administration	9	..	8	1	8	..	4	..	30
Educational Psychology	..	..	..	..	..	..	1	..	1
Guidance	..	..	..	..	..	1	..	..	1
Industrial Arts	1	..	..	..	..	..	..	..	1
Physical Education	1	..	..	..	..	..	..	..	1
Zoology	..	..	..	..	..	..	..	1	1
Physics	..	1	..	..	..	..	..	..	1
Chemistry	..	1	..	..	..	..	..	..	1
Biology	..	..	1	..	..	..	..	..	1
History	..	..	..	1	..	..	..	..	1
Home Economics	..	..	..	..	..	..	..	1	1
English	..	..	..	..	..	..	..	1	1
No Response	..	..	..	..	..	1	..	..	1
Totals	21	7	14	7	14	14	10	12	99

TABLE 20

DISTRIBUTION OF THE MATHEMATICS TEACHERS WHOSE UNDERGRADUATE MINOR WAS MATHEMATICS ACCORDING TO THEIR GRADUATE MAJORS

Graduate Majors	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Mathematics	..	..	..	1	..	..	1	1	3
Secondary Education	4	1	3	..	7	1	1	1	18
School Administration	6	..	2	..	1	1	1	..	11
Guidance	..	..	1	..	..	..	..	..	1
Educational Psychology	..	..	..	..	..	..	..	1	1
Sociology	..	..	..	..	1	..	..	..	1
Industrial Arts	1	..	..	..	1	..	..	..	2
English	..	..	..	..	..	1	..	..	1
Botany	..	..	..	..	..	..	1	..	1
No Response	..	..	..	1	..	..	..	..	1
Totals	11	1	6	2	10	3	4	3	40

with 41 teachers (30 per cent) being the principal choices.

The concern above has been with graduate majors, especially in mathematics. Table 21 provides, in addition to a distribution of the teachers with a graduate major in mathematics, a distribution of those with a graduate minor in mathematics. Quite naturally, most of the latter also concentrated on mathematics to some extent as an undergraduate.

TABLE 21

DISTRIBUTIONS OF THE MATHEMATICS TEACHERS WITH A GRADUATE MAJOR OR A GRADUATE MINOR IN MATHEMATICS ACCORDING TO THEIR UNDERGRADUATE MAJORS AND MINORS

Graduate Majors or Minors in Mathematics	Size of High School								
	Less than 200		200 to 400		400 to 800		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Graduate Major in Math.									
Teachers with:									
U.G. major in math.	1	1	1	2	..	8	1	2	16
U.G. minor in math.	..	..	..	1	..	..	1	1	3
Neither U.G. major or minor in math.	..	..	..	..	..	1[a]	..	..	1
U.G. major and minor unknown	..	..	..	1[b]	..	..	..	..	1
Graduate Minor in Math.									
Teachers with:									
U.G. major in math.	4	1	..	1	1	..	3	4	14
U.G. minor in math.	1	1	..	..	4	1	1	2	10
Neither U.G. major or minor in math.	1[c]	..	..	..	..	..	1[d]	..	2
U.G. major and minor unknown	1[e]	..	..	..	..	..	1[f]	..	2

[a]26 hours of U.G. math. [b]26 hours of U.G. math.

[c]12 hours of U.G. math. [d]3 hours of U.G. math.

[e]20 hours of U.G. math. [f]30 hours of U.G. math.

(These teachers either did not claim a major or minor in mathematics, or they failed to indicate any major or minor.)

Of the 28 with a graduate minor in mathematics, only two had not concentrated in that subject as an undergraduate. Likewise, one of the majors in mathematics at the master's level declared a major or minor in mathematics as an undergraduate. Footnotes at the bottom of Table 21 show the number of semester hours those teachers had earned as an undergraduate.

Table 22 summarizes the information concerning graduate majors of the teachers with an undergraduate major or minor in mathematics.

TABLE 22

DISTRIBUTION OF THE GRADUATE MAJORS OF THE MATHEMATICS TEACHERS WITH AN UNDERGRADUATE MAJOR OR MINOR IN MATHEMATICS

Graduate Major	Number of Teachers with Undergraduate Major in Mathematics	Number of Teachers with Undergraduate Minor in Mathematics	Total
Mathematics	16	3	19
Education*	75	33	108
Science	4	1	5
Other	3	2	5
No Response	1	1	2
Totals	99	40	139

*Includes elementary and secondary education, school administration, physical education, industrial arts education, business education, and educational psychology.

Table 23 provides a breakdown of the graduate majors and minors of those working toward a master's degree at the time of the study. Of the 34 teachers in this category, 32 had a major or minor in mathematics as an undergraduate, yet only four had a major and none had a minor in mathematics at the master's level.

TABLE 23

DISTRIBUTION OF THE MATHEMATICS TEACHERS WITH A MASTER'S DEGREE IN PROGRESS ACCORDING TO THEIR GRADUATE MAJORS AND MINORS

Major and Minor	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Math. & Ind. Arts	..	..	1	..	..	..	..	..	1
Math. & no minor	1	..	..	..	..	1	1	..	3
Sch'l. Adm. & Sec. Educ.	1	..	1	..	..	..	..	..	2
Sch'l. Adm. & History	..	..	..	..	1	..	..	..	1
Sch'l. Adm. & no minor	6	..	2	..	2	..	..	..	10
Sec. Educ. & no minor	2	1	1	..	5	1	1	..	11
Guidance & no minor	..	..	1	..	..	..	..	..	1
Chemistry & Physics	..	1	..	..	..	..	..	..	1
Home Ec. & Sec. Educ.	..	..	..	..	..	..	..	1	1
No Response	..	..	1	1	..	1	..	..	3
Totals	10	2	7	1	8	3	2	1	34

Preparation through Courses in College Mathematics

After determining the status of the teachers with regard to their concentration in mathematics in terms of majors and minors, it is appropriate to consider the amount and nature of that work in terms of semester hours and specific courses, and to record certain attitudes and opinions toward college mathematics.

Undergraduate mathematics taken by the teachers. Table 24 shows the status of the teachers with respect to semester hours of mathematics taken at the undergraduate level. Of the 191 teachers responding, 23 per cent earned 20 hours or less, while the same percentage earned 31 hours or more, leaving a bare majority (54 per cent) in the range from 21 to 30 hours, inclusive. The computed median number of semester hours is slightly less than 26 hours, which means that approximately 50 per cent of the teachers had less than 26 hours.

Little difference exists in the means or medians between sexes or among the various sizes of schools. In the largest size schools, the female group had fewer teachers in the lower portion of the semester hour range; no teacher in that group had less than 16 hours.

Another distribution of some interest is that of the teachers with majors and minors in mathematics. Table 25 presents both distributions. Several interesting comments can be made regarding that table and a comparison of it with Table 24.

First, is the fact that one teacher with 15 hours of

TABLE 24

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO THE NUMBER OF SEMESTER HOURS OF UNDERGRADUATE MATHEMATICS EARNED

Semester Hours of Mathematics	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Undergraduates:									
Less than 11	1	..	..	..	..	1	2	..	4
11 - 15	4	1	2	1	5	1	..	..	14
16 - 20	4	2	6	1	5	5	1	1	25
21 - 25	12	6	3	4	8	6	5	9	53
26 - 30	10	6	5	6	11	4	5	4	51
31 - 35	8	3	6	1	3	2	5	3	31
36 - 40	4	..	2	1	1	2	..	2	12
41 - 45	..	..	..	..	..	1	..	..	1
No Response	1	..	..	2	..	..	..	1	4
Medians	27	26	27	27	25	24	27	26	26

mathematics declared that she had a major in the subject and that seven teachers with 16 to 20 hours made the same declaration. On the other hand, if one compares the two tables it is readily noticeable that a number of teachers with a considerable amount of hours did not declare a major in the subject. Extreme examples are as follows: ten teachers in 26 to 30 hour range, two teachers in the 31 to 35 hour range,

TABLE 25

DISTRIBUTION OF THE MATHEMATICS TEACHERS WITH UNDERGRADUATE MAJORS AND MINORS IN MATHEMATICS ACCORDING TO NUMBER OF SEMESTER HOURS OF UNDERGRADUATE MATHEMATICS

Number of Hours	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Mathematics Majors									
11 - 15	..	1	..	..	..	..	..	..	1
16 - 20	1	1	1	..	..	3	1	..	7
21 - 25	5	5	2	2	3	5	3	6	31
26 - 30	8	5	5	4	9	4	3	3	41
31 - 35	8	3	5	1	3	2	5	2	29
36 - 40	3	..	2	1	1	1	..	2	10
41 - 45	..	..	..	..	..	1	..	..	1
No Response	..	..	..	2	..	..	..	1	3
Totals	25	15	15	10	16	16	12	14	123
Medians	30	27	31	29	29	26	30	27	28
Mathematics Minors									
6 - 10	..	..	..	..	..	..	1	..	1
11 - 15	2	..	..	..	4	1	..	..	7
16 - 20	2	1	4	1	4	..	..	1	13
21 - 25	7	..	1	2	4	1	2	3	20
26 - 30	2	1	..	..	2	..	1	1	7
31 - 35	..	..	1	..	..	..	..	1	2
36 - 40	..	..	..	..	..	1	..	..	1
No Response	1	..	..	..	..	..	..	..	1
Totals	14	2	6	3	14	3	4	6	52
Medians	23	..	..	..	20	..	..	..	22

and two teachers in the 36 to 40 hour range did not declare a major or a minor in mathematics. Further studies of that portion of Table 21 devoted to graduate minors in mathematics show that most of these teachers appear there. Apparently there is some difference of opinions among teachers, or perhaps among training institutions, as to the number of semester hours required for a major.

Total hours of mathematics earned by the teachers. If the emphasis is placed upon number of hours of mathematics regardless of academic degrees or majors and minors, Table 26 shows the preparation of the group in total semester hours of mathematics. It is noticed that the medians reported are not materially different from those reported in Table 24 (undergraduate mathematics only) except in the case of the larger schools. The median of 29 for the sample compares favorably with that found by Wahlstrom who found that the median for the Wisconsin teachers of 1949-50 was 24 semester hours.

Reasons Given by the Teachers for not Taking More Mathematics

It was felt by the writer that an opportunity should be given the teachers to express their reasons for not studying more mathematics at both the undergraduate and graduate level. The amount of college mathematics taken by teachers of secondary mathematics is known to range from very little to a considerable amount. Sueltz found that 16 per cent of the teachers of secondary mathematics sampled in 1930-31

TABLE 26

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO THEIR TOTAL NUMBER OF SEMESTER HOURS IN MATHEMATICS

Number of Hours	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Less than 16	2	1	2	1	3	..	1	..	10
16 - 20	4	1	6	1	4	2	..	..	18
21 - 25	14	4	2	2	8	6	4	3	43
26 - 30	8	6	4	4	12	2	2	4	42
31 - 35	8	3	7	2	4	2	4	5	35
36 - 40	5	1	3	2	1	1	2	1	16
41 - 45	..	..	..	1	1	2	2	2	8
46 - 50	1	1	..	..	..	2	2	2	8
51 - 55	1	..	..	..	..	..	..	..	1
56 - 60	..	1	..	2	..	1	..	1	5
61 - 65	..	..	..	..	..	2	..	1	3
66 - 70	..	..	..	..	..	..	..	..	..
70 or more	..	..	..	..	..	2	1	..	3
No Response	1	..	..	1	..	..	..	1	3
Medians	27	28	28	30	26	34	34	34	29

earned less than 10 semester hours of college mathematics, while nine per cent earned more than 40 semester hours.[1] It was anticipated that the present sample would distribute itself over a considerable range. A determination of the teachers' reasons for not studying more mathematics was considered appropriate.

<u>Reasons given for not studying more undergraduate mathematics</u>. Table 27 shows the principal reasons given by the teachers. Some teachers gave more than one reason; therefore, the total number of reasons exceed the number of teachers. Quite naturally, many of the teachers indicated that they took enough courses to earn a major or minor. Some limiting factors noted are those caused by difficulty in scheduling enough mathematics in a four year course and the apparent limited offerings of some institutions. Especially significant is the remark by 12 teachers that they didn't expect to teach mathematics. Seventeen teachers apparently were attracted to another field. Four teachers expressed a dislike for mathematics or for the college mathematics instructors.

<u>Reasons given for not studying more graduate mathematics</u>. Since it was realized that those teachers with a limited amount of undergraduate mathematics would probably have studied very little graduate mathematics, the teachers

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[1] Sueltz, *op. cit.*, p. 45.

TABLE 27

REASONS GIVEN BY THE MATHEMATICS TEACHERS FOR NOT STUDYING MORE UNDERGRADUATE MATHEMATICS

Reasons	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Took all required for a major	13	10	7	6	9	10	6	11	72
Took all that was offered	11	6	5	5	6	4	6	8	51
Took all required for a minor	9	2	3	2	9	2	3	..	30
Took all that my schedule permitted	6	1	5	1	3	3	2	4	25
Became interested in another field	5	1	3	..	6	1	1	..	17
Didn't expect to teach mathematics	4	1	3	1	2	1	..	..	12
Didn't like the instructors	..	..	..	..	1	1	..	..	2
Didn't like mathematics	1	..	..	..	..	..	1	..	2
Took all required for a teaching field	1	..	..	..	..	1	..	..	2
Started mathematics late	..	..	..	..	2	..	..	..	2
Other	3	..	2	..	..	..	..	..	5
No Response	..	..	..	1	1	2	1	..	5
Total Reasons Given	53	21	28	15	38	23	19	23	220

considered here are those with a major in undergraduate mathematics. There were two categories of these teachers: those with some graduate mathematics and those with no graduate mathematics. Accordingly, Table 28 gives the reasons proposed by both groups. Aside from those that stated that they took enough mathematics to earn a major or minor, the principal reasons given were: (1) that graduate mathematics is too remote from high school mathematics, and (2) that the teachers changed fields or had more interest in another field. The latter reason has been confirmed by data in Table 19 which has shown that only 16 of 123 mathematics majors at the undergraduate level majored in mathematics for the master's degree. The first reason is very similar to the thought expressed in the Joint Report, which stated:

> Although the traditional 'major work' of the university or the college department of mathematics has been for the most part quite well conceived so far as content is concerned, its actual bearing on secondary education has too often been left for the teacher to infer. Moreover, university and college teachers have not always kept in touch with the problems of secondary education even when a large number of their more advanced students were preparing for high school positions.[1]

Mathematics Courses Studied and the Teachers' Opinions Concerning Their Helpfulness

In order to supplement the information concerning the teachers' major and minor concentration in mathematics and the amount of mathematics studied, the teachers were asked to

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[1] The Place of Mathematics in Secondary Education, op. cit., pp. 198-199.

TABLE 28

REASONS GIVEN BY THE MATHEMATICS TEACHERS WITH AN UNDERGRADUATE MATHEMATICS MAJOR AND A COMPLETED MASTER'S DEGREE FOR NOT TAKING ANY GRADUATE MATHEMATICS OR MORE GRADUATE MATHEMATICS

Reasons for not taking:	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Graduate Mathematics									
Too remote from high school mathematics	4	1	1	2	4	..	3	..	15
Changed fields	2	..	2	1	2	1	1	1	10
More interest in another field	..	..	1	..	..	..	..	1	2
Too much time after Bachelor's degree	1	..	1	..	..	..	..	..	2
Language requirement	..	1	..	..	..	..	..	..	1
Not feasible in summer school	..	..	..	..	1	..	..	..	1
More Graduate Mathematics									
Too remote from high school mathematics	2	1	2	..	1	2	3	2	13
Took all required for a major	1	1	..	2	..	6	..	2	12
Changed fields	2	1	..	1	..	..	1	1	6
Took all required for a minor	2	..	..	..	..	..	..	1	3
Too much time after Bachelor's degree	..	..	..	..	..	1	..	1	2
Lack of Prerequisites	..	..	..	..	..	1	..	..	1
No response	1	..	1	1	..	..	..	1	4
Totals	15	5	8	7	8	11	8	10	72

indicate the courses they took and which of them they considered the most helpful or to have contributed practically nothing toward their teaching. Table 29 shows their response to both of these considerations.

The mathematics courses studied. Not all of the teachers responded to the request for this information. Computation of the approximate number of semester hours of mathematics represented in Table 29 showed that the data in that table represented almost 90 per cent of the total numbers of semester hours of mathematics reported by the teachers. So these data present a reasonably accurate pattern of courses taken by the teachers.

The courses which more than 50 per cent of the teachers have taken are intermediate algebra, solid geometry, college algebra, plane trigonometry, plane analytic geometry, and differential and integral calculus. Approximately one-third of the teachers have earned credit in theory of equations, advanced plane geometry, history of mathematics, and mathematics of finance. From one-fourth to one-fifth of the teachers studied mathematical statistics, ordinary differential equations, spherical trigonometry, higher algebra, solid analytic geometry, and plane geometry.

Some error may be introduced into these data due to lack of common meaning in course titles. Five per cent of the teachers reported that they studied business mathematics; these courses may or may not be the same as mathematics of

TABLE 29

NUMBER AND PER CENT OF THE MATHEMATICS TEACHERS WHO TOOK THE VARIOUS COLLEGE MATHEMATICS COURSES, NUMBER AND PER CENT* FINDING THE COURSES HELPFUL, AND NUMBER AND PER CENT* WHO CONSIDERED THE COURSES TO HAVE CONTRIBUTED VERY LITTLE

Course	Number Taking Course	Per Cent of Total	Contribution			
			Helpful		Not Helpful	
			No.	Per Cent	No.	Per Cent
College Algebra	186	95	98	53	1	1
Plane Anal. Geom.	170	87	40	24	11	7
Plane Trigonometry	163	84	70	43	0	0
Diff. Calculus	157	81	11	7	30	19
Integ. Calculus	129	66	6	5	25	19
Solid Geometry	108	55	27	26	3	3
Interm. Algebra	104	53	43	42	1	1
Theory of Equations	71	36	13	18	5	8
Adv. Plane Geometry	69	35	27	39	0	0
History of Math.	62	32	16	26	5	8
Math. of Finance	60	31	14	23	2	3
Mathematical Statis.	52	27	7	14	5	10
Ordinary Diff. Eq'ns	48	25	0	0	3	6
Spherical Trig.	42	22	3	7	6	14
Higher Algebra	40	21	8	20	5	13
Solid Anal. Geom.	39	20	5	13	6	15
Plane Geometry	39	20	14	36	0	0
Advanced Calculus	33	17	4	12	6	18
Projective Geometry	26	13	2	8	2	8
Basic Mathematics	26	13	8	31	1	4
Surveying	23	12	2	9	0	0
Descriptive Geom.	22	11	2	9	1	5
Slide Rule	20	10	4	20	1	5
Mechanics	20	10	2	10	0	0
Complex Variable	13	7	0	0	2	15
Business Math.	10	5	4	40	1	10
Adv. Anal. Geom.	8	4	0	0	1	13
Real Variable	6	3	1	17	0	0
Partial Diff. Eq'ns.	6	3	0	0	2	33
Differential Geom.	3	2	1	33	1	33
Vector Analysis	2	1	0	0	0	0
Anal. Proj. Geom.	2	1	0	0	0	0
Modern Geometry	2	1	0	0	0	0
Theory of Numbers	2	1	0	0	0	0
Other	12	6	0	0	0	0

*Per cent of number of teachers who took the course.

finance. It is possible that the same may be true of other courses.

It is of interest to note that 20 per cent reported that they studied plane geometry, a subject commonly thought of as a high school subject.

Contribution of the college mathematics courses. Study of Table 29 with respect to the helpfulness of the various courses to the respondents as teachers of secondary mathematics should be done by considering simultaneously the two columns related to helpfulness. For example, 53 per cent of the teachers taking the course considered college algebra as helpful, while one per cent thought otherwise. On the other hand, only seven per cent thought differential calculus helpful, opposed to 19 per cent who considered it of no help.

Most of the courses that appear to be most helpful are those courses that are usually taken in the first two years of college. In rank order according to percentage they are: college algebra, plane trigonometry, intermediate algebra, advanced plane geometry, solid geometry, history of mathematics, plane analytic geometry, and mathematics of finance.

Of special interest is the fact that both differential and integral calculus were considered not helpful more often than helpful.

Professional Preparation

It was originally intended to survey the teachers with respect to the amount and kind of education courses which they studied as well as their opinions as to the helpfulness of those courses. The nature of the checklist and the responses of the teachers made the study of the kind of courses taken and their helpfulness unproductive. Most of the teachers appeared to have taken most of the types of courses suggested in the checklist and very few of the teachers indicated their judgments as to helpfulness of the various types of courses. Therefore, it was decided that only the amount of professional courses in terms of semester hours would be included in this report. In addition to a general discussion of the amount of professional courses, special attention will be made to some aspects of the teachers' preparation in courses in the teaching of mathematics in the next section.

Semester hours in professional courses (Education). Table 30 provides a sufficient description of the amount of education courses in terms of semester hours. The first portion of the table shows the median number of undergraduate hours of the entire sample was approximately 23 hours, with no great differences among the various groups of teachers. The range and distribution approximates that for undergraduate mathematics courses taken (see Table 24) and the median is two to four hours less for undergraduate education than for undergraduate mathematics.

The second portion of Table 30 shows the total hours

TABLE 30

DISTRIBUTIONS OF THE MATHEMATICS TEACHERS ACCORDING TO THE NUMBER OF UNDERGRADUATE AND TOTAL HOURS OF EDUCATION EARNED

Semester Hours in Education	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Undergraduate Hours									
Less than 11	4	..	..	..	..	1	1	..	6
11 - 15	1	2	2	3	3	1	3	4	19
16 - 20	5	5	6	1	5	3	3	3	31
21 - 25	21	2	7	3	12	6	2	8	61
26 - 30	5	5	4	3	10	8	6	3	44
31 - 35	3	1	2	2	1	2	1	1	13
36 - 40	..	..	1	1	..	..	..	..	2
More than 40	1	..	1	1	1	..	1	..	5
No Response	4	3	1	2	1	1	1	1	14
Medians	23	22	23	26	24	25	25	22	23
Total Hours									
11 - 15	1	1	1	1	..	..	..	1	5
16 - 20	..	4	1	3	..	1	1	1	11
21 - 25	6	1	1	1	5	6	2	4	26
26 - 30	1	4	3	1	4	4	3	2	22
31 - 35	3	..	1	4	2	2	1	1	14
36 - 40	3	..	..	1	5	2	2	3	16
41 - 45	6	1	3	1	2	1	1	2	17
46 - 50	5	2	1	..	1	1	1	3	14
51 - 55	5	3	..	1	2	..	..	1	12
56 - 60	4	..	5	1	5	2	1	1	19
61 - 65	1	..	2	1	3	1	2	..	10
More than 65	5	..	5	..	3	1	3	..	17
No Response	4	2	1	1	1	1	1	1	12
Medians	46	32	56	33	42	31	41	37	40

of education, both graduate and undergraduate, earned by the teacher. It is apparent from a study of the various distributions and their medians that the men teachers have studied more courses in education than the women and that the entire group has concentrated more on professional courses than on courses in mathematics (see Table 26).

The nature of the distributions according to total hours of mathematics and total hours of education are somewhat different. In the distribution according to total hours of mathematics five-eighths of the teachers are included in the 21 to 35 hour range, while in the similar distribution concerning education courses it is necessary to choose a range of 21 to 55 hours to include the same portion of the sample. However, in considering the above statement, it should be remembered that 11 of the men teachers were seeking doctor's degrees in education, thus causing the distribution to become less concentrated at some central region due to the large number of hours which they earned in graduate education courses.

Preparation through Courses in the Teaching of Mathematics

It is generally accepted that neither a knowledge of academic mathematics nor a knowledge of educational theory alone is sufficient to prepare a teacher for the classroom. Both are necessary and the good effects of both are enhanced when the two are combined in courses which are sometimes called _the teaching of mathematics_, _the teaching of algebra_, etc.

Since a common pattern for the training of mathematics teachers includes one or more courses in the teaching of mathematics, it was felt that another measure of the effectiveness of the preparation of this group of teachers would be a study of the extent and nature of their preparation in this area. Also, the opinions of the teachers as to the proper person to teach such courses, as well as to the effectiveness of the courses taken with respect to scope and number, was of some interest to the writer.

Number of semester hours and type of courses taken by the teachers. Table 31 shows the distribution of the teachers with respect to the number of hours in these courses. The first significant finding is that 34 teachers, or about 19 per cent of those responding, had no credit in courses in the teaching of mathematics. A plurality (76 teachers) had from two to four hours, while a majority (118 teachers) had from two to seven hours. Thirty-one teachers earned more than ten hours. The median number of hours for the entire sample was approximately four hours.

Type of courses taken. Table 32 shows the type of courses as indicated by the titles. The all inclusive title, the teaching of secondary mathematics, was chosen by almost one-half of the teachers as the title best representing the courses they took. The remaining courses imply varying degrees of specificity.

TABLE 31

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO THE NUMBER OF HOURS IN COURSES IN THE TEACHING OF MATHEMATICS

Semester Hours	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
None	11	4	3	2	7	3	4	..	34
2 - 4	19	7	9	3	16	6	7	9	76
5 - 7	6	5	6	4	6	7	4	4	42
8 - 10	3	1	1	3	1	4	1	3	17
11 - 13	1	1	1	3	..	..	1	1	8
14 - 16	..	..	1	..	1	1	1	1	5
More than 16	..	..	..	..	..	..	..	1	1
No response	4	..	3	1	2	1	..	1	12
Medians	3	4	4	7	3	5	4	5	4

Opinions as to the adequacy of the courses. The teachers were asked to express their opinions as to the adequacy of the courses in professional mathematics with respect to the number and scope of the course taken. Table 33 includes their response to both. It was felt that the number of hours credit involved would influence their responses, so the table is divided according to the number of hours earned. A relationship between the number of hours earned and the

TABLE 32

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO THE TYPES OF COURSES IN THE TEACHING OF MATHEMATICS STUDIED

Type of Course	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
The Teaching of:									
Secondary Math.	18	10	8	11	15	12	4	13	91
Sr. H. S. Math.	5	2	5	6	9	3	3	9	42
Arithmetic	6	5	5	6	2	8	5	5	42
Algebra	8	3	7	4	3	5	4	5	39
Geometry	6	..	6	3	4	4	7	7	37
Jr. H. S. Math.	2	5	3	3	5	2	2	2	24
General Math.	6	1	3	1	2	2	2	2	19
Seminar Course	5	3	..	2	1	4	4	2	21
Other*	2	..	..	..	..	..	..	3	5
Total Courses	58	29	37	36	41	40	31	48	320
Number Reporting No Credit or No Type of Course	13	4	5	3	8	3	4	..	40

*Methods in Teaching Mathematics, Teaching and Supervision of Mathematics, Field Work in Mathematics, Psychology and Sociology of Arithmetic.

feeling toward the adequacy of the courses is noticeable; there are some that feel that the courses were inadequate in both respects until the range 14 to 16 hours is reached. About 39 per cent of those responding considered the number of courses inadequate, while 42 per cent of the teachers felt that the scope of the courses was too limited.

TABLE 33

OPINIONS OF THE MATHEMATICS TEACHERS CONCERNING THE ADEQUACY OF THE NUMBER AND SCOPE OF THE COURSES IN THE TEACHING OF MATHEMATICS

Semester Hours in the Courses	Adequacy of Number of Courses			Adequacy of Scope of Courses		
	Yes	No	No reply	Yes	No	No reply
None	..	..	34	..	..	34
2 - 4	38	34	4	42	31	3
5 - 7	25	16	1	22	19	1
8 - 10	12	5	..	7	9	1
11 - 13	5	3	..	6	2	..
14 - 16	5	..	..	5	..	..
More than 16	1	..	..	1	..	..
No Response	3	..	9	3	1	8
Totals	89	58	48	86	62	47

<u>The teachers' opinions regarding the content of these courses</u>. Since the teachers were asked to express their opinions as to the adequacy of the scope of the courses, it was felt that the next step should be to ask them to indicate their opinions as to topics or activities considered

TABLE 34

DISTRIBUTION OF THE OPINIONS OF THE MATHEMATICS TEACHERS CONCERNING TOPICS OR ACTIVITIES APPROPRIATE AND VALUABLE IN COURSES IN THE TEACHING OF MATHEMATICS

Topic or Activity	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Attention to individual differences of students	32	13	17	12	24	20	11	14	143
Study of the applications of mathematics	30	14	16	12	23	17	13	14	139
Construction of teaching aids for secondary mathematics	36	12	16	8	20	15	12	14	133
A rapid review of the content of the common secondary mathematics courses	23	11	14	10	23	16	10	15	122
Analysis of representative textbooks	23	7	11	10	14	11	5	11	92
Analysis of standardized tests	20	6	9	11	10	14	7	8	85
Selection of commercial teaching aids	17	5	6	3	10	9	5	4	59
Analysis of workbooks	11	6	5	7	7	6	3	3	48
Other*	..	..	1	..	..	2	1	1	5
Totals	192	74	95	73	131	110	67	84	826

*Study of proper construction and furnishing of classrooms, Evaluation of student progress, Methods of presentation, and Construction of tests.

appropriate and valuable in the courses. Table 34 shows their reaction to this request. The two most common were concerned with attention to individual differences of students and study of the applications of mathematics, followed closely by a concern for attention to construction of teaching aids and a review of the secondary mathematics subjects. Some concern is expressed for analysis of textbooks, workbooks, standardized tests, and selection of commercial teaching aids.

The teachers' opinions as to the type of person to teach these courses. Since most teachers of secondary mathematics come in contact with two separate groups of instructors (professors of mathematics and professors of education) and two different types of subject matter (academic mathematics and educational theory) in their professional preparation, it is felt by some that the preparation of mathematics teachers is accomplished under a dichotomized system which fails to achieve the optimum results. Karnes investigated this area by asking the heads of college departments of mathematics in 59 Southern colleges and universities their feelings with regard to this subject.[1] Sixty-three per cent of those persons believed that a "liaison professor" between the departments of education and mathematics would be beneficial in providing mathematics teachers with professional training. Twenty-four per cent of those mathematics departments already

[1] Karnes, op. cit., p. 122.

TABLE 35

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO THEIR OPINIONS CONCERNING THE PROPER PERSON TO INSTRUCT IN THE COURSE IN THE TEACHING OF MATHEMATICS

Description	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
A professor who divides his time between the depts. of mathematics and education	24	13	17	8	22	7	8	8	107
A mathematics professor	14	3	5	6	7	5	4	6	50
A professor who has had experience teaching secondary mathematics	3	1	..	1	1	2	1	..	9
An education professor	..	..	1	..	1	2	..	1	5
A mathematics professor who has had experience teaching secondary mathematics	1	..	..	..	..	2	..	2	5
The supervising teacher in the laboratory school	..	..	..	..	..	1	1	..	2
Various combinations of the above	2	1	..	1	1	3	2	3	13
No Response	..	..	1	..	1	..	2	..	4

had the services of a liaison professor.

The teachers in this study showed a similar reaction. Table 35 indicates that about 55 per cent of them feel that the best person to teach the professional mathematics courses would be a professor who divides his time between the two departments. About 26 per cent preferred a mathematics professor. Little interest was expressed in an education professor along this line. A few teachers insisted upon a person with secondary school teaching experience.

Undergraduate preparation in related fields. Most preferred programs for the training of mathematics teachers at the secondary level indicate the desirability of the prospective teacher studying related fields, especially in physics, chemistry, or astronomy.[1] Others select these along with mechanics, economics, and business problems, and the like.[2]

The status of the teachers with respect to the amount, in semester hours, of the three principal sciences, physics, chemistry, and biology, studied as an undergraduate, is shown in Table 36. Biology was included since the writer felt that perhaps more teachers studied biology than either of the other two sciences. Only the data concerning undergraduate

[1] The Place of Mathematics in Secondary Education, op. cit., pp. 202-203.

[2] Second Report of the Commission on Post-War Plans, op. cit., p. 218.

TABLE 36

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO THE NUMBER OF UNDERGRADUATE HOURS EARNED IN PHYSICS, CHEMISTRY, AND BIOLOGY

Undergraduate Semester Hours	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Physics									
None	12	5	4	8	4	9	3	5	50
1 - 5	4	4	6	3	8	8	1	4	38
6 - 10	14	5	9	3	11	2	7	6	57
11 - 15	4	1	4	1	2	2	2	3	19
16 - 20	6	1	..	1	5	1	2	..	16
21 - 25	..	..	..	..	..	..	2	..	2
More than 25	1	..	1	..	1	..	1	..	4
No Response	3	2	..	..	2	..	..	2	9
Medians	7	5	7	1	7	2	9	6	6
Chemistry									
None	12	5	4	6	6	11	4	5	53
1 - 5	10	5	7	1	8	2	6	3	42
6 - 10	12	3	10	5	11	7	4	8	60
11 - 15	3	1	1	2	2	1	..	1	11
16 - 20	1	2	1	1	1	..	..	..	6
21 - 25	..	..	..	..	2	1	2	1	6
More than 25	3	..	1	1	1	..	2	..	8
No Response	3	2	..	..	2	..	..	2	9
Medians	5	4	6	7	6	2	5	6	5
Biology									
None	6	3	2	6	4	6	6	5	38
1 - 5	12	3	2	5	8	4	4	3	41
6 - 10	8	3	10	3	10	7	4	4	49
11 - 15	8	5	5	..	5	1	3	4	31
16 - 20	4	..	2	2	2	2	1	1	14
21 - 25	3	..	3	..	1	1	..	..	8
More than 25	1	2	..	..	1	1	..	1	6
No Response	2	2	..	..	2	..	..	2	8
Medians	9	10	10	3	8	7	5	7	7

study is presented because their graduate study in these subjects was very limited; on the average, about five per cent of the teachers studied these sciences at the graduate level. The three parts of Table 36 indicate that about 27 per cent of the teachers did not study physics, and that about 28 per cent did not study chemistry at the undergraduate level. Twenty per cent failed to study biology. The character of the distributions is about the same. No real difference is apparent in the medians. On the average, the entire sample is slightly more acquainted with the field of biology than either physics or chemistry.

The teachers' study of astronomy. Most authorities recommend the desirability of teachers of secondary mathematics studying astronomy as a pertinent related field. An examination of the responses of the teachers showed that only 48 of the sample (24 per cent) had earned any credit in astronomy; for the most part these teachers had only two or three hours. One-half of the women teachers in the largest size schools, however, had studied astronomy.

CHAPTER III

PROBLEMS OF THE MATHEMATICS TEACHERS

The primary purpose of this chapter is to present the principal problems experienced by the mathematics teacher in the North Central Association high schools of Oklahoma. In the checklist sent to the teachers, space was provided for the teachers to indicate their principal problems and to elaborate on those problems with appropriate comments. Initially, tabular data will be presented to outline the types of problems and their seriousness in the minds of the teachers. Secondly and finally, the teachers' comments will be presented as a means of showing interested readers the specifics of the problems as the teachers view them.

The Problems as Indicated by the Teachers

In the checklist certain selected problems, which might interfere with the efficiency of the teachers in the performance of their teaching responsibilities, were suggested. The respondents were asked to check those applicable to them, to amplify their selection with a comment and to list other problems.

TABLE 37

PRINCIPAL PROBLEMS EXPERIENCED BY THE MATHEMATICS TEACHERS, REPORTED WITH COMMENT AND WITHOUT COMMENT

Problems	Size of High School: Less than 200 M 44	W 18	200 to 399 M 24	W 16	400 to 799 M 33	W 22	800 or more M 18	W 20	Total 195
With Comment									
Individual Differences	11	8	7	4	8	9	4	4	55
Teaching Load	5	6	5	4	7	8	8	5	48
Extra-Curricular	11	7	5	4	7	5	2	6	47
Pupil Personnel	7	4	3	5	3	4	3	4	33
Instructional Materials	6	2	3	..	8	8	3	..	30
Planning Instruction	6	2	3	1	2	2	3	3	22
Supervisory	1	1	1	3	1	..	1	..	8
Background of Students	..	1	..	..	1	..	1	..	3
Low Salary	..	..	..	..	1	..	..	..	1
Other	..	..	..	..	..	1	..	..	1
Totals	47	31	27	21	38	37	25	22	248
Without Comment									
Individual Differences	8	3	9	2	12	2	3	7	46
Teaching Load	2	..	5	..	4	1	3	3	18
Extra-Curricular	5	3	4	1	4	2	2	3	24
Pupil Personnel	3	3	5	..	4	3	3	3	24
Instructional Materials	2	2	3	2	3	1	..	..	13
Planning Instruction	..	..	1	..	2	1	1	..	5
Supervisory	1	..	..	..	2	..	..	..	3
Background of Students	1	..	1	..	..	..	..	..	2
Low Salary	1	..	..	..	..	..	..	..	1
Other	..	1	..	..	..	..	..	1	2
Totals	23	12	28	5	31	10	12	17	138

Table 37 shows the teachers' principal problems as selected. Some of the teachers merely checked the problems suggested, but a majority made specific comments. The table preserves this dichotomy of responses. The data are presented in the manner of most of the previous tables in order to show the universality of the problems. Other than the above consideration, the principal interest in that table lies in the total responses for each type of problem. Inspection of the table indicates that the problems seem to be relatively of the same importance, whether or not the teachers felt it worthwhile to comment upon them.

Table 37 invites a comparison of the problems indicated by the teachers with respect to whether or not the teachers commented upon them, with respect to sex, and with respect to the sizes of the schools in which the teachers were employed. The three subsequent tables make those comparisons.

Rank order of the problems is fairly obvious from a study of Table 37. However, to provide a convenient means of comparison, Table 38 was constructed to show the rank of the problems with comment, without comment, and when combined. Little difference between the three rank orders is observed. The problem of individual differences occupies the first position; it will be recalled that this area was the prime topic that the teachers suggested to be included in courses in the teaching of mathematics (see Table 34).

TABLE 38

RANK ORDER OF THE PRINCIPAL PROBLEMS EXPERIENCED BY THE MATHEMATICS TEACHERS

Problem Expressed	Rank of Problem		
	Without Comment	With Comment	Total*
Individual Differences	1	1	1
Extra-Curricular	2½	3	2
Teaching Load	4	2	3
Pupil Personnel	2½	4	4
Instructional Materials	5	5	5
Planning Instruction	6	6	6
Supervisory	7	7	7
Background of Students	8	8	8
Low Salary	10	9½	9
Other	9	9½	10

*Rank obtained by adding the teachers' responses with and without comment.

It was of some interest to the writer to investigate the relationship of the occurence of the problems to the size of the school in which the teachers worked. Table 39 shows that relationship by indicating the number and per cent of the teachers who experienced the problems in the various sizes of high schools. The principal differences noted are in the areas of extra-curricular activities and teaching load. Extra-curricular problems tended to be slightly less a problem in the larger schools, while teaching load appeared to be

TABLE 39

PRINCIPAL PROBLEMS OF THE MATHEMATICS TEACHER GROUPED BY SIZE OF SCHOOL

Problem	Less than 200 No.	Less than 200 Per Cent	200 to 399 No.	200 to 399 Per Cent	400 to 799 No.	400 to 799 Per Cent	800 or more No.	800 or more Per Cent	Total No.	Total Per Cent
Individual Differences	30	48	22	55	31	56	18	47	101	52
Extra-curricular	26	42	14	35	18	33	13	34	71	36
Teaching Load	13	21	14	35	20	36	19	50	66	34
Pupil Personnel	17	27	13	32	14	25	13	34	57	29
Instructional Material	12	19	8	20	20	36	3	8	43	22
Planning Instruction	8	13	5	13	7	13	7	18	27	14
Supervisory	3	5	4	10	3	5	1	3	11	6
Other*	4	6	1	3	3	5	2	5	10	5
Total Teachers	62	100	40	100	55	100	38	100	195	100

*Includes low salary.

more of a problem to the teachers in the larger schools. Rank order in each size of schools varies only slightly from the rank order for the entire sample of teachers.

When the relative seriousness of the problems are compared using sex as the basis for division of the sample, as is done in Table 40, little difference in the percentages is noted. The rank order for each sex is the same as that for the entire sample.

TABLE 40

PRINCIPAL PROBLEMS OF THE MATHEMATICS TEACHERS GROUPED BY SEX

Problem	Men		Women		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent
Individual Differences	62	52	39	51	101	52
Extra-curricular	40	34	31	41	71	36
Teaching Load	39	33	27	36	66	34
Pupil Personnel	31	26	26	34	57	29
Instructional Material	28	24	15	20	43	22
Planning Instruction	18	15	9	12	27	14
Supervisory	7	6	4	5	11	6
Other*	6	5	4	5	10	5
Total Teachers	119	100	76	100	195	100

*Includes low salary.

Specific Comments Made by the Teachers

The above data standing alone would be relatively meaningless unless accompanied by the particular specific problems included in the broad categories discussed above. In order to enliven these data, actual comments of the teachers will be given below. Quoting or paraphrasing the comments will be done without reference to sex or size of school in order to preserve the anonymity of the respondents. The comments will be divided according to the categories used above. Some of them will appear to belong in two or more categories; the principal idea appearing in the comment will determine its placement.

<u>Comments concerning the problem of individual differences</u>. Some teachers were concerned with the problem of teaching the slow learner, others were worried about the fate of the more capable pupils, while a third group felt the need of caring for both categories. Representative of comments concerning the slow students were these:

> We do need better enrollment procedure so that the slower ones may be placed in smaller classes.
>
> I think our school needs a counselor who can direct a child away from some of his choices when he is not capable of doing some work. Our tests given to freshmen help, but we still have too many who are not mentally capable of taking higher forms of mathematics and science just because they choose certain professions.
>
> Students are from smaller schools in the county, poor foundation work.
>
> Spending proportionaly too much time on slow students.
>
> . . .the person with a very low I. Q. Next year I am planning one class in General Mathematics that will permit each individual to progress as he can.
>
> Timidity in tackling difficult work.
>
> Too many rural pupils whose backgrounds are in sharp contrast to our junior high groups.
>
> Too many are enrolled in geometry who have no interest and no aptitude for it but are taking it only for the credit.
>
> Most poor mathematics students never reach my classes. I have very few failures. I try to create interest and not discourage the few slow ones. My big problem is

> breaking lazy habits. Too many are satisfied with a D--just passing.
>
> Limited background, inadequate home conveniences, economic status below standard.
>
> Keeping the slower students interested.

Not all the teachers were concerned with the slow or retarded students. A number were concerned about the superior or more motivated student. The following comments illustrate some of their viewpoints:

> I find it difficult to keep good students busy.
>
> A group of pupils of varying ability make it impossible to teach the better ones as much as they could learn.
>
> Time is the main element. With heterogeneous group--the more apt student is still not getting all of the opportunities that he should. (Next year we are initiating a better guidance program.)
>
> The football and basketball practice periods make it impossible to schedule the classes so that college bound [students] and students who like the subjects may take the maximum courses. . . .

Then there were the teachers who felt the need to care for the pupils distributed over the range of intelligence and aptitude.

> Have not reached a satisfactory answer to helping exceptionally bright and especially retarded students.
>
> I have too many students in my Algebra I class who are not capable of learning it. I can't seem to make the courses flexible enough to take care of the very poor and the very strong in the same class.
>
> Some students can go so much faster than others but try to grade according to the pupil's own ability.
>
> I have a wide variation of pupils. I am not sure that homogeneous grouping is the answer to the problem.

In spite of efforts of teachers to provide for individual differences, success is very low. Too much variation in ability; too many outside interruptions.

There is too much difference between the upper and lower level of pupils in my classes.

Students in small high schools cannot be grouped homogeneously, therefore we must pass those on who are not capable of obtaining material offered.

Difficulty in teaching all students as a group. Either slower students can't keep up or the ones quicker to learn are slowed down and lose interest.

Finally, there were general comments which provided additional insight into the problem.

The problem of individual differences plus absenteeism due to extra-curricular activities make the problem almost beyond solution.

With 40 [students] in class you have no time for 40 individual differences.

Lack proper grouping.

The school enrollment is so small that proper grouping of pupils in different classes for the same grade cannot be had.

Classes are too large to meet this problem.

Have to cope with them in an overcrowded classroom.

Need homogeneous grouping in mathematics. Pupils taking algebra should be taking it by desire or choice and not as a requirement because the general mathematics classes are filled.

If the pupils could be classified as to ability the teaching results would be better.

These are always problems but not a greater one in this school than in any other of the same size and type.

Lack of time to do much.

Classes too large to meet these adequately.

> Too large a number to deal with in limited time.
>
> I experience difficulty in making assignments commensurate with individual student achievement and ability.
>
> Need a good guidance program.

The above comments indicated an awareness on the part of a number of the teachers with respect to the constant problem of providing for the needs of pupils of varying abilities and interests. Apparently some were at a loss as to what to do. A number felt that homogeneous grouping according to ability was the answer. Others felt that the classes were too large and time was too limited to do much about the problem.

<u>Comments concerning the problems growing out of extra-curricular activities</u>. The teachers appeared to have two main concerns with respect to this problem. Primarily, their concern was toward the student and the effects of these activities upon them, and secondly, the extra work placed upon the teacher.

Typical comments with respect to the first concern follow:

> The students are absent so often for extra-curricular activities that it is impossible to maintain interest or present the required material.
>
> Most of our students are rural and practically all activities and practices occur during school hours. I can't teach a student who is not in class. Most recent example: one boy who has been in school but out of class for six successive days.
>
> In every small high school there are problems--sometimes I think the entire schedule is made for the

convenience of the band-athletic program.

Students absent from class due to activities of band, F.F.A., chorus, athletics, etc. All such activities are legitimate and necessary in our present day schools, but are definitely a hindrance in the study and teaching of mathematics.

Some difficulty with interruptions due to baseball, track, Y-teen, etc. Some is to be expected but most students would rather play than work. They 'drop the thread' if out too often.

Too many for some students. Some limitations need to be placed upon a student-teacher participation.

My greatest problem is to have my students in class. These are good, but you can't teach a child unless he is present.

Interruptions due to extra-curricular activities, especially competitive athletics, are many times too often --tending to become more than 50 per cent of the time.

A smaller number of teachers felt that the extra-curricular activities consumed too much of their own time, thus reducing their efficiency as teachers.

Clubs take up too much of my time, leaving very little time for planning of mathematics classes.

I am counselor, senior sponsor, chairman of the textbook committee, have duty in the hall at noon or before school, and rest-room duty. There are not enough hours in the day to do all that should be done.

I am involved in too many.

There are too many extra-curricular activities that I have to sponsor that are not in my field, Junior play, etc.

/I am/ Junior Class sponsor. We have to raise money for Junior-Senior trip. This means preparation for concession stands and attendance at all basketball and football games.

Too many extra duties--class sponsor, pep club, attending two or three school functions per week, selling tickets, helping with plays, etc.

> There are so many activities and school socials to attend that it interferes with students study as well as my checking papers. I find it hard to keep up.

Ninety-one teachers indicated that the extra-curricular activities of the school created problems for them. Some felt that there were too many activities, others indicated that some students were overloaded with activities, while still others considered themselves overloaded with sponsorship of activities.

Comments concerning teaching load. The third ranking problem for the teachers as a group was that brought about by the teaching load placed upon them. Data as to teaching load in terms of classes per day will be presented in the next chapter. The following comments, in general, represent the teachers who have the greatest teaching load.

> Six consecutive classes of approximately 200 is too much. One becomes too tired. No time for planning, for individual conference, etc.

> Especially in advanced algebra [42 students] where a great deal of extra help would be advisable.

> I think 201 pupils require too much routine book work such as checking of papers, records, etc., especially when one teaches six periods a day.

> If my classes were never more than 20, I could accomplish much more.

> Load is not divided--47 in biology, 15 in geometry. I am teaching four different subjects, each requiring a different preparation.

> Five hours teaching, one hour study hall, one-half hour home-room--no free time--large classes.

> Large classes minimize pupil participation, destroy

much of value of geometry classes especially.

Too many students in class--need a conference hour.

Responsible for all home room activities of. . .grade of 70 students in first hour plus teaching a class.

Classes are too large--and I teach six classes and one study hall.

Not having any free periods greatly limits the amount of conference and counseling which are so necessary in doing a good job of teaching.

Last semester I had 43 in solid geometry class.

Scheduled for five classes and one study hall--that constitutes the entire teaching day leaving no time for conferences, help to students needing it, or for any type of guidance program.

Teaching first year algebra, eighth grade mathematics, seventh grade science, biology, and chemistry along with extra-curricular activities. I do not have time to prepare unless I work 20 hours a day and for the salary I get I will not work that much.

Too great for effective work because of the extreme variation in ability among the unselected pupils in mathematics classes.

Spend too much time on records. Every new idea gotten by any educator falls on the teacher.

Too many in classes and too much secretarial work.

Classes are too large for adequate individual instruction.

No free time to prepare experiments for science classes.

Judging from the above comments, many of the teachers thought that they had too many classes per day, too many different kinds of subject matter to teach, or classes which were too large to permit them to do an effective job of teaching.

<u>Comments related primarily to pupil personnel</u>. This problem category was probably the least defined of all those represented by the teachers' responses. Their comments were extended over a considerable range, but indicated an awareness, on the part of the teachers, of problems that affected them in their particular teaching situation.

> /Students/ are too busy with too much, so do a half-way job on everything and call that success. Perfection is not important to the average student. Pupil attitude: 'How many grade points do I have?' 'What do I know' about the subject is less important.

> Lack of study at home on part of students.

> Pupils here avoid subject they consider difficult.

> Discipline in high school classes.

> Absences on part of weaker students.

> Presence of weak, average, and strong pupils in some classes tends to cause strong students to 'float' and weak pupils to feel that they are 'inferior' but will pass the subject anyway because the school cannot keep them forever.

> Lack of ambition on part of many students. Too many out-of-school interests for students. Poor study habits.

> Students who get little rest at night.

> Pupils do not seem to see the need for study.

> I find a lack of interest among the students, especially during the last nine weeks. Also discipline problems are increasingly more difficult to handle.

> There is no time for and no guidance program is attempted.

> The number of students wishing to avoid study seems to be on the increase. In. . .we have large numbers of pupils living with grandparents, aunts, uncles, etc.--result of broken homes.

These representative comments indicate that the teachers felt that the problems mentioned had a definite bearing on the teaching of mathematics in their schools.

Comments regarding instructional materials. The problem which ranked fifth was that which was related to instructional materials. Forty-three teachers indicated some difficulty with respect to instructional materials and 30 of them made specific comment concerning those problems. Typical comments follow:

> Limited supply of teaching aids.
>
> Texts and rulers are the only available materials.
>
> [The] school doesn't seem to think these are needed.
>
> Limited finances.
>
> Very poor when compared to the materials provided for other departments.
>
> Room assigned doesn't have adequate blackboard space for drill and geometry problems.
>
> Mathematics O.K. Biology equipment inadequate.
>
> We find it difficult to find workbooks with the drills we feel are pertinent to the work being studied. We 'ditto' the workbooks for classroom use.
>
> Not critical--but more could be used.
>
> So many of the problems in our textbooks are not practical.
>
> I would like to have filmstrips and slides made available for my algebra class.
>
> Films would be outstanding but thus far I have found none that are. They cannot be correlated with courses.
>
> Films are not available when needed--come at wrong time.

My own testing program has become burdensome, due, I think, to the fact that most of my tests are handmade. Revising adds to the problem too.

Most of the remaining remarks simply stated that there were not enough instructional materials. Instructional materials apparently were not a major problem for the teachers, but to some it was worthy of note. In Chapter IV more attention will be paid to this area.

Comments concerning planning for instruction. Planning for instruction was the sixth ranking problem according to the responses of the teachers. Of the entire sample only 27 teachers indicated this area to be a problem for them; 22 of them made specific comments. Representative ones follow:

Large classes with no time set up for planning. Checking papers after school leaves little time for recreation, professional reading, and assembling materials.

Plan your work and work your plan--because of poor administrative organization I cannot work my plan. Schedules are changed, classes cut short, announcements made, and students called out after the day's work has begun.

Since no free time is available during school hours, all new tests must be made, papers checked, plans made, and pupil personnel problems taken care of after a day's work has been done.

Lesson planning is done annually. . .by the various mathematics teachers--and you cannot possibly fit this program to a school where there are so many outside activities.

I feel that this problem will become less acute as I get more experience--it now takes too much time.

Insufficient time to properly plan teaching program. The work here requires constant pupil-teacher contact from 8:10 a.m. to 3:45 p.m. with only a 20 minute period free from students during lunch hour.

> Hate to do it; leave it until the last minute.

Other comments were primarily concerned with lack of time to properly plan their work.

Comment related to supervision. Only eight teachers made remarks concerning the supervision they received. However they were frank and strong. Possibly the teachers hesitated to commit themselves regarding their supervisors.

> The schedule of classes is made by the superintendent-principal, which, I realize, is a difficult task, but from there on the problems belong to the individual teachers.

> Lack of a school-wide development of what constitutes democratic teaching and how it is achieved prevents our program from being as effective as is desirable. The principal, as our supervisor, badly needs training in techniques of good supervision.

> Cooperation is very poor.

> No supervision of classroom work and no planned attack.

The nature of the teachers' supervision in terms of the relationships involved and the means by which it was accomplished will be considered in Chapter IV.

Random comments by the teachers. In addition to the comments made by the teachers concerning specific problems, there were many comments which were hard to categorize. Some of them were related to the above categories but were not included because they seem to have special significance. Some typical ones follow:

> Interruptions--the bane of present day schools is interruptions--by athletics, by charity drives, by so-called modern enrichment outside activities. Will

educators in high places ever recognize the obvious--that the modern child has so many more opportunities for enriching experiences than his ancestors had that the schools have less need to provide such outside experiences and should, therefore, get down to business on basic teaching.

Inability of pupils to work written problems.

A different assignment every year--never know until school begins what classes I will teach.

Am being required to sit through a course in. . . . I am not qualified to teach it--do not have any hours at all in it.

Television--outside interference.

Lack of knowledge of fundamentals on the part of the high school students.

How to prevent copying or reduce it to a minimum.

Time for conferences since I am a superintendent.

Lack of interest in mathematics by administration.

One problem I have been encountering is one that deals with state Algebra I and II textbooks having all the answers given. I have had to practically write a syllabus of extra problems so that the students will be given problems where the answer is not provided for them.

Many students do not have sufficient grade school arithmetic.

The significance of the categorized and random comments above cannot be measured by any particular test which yields a numerical value for their probability of occurence. However, they may be considered as significant in the minds of the individual teachers contributing them and to indicate possible areas for improvement in their particular schools or in their own methods to attack the problems confronting them.

CHAPTER IV

PRACTICES OF THE MATHEMATICS TEACHERS

The two previous chapters have described the preparation and some of the problems of the mathematics teachers. The purpose of this chapter is to describe the teachers practices in selected areas of their professional positions and responsibilities. These practices range from those that were a matter of choice on the part of the individual instructor to those that were intrinsically related to the particular teaching situation of the individual teachers at the time of the study. The data below will reflect to a degree some of the characteristics of the teaching conditions in the schools as well as indicate how the teachers attacked certain teaching problems. Some of the data will be related to the problems considered in Chapter III; reference will be made to that chapter when appropriate. A brief overview of the contents of the present chapter is as follows:

1. Some characteristics of the teaching position.
2. Some specific practices of the teachers.
3. Some professional practices.
4. The nature of supervision received in terms of relationships and activities involved.

Certain Characteristics of the Positions of the Teachers

In this section the positions and responsibilities of the teachers will be described in terms of the teachers principal activities other than teaching classes, of their extra-curricular responsibilities, their teaching load, the variety of subjects taught, and the sizes of their mathematics classes according to subject.

Major responsibilities other than teaching. In any group of teachers there will be some who will have responsibilities which will consume a considerable amount of their time. A proper consideration of teaching load should include a study of those responsibilities. Table 41 shows the number and distribution of the teachers in the sample who indicated certain major responsibilities other than teaching classes. Seventy-two teachers had responsibilities which may be classed as other principal responsibilities; the major portion of this number were athletic coaches, superintendents, principals, and heads of departments.

Extra-curricular responsibilities of the teachers. In order to show the variety and nature of their duties connected with extra-curricular student activities Table 42 was constructed. Home room duty was the principal task in this category given the teachers, followed by the caretaker type of activity involved in supervising lunch rooms, grounds and corridors, and ticket sales. A variety of duties common to

TABLE 41

DISTRIBUTION OF A PORTION OF THE SAMPLE
ACCORDING TO MAJOR RESPONSIBILITIES
OTHER THAN TEACHING MATHEMATICS

Major Responsibilities	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Athletic Coach	4	..	6	..	8	..	2	..	20
Counselor	..	..	..	..	2	..	..	1	3
Librarian	..	1	..	1	..	..	..	..	2
Activity Director	..	1	..	1	..	..	..	..	2
Audiovisual Director	..	..	..	..	1	..	..	..	1
Superintendent	5	..	..	..	..	..	..	..	5
Principal	9	..	2	..	..	..	..	..	11
Department Head	5	1	3	5	5	4	1	4	28
Totals	23	3	11	7	16	4	3	5	72

many schools follows. It is of some interest to note that only 12 teachers mentioned sponsorship of mathematics clubs in contrast to 18 who sponsored clubs in other subjects. An apparent discrepancy in the number of athletic coaches in Table 41 and the number of teachers in Table 42 who were involved in interscholastic athletics can be explained by stating that seven of the latter were not primarily coaches. An appreciable number of the teachers listed counseling as one of their responsibilities.

TABLE 42

EXTRA-CURRICULAR RESPONSIBILITIES OF THE MATHEMATICS TEACHERS

Extra-curricular Responsibilities	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Mathematics Club	2	1	2	1	1	..	3	2	12
Other Subject Club	3	2	1	2	5	3	1	1	18
Counseling	15	7	4	5	8	6	2	7	54
Interscholastic Athletics	10	1	6	..	8	..	2	..	27
Intra-mural Athletics	8	1	2	..	5	..	..	1	17
Dramatics Coach	..	1	1	..	..	2	..	..	4
Assembly Programs	14	8	2	4	4	3	2	3	40
Class Sponsor	10	8	6	6	6	8	1	3	48
Home room Sponsor	22	11	9	7	21	19	16	16	121
Audiovisual Duties	4	1	3	..	2	1	..	..	11
School Publications	4	1	2	2	1	1	1	..	12
Lunch Hour Duties	14	5	9	9	13	7	2	3	62
Ground and Corridor Duties	20	6	10	6	14	13	4	3	76
Ticket Sales	13	6	10	4	18	9	9	5	74

Teaching load. Other than the duties mentioned above, the teaching load of a teacher consists, to a great extent, of the number of classes taught per unit of time and the number of students in those classes. Table 43 shows the number of classes taught per day by superintendents, principals, department heads, coaches, and the respondents who were primarily classroom teachers. The superintendents and principals, in general, taught two classes, while department heads and teachers, for the most part, taught five classes per day. Athletic coaches taught, on the average, four classes per day.

In an attempt to arrive at a reasonable assumption which may be made concerning the number of classes per day a teacher in this sample was expected to teach, the number of teachers in all categories of Table 43 who taught four classes or less per day was compared with the number of teachers with other major responsibilities. The difference, 11 teachers, was more than taken care of by one principal, two coaches, and 16 department heads who taught five or more classes. Two obvious conclusions can be drawn from this analysis; first, that the teachers who had no other major duties were expected to teach five classes per day and, second, most of the department heads were teaching as many classes as the average teacher, thus causing doubt as to the merit of the title of department head.

Table 44 shows the distribution of classes according to size for the largest classes, smallest classes, and

TABLE 43

DISTRIBUTION OF THE MATHEMATICS TEACHERS IN VARIOUS OFFICIAL POSITIONS, ACCORDING TO THE NUMBER OF CLASSES TAUGHT PER DAY

Number of Classes	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Superintendents									
1	1	..	..	..	..	..	..	..	1
2	4	..	..	..	..	..	..	..	4
Principals									
1	2	..	1	..	..	..	..	..	3
2	4	..	1	..	..	..	..	..	5
3	1	..	..	..	..	..	..	..	1
4	1	..	..	..	..	..	..	..	1
5	1	..	..	..	..	..	..	..	1
Department Heads									
2	..	..	..	..	1	..	..	..	1
3	..	..	..	1	..	..	..	..	1
4	..	1	..	..	..	2	1	1	5
5	..	..	2	3	4	2	..	3	14
6	1	..	1	..	..	..	..	..	2
No Response	..	..	..	1	..	..	..	..	1
Teachers									
1	..	..	..	..	..	..	1	..	1
2	..	..	..	1	1	..	..	1	3
3	..	..	..	..	1	1	..	..	2
4	5	1	3	1	3	1	..	1	15
5	17	12	10	7	13	9	11	12	91
6	2	3	..	2	2	6	2	2	19
No Response	1	1	..	..	..	1	1	..	4
Athletic Coaches									
3	3	..	1	..	1	..	2	..	7
4	1	..	5	..	5	..	..	..	11
5	..	..	..	..	2	..	..	..	2

TABLE 44

SIZES OF CLASSES TAUGHT BY THE MATHEMATICS TEACHERS

Size of Class	Size of High School: Less than 200 M 44	W 18	200 to 399 M 24	W 16	400 to 799 M 33	W 22	800 or more M 18	W 20	Total 195
Largest									
10 - 14	1	..	..	1	..	..	..	..	2
15 - 19	7	1	..	..	..	..	..	..	8
20 - 24	6	3	3	1	1	1	1	1	17
25 - 29	7	3	1	5	6	1	..	3	26
30 - 34	15	1	12	3	10	11	3	5	60
35 - 39	3	6	5	3	6	4	7	8	42
40 - 44	2	2	2	1	7	3	5	3	25
45 - 49	2	1	..	1	2	1	1	..	8
50 or more	..	..	1	..	1	..	..	..	2
No Response	1	1	..	1	..	1	1	..	5
Medians	30	35	33	30	31	33	38	35	33
Smallest									
1 - 9	13	7	2	2	1	2	..	..	27
10 - 14	10	3	6	7	8	7	1	1	43
15 - 19	7	5	8	3	7	7	2	2	42
20 - 24	9	1	3	3	9	4	3	8	40
25 - 29	3	1	4	..	4	1	5	6	24
30 - 34	1	..	1	..	1	..	3	3	9
35 - 39	..	..	..	..	2	..	2	..	4
40 or more	..	..	..	..	1	..	..	..	1
No Response	1	1	..	1	..	1	1	..	5
Medians	14	14	17	14	20	16	27	24	18
Average									
10 - 14	6	1	..	..	..	..	..	..	7
15 - 19	8	3	1	2	2	1	1	..	18
20 - 24	11	5	6	1	6	3	..	3	35
25 - 29	15	5	9	6	15	10	4	8	72
30 - 34	2	2	7	3	6	5	7	5	37
35 - 39	..	1	1	3	3	2	3	4	17
40 or more	1	..	..	..	1	..	2	..	4
No Response	1	1	..	1	..	1	1	..	5
Medians	23	24	28	29	28	28	32	29	27

average size classes taught by the mathematics teachers. These included all classes regardless of subject matter. Sizes of mathematics classes will be discussed later. The medians for the largest classes range from 30 to 38 students for the various groups of teachers with a median of 33 for the sample. The medians for the smallest classes vary from 14 to 24; the median for the sample is 18. The medians for the average size classes range from 23 to 32 with an overall median of 27. It is noted that the medians in general increase with the size of school with the most apparent increase occurring in the smallest and average classes. The computed mean for the sample, using the distribution of average classes, was 26.8 students, slightly less than the median.

Number and type of subjects taught. Table 45 shows the number of different types of subject matter taught by these teachers. For the purpose of this table grade school mathematics is excluded since the primary concern here is with secondary mathematics at the senior high school level. One hundred and two teachers (54 per cent) taught mathematics only. If grade school mathematics were included that number would be increased to approximately 135 teachers. Very few of the teachers taught more than two kinds of subject matter other than mathematics.

The distribution of the different courses in mathematics is shown in Table 46. Algebra I and plane geometry lead with 131 and 111 teachers teaching them, respectively.

TABLE 45

DISTRIBUTION OF THE MATHEMATICS TEACHERS ACCORDING TO THE NUMBER OF FIELDS OF SUBJECT MATTER TAUGHT

Subjects	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Mathematics only	17	6	12	6	17	17	10	17	102
Mathematics and one other	16	4	8	8	13	2	6	3	60
Mathematics and two others	7	7	3	1	2	2	1	..	23
Mathematics and three others	2	..	1	..	1	..	..	..	4
Mathematics and four others	1	..	..	..	..	..	..	..	1
No Response	1	1	..	1	..	1	1	..	5

About one-third of the teachers taught general mathematics and Algebra II. One out of six teachers taught solid geometry and trigonometry.

Related to the above data is that presented in Table 47 which shows the mathematics courses offered in the North Central Association high schools of Oklahoma during the school year 1953-54. (This table does not show the courses which may be taught in alternate years.) It is noted that the number of teachers who taught the various subjects is roughly proportional to the number of schools offering the subjects.

Algebra and plane geometry were the most common subjects taught, followed by advanced algebra, general mathematics, trigonometry, solid geometry, and high school arithmetic, in that order.

TABLE 46

SECONDARY MATHEMATICS COURSES TAUGHT BY THE MATHEMATICS TEACHERS DURING THE SECOND SEMESTER, 1953 - 54

Mathematics Courses	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
General Mathematics	18	5	9	4	11	7	5	4	63
Algebra I	31	16	18	12	19	15	8	12	131
Plane Geometry	19	12	12	11	17	12	12	16	111
Advanced Algebra	14	15	6	6	12	9	8	7	77
Solid Geometry	3	2	3	4	5	5	5	2	29
Trigonometry	3	3	4	5	4	3	3	4	29
High School Arithmetic	1	2	1	2	..	2	2	2	12
Refresher Mathematics	1	1	1	1	4	2	2	1	13
Other	1	1	..	1	..	..	1	..	4
No Response	1	1	..	1	..	..	1	..	4

Table 48 shows the variety of subject matter other than mathematics taught by the teachers. After grade school mathematics (taught by 31 teachers), science courses were the most common subjects taught except for chemistry which

TABLE 47

MATHEMATICS COURSES OFFERED IN 1953 - 54 BY THE NORTH CENTRAL HIGH SCHOOLS OF OKLAHOMA

Mathematics Courses	Size and Type* of High School: Less than 200		200 to 399		400 to 799		800 or more		Total		Total
	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr	3yr	4yr	
General Mathematics	13	20	9	12	6	12	4	2	32	46	78
Algebra I	27	34	18	15	17	12	11	2	73	63	136
Plane Geometry	27	28	20	15	17	12	11	2	75	57	132
Advanced Algebra	19	15	20	13	16	11	11	2	66	41	107
Solid Geometry	5	4	8	3	13	7	10	1	36	15	51
Trigonometry	5	3	13	8	15	7	11	2	44	20	64
High School Arithmetic	3	7	7	1	4	1	2	2	16	11	27
Refresher Mathematics	..	..	..	..	2	..	1	..	3	..	3
High School Mathematics	..	..	..	..	..	..	1	..	1	..	1
Core Mathematics	..	..	..	..	1	..	..	..	1	..	1
College Algebra	..	..	..	..	1	..	..	..	1	..	1
Number of Schools	28	35	21	15	17	12	11	2	77	64	141

*Type of high school refers to the number of years included in the school's program--in this table, three years or four years.

TABLE 48

OTHER SUBJECTS TAUGHT BY THE MATHEMATICS TEACHERS

Other Subjects	Size of High School: Less than 200 M 44	W 18	200 to 399 M 24	W 16	400 to 799 M 33	W 22	800 or more M 18	W 20	Total 195
Grade School Mathematics	11	6	3	3	4	2	2	..	31
General Science	7	1	2	..	1	..	..	..	11
Biology	3	3	3	..	..	1	..	1	11
Physics	2	..	1	1	4	..	2	..	10
Physical Education	1	1	4	..	2	..	2	..	10
Chemistry	4	..	1	1	2	..	1	..	9
History or Social Studies	1	4	..	..	1	1	..	1	8
Drivers' Training	4	..	1	..	2	..	..	..	7
Industrial Arts	2	..	1	..	..	..	..	..	3
Language Arts	1	1	..	..	..	1	..	..	3
Business Education	1	..	1	1	..	..	..	..	3
Classical or Modern Language	1	1	..	1	..	1	..	..	4
Music	2	..	..	..	..	..	..	..	2
Home Economics	..	..	..	1	..	..	..	..	1

was exceeded by physical education. A miscellany of subjects was taught by a few teachers.

The final consideration in this section will be the sizes of the mathematics classes taught which are shown in Table 49. The most obvious and significant observation is, that with very few exceptions, the larger schools had larger classes regardless of the particular course. For example, in plane geometry 30 out of 33 classes in the smallest schools had less than 30 pupils, while in the largest schools 44 out of 65 classes had 30 or more pupils.

Some Specific Practices of the Teachers

The checklist sent to the teachers provided them with the opportunity to state in what manner they attempted to care for the individual differences of the students, which instructional materials they used and would like to use if they were available, what were their practices with respect to use of tests, and what means they used to plan for instruction.

Methods used to care for individual differences. In Chapter III it was found that the problem which vexed the teachers the most was that of trying to care for the individual differences of the students in their classes. Table 50 shows the ways in which the teachers attempted to meet this problem. Individual instruction was the most common means used, followed closely by extra drill, use of graded problems,

TABLE 49

SIZES OF THE MATHEMATICS CLASSES TAUGHT BY THE MATHEMATICS TEACHERS

Size of Class	Size of High School: Less than 200 M 44	W 18	200 to 399 M 24	W 16	400 to 799 M 33	W 22	800 or more M 18	W 20	Total 195
General Mathematics									
1 - 9	..	1	..	..	..	..	..	..	1
10 - 19	3	4	1	..	2	1	..	..	11
20 - 29	13	..	4	1	13	1	2	5	39
30 - 39	4	2	7	..	9	5	1	..	28
40 - 49	1	..	..	1	1	2	1	..	6
Algebra I									
1 - 9	..	1	..	..	..	..	..	..	1
10 - 19	13	4	..	1	..	..	..	1	19
20 - 29	18	..	17	13	13	26	2	9	98
30 - 39	11	2	15	9	24	7	11	11	90
40 - 49	1	..	..	1	..	3	3	..	8
Plane Geometry									
1 - 9	2	2	..	..	..	..	..	..	4
10 - 19	9	5	1	3	2	..	4	..	24
20 - 29	7	5	17	9	20	16	..	17	91
30 - 39	2	1	1	4	7	10	19	21	65
40 - 49	..	..	..	..	5	..	1	3	9
Advanced Algebra									
1 - 9	6	2	..	..	..	..	..	..	8
10 - 19	6	3	2	4	5	..	1	..	21
20 - 29	2	..	4	4	6	7	2	3	28
30 - 39	..	..	..	..	2	2	6	7	17
40 - 49	..	..	..	..	1	..	2	2	5
Solid Geometry									
1 - 9	..	..	1	1	1	1	..	..	4
10 - 19	2	..	2	..	1	1	..	3	9
20 - 29	1	..	..	..	..	1	1	..	3
30 - 39	..	..	..	..	..	..	..	1	1
Trigonometry									
1 - 9	1	1	..	1	1	..	..	..	4
10 - 19	1	1	2	2	2	3	1	..	12
20 - 29	..	..	..	2	2	1	2	3	10
30 - 39	..	..	..	..	..	..	2	1	3
High School Arithmetic									
1 - 9	..	2	..	..	..	..	..	..	2
10 - 19	1	1	..	3	..	1	1	..	7
20 - 29	..	1	2	..	3	3	1	2	12
30 - 39	..	..	..	1	2	1	6	..	10

TABLE 50

PRACTICES OF THE MATHEMATICS TEACHERS WITH RESPECT TO INDIVIDUAL DIFFERENCES OF STUDENTS

Practice	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Individual Instruction	34	12	19	12	20	15	8	15	135
Extra Drill	24	12	10	6	13	14	6	9	94
Graded Problems	18	14	10	7	15	12	10	1	87
Directed Study	15	9	10	7	15	14	7	7	84
Individual Assignment	20	4	3	5	15	14	3	2	66
Allow Varying Rates of Progress	8	4	8	10	10	10	6	5	61
Special Projects and Reports	13	6	5	4	11	6	6	5	56
Grouping in the Classroom	5	3	6	2	4	7	2	1	30
Contract Assignment	8	3	2	2	6	1	3	1	26
Diagnostic Tests	6	3	3	3	5	3	1	1	25
Homogeneous Grouping (School Wide)	3	2	2	..	3	1	7	2	20
Supplementary Directed Reading	4	1	3	1	3	2	1	2	17
Total Responses	158	73	81	59	120	99	60	51	701

and directed study. Other fairly common means were individual assignments, the allowance of varying rates of progress, and special projects and reports. Only 20 teachers reported that homogeneous grouping was used in their school. It will be recalled that considerable sentiment was expressed in the comments of Chapter III toward the desirability of grouping the students homogeneously.

Practices and desires concerning the use of instructional materials. In order to determine the extent of use of instructional materials the teachers were asked to indicate the materials used in the specific mathematics courses they taught. Also, they were asked to indicate those materials that they would like to use if they could obtain them. It was feared by the writer that the detail asked for might yield inconclusive data. Table 51, which shows the teachers' responses according to subject matter, has a certain consistency which shows that the teachers who responded gave some thought to their responses. Taking, as example, the data concerning films and slides, it is apparent that there was a greater teacher-expressed demand for the former than the latter.

In Table 51, the "total" column on the right may be considered as a measure of teacher interest in the particular item; the values may be influenced to some extent by the degree of the teachers' familiarity with the item. The "total" is merely the sum of the response for all the subjects and

TABLE 51

NUMBER OF TEACHERS WHO USED AND DESIRED TO USE CERTAIN INSTRUCTIONAL MATERIALS IN THE COMMON SECONDARY MATHEMATICS COURSES

Instructional Materials	Secondary Mathematics Courses														Total*	
	Gen'l Math.		Algebra I		Plane Geom.		Solid Geom.		Algebra II		Trig.		Other			
	U*	D*	U	D	U	D	U	D	U	D	U	D	U	D	U	D
Supplementary Texts	46	5	79	4	78	4	21	..	47	3	24	2	18	6	313	24
Suppl. Reading Books	10	11	14	7	22	5	5	2	14	5	5	3	3	5	73	38
Films	22	13	19	23	30	15	3	3	8	10	1	7	4	4	87	75
Filmstrips	17	12	19	15	28	14	2	5	5	6	2	6	5	5	78	63
Slides (2 x 2 & $3\frac{1}{2}$ x 4)	2	7	3	12	4	9	..	4	1	3	1	2	2	..	13	37
Opaque Projector	5	6	2	7	4	10	1	1	3	3	3	2	4	1	22	30
Overhead Projector	2	5	1	6	..	9	..	1	2	2	..	2	..	..	5	25
Stereographs	..	3	2	2	5	2	2	..	1	..	..	1	2	..	12	8
Models	23	7	27	15	54	14	26	3	14	1	12	2	8	4	163	46
Devices (Flex. fig.)	15	14	20	13	31	16	11	2	7	6	7	3	5	3	96	57
Bulletin Boards	33	3	58	10	66	7	18	1	27	4	13	2	20	2	235	29
Colored Chalk	29	2	45	8	71	8	24	3	32	3	11	3	14	1	226	28
Coordinate Bl'kboards	17	7	42	13	24	5	7	1	36	5	12	4	4	2	142	37
Spherical Blackboards	..	2	1	5	3	3	10	4	9	1	4	2	1	1	28	18
World Globe	9	4	8	3	16	2	12	1	6	1	3	2	4	1	58	14
Bl'kboard Protractors	36	9	34	3	80	8	15	..	18	2	16	1	13	2	212	25
Bl'kboard Compasses	41	11	45	1	98	4	18	1	26	..	19	..	16	1	263	18
Blackboard Rulers	42	9	51	1	92	4	23	..	34	1	20	..	18	..	280	15

TABLE 51--Continued

Instructional Materials	Secondary Mathematics Courses														Total*	
	Gen'l Math.		Algebra I		Plane Geom.		Solid Geom.		Algebra II		Trig.		Other			
	U*	D*	U	D	U	D	U	D	U	D	U	D	U	D	U	D
Blackboard Stencils	4	5	4	7	5	10	..	2	7	2	..	2	1	..	21	28
Blackboard Templates	1	5	..	5	..	6	..	2	1	2	..	2	..	..	2	22
Pantograph	1	3	3	2	4	11	1	2	1	2	..	2	1	1	11	23
Parallel Rulers	3	11	12	10	10	22	2	3	6	3	2	3	2	4	37	56
Charts-Commercial	20	5	24	10	17	15	2	3	14	6	3	6	5	3	85	48
Charts-School made	10	4	11	5	14	5	2	..	4	1	2	3	4	..	47	18
Surveying Equipment	5	8	3	11	9	13	3	3	6	3	5	8	..	1	31	47
Demonstration Slide-rule	8	2	10	8	13	7	8	1	21	11	15	7	3	2	78	38

*U means that the teacher used the material, while D means that the teacher desired to use the material if it were available.

may not be compared to the number of teachers or any other particular value. Again using films and slides as examples, there were 87 teacher responses indicating use and 75 responses indicating desire for use of films, while 13 teachers indicated a use of slides, compared to 37 who would have liked to use them. Failure to respond can only be determined by comparing the number of teachers teaching each subject to the number who responded to each item.

The instructional materials which were used most often were supplementary texts, blackboard rulers, blackboard compasses, bulletin boards, colored chalk, blackboard protractors, models, and coordinate blackboards. These are the materials which, in addition to ordinary blackboards, are generally used by secondary mathematics teachers.[1] Supplementary reading books, films, filmstrips, devices (such as flexible figures), charts, and demonstration slide rules were used to some extent. The materials which were in demand to some extent, but not much used, were slides, opaque projector, overhead projector, blackboard stencils, blackboard templates, pantograph, parallel rulers, and surveying equipment.

Interested readers may find many pertinent facts and reasons for conjecture in these data, for example, the fact that of 29 teachers of solid geometry, only 10 indicated they used a spherical blackboard and only four expressed a desire

[1]Henry W. Syer and Peter J. Ingeneri, "Multi-Sensory Aids in Mathematics," School Science and Mathematics, XLIX (February, 1949), 134-140.

to use it if they could get it. Did the remaining 15 teachers fail to respond because of lack of knowledge of the item, or did they fail to use it because they were not aware of its potential value?

Practices with respect to use of tests. An important part of a teacher's job is the evaluation of student progress and achievement. To obtain some idea as to the means by which the teachers conducted their testing program, they were asked to indicate the frequency and type of tests given. Tables 52 and 53 show their responses to both considerations. The nature of the checklist permitted multiple responses. In so far as frequency is concerned, the teachers tended to give tests either weekly or at the end of a unit or chapter, or both. Some favored giving tests near the end of the semester or at the end of a marking period. Eighteen teachers favored daily tests.

The principal types of tests which the teachers favored were tests of their own making. These tests were almost equally divided between printed tests (mimeograph, etc.) and tests written on the blackboard with the former slightly favored. Sixty teachers indicated that they used standardized tests at some point in the courses, while fifty favored the use of some sort of diagnostic test. Objectivity, apparently, was a criterion not highly favored.

Practices concerning planning for instruction. Planning for instruction was a problem of some concern to the

TABLE 52

PRACTICES OF THE MATHEMATICS TEACHERS WITH RESPECT TO FREQUENCY OF TESTS GIVEN

Frequency	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Unit or Chapter End	23	13	15	11	19	13	7	13	114
Weekly	21	12	17	8	19	17	5	4	103
Near End of Semester	13	3	11	7	12	10	3	6	65
Near End of Marking Period	12	..	7	7	10	6	4	5	51
Daily	4	1	3	1	1	5	2	1	18
When Needed	2	1	..	..	2	..	..	1	6
Every Two Weeks	4	1	..	..	..	..	1	2	8
Three Times a Week	..	..	..	..	..	..	1	..	1
Total Responses	79	31	53	34	63	51	23	32	366

teachers. Table 37 has shown that it was the sixth ranking problem of those considered in that table. Table 54 indicates the ways in which the teachers did that planning. For their long range planning they tended either to have modified the textbook plan or accepted it. When planning for a short period ahead, they seemed to favor daily or weekly lesson plans; yet a considerable portion still used the textbook as basis for planning. Apparently the textbook was an important consideration in the planning of these teachers.

TABLE 53

PRACTICES OF THE MATHEMATICS TEACHERS WITH RESPECT TO TYPE OF TESTS GIVEN

Type of Test	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Teacher-made:									
Duplicated	28	13	21	11	28	17	13	13	144
On Blackboard	31	8	17	8	17	15	12	13	121
Standardized Tests	13	5	3	3	8	10	9	11	62
Diagnostic Tests	9	5	5	4	10	6	5	6	50
Objective always	7	1	7	1	7	1	2	2	28
Open book	..	..	..	1	1	..	..	..	2
Total Responses	88	32	53	28	71	49	41	45	407

Some Professional Practices

Included in this section will be the teachers attention to membership in professional organizations, their habits in reading professional periodicals, and the availability of professional books concerned with the teaching of secondary mathematics.

Membership in professional organizations. Table 55 shows the distribution of the teachers according to their membership in professional organizations, both mathematical and general. It is clear that the teachers' primary concern

TABLE 54

PRACTICES OF THE MATHEMATICS TEACHERS WITH RESPECT TO TWO TYPES OF PLANNING FOR INSTRUCTION

Types of Planning	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Long Range									
Modify Textbook Plan	32	16	17	15	27	19	14	15	155
Accept Textbook Plan	7	1	7	2	3	5	3	3	31
Organize Course in Outline Form	8	..	3	6	5	3	1	4	30
Write a Syllabus	1	1	1	..	..	1	1	..	5
Total Responses	48	18	28	23	35	28	19	22	221
Short Term									
Divide Textbook into Short Units	12	11	11	5	11	7	7	1	65
Write Daily Lesson Plans	6	6	8	3	7	8	4	8	50
Write Weekly Lesson Plans	11	1	5	3	8	9	5	3	45
School Requires Lesson Plans	4	..	2	1	5	5	2	1	20
Total Responses	33	18	26	12	31	29	18	13	180

TABLE 55

MEMBERSHIPS HELD BY THE MATHEMATICS TEACHERS IN PROFESSIONAL ORGANIZATIONS

Professional Organizations	Size of High School								
	Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Mathematical									
National Council of Teachers of Mathematics	5	5	4	7	11	11	10	12	65
Mathematical Association of America	..	1	..	1	3	1	1	..	7
Central Association of Science and Mathematics Teachers	..	1	..	..	1	..	..	1	3
Other	..	..	..	..	1	3	1	..	5
Totals	5	7	4	8	16	15	12	13	80
General									
Oklahoma Education Association	42	15	23	15	32	22	17	20	186
National Education Association	26	9	19	10	23	15	14	20	136
Local Education Association	4	..	5	2	10	5	6	9	41
Administrators' Organization	9	..	..	..	..	..	..	..	9
Other	4	5	1	5	2	3	3	..	23
Totals	85	29	48	32	67	45	40	49	395

was membership in a general type educational organization rather than a mathematical organization. Less than one-half the teachers belonged to a mathematical organization; they were, on the average, members of two general type educational organizations. One out of three teachers belonged to the National Council of Teachers of Mathematics, the principal subject matter organization for this category of teachers. All but nine teachers were members of the Oklahoma Education Association, and 70 per cent were members of the National Education Association. Teachers in the larger schools tended to belong to mathematical organizations more than those in the smaller schools, while no apparent difference is discernible between the teachers in the various sizes of schools with respect to membership in general educational organizations, except that teachers in the larger schools appeared to be attracted to the National Education Association more than the teachers of the smaller schools.

Professional periodicals read. The teachers were asked to indicate the extent to which they read professional periodical literature and to show whether the periodical was obtained from the school library or through a personal subscription. Table 56 shows that information according to mathematical or general educational periodicals. The Mathematics Teacher and School Science and Mathematics were practically the only periodicals of a mathematical nature read by the teachers. The former was read by 111 teachers,

TABLE 56

PROFESSIONAL PERIODICALS READ REGULARLY BY THE MATHEMATICS TEACHERS AND THEIR SOURCE: SCHOOL LIBRARY (SL) AND PERSONAL SUBSCRIPTION (PS)

Periodicals		Size of High School: Less than 200 M 44	Less than 200 W 18	200 to 399 M 24	200 to 399 W 16	400 to 799 M 33	400 to 799 W 22	800 or more M 18	800 or more W 20	Total 195
Mathematical										
The Mathematics Teacher	SL:	10	5	5	1	11	5	3	6	46
	PS:	5	5	4	7	11	11	10	12	65
School Science and Mathematics	SL:	6	2	2	3	10	5	4	7	39
	PS:	2	..	1	..	3	2	..	1	9
Other	SL:	4	1	..	..	1	..	..	..	6
	PS:	1	1	..	1	..	..	2	2	7
Totals		28	14	12	12	36	23	19	28	172
General										
The Oklahoma Teacher	SL:	..	1	1	1	..	..	..	..	3
	PS:	36	13	23	15	30	20	17	19	173
The NEA Journal	SL:	10	5	2	3	4	2	2	..	28
	PS:	26	9	19	10	23	15	12	20	134
Other	SL:	5	1	3	1	1	3	2	..	16
	PS:	6	2	3	4	7	..	2	5	29
Totals		83	31	51	34	65	40	35	44	383

all of whom were members of the National Council of Teachers of Mathematics, and 46 more who indicated that the source was the school library. Thirty-nine of the 48 teachers who read School Science and Mathematics stated that the source was the school library.

The periodicals of a general educational nature were read much more than those of a mathematical nature. Ninety per cent of the teachers read The Oklahoma Teacher, while 83 per cent read the NEA Journal, the primary source being a personal subscription. Other general periodicals of various kinds were read by a minority.

Professional books available to the teachers. It was of some interest to the writer to determine to what extent professional books on the teaching of secondary mathematics were available to the teachers in the school library and in their own library. Response to this inquiry was the most disappointing of all. However, the data is presented in Table 57 to show some facts of interest. The inquiry asked for information concerning books on the teaching of mathematics in the secondary school and for information concerning yearbooks of the National Council of Teachers of Mathematics. Twenty teachers reported there were no books in their school library on the teaching of mathematics and 16 had no such books in their personal library; these numbers constitute about 10 per cent of the sample. About 20 per cent reported that one or two books were available in both of those sources,

TABLE 57

PROFESSIONAL REFERENCE BOOKS ON TEACHING OF MATHEMATICS AND YEARBOOKS OF THE NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS AVAILABLE TO THE MATHEMATICS TEACHERS IN THE SCHOOL LIBRARIES (SL) AND PERSONAL LIBRARIES (PL)

Number of Books Available		Size of High School								
		Less than 200		200 to 399		400 to 799		800 or more		
		M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Reference Books										
None	SL:	6	3	3	3	..	3	2	..	20
	PL:	6	2	3	2	..	1	2	1	16
One or Two Books	SL:	8	2	8	3	6	8	4	3	42
	PL:	7	1	6	1	8	8	1	5	37
More than Two Books	SL:	6	4	3	2	15	2	8	5	45
	PL:	9	8	5	6	10	5	3	5	51
No Response	SL:	24	9	10	8	12	9	4	12	88
	PL:	22	7	10	7	15	8	12	9	90
Yearbooks										
None	SL:	6	4	9	6	6	7	1	..	39
	PL:	7	3	7	5	5	3	2	..	32
A Few	SL:	12	2	3	3	4	5	2	2	33
	PL:	..	3	3	2	3	8	3	7	29
Most	SL:	2	..	2	..	3	..	6	6	19
	PL:	..	1	..	..	..	..	1	2	4
All	SL:	..	..	..	..	4	..	2	2	8
	PL:	..	1	..	..	..	..	..	1	2
No Response	SL:	24	12	10	7	16	10	7	10	96
	PL:	37	10	14	9	25	11	12	10	128

while about 25 per cent indicated they had access to more than two books on the teaching of mathematics. These data lose significance when it is noted that about 45 per cent of the teachers failed to respond to this item in both respects.

Thirty-nine teachers reported that none of the yearbooks of the National Council of Teachers of Mathematics were in the school library. Eight teachers reported that their school libraries had all the yearbooks. In between these extremes, 33 reported that their library had a few and 19 indicated that their library had most of the yearbooks. At least 60 teachers, then, had some access to these aids to teaching. Ninety-six teachers failed to respond to this part of the inquiry.

Two teachers said that they had all the yearbooks in their possession; four had most of them, while 29 had a few. Failure to respond caused this data to be of limited value

Supervision received by the teachers. Chapter III has suggested that some of the teachers had some rather vexing problems. One of the functions of supervision is to reduce the problems confronting teachers. It was anticipated that the teachers would report problems of some magnitude; therefore, it was felt justifiable to attempt to determine the nature and type of supervision received by the teachers.

Table 58 shows the principal activities involved in the supervision given the teachers. At the top of the list, numerically, are activities of an administrative nature.

TABLE 58

THE NATURE OF THE SUPERVISORY ACTIVITIES
REPORTED BY THE MATHEMATICS TEACHERS

Nature of Supervisory Activity	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
Keeping Administration Informed of My Needs	13	9	8	..	15	10	7	7	69
Concerned with administrative Details	21	4	10	5	10	6	6	4	66
Planning and Carrying Out Testing Program	16	4	5	1	6	4	4	4	44
Selecting and Organizing Teaching Materials	9	5	2	1	7	4	5	4	37
Preparing Courses of Study or Teaching Units	6	4	2	2	6	3	8	2	33
Comparing Different Methods of Instruction	4	4	..	..	5	2	4	..	19
Providing Professional Literature	4	2	1	..	6	..	2	3	18
Conducting Research to Improve Instruction	2	3	1	1	3	2	2	..	14
"I Had No Supervisor"	..	1	1	..	..	2	..	..	4
Total Responses	75	36	30	10	58	33	38	24	304

According to the responses of the teachers, activities such as "conducting research to improve instruction" received minor attention.

To complement the data of Table 58, the teachers were asked to indicate the nature of the supervisory relationships in their schools. Table 59 indicates the emphasis placed on the various relationships. Faculty meetings appeared to be the primary method of conducting supervision. An interesting contrast is noted when the response to the frequency of classroom visits is studied; 81 teachers indicated that their classrooms were visited occasionally, while only 17 said that they were visited frequently. Fifty-six teachers were supervised by the combination of classroom visitations, conferences, and faculty meetings. More than one-fifth of the teachers felt that there was no concern for their teaching methods, while one out of ten had discovered no concern for their teaching problems. A few teachers admitted that their supervisor had no opportunity to supervise.

Perhaps two comments, one from a teacher in her first year of teaching and the other from a supervisor with extensive experience, will suffice to illustrate the supervisory problem. The first teacher stated that, "All my questions are answered, but no one makes an effort to give me 'pointers' without my asking for them." The supervisor (in another

TABLE 59

THE NATURE OF THE SUPERVISORY RELATIONSHIPS REPORTED BY THE MATHEMATICS TEACHERS

Nature of Supervisory Relationship	Size of High School: Less than 200		200 to 399		400 to 799		800 or more		
	M 44	W 18	M 24	W 16	M 33	W 22	M 18	W 20	Total 195
No Concern for My Teaching Methods	8	5	3	6	7	4	6	3	42
No Concern for My Teaching Problems	4	3	2	1	3	1	5	1	20
Occasional Visits to My Classroom	18	4	15	6	14	11	6	7	81
Frequent Visits to My Classroom	4	3	2	2	3	2	1	..	17
Primarily Conferences with Supervisor	3	4	4	1	2	3	1	3	21
Primarily Faculty Meetings	13	6	15	8	15	10	9	10	86
Classroom Visitations, Conferences, and Faculty Meetings	12	4	4	5	11	6	9	5	56
Supervisor Had Too Many Duties to Properly Supervise	5	2	3	1	4	..	2	1	18
Respondent was a Supervisor	4	..	1	..	1	..	..	1	7
Total Responses	71	31	49	30	60	37	39	31	348

school) seems to retort when she says, "I am a mathematics supervisor, but only when help is needed or requested. I try to do anything that will help a new teacher but I do not have time for visiting other teachers' classes."

CHAPTER V

SUMMARY AND CONCLUSIONS

Limitations

In an early portion of the report a limiting factor related to the nature of the checklist was mentioned. This limitation may be restated at this point by asking the question, "Did the teachers respond to the checklist in the easiest manner possible?" If so, then important considerations which the teachers could have mentioned may have been omitted, even though space and suggestions to amplify or extend the responses were provided. Another limitation, previously mentioned, placed on the interpretation of findings was the lack of responses on the part of some of the teachers. Failure of one teacher in four to respond may have affected the data in some instances. With these sources of bias in mind, the summary of findings and conclusions is presented.

Personnel Characteristics of the Sample

1. Sixty-five per cent of the sample were men, of whom nine out of 10 were married. Forty-five per cent of the women teachers were married.

2. The women teachers were a much older group, as a

whole, than the men teachers. The median age of the women teachers was 47, while that of the men was 35. Ages of the teachers tended to increase with the size of the school.

3. Tenure in their present positions was considerably greater for the women than for the men. The median years of tenure for the former was 15, for the latter, seven.

4. Although relative tenure depended in part on the relative ages of the two groups, it appears that the women teachers are more stable in the profession than the men.

5. The principal influences tending to cause the teachers to become teachers of mathematics were personal preference, influence of a high school teacher, influence of a college mathematics teacher, being requested or required to teach mathematics, and the influence of some member of the teacher's family.

6. One-fourth of all the teachers had not attended a college or university in the last five years; one-half of the women teachers had not done so.

Preparation in Terms of Degrees

1. All the teachers of the sample had a bachelor's degree. The sources of these degrees were as follows: state colleges, 56 per cent; the two state universities, 24 per cent; private colleges in Oklahoma, seven per cent; out-of-state institutions, 13 per cent.

2. Sixty-three per cent of the sample and of each

sex had master's degrees; in addition, 17 per cent of the sample were working toward a master's degree at the time of the study. The major sources of these degrees were the two state universities; 19 per cent had attended or were attending out-of-state institutions.

3. Nine per cent of the men teachers were working toward doctor's degrees. None of the women teachers was doing so, although several had considerable work beyond a master's degree.

Major and Minor Preparation

1. Sixty-five per cent of the sample had a major in mathematics at the undergraduate level; 27 per cent had a minor in mathematics.

2. The principal undergraduate minors of the teachers with an undergraduate major in mathematics were history or social studies, physics, biology, and education. The principal undergraduate major of those with a minor in mathematics was education.

3. Only one out of six teachers who had an undergraduate major in mathematics majored in mathematics at the graduate level. Almost that same portion, however, did earn a minor in mathematics. Thirty per cent of those with an undergraduate major in mathematics, then, continued to concentrate in mathematics to some degree at the master's level.

4. One-fourth of the teachers with an undergraduate

minor in mathematics continued that degree of concentration at the master's level. Three teachers in this category changed to a major concentration in mathematics at the master's level.

5. The majority of teachers who continued to concentrate in mathematics at the master's level were women; of the 43 teachers with either a major or minor in mathematics, 25 were women.

6. Five out of seven teachers with an undergraduate major in mathematics changed to either secondary education or school administration at the master's level; most of the latter were men. In fact, one-half of the men who had an undergraduate major in mathematics changed to school administration.

7. The teachers with undergraduate minor in mathematics also changed to secondary education and school administration in about the same proportions. Again they were, for the most part, men.

8. Based upon the above data, it was concluded that the women teachers tend to remain teachers of mathematics longer than men. The men appear to be "passing through" mathematics teaching as a step to other preferred and, perhaps, more lucrative positions. This inference is reinforced by the data on comparative ages of the sexes and tenure in their present positions.

Preparation in Mathematics Courses

1. The median number of undergraduate semester hours in mathematics for all the teachers was 26; for teachers with a major in mathematics the median was 28 and for teachers with a minor, the median was 22.

2. The median number of total semester hours of mathematics, including both undergraduate and graduate, was 29; the range extended from 11 hours to 81 hours.

3. The principal reasons given by the teachers for not taking more mathematics at the graduate level were that graduate mathematics was only remotely related to high school mathematics and that the respondents changed fields.

4. The courses which the majority of the teachers sutdied were those courses most commonly studied in the first two years of college, i.e., intermediate algebra, solid geometry, college algebra, plane trigonometry, plane analytic geometry, differential calculus, and integral calculus.

5. The above courses, with the exception of the two calculus courses and with the addition of advanced plane geometry, were generally the courses considered most helpful toward teaching secondary mathematics at the high school level.

6. Considering the minimum recommendations of various authorities, e.g., the recommendations of the Commission on Post-War Plans,[1] the following courses in college mathe-

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[1] "Second Report of the Commission on Post War Plans," op. cit., pp. 218-219.

matics were not adequately studied by the teachers: theory of equations, advanced plane geometry (or college geometry), history of mathematics, spherical trigonometry, and applications of mathematics (surveying, slide rule, etc.).

Preparation in Professional Education Courses

1. The median number of semester hours in education courses at the undergraduate level was 23. The range was from less than 11 hours to more than 40 hours.

2. The median for the total number of semester hours of education was 40. Although the range for total hours of mathematics is about the same as that for education courses, the median for the latter is 11 hours more. Seventeen teachers reported that they had earned more than 65 hours of education credit.

Preparation in Courses in Teaching of Mathematics

1. Seventeen per cent of the teachers reported that they had no credit in these courses. Those who had credit had, on the average, taken two courses. The median number of semester hours was four.

2. About 40 per cent of the teachers with credit in these courses felt that both the number and scope of these courses was inadequate.

3. The principal topics or activities considered valuable and appropriate in these courses were attention to individual differences of students, study of applications of

mathematics, construction of teaching aids, and a rapid review of the content of the common secondary mathematics courses.

4. Five out of nine teachers thought that a proper person to teach these courses would be a professor who divided his time between the departments of mathematics and education.

Preparation in Related Fields

1. About 27 per cent of the teachers reported no undergraduate training in physics and 28 per cent reported none in chemistry. The teachers had a slightly better background in biology than in either physics or chemistry.

2. Only one out of four teachers reported any credit in astronomy.

Problems of the Teachers

1. The problems which, in the opinion of the teachers, appeared to reduce their efficiency the most were those related to individual differences of their students, their teaching load, and their extra-curricular duties.

2. Considerable sentiment was expressed for the desirability of homogeneous grouping of the student to more adequately care for individual differences of the students. Only 20 teachers reported that their schools practiced homogeneous grouping.

3. If proper allowance is made for other major duties

of some of the teachers apart from teaching, it can safely be asserted that the standard teaching load was five classes per day.

4. The student-teacher ratio, on the average, was found to be 27. The larger schools had significantly larger classes than the smaller schools.

Practices of the Teachers

1. The principal means used to care for individual differences of students was individual instruction. A variety of approaches, however, was used.

2. The instructional materials used by the teachers were, for the most part, the common and traditional ones. Some of the teachers expressed extreme dissatisfaction with the materials available.

3. The teachers tended to give tests at the end of a teaching unit or on a weekly basis.

4. Teacher-made tests, either written on the blackboard or duplicated in some form, were the principal type of tests given; less than one out of three teachers gave standardized tests or diagnostic tests.

5. When planning for instruction, the principal tendency of the teachers was to follow closely the textbook plan.

6. Only one out of three teachers was a member of the National Council of Teachers of Mathematics; on the other

hand, practically all of the teachers were members of the Oklahoma Education Association and most were members of the National Education Association.

7. Four out of seven teachers read The Mathematics Teacher; practically every teacher read The Oklahoma Teacher and the NEA Journal.

8. About 10 per cent of the teachers reported that there were no books on the teaching of mathematics available to them. At least 20 per cent had no access to Yearbooks of The National Council of Teachers of Mathematics.

9. The supervision received by the teachers was mostly of a perfunctory nature, carried on by faculty meetings and occasional visits to the teachers' classrooms.

General Conclusions and Recommendations

1. The teachers of mathematics in the North Central Association high schools of Oklahoma are well prepared in terms of college degrees.

2. When the preparation of these teachers is considered in terms of major and minor areas of concentration and in amounts of credit in those areas, it is quite varied. Preparation in college mathematics was extended over a wide range of credit and courses; preparation in professional courses exhibited the same characteristic. This is, perhaps, to be expected when it is remembered that these teachers have been trained by a number of institutions over an

extended period of time. This diversity of preparation reflects changing emphases by the institutions through the years, and at the present time by the various types of institutions.

3. Data in this study reflects the acceptance on the part of the teachers of the fact that five years of training is the optimum amount for teachers of secondary mathematics. The forces that brought about this acceptance--whether they were genuine professional reasons at one extreme or salary considerations at the other extreme--will not be discussed here.

The diversity of preparation mentioned above, especially with respect to the fifth year, leads to questions concerning the proper scope of that preparation. Is a teacher optimally trained when that teacher studies only mathematics or education at the graduate level? If a teacher studies mathematics only at the graduate level it could imply that his undergraduate preparation in education was adequate. If only education was studied in the fifth year then it could be implied that his undergraduate preparation in mathematics was adequate. With some exceptions, both of these implications could not be taken to be true. Yet, some of the data of this study lends credence to both statements.

Is it possible that some teachers of secondary mathematics need very little of either mathematics or education at the graduate level to increase their teaching competency?

A variety of teaching responsibilities and requirements in the high school would seem to indicate a broadening of the base of preparation rather than a vertical extension either of educational theory and methods or of mathematics. Would not a study of other, perhaps related, areas, even at a basic undergraduate level improve that fifth year preparation in the direction of teaching competency? If a teacher of mathematics is often called upon to teach general science, would not a study of those sciences in which the teacher had little or no preparation be more relevant than the oft repeated pattern of more education or more mathematics?

Are arbitrary divisions of subject matter into two levels--undergraduate and graduate--and quasi-statutory requirements for degrees, as evidence of professional advancement, joint barriers to improvement of teachers in the direction of improving the teacher in terms of the things he is going to have to do anyway?

It is the judgment and recommendation of this writer that consideration be given to means whereby the criterion for choice of college subjects to study in the fifth year of preparation be improvement of teaching competency, regardless of the level of subject matter, undergraduate or graduate, and that the measures of professional improvement, whether they be academic degrees or something else, be related to this criterion. Good effects of such plans would seem to be flexible preparation to meet varying conditions in the schools, removing deficiencies in undergraduate training occasioned by lack of time, lack of proper advice, and lack of knowledge on the part of the prospective teacher with respect to an optimum program. The concept of broad fields of preparation, changing conditions in the schools, and removal of deficiencies of individual teachers should give rise to plans for preparation of teachers in the fifth year which transcend the division of subject matter into undergraduate and graduate levels.

4. Even though low salary was not often mentioned as a principal problem by the teachers, it is felt by the writer that economic pressure on the men teachers is implied in the data which showed the preponderance of men teachers shifting to school administration at the graduate level, presumably to become qualified to occupy the more lucrative administrative positions. Considerations should be given to means by which these men could remain as classroom teachers without undue financial stress.

5. College departments of mathematics should, insofar as its other responsibilities will permit, make every effort to identify the problems of secondary teachers of mathematics and relate the college mathematics courses, especially the more advanced ones, to the teaching of secondary mathematics. The role of the teacher in extending mathematical competency and knowledge horizontally rather than vertically should be recognized.

6. Courses in the teaching of mathematics should place particular stress upon the topic of individual differences of students, particularly with respect to mathematics learning, so that teachers may develop competency in adjusting the high school mathematics courses and curriculum to more adequately meet this problem.

7. Closer liaison should be established between the departments of mathematics and education, possibly by a person who spends some time in both departments.

8. Local supervisors of mathematics teachers need to involve themselves to a greater degree in the work of the mathematics teacher. The problems arising from a combination of a variety of students, a rather heavy teaching load, and duties other than teaching should not be faced by the teacher alone. The supervisor may not be acquainted with the problems arising from the subject matter, but he should find the means and take the time to ameliorate these other conditions where they exist.

9. Other than the supervisor and the training institution, the principal means for a teacher to keep abreast of the time and to seek solutions to teaching problems are the publications related to the teaching of mathematics. More attention should be paid by the teachers and supervisors, especially, to this important phase of in-service education. Where necessary these publications should be subsidized by the school and made available to the teachers. This recommendation applies especially to the periodical type of literature.

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APPENDICES

APPENDIX A

State Capitol Building
Oklahoma City, Oklahoma
April 15, 1954

The North Central State Committee is sponsoring a study to investigate factors affecting teachers and teaching of secondary mathematics. Some of those factors are concerned with your professional training and experience together with your evaluation of that training and experience.

The enclosed checklist, when completed and returned by you, will represent your contribution to that study. Less than one hour will be needed to complete the checklist. In most cases a check is all that is needed. However, many of the suggested responses may not fit your particular situation; you are invited - in fact urged - to write in other responses where appropriate.

Your cooperation in completing this checklist and returning it in the self-addressed envelope will be highly appreciated. All information will be kept strictly confidential. It is not necessary for you to sign the checklist; only the name of the school is needed.

If you desire a summary of the checklist be sure to respond in the affirmative at the end of the checklist.

Thank you for your cooperation.

Sincerely yours,

Standifer Keas

J. Standifer Keas
Chairman,
Oklahoma State Committee,
North Central Association,
Commission on Secondary Schools.

APPENDIX B

APPENDIX C

MATHEMATICS TEACHERS: THEIR PREPARATION, PROBLEMS, AND PRACTICES
IN THE NORTH CENTRAL HIGH SCHOOLS OF OKLAHOMA

Name of School ______________________, Address ______________________ Okla.

Your name (omit if you wish) ______________________________ Age ______
Male ___ Female ___ Married ___ Single ___ Single (or widowed) with dependents ___
Your official status now: Supt ___ Principal ___ Dept Head ___ Teacher ___.

Degrees held or in progress: List title, major, minors, college or university, and year obtained or expected. Use last space (____) for a degree in progress and give fractional part completed, e.g., (MA $\frac{1}{2}$).

Title	Major	Minors	College or University	Year
( )				

Oklahoma teaching certificates held: List type (S-Standard, P-Provisional, T-Temporary, L-Life), area (Mathematics, Science, Foreign Language, etc.), and teaching fields where applicable (Physics, Chemistry, French, etc.).

Type	Area	Teaching Fields

What is your preferred teaching field? ______________. Give the calendar year of your last attendance in a college or university. 19______.

What influenced you most in the choice of mathematics as a subject to teach? (Check or list one)

___influence of a high school teacher
___influence of a college math teacher
___influence of other college teacher
___influence of a family member
___influence of a friend
___was required to teach it and liked it very much
___pure chance or accident
___I am only teaching it temporarily
___(Other) ______________________

Experience: Give number of years.

___in non-teaching work
___total years of teaching
___as an elementary teacher
___as a jr. high school teacher
___as a sr. high school teacher
___as high school teacher of mathematics
___number of years in present position

Courses in high school mathematics: Give units of credit ($\frac{1}{2}$, 1, etc.; one year's work equals one unit) that you received as a high school student.

___General Mathematics
___Algebra
___Plane Geometry
___Solid Geometry
___Trigonometry
___Arithmetic
___ (Other) ______________________
___ ______________________
___ ______________________
___ Total units

Check the appropriate blank which gives the size of your graduating class when you graduated from high school. ___1-20, ___21-80, ___81 or more.

Courses in college mathematics: Fill in the three columns as indicated.
U: Check the courses you took as an <u>undergraduate</u>
G: Check the courses you took as a <u>graduate student</u>
E (Evaluation: Place a cross (X) opposite those <u>four courses</u> most helpful to you as a teacher of high school mathematics.
: Place a circle (O) opposite all those courses that have contributed practically nothing.

U	G	E		U	G	E	
___	___	___	General (or Basic) Math.	___	___	___	Surveying
___	___	___	Plane geometry	___	___	___	Slide Rule
___	___	___	Solid Geometry	___	___	___	Descriptive Geometry
___	___	___	Intermediate Algebra	___	___	___	Advanced Calculus
*___	___	___	College Algebra	___	___	___	Partial Differential Eq's
*___	___	___	Plane Trigonometry	___	___	___	Projective Geometry
*___	___	___	Plane Analytic Geometry	___	___	___	Modern (Higher) Algebra
*___	___	___	Differential Calculus	___	___	___	Mechanics
*___	___	___	Integral Calculus	___	___	___	Function Theory (Complex)
**___	___	___	Mathematical Analysis	___	___	___	Function Theory (Real)
___	___	___	Theory of Equations	___	___	___	Differential Geometry
___	___	___	Ordinary Differential Eq's	___	___	___	(Other) ___
___	___	___	Advanced Plane Geometry	___	___	___	___
___	___	___	Spherical Trigonometry	___	___	___	___
___	___	___	Mathematics of Finance	___	___	___	___
___	___	___	Mathematical Statistics				Semester hours in courses above:
___	___	___	History of Mathematics				Undergraduate ___
___	___	___	Solid Analytic Geometry				Graduate .... ___
							Total .... ___

*These courses are sometimes integrated into a series of courses called Mathematical Analysis included above**. Use appropriate titles.

Reason why you did not take more undergraduate mathematics: (Check or list)

___I took all that was offered
___I didn't like mathematics
___I didn't expect to teach math
___I lost interest in math
___I took all that was required for a major
___I became interested in another field
___I didn't like the math instructors
___I took all that was required for a minor
___ (Other) ___

Reason why you did not take: (1) any graduate mathematics or ___(Check
(Check or list one below) (2) any more graduate mathematics ___ one)

___I haven't begun graduate study
___I lost interest in mathematics
___I took all that was offered in summer school
___graduate math is too remote from high school mathematics
___graduate math was too difficult
___I took all that was offered for a major
___I took all that was offered for a minor
___ (Other) ___

Professional courses in the teaching of mathematics: Fill in the two columns as indicated. (These may not be exact course titles; choose appropriate ones).

B: Check the courses taken before you began teaching mathematics.

A: Check the courses taken after you began teaching mathematics.

B	A		B	A	
___	___	Teaching of Secondary Mathematics	___	___	Teaching of Arithmetic
___	___	Teaching of Sr. High School Math	___	___	Teaching of Algebra
___	___	Teaching of Jr. High School Math.	___	___	Teaching of Geometry
___	___	Teaching of General Mathematics	___	___	(Other) ________________
___	___	Seminar in teaching of math.			

Total hours in these courses________

Do you believe that the number of courses offered in the teaching of mathematics was adequate when you took the above courses? Yes____ No____.

Do you believe that the scope of the courses you took in the teaching of mathematics was adequate? Yes____ No____.

Indicate below some of the topics or activities which you consider as appropriate and valuable in courses designed specifically for the preparation of teachers of secondary mathematics.

___a rapid review of the content of the more common secondary math courses
___analysis of several representative textbooks in the common courses
___analysis of several representative workbooks in the common courses
___analysis of standardized tests in secondary mathematics
___construction of teaching aids for secondary mathematics
___selection of commercial teaching aids for secondary mathematics
___study of the applications of mathematics
___attention to problems of individual differences of students
___ (Other) ____
___ ____

In your opinion who should teach the courses in the teaching of mathematics?

___a mathematics professor ___an Education professor
___a professor who divides his time between the department of mathematics and the department of Education
___ (Other) ____

Courses in the sciences: Fill in the two columns as indicated below.

U: Number of semester hours you took as an undergraduate

G: Number of semester hours you took as a graduate student

Physical Sciences U	G		Biological Sciences U	G		Earth Sciences U	G	
___	___	Physics	___	___	Zoology	___	___	Geology
___	___	Chemistry	___	___	Botany	___	___	Geography
___	___	Astronomy	___	___	Biology	___	___	________
___	___	________	___	___	Physiology	___	___	________
___	___	________	___	___	________	___	___	________

Professional courses (Education): Fill in the three columns as indicated.
U: Check the courses you took as an undergraduate.
G: Check the courses you took as a graduate student.
E (Evaluation): Place a cross (X) opposite those <u>four</u> <u>courses</u> most helpful to you as a teacher of high school mathematics.
: Place a circle (O) opposite <u>all</u> those courses that have contributed practically nothing.

U	G	E		U	G	E	
___	___	___	Practice Teaching	___	___	___	Audio-Visual Aids
___	___	___	Adolescent Psychology	___	___	___	Educational Guidance
___	___	___	Educational Measurements	___	___	___	Educational Statistics
___	___	___	Methods of Teaching	___	___	___	Extra-Curricular Activities
___	___	___	Principles of Education	___	___	___	Supervision
___	___	___	Philosophy of Education	___	___	___	Administration
___	___	___	History of Education	___	___	___	(Other) ______________
				___	___	___	______________

Semester hours in Education:
Undergraduate _____
Graduate ... _____
Total ...... _____

Membership in professional organizations: (Check or list those to which you belong)
___ National Council of Teachers of Mathematics
___ The Mathematical Association of America
___ The Central Association of Science and Mathematics Teachers
___ The National Education Association
___ The Oklahoma Education Association
___ (Other) ______________________________
___ ______________________________

Present teaching load: List all subjects taught now (2nd semester, 1953-54). Put mathematics courses first, then other subjects, if any, and finally study halls and free periods as indicated. A sample is provided.

Subject	Grade or Year	No. of Classes	Class Periods in Minutes	No. of Pupils
1st-yr algebra	9	2	50	61
Study Halls				xxxxxx
				xxxxxx
			Total	

Number of pupils in largest class _______

Number of pupils in smallest class _______

Average class size _______

Professional periodicals: Check or list those which you read regularly and indicate their source as outlined below.
SL: The periodical is in the school library
PS: The periodical is received through a personal subscription

SL	PS	Mathematical	SL	PS	General
___	___	The Mathematics Teacher	___	___	The Oklahoma Teacher
___	___	School Science and Mathematics	___	___	The Journal of the N.E.A.
___	___	The American Mathematical Monthly	___	___	(Other) ___
___	___	(Other) ___	___	___	___
___	___	___	___	___	___

Professional books available: Check the following items which apply to you or your school and indicate their source as outlined below.
SL: The books are in the school library
PL: The books are in your personal library

SL	PL	
___	___	No books on the teaching of secondary mathematics are available
___	___	1 or 2 books on the teaching of secondary mathematics are available
___	___	More than 2 books on the teaching of secondary mathematics are available
___	___	None of the Yearbooks (of the National Council) are available
___	___	A few of the Yearbooks are available (Total is 21)
___	___	Most of the Yearbooks are available
___	___	All of the Yearbooks are available.

Extra-curricular responsibilities: Check or list those non-classroom duties which you regularly have.

___ Mathematics club sponsor
___ Other-subject club sponsor
___ Home-room teacher
___ Lunch-hour supervisor
___ Grounds & corridor supervisor
___ Counseling
___ Supervise school publication
___ Audio-visual director
___ Dramatics coach
___ Debate coach
___ Intramural athletics
___ Ticket sales
___ Athletic coach
___ Supervise assembly programs
___ (Other) ___
___ ___

Supervisory relationships: Indicate the nature of the supervision you receive by checking or listing the appropriate item.

___ No one concerns himself about my teaching methods
___ No one concerns himself about my teaching problems
___ Occasional visits are made to my classroom
___ Frequent visits are made to my classroom
___ Confined primarily to conferences with the supervisor
___ Confined primarily to group or faculty meetings
___ Consists of classroom visitation, conferences, and faculty meetings.
___ The supervisor has too many other duties to properly supervise.
___ (Other) ___
___ ___

Nature of supervisory activity: Indicate the types of activity involved in the supervisory activity in your situation.

___ Concerned with administrative details
___ Selecting and organizing teaching materials
___ Preparing courses of study and/or teaching units
___ Comparing different methods of instruction
___ Planning and carrying out testing programs
___ Conducting research to improve instruction
___ Providing professional literature
___ Keeping the administration informed of my needs
___ (Other) ____________________
___ ____________________

Practices with respect to use of tests: Indicate your practices by checking or listing appropriate items.

Frequency of tests

___ Daily
___ Weekly
___ Near end of marking period
___ At end of unit or chapter
___ Near end of semester
___ (Other) ____________________
___ ____________________

Type of Tests

___ Teacher-made tests written on the blackboard
___ Teacher-made tests printed (ditto. etc.)
___ Standardized tests are used
___ Diagnostic tests are used
___ Tests are always objective
___ (Other) ____________________
___ ____________________

Practices with respect to individual differences of students: Check or list the means or methods by which you attempt to take care of students with varying capacities and needs.

___ Contract assignments
___ Individual assignments
___ Special reports and projects
___ Extra drill
___ Individual instruction
___ Directed study
___ Diagnostic tests
___ Allow varying rates of progress
___ Homogeneous grouping (school-wide)
___ Grouping within the classroom
___ Problems graded according to difficulty
___ Supplementary directed reading
___ (Other) ____________________
___ ____________________

Practices with respect to planning for instruction: Check or list what you do to prepare for instruction.

Long Range Planning

___ I accept the textbook organization
___ I modify the textbooks plan
___ I organize the course in outline form
___ I write a syllabus
___ (Other) ____________________
___ ____________________

Short-Term Planning

___ I divide the textbook into short units
___ I write daily lesson plans
___ I write weekly lesson plans
___ Lesson plans are required
___ (Other) ____________________
___ ____________________

Instructional materials: Indicate the type of instructional materials you use and those that you think would be desirable to use. At the top of the columns place the number corresponding to the subjects listed which you teach and under the sub-columns labeled U and D check those items you use and desire to use, if they were available, respectively.

1. General Mathematics
2. 1st-yr Algebra
3. Plane Geometry
4. Solid Geometry
5. Advanced Algebra
6. Trigonometry
7. Commercial Arithmetic
8. Refresher Mathematics
9. ____________________
10. ____________________

	( )		( )		( )		( )		( )	
	U	D	U	D	U	D	U	D	U	D
Supplementary Texts										
Supplementary Reading Books .										
Films										
Filmstrips.										
Slides (2x2 & $3\frac{1}{2}$x4)										
Opaque Projector.										
Overhead Projector (Vue-graph)										
Stereographs.										
Models.										
Devices (Flexible figures). .										
Bulletin Boards										
Colored Chalk										
Coordinate Blackboards. . . .										
Spherical Plackboards										
World Globe										
Blackboard Protractors. . . .										
Blackboard Compasses.										
Blackboard Rulers										
Blackboard Stencils										
Blackboard Templates.										
Pantograph.										
Parallel Rulers										
Charts - Commercial										
Charts - School Made.										
Surveying Equipment										
Demonstration Sliderule . . .										
(Other)										
____________________										
____________________										
____________________										
____________________										
____________________										
____________________										
____________________										

Principal problems you are experiencing now: Check or list the principal problems that you think are interfering with your efficiency as a teacher. Below each one checked indicate the nature of the problem.

____Planning for instruction

____Teaching load

____Instructional materials

____Pupil Personnel Problems

____Supervisory Problems

____Extra-curricular problems

____Problems of Individual differences

____ (Other) ______________________________

____ (Other) ______________________________

Do you desire to have a summary of the findings of this study sent to you?
Yes____ No____.

State Capitol Building
Oklahoma City, Oklahoma
May 3, 1954

Dear Mathematics Teacher:

About two weeks ago you were sent a check-list concerning the preparation, problems, and practices of mathematics teamhers in the North Central High Schools of Oklahoma. To date no response has been received from you. I realize that it is probably a very busy time of the year and you may have mis-laid or forgotten it.

It is possible that your response is in the mail now. If not, won't you please take a little time to make your contribution to a study which needs your peculiar problems, particular preparation, and principal practices (combined with those of other teachers) to help provide the most complete picture possible concerning the status of this group of teachers.

In case you have misplaced or lost the other form sent you, another is inclosed for your convenience. When you have completed the check-list please send it to the following address:

J. Standifer Keas
State Capitol Building
Oklahoma City, Oklahoma

Thank you for your cooperation.

Yours truly,

Standifer Keas

J. Standifer Keas