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FORS, Elton W., 1934-

TRENDS AND FACTORS IN THE CURRICULAR CHOICES OF THE MATHEMATICS MAJORS IN SELECTED STATE COLLEGES AND UNIVERSITIES IN OKLAHOMA.

The University of Oklahoma, Ph.D., 1969
Education, teacher training

University Microfilms, Inc., Ann Arbor, Michigan

THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

TRENDS AND FACTORS IN THE CURRICULAR CHOICES OF THE MATHEMATICS MAJORS IN SELECTED STATE COLLEGES AND UNIVERSITIES IN OKLAHOMA

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

BY

ELTON W. FORS

1969

TRENDS AND FACTORS IN THE CURRICULAR CHOICES OF THE MATHEMATICS MAJORS IN SELECTED STATE COLLEGES AND UNIVERSITIES IN OKLAHOMA

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ACKNOWLEDGMENTS

The writer would like to express his sincere appreciation to Dr. Harold Huneke, who suggested the problem and directed the work, for his assistance in contacting the schools and in collecting the data, for his advice, editorial aid and encouragement throughout the research and in the writing of this dissertation.

My gratitude is also extended to the other members of the committee, Dr. Arthur Bernhart, Professor Eunice Lewis, and Dr. John Renner for their time and helpful suggestions concerning the research and the writing of this dissertation.

The writer would also like to thank the following persons for coordinating the collection of the data at the schools included in this study: Professor Dorthea Meagher, Central State College; Dr. James Danley, East Central State College; Dr. Herbert Monks, Northeastern State College; Dr. Jack Phelps, Northwestern State College; Professor Robert Murphy, Panhandle State College; Dr. Leslie Dwight, Southeastern State College; Dr. Raymond McKellips, Southwestern State College; Professor Wayne Rhea, Oklahoma Baptist University; Dr. Lysle Mason, Phillips University; and Dr. Harold Huneke, The University of Oklahoma.

Finally, the writer would like to thank his wife, Pat, for her patience, understanding, and encouragement throughout the preparation and writing of this dissertation.

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CHAPTER I

INTRODUCTION

Introduction to the Problem

The classroom teacher is an important person in the American educational system. The Educational Policies Commission has stated that "qualified teachers are the primary and essential factor in good education."[1] If the supply of qualified teachers is inadequate, a major obstacle to the production of trained manpower is created and can create shortages in other areas where trained manpower is critically needed.[2]

The Research Division of the National Education Association has noted that "within the group of prospective new high school teachers the concentration in some teaching

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[1] Educational Policies Commission, Manpower and Education (Washington: National Education Association and the American Association of School Administrators, 1956), 109.

[2] Ibid, 113.

fields is considerably in excess of the prospective employment; in other fields the number of newly graduated candidates is scarcely more than one-half of the number of new teachers actually employed. In order, these latter fields are mathematics, the physical sciences, English and foreign languages."[3] George S. Carnett stated, that "in the United States, mathematics is an area of perennial teacher shortage at all levels of instruction."[4]

In the past, when qualified teachers were not available, the schools usually placed the best person available in the classroom. The schools have assigned teachers whose main interest was in some related field, such as science, to teach mathematics. They have also turned to qualified former teachers, qualified teachers who postponed their entry into teaching and to persons with mathematical qualifications, but without the professional education qualifications.

Consequently, the continuing shortage of mathematics teachers has necessitated the placement of many persons in the mathematics classroom who have less than a mathematics major in college preparation and whose main interest is in some other field. Carl A. Larson stated that "a survey by

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[3]"The Selective Shortage of Teachers," NEA, Research Bulletin, XLIII (October, 1965), 74.

[4]George S. Carnett, "Is Our Mathematics Inferior?," The Mathematics Teacher, LX (October, 1967), 585.

the Department of Education revealed that probably more boys and girls in California secondary schools are taught by teachers who have neither majors nor minors in mathematics than in any other field."[5] P. D. Vario and W. M. Perel, in studying the applications to a National Science Foundation Institute in 1965-66 at the University of North Carolina at Charlotte, discovered that seventy-eight percent of the applicants taught only mathematics and approximately sixty-one percent of the applicants had a mathematics major. Only twenty-five percent had more than two courses above the calculus.[6] Charles Bradshaw stated that of 321 teachers who were teaching at least one mathematics class in the secondary schools of Nevada, during the academic year 1964-65, thirty-one percent were mathematics majors, seventeen percent were mathematics minors, and fifty-two percent were neither a major nor a minor. Forty teachers had no college mathematics and 121 had less than eight hours of college mathematics.[7]

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[5]Carl A. Larson, "Problems Connected with the Raising of Teacher Preparation Standards in the Far West," Five Conferences on the Training of Teachers of Mathematics (Pontiac, Michigan: Committee on the Undergraduate Program in Mathematics, 1961), 3.

[6]P. D. Vario and W. M. Perel, "Mathematics Teacher in the Market Place," Clearing House, XLI(January, 1967), 288-91.

[7]Charles K. Bradshaw, "Mathematics Teaching in the Public Secondary Schools of the State of Nevada" (unpublished Ed. D. dissertation, University of California, Berkeley, 1968).

A major reason for these conditions is that the number of college graduates who entered teaching and were qualified to teach mathematics, has not been sufficient to meet the demand. In 1967, the college graduates who were qualified for mathematics teaching credentials, filled only seventy percent of the national demand for new teachers for the academic year 1967-68.[8]

This study was concerned with the supply of new secondary mathematics teachers which is primarily determined by: (1) the number of students who enter college intending to major in mathematics; (2) the number of students who transfer into or out of the mathematics curriculum; (3) the percentage of mathematics majors who select the teacher certification programs; and (4) the number of students who complete the teacher certification programs, but do not go into teaching.

Statement of the Problem

The problem in this study was to determine for a selected group of colleges and universities in Oklahoma:

a) The changes in the number of mathematics majors who have completed the teacher certification programs, 1963-1968.

b) The factors that influenced the junior and senior

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[8]George S. Carnett, loc. cit., 585.

mathematics majors of 1968-69 and the graduates of 1968 to become mathematics majors.

c) The factors that influenced the junior and senior mathematics majors of 1968-69 and the graduates of 1968 to enter or not to enter the teacher certification programs.

d) The factors that influenced some of the students in the teacher certification programs, 1968-69, not to enter the teaching profession upon their graduation.

The Need for the Study

The need for the study is partially indicated by the statements presented in the introduction. If there is a growing shortage of qualified mathematics teachers in the secondary classrooms, then we can expect less than optimal teaching of mathematics in the secondary schools. This could tend to decrease the number of mathematics majors, from which the secondary and college teachers, as well as other mathematicians, must be obtained to meet the needs of the expanded mathematics offerings in the high schools and colleges and the expanded needs of industry.

The Educational Policies Commission has stated that "all possible steps should be taken to attract into teaching, larger proportions of college graduates--particularly those graduates trained to teach, who now go into other fields."[9]

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[9]Educational Policies Commission, loc. cit., 115.

This is particularly true in mathematics since the computer industry has opened many more opportunities for mathematics majors and more opportunities exist for graduate study in mathematics.

To increase the output of secondary mathematics teachers, it is necessary to know what changes are occurring in the production of mathematics teachers and why they are occurring. If the output is not increasing with the demand, it is necessary to know if it is because of fewer mathematics majors, fewer majors selecting the teaching curricula, fewer majors going into teaching after becoming qualified for certification, or possibly a combination of these factors.

In the study of teacher characteristics it is important to distinguish between those interests and values which are a consequence of participation in a career and those which predispose the individual toward the choice of such a profession.[10] "Comparative studies of people already in a field are in themselves a limited source of data regarding the essential characteristics of those who might aspire to enter it."[11] This study attempted to obtain better data

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[10]George G. Stern, "Measuring Noncognitive Variables in Research on Teaching," Handbook of Research on Teaching, N. L. Gage (ed.)(Chicago: Rand McNally and Company, 1963), 418.

[11]Ibid.

by comparing individuals in the profession, individuals who were about to enter the profession, and those mathematics majors who were not planning to enter the profession.

Limitations

This study was limited to Phillips University, Oklahoma Baptist University, the University of Oklahoma and seven state colleges in Oklahoma. The study included the graduates for the period 1963-1968 and the junior and senior mathematics majors for the academic year 1968-69.

Definitions of Terms

Teaching Curriculum - Any mathematics program that involves the completion of the education and psychology courses that would be necessary to become certified as a secondary mathematics teacher in Oklahoma from a student's particular school.

Non-teaching Curriculum - Any mathematics program that does not involve the completion of the education and psychology courses that would be necessary to become certified as a secondary mathematics teacher in Oklahoma from a student's particular school.

CHAPTER II

REVIEW OF RELATED LITERATURE AND RESEARCH

Trends in the Production of Mathematics Teachers

There are many ways to estimate the demand for new teachers. In the 1967 edition of Teacher Supply and Demand in Public Schools, two useful estimates were used. One of these estimates is based on teacher demand related to a minimum standard, and is called the Quality Criterion Estimate; the second estimate is based on the expectation of a continuation of the trends in the staffing of public schools, adjusted to account for expected staff increases due to the Elementary and Secondary Education Act of 1965. This second estimate is called the Adjusted Trend Criterion Estimate.[12]

The Quality Criterion Estimate uses the components of: (1) the number of new teachers needed to fill new positions being created to accommodate enrollment changes; (2) the number of new teachers needed to replace the teachers who are interrupting or terminating their careers; (3) the

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[12]National Education Association, Research Division, Teacher Supply and Demand in Public Schools, 1967 (Washington: National Education Association, 1967), 31-32.

number of teachers having substandard professional qualifications who need to be upgraded or replaced; (4) the number of new teachers needed to reduce overcrowded classes to reasonable maximum sizes; and (5) the number of new teachers needed to provide adequate staffing of new educational offerings, added special instructional services, and reorganization for instruction.[13]

The Adjusted Trend Criterion Estimate considers the recent staffing practices by projecting from the number of new teachers employed in recent years. This reflects the trends toward improvement and changing conditions as opposed to the achievement of a minimum staff in the classroom and provides a minimum estimate of the employment opportunities for beginning and re-entering teachers.[14]

The main components of this estimate are: (1) positions being created or eliminated as a result of changes in enrollment, organization for instruction, and in the pupil teacher ratio; and (2) positions created by the teachers who are terminating or interrupting their teaching careers.[15]

Based on the Quality Criterion Estimate, 135,966 new secondary teachers were needed in 1967. The more conservative estimate, the Adjusted Trend Criterion Estimate,

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[13] Ibid, 33.

[14] Ibid, 37.

[15] Ibid, 37.

predicted a need for 98,751 new secondary teachers.[16]

The supply of beginning secondary mathematics teachers in 1967 was 7,282. The conservative estimate, the Adjusted Trend Criterion Estimate, predicted that the demand for beginning teachers of secondary mathematics in that year would be 11,223. This estimate allowed for the re-entry of 4,257 former teachers into the classroom. If this re-entry rate were reduced the shortage of 3,941 teachers would be even greater.[17]

The Quality Criterion Estimate would inflate these figures; but, "based on the Adjusted Trend Criterion Estimate of demand, with allowance for the re-entry of qualified experienced teachers as in 1966-67, the shortages of beginning teachers are expected to continue in elementary schools, secondary-school mathematics, and secondary-school sciences."[18]

Changing enrollment patterns have probably contributed to this shortage. Kenneth Brown reported that, between 1948-49 and 1962-63, the enrollment in secondary-school mathematics increased 128 percent. In 1948-49 there were 2,958,000 students enrolled in high school mathematics courses. This increased to 6,731,000 in 1962-63. The

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[16] Ibid, 38.

[17] Ibid, 53.

[18] Ibid, 5.

greatest increase of 173 percent occurred in intermediate algebra, which would indicate that more students were taking three years of high school mathematics. In this same period, the total enrollment in grades 9-12 increased from 5,399,000 to 10,050,000 for a gain of eighty-six percent. Thus, the enrollments in mathematics grew faster than the total high school enrollment.[19]

According to estimates made by the Research Division of the National Education Association, by 1975, high school enrollments will increase by twenty-five percent. Such an increase would create a need for additional mathematics teachers which would probably be greater than the need for secondary teachers in other fields.[20]

The Research Division of the National Education Association also noted that the college graduates prepared to teach mathematics has been increasing since 1954. Numerically, the production has increased from 2,223 in 1954 to 10,285 in 1967.[21] These figures represent 4.54 percent and 7.47 percent respectively of the total number of students

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[19]Kenneth E. Brown and T. L. Abell, "Trends in Mathematics Offerings and Enrollments," The Mathematics Teacher, LIX (November, 1966), 652-55.

[20]"Population Trends Signal School Needs," NEA, Research Bulletin, XLVI (March, 1968), 24.

[21]NEA, Research Division, loc. cit., 15.

prepared to teach in high school subjects for those years. The U. S. Office of Education stated that in 1956-57, 5,546 bachelor degrees were awarded in mathematics and statistics. This represented 1.6 percent of the total number of bachelor degrees awarded. In 1966-67, it was estimated that 24,330 students would complete degrees in mathematics and statistics. This would be 4.2 percent of the total number of bachelor degrees awarded.[22] These figures indicate that the percentage and the number of persons qualified to teach is estimated to be increasing and that the percentage and the number of bachelor degrees awarded in mathematics is estimated to be increasing.

In 1956-57 the new teacher education graduates constituted 58.2 percent of all the new teachers employed in mathematics. In 1960-61 they represented 73.1 percent and in 1964-65 they represented 79.6 percent. However, in 1966-67 this percentage fell to 66.7 percent.[23] This was indicative of an increased demand and/or fewer entries into teaching by the graduates who were qualified to teach.

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[22]U. S. Office of Education, Projections of Educational Statistics to 1976-77 (Washington: U. S. Government Printing Office, 1968), 32-34.

[23]NEA, Research Division, loc. cit., 51.

Theories of Occupational Choice

There are several theories about how individuals choose an occupation, but Samuel Osipow has grouped them into five general categories:

(1) Personality theories of occupational choice. - These theories have as a general hypothesis that workers select their occupations because they see a potential for the satisfaction of their needs.[24] "A corollary hypothesis is that exposure to a job gradually modifies the personality characteristics of the worker so that, for example, accountants eventually become like one another if indeed they were not similar in personality to begin with."[25]

(2) Trait-Factor Theories. - The trait-factor theories "assume that a straight forward matching of an individuals abilities and interest with the world's vocational opportunities can be accomplished, and once accomplished, solves the problems of vocational choice for the individual."[26]

(3) Sociological Theory. - The sociological or accident theory suggests that "circumstances beyond the control

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[24]Samuel H. Osipow, Theories of Career Development (New York: Appleton-Century-Crofts, 1968), 12.

[25]Ibid.

[26]Ibid, 10.

of an individual contribute significantly to the career choices he makes and that the principal task confronting youth (or older person, for that matter) is the development of techniques to cope effectively with his environment."[27]

(4) Self-Concept Theory. - The self-concept theory "holds as its central theses that: (a) individuals develop more clearly defined self-concepts as they grow older, although these may vary to conform with the changes in one's view of reality as correlated with aging; (b) people develop images of the occupational world which they compare with their self-image in trying to make career decisions; and (c) the adequacy of the eventual career decision is based on the similarity between an individuals self-concept and the vocational concept of the career he eventually chooses."[28]

(5) Systems Theory. - In the systems theory, career development is viewed as a sequence of decisions similar to the links in a chain. It is assumed that each person must make many of these minor decisions before a final decision about a career is made. For example, a high school student must make choices about his elective

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[27] Ibid, 11.

[28] Ibid, 11.

> courses; he must decide whether or not to take mathematics or some other courses. Excluding mathematics may start him on a path away from science. When the choice of a college is made, such as a liberal arts college, then engineering may become a less likely occupation. The selection of a major also plays a major role because it is probably the best predictor of a career choice that is presently known.[29]

J. L. Holland also feels that the choice of a major field is an important predictor and notes that students tend to maintain their vocational choices when their college is dominated by students whose vocational choices are similar to their own.[30] This theory is interesting when the changing nature of the teachers' colleges to liberal arts colleges or universities is considered.

Lyon speculates that one should think in terms of serial careers for future workers. He notes that some people will be displaced in their present employment and will move on to another occupation. He argues that the cultural and economic factors which influence the psychology of choice

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[29] Ibid, 236-41.

[30] J. L. Holland, "Explorations of a Theory of Vocational Choice: Longitudinal Study Using a Sample of Typical College Students," Journal of Applied Psychology, Monograph Sup. LII (February, 1968), 33.

must be seen as changeable and changing.[31] Lyon's thoughts take on special meaning when we note that it has been predicted that one-half of the jobs that will exist ten years from now do not exist today.[32]

Why Teaching is Chosen as an Occupation

After studying 556 students at Michigan State University, Takako Mori concluded that "the motivation for becoming a teacher is the result of two vectors: the individual's attitudes toward the occupational values of teaching and his self-concepts of his needs for becoming a teacher."[33]

Clarence Fielstra studied 230 students enrolled in an introductory education course at the University of California and noted that the most influential factors in their decisions to become teachers were: (1) an inspirational teacher; (2) a friend or relative; (3) newspaper accounts on the need for teachers; (4) leaflets, magazine articles, books

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[31]R. Lyon, "Beyond the Conventional Career: Some Speculations," Journal of Counseling Psychology, XII (Summer, 1965), 153-58.

[32]Mathematical Association of America, You'll Need Math...in Many Careers Besides Mathematics (Buffalo, New York: Mathematical Association of America, 1967), 16.

[33]Takako Mori, "Analysis of Factors Influencing Motivations for Becoming a Teacher," Journal of Educational Research, LX (December, 1966), 174.

on teaching and education; and (5) their parents.[34]

In a study of high school seniors who were judged as capable of completing college and identified as having interest in teaching, seven years after their graduation, it was found that out of 232 men respondents, eighty-eight were teachers, and out of 259 women respondents, 140 were teachers. The motives of the males for selecting teaching were the life-long opportunity to learn and summer travel, recreation or study. Aside from parents, both male and female teachers declared that respected teachers were the most influential in helping them to select their vocation. The second most influential force was a friend who also became a teacher. Non-teaching males cited poor salaries, lack of advancement opportunities and monotony as major deterrents.[35]

C. E. Hood noted several disadvantages of teaching that were given by 226 university students who had selected teaching as a career. They were: (1) restricted personal freedoms; (2) low salaries; (3) heavy workload; (4) unrealistic certification requirements; (5) restrictions on the

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[34]Clarence Fielstra, "An Analysis of Factors Influencing the Decision to Become a Teacher," The Journal of Educational Research, XLVIII (May, 1955), 659-67.

[35]Robert Gray Wolstoncroft, "Secondary Students' Interest in Teaching Seven Years Later: A Follow-up Study" (unpublished Ed. D. dissertation, University of Southern California, 1968).

freedom to teach; (6) oversupply of teachers in desirable locations; (7) low prestige; (8) discipline problems; and (9) job insecurity.[36]

In 1960, Tink investigated a sample of 914 high school students, 389 college students, and 132 teachers in Wisconsin and Illinois to determine their reasons for choosing or not choosing teaching as a vocation. He found that those persons who chose teaching did so because it was interesting and enjoyable and it was a challenge to the imagination. Teaching also gave them the enjoyment of working with pupils and the opportunity to work with their favorite subject. Those not planning to teach listed a different vocational interest, unfavorable conditions or personal inadequacies.[37]

In 1964, Maxwell studied a sample of 1324 college bound high school seniors, 989 sets of parents, 183 teachers, 23 community organizations and 18 Future Teachers of America groups to determine the factors influencing the college bound seniors in choosing, ignoring or rejecting teaching. He found that his sample felt that teaching was more suitable

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[36]C. E. Hood, "Why 226 University Students Selected Teaching as a Career," Clearing House, XL (December, 1965), 228-31.

[37]Albert Kerby Tink, "Factors Relating to Students Choosing or not Choosing Teaching as a Vocation" (unpublished Ph. D. dissertation, Northwestern University, 1960).

for women than men. They also felt that teaching salaries were not commensurate with the education required and the continuous effort required to become and to remain a good teacher.[38]

In 1965, Anderson studied thirty-four college graduates, who were attempting to become certified to teach in the secondary schools, at Michigan State University. He noted that the reasons given for their desire to become certified to teach were: (1) dissatisfaction or lack of success in their work; (2) failure to be admitted to graduate schools or professional schools; (3) the need to make some vocational commitment. Twenty-eight of the thirty-four felt that the program was an initial step toward fields other than teaching on the secondary level.[39]

Certified Teachers Who Fail to Enter the Profession

Of the 1965-66 graduates of the mathematics teaching curriculums, 70.8 percent entered teaching the next year. This was slightly greater than the percentage of the total secondary teaching graduates who entered teaching, which

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[38]William E. Maxwell, "Factors Influencing College Bound Public High School Seniors of Montgomery County in Choosing, Ignoring or Rejecting Teaching as a Career" (unpublished Ed. D. dissertation, Temple University, 1964).

[39]Keith P. Anderson, "A Study of College Graduates Certifying for Secondary School Teaching" (unpublished Ph.D. dissertation, Michigan State University, 1965).

was 66.6 percent. Of those mathematics graduates who did not enter teaching, 6.8 percent were otherwise gainfully employed, 7.8 percent continued formal study, 2.4 percent entered military service, 1.7 percent entered full-time homemaking, 0.6 percent were seeking employment and no information was available on 9.9 percent.[40]

Edward Harper studied 787 graduates of Michigan State University of 1956-57 who were certified to teach and concluded that the decision to reject teaching seemed to be the result of circumstances and not because of any distinct factors. He did note, however, that those who major in physical sciences and vocational areas, tend to take positions other than in teaching.[41]

B. J. Hollaway reported on the employment destinations for mathematicians produced by Manchester University in the years 1963-66 inclusive. He noted that there had been a "very rapid decrease, not only in the proportion of the 'effective output' (i.e. those not remaining at the university for further study of mathematics) entering teaching, but also the substantial decline in the numbers and

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[40]NEA, Research Division, loc. cit., 24-25.

[41]Edward Harold Harper, "Why Certified Teachers Fail to Enter the Teaching Profession" (unpublished Ed. D. dissertation, Michigan State University, 1958).

that the drop in numbers is almost exactly equal to the number entering computer work."[42]

Another factor that may influence some graduates not to enter teaching is the difference in starting salary between industrial positions and teaching. In 1965-66 the average beginning salary for male teachers in school systems of over 6000 enrollment was $4,925. The average beginning salary for a graduate with a bachelor's degree in private industry was $6,672, a difference of $1,747. In 1966-67 this difference was $2,118 and in 1967-68 it had grown to $2,425.[43]

Why Teachers Leave Teaching as an Occupation

The 1967 report of Teacher Supply and Demand in Public Schools of the National Education Association, Research Division used 8.6 percent as an estimate of the percentage of teachers who would leave the profession for that year.[44] W. W. Charters, Jr. reported that the dropout rate for males is the greatest during the first two years and that at the

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[42]B. J. Hollaway, "Computers Gobble up Mathematicians," Times Educational Supplement, MMDCCXV (June 2, 1967), 1857.

[43]"Starting Salaries: Teaching vs. Private Industry," NEA, Research Bulletin, XLVI (March, 1968), 8.

[44]NEA, Research Division, loc. cit., 34.

end of five years, only about twenty percent of the incoming group are in the classroom.[45]

A large teacher turnover wastes the time spent in preparing the teacher as well as the loss of their services to education.[46] A popular belief for this turnover is the salary conditions. However, it may be that what is really involved is job satisfaction.[47]

Feldvebel stated that the teaching profession in the United States has historically been a low status occupation. He also noted that low salaries, as a rule, are related to low status.[48] It is suggested by the National Education Association, however, that social status varies with happiness. They feel that if teachers are unhappy, then their morale and status are low. Thus teachers who are unhappy

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[45]W. W. Charters, Jr., "Teacher Survivial Rates Examined in a Career Process Program," Research and Development Perspectives (Eugene: University of Oregon, 1968), 1-2. as reported by Henry Knapp, "A Tribute to the Real Fathers," Phi Delta Kappan, XLIX (June, 1968), 575.

[46]Joseph A. Kershaw and Ronald N. McKean, Teacher Shortages and Salary Schedules (New York: McGraw-Hill Book Company, Inc., 1962), 37.

[47]William C. Menninger, "The Meaning of Work in Western Society," Man in a World at Work, ed. Henry Borow (Boston: Houghton Mifflin Company, 1964), xiv.

[48]A. M. Feldvebel, "Teacher Satisfaction," Clearing House, XLIII (September, 1968), 44-45.

about materials and supplies, poor facilities, would tend to think of themselves as low in status.[49]

Blanche Geer feels that teachers leave the profession because it does not have any committing valuables. She feels that the students in the teaching curricula have no greater investment in their education than other majors. When compared to other professions such as law or medicine, they have not invested as much time or money in their education and they do not have their self-esteem or pride at stake if they do not enter teaching. She also stated that a teacher does not have to build a clientele because his clients are selected for him. A professional or business man builds a big investment in clients and acquires this valuable which further commits him to his profession. Although the vacations of teachers are thought to be desirable features, they also offer the opportunity to develop off the job commitments which increases the chances for the teacher to leave the profession.[50]

Why Students Choose Mathematics and Mathematics Teaching

In 1962, Hoff investigated the question of whether or not there was a characteristic pattern of influences

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[49]"Are Teachers Happy?," NEA, Research Bulletin, XLVI (May, 1968), 40.

[50]Blanche Geer, "Occupational Commitment and the Teaching Profession," School Review, LXXIV (Spring, 1966), 31-47.

affecting the choice of mathematics or mathematics education as an undergraduate major. Ninety-three junior and senior mathematics majors at Oklahoma State University were studied. He stated that over one-half of the mathematics majors were enrolled in some other major before becoming mathematics majors. Most of the transfers were from the physical sciences and engineering. Their reasons for choosing mathematics were: (1) they enjoyed mathematics; (2) they felt mathematics challenged them; (3) a pre-college teacher influenced them; (4) they anticipated a large number of job opportunities; (5) a desire to teach; (6) the results of an aptitude test; (7) their high school mathematics was easy; and (8) it would take less time to obtain this degree than others that interested them.[51]

In 1966, Finco studied 217 junior and senior mathematics majors at Purdue University on tests of temperament, interest and value. He considered subgroups of the mathematics majors and transfers from mathematics majors on the following criteria: (1) student's original major was mathematics; (2) sex; (3) the student planned to teach mathematics. Seven discriminant functions were computed using: (1) Guilford-Zimmerman Temperament Survey; (2) Allport-Vernon-Lindzey Study of Values; (3) Kuder Preference Record; and

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[51]William Eldridge Hoff, "A Study of Influences on the Choice of Mathematics or Mathematics Education as an Undergraduate Major" (unpublished Ed. D. dissertation, Oklahoma State University, 1962).

(4) a student questionnaire. Of the seven functions, computed, five were significant and able to distinguish between the subgroups. He stated that there was some support for concluding that mathematics education majors were more person oriented than the mathematics non-teacher and that transfers from mathematics majors migrate toward non-scientific fields, while science and technical majors migrate toward mathematics.[52]

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[52]Arthur Anthony Finco, "Mathematics Majors and Transfers from Mathematics Majors at Purdue University: Temperament, Interest, Value, and Student Questionnaire Differences at the Exploratory Stage" (unpublished Ph. D. dissertation, Purdue University, 1966).

CHAPTER III

PROCEDURES FOR COLLECTING THE DATA

Introduction

The general procedures used for collecting the data in this study were a questionnaire to the students and an interview with the department chairman or, in the case of an organization by division, a member of the senior mathematics staff from each participating college or university. The additional procedure of searching the graduation lists in the records office was required to obtain the data for some of the schools.

The Number of Graduates

Information regarding the number of bachelor degrees awarded at each school, the number of bachelor degrees awarded in mathematics and the number of bachelor degrees awarded in mathematics teaching for each year since 1963 was sought from each school. The decision to use the last six years was determined on the basis of availability of the data at all of the schools.

Some of the schools compiled the data for their graduates on a fiscal basis, but for this study it was felt

that the graduates of January, June and August for a given year would be grouped together to form the basis of the number of mathematics graduates potentially available in September, the beginning of a new school year.

The desired information was provided by the records office at Southwestern State College and at Northeastern State College. At Phillips University, East Central State College and Panhandle State College the department chairman supplied the data with some assistance from the records offices. At Central State College, Northeastern State College, Southeastern State College, Oklahoma Baptist University, and the University of Oklahoma, the information was obtained from graduation lists and/or graduation programs with the assistance of the mathematics departments and the records offices. At the University of Oklahoma, the number of bachelor degrees granted in a given year was obtained from the annual report of the records office to the Board of Regents for the University. The number of graduates certified to teach was determined by the number who completed student teaching in a given year.

To determine whether or not a statistically significant trend in the production of mathematics majors and in the production of mathematics teaching majors existed, trend analysis procedures as described by Edwards[53] were used to

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[53]Allen L. Edwards, Experimental Design in Psychological Research (rev. ed; New York: Holt, Rinehart and Winston, 1960), 224-50.

analyze the data obtained.

To guard against unnecessary changes that could result from the findings in this study, a conservative approach was taken in the analysis. This required a relatively low level of significance for the testing of the null hypothesis that no trends existed in the data. The 5% level of significance was chosen for the analysis, but when a value was very significant, the 1% level of significance was indicated for emphasis.

A Type I error, rejecting the hypothesis that no trend existed, when it was true, could imply that action should be taken to change the trend, when in fact no significant trend existed. If a Type I error did occur, the conclusions could be used to indicate a false need for changes in the programs for the preparation of secondary teachers of mathematics. Such changes may not improve the effective output of secondary mathematics teachers and could reduce the output as well as the quality. With the selection of the 5% level of significance, the probability of a Type I error is only .05.

A Type II error, accepting the hypothesis that no trend existed, when it was false, was more likely to occur with a 5% level of significance than it would with a greater level of significance. But a Type II error, would not cause any changes from the present programs to untested programs,

where the results would be less certain than they are with the present programs. If the probability of a Type II error is very large, then there would be a good chance for overlooking a possible trend when it existed. This would also be undesirable, because a chance for improvement would not be discovered. However, this risk was accepted, in this study, in favor of a greater assurance that an indicated trend was not due to chance alone.

Requirements for Mathematics Majors

The information concerning the requirements for mathematics majors was obtained from current college bulletins from each institution. During the interview at each school, any deviations from the printed requirements or changes in the majors since 1963, or anticipated changes, were recorded. Course changes were also noted if they affected the number and variety of electives available to the majors. For the mathematics teaching degree, the number of credit hours and the course work required in psychology or education were also collected. When clarifications were necessary, arrangements were made with personnel from the teacher education departments to provide the assistance needed.

Course Offerings and Programs

The course offerings and programs at each school were compared, using as a basis, the recommendations for

mathematics majors[54] and mathematics teachers[55] as stated by the Committee on the Undergraduate Program in Mathematics (CUPM). The comparison was based on the number of courses and the number of credit hours available to the majors at each of the recommended levels. The content of the courses as indicated by the college bulletins was the primary basis for the classification, but the information provided by each department as to the actual content of certain courses was also used in the classification. Even though a course was judged to have met the CUPM recommendations it was not possible to determine the actual "spirit" in which the course was taught; hence, the information was not presented as a measure of how well the schools met the CUPM recommendations. It was presented only as a basis of comparison of the programs as stated by the schools participating in this study.

Questionnaire for the Juniors and Seniors

The questionnaire was designed to explore the future employment or activity of the mathematics majors with respect

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[54]Mathematical Association of America, A General Curriculum in Mathematics for Colleges, A Report Prepared by the Committee on the Undergraduate Program in Mathematics (Berkeley, California: Mathematical Association of America, 1965).

[55]Mathematical Association of America, Recommendations for the Training of Teachers of Mathematics, A Report Prepared by the Committee on the Undergraduate Program in Mathematics (rev.; Berkeley, California: Mathematical Association of America, 1966).

to their entry into teaching or some other occupation. It also sought to determine the possible reasons for their selection of a mathematics major and their selection of the teaching or non-teaching curricula. It was a check type questionnaire with alternative responses, but it also allowed the option of writing in a response if it was appropriate.

The questions were originally selected from the literature and from the personal knowledge and experiences of the writer. After additions and modifications by the members of the dissertation committee, the questionnaire was presented to fourteen graduate students who were participating in the Title V(C) Fellowship Program of the U. S. Office of Education in mathematics at the University of Oklahoma. These students had all completed the teacher certification requirements in mathematics, but did not have any experience as teachers, other than student teaching.

Some modifications were suggested by these students and they were incorporated into a revised form. This revision was submitted to eleven mathematics students at Bethany Nazarene College and to twenty-six mathematics students at the Oklahoma College of Liberal Arts. As a result of the responses by these students, some choices were added and some modifications in wording were made. A copy of the final form was then prepared and is included in Appendix A.

Each participating school was contacted by mail and asked to return a postcard indicating the number of junior

and senior mathematics majors at their school. When an indication of the number of junior and senior mathematics majors was obtained, a supply of the questionnaire was mailed to each school. A letter was also sent to each school indicating that, if possible, all of the juniors and seniors in mathematics should complete a questionnaire and that it could be completed during the enrollment or pre-enrollment period, during a regular class period or in some other way which would be convenient for them. The questionnaires were returned to the writer at the time of the visit to each campus or in certain cases, by mail.

Questionnaire for the Graduates

The questionnaire for the graduates of the mathematics teaching programs was essentially the same as the questionnaire for the juniors and seniors of 1968-69. But, since they were all graduates of a certificate program, certain questions were omitted that pertained only to undergraduates in the non-teaching programs. One question based on their present experience, concerning the most valuable and least valuable courses required in their major program was added. A copy of the final form is included in Appendix A.

Each college supplied either current or home addresses for their graduates. A copy of the questionnaire, a stamped addressed envelope, and a letter explaining the purpose of

the questionnaire and instructions for its completion and return were sent to the graduates. About two weeks later, a second letter containing another questionnaire and envelope was sent to those who did not respond to the first request. Copies of the letters sent with the questionnaire at each stage are included in Appendix B.

Processing of the Questionnaires

Each questionnaire was coded and the data were transferred to data processing cards. The sorting equipment at the computer center on the main campus of the University of Oklahoma was used to sort the cards into various categories and to count the cards in each category.

The information acquired was data that could be reduced to frequencies. The tables were constructed to show the frequencies in the categories of male or female, junior or senior, teaching or non-teaching and the responses to the questionnaire items.

CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

Introduction

In this chapter the following abbreviations will be used to indicate the participating schools: Central State College (CSC); East Central State College (ECSC); Northeastern State College (NESC); Northwestern State College (NWSC); Panhandle State College (PSC); Southeastern State College (SESC); Southwestern State College (SWSC); Oklahoma Baptist University (OBU); Phillips University (PU); the University of Oklahoma (OU).

The Number of Graduates

Table 1 presents the number of mathematics graduates from the certificate programs from each of the schools for the years 1963 through 1968. The highest number of graduates for the period, 128, occurred in 1963 and the lowest number, ninety-seven, graduated in 1967. In 1968 the number of graduates was 127, which was the second highest total for the period.

The table also indicates that Northeastern State College (NESC) was the largest producer of majors who were

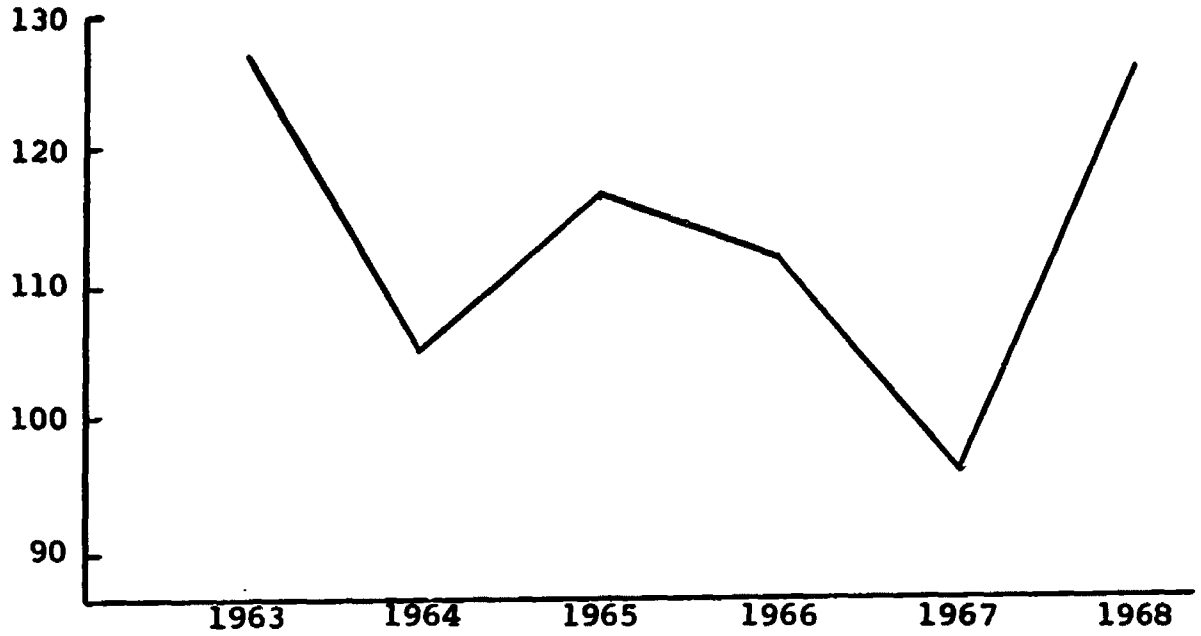
TABLE 1

THE NUMBER OF GRADUATES FROM THE MATHEMATICS CERTIFICATE PROGRAMS

YEAR	CSC	ECSC	NESC	NWSC	PSC	SESC	SWSC	OBU	PU	OU	TOTAL
1963	7	25	38	2	4	13	12	4	0	23	128
1964	9	14	29	4	2	13	14	0	0	20	105
1965	5	13	38	5	5	17	14	3	1	16	117
1966	2	9	35	8	7	15	9	3	2	21	111
1967	4	11	34	6	0	12	11	2	2	15	97
1968	7	13	35	11	4	13	18	6	2	18	127

eligible for teaching certificates and have been relatively consistent in the number graduated each year. East Central State College (ECSC), by contrast, experienced a decline from 1963 through 1966 and then an increase from 1967 through 1968. The mathematics department at ECSC felt that this was mainly due to a change in the calculus sequence in 1963 to a combined course in analytic geometry and calculus. They have now returned to their original sequence of analytic geometry and calculus.

Graph 1 indicates the number of graduates from the certificate programs in mathematics. The irregular pattern suggested that there was no significant trend in the number of graduates from the certificate programs in mathematics.



Graph 1. Graph of the Number of Graduates from the Certificate Programs in Mathematics.

The statistical verification of no significant trend is presented in Table 2. The F-value of 1.766 was less than 2.425, the required value for significance at the 5% level.

Table 3 presents the number of graduates from each school with mathematics majors for the years 1963 through 1968. The smallest number of mathematics majors was graduated in 1965 and each year since then, this number has been increased by very small amounts.

The graph of the data, Graph 2, indicated that there could be a quadratic trend in the data, but the statistical analysis in Table 4 did not indicate any significant trend.

TABLE 2

ANALYSIS OF DATA ON GRADUATES OF CERTIFICATE PROGRAMS[a]

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	$F_{.05}(5,45)=2.425$ $F_{.05}(1,45)=4.055$
Years	75.28	5	15.06	1.766 n.s.
Schools	5,505.75	9	611.75	
Error	383.55	45	8.52	
Total	5,964.58	59		
Linear Component	1.75	1	1.75	.205 n.s.
Quadratic Component	30.858	1	30.858	3.62 n.s.

TABLE 3

THE TOTAL NUMBER OF MATHEMATICS MAJORS GRADUATED 1963-68

Year	CSC	ECSC	NESC	NWSC	PSC	SESC	SWSC	OBU	PU	OU	TOTAL
1963	28	30	56	10	9	17	27	5	5	82	269
1964	43	33	53	10	8	19	29	3	3	63	264
1965	32	18	57	13	13	23	27	4	5	56	248
1966	40	14	48	14	11	24	31	6	7	71	266
1967	31	25	61	16	6	15	30	4	5	75	268
1968	41	22	41	24	8	20	34	9	6	69	274

[a]Bartlett's test of homogeneity of variance yielded a chi square of 1.041 which was less than 11.07, the value required for significance at the 5% level.

Graph 2. The Total Number of Mathematics Majors Graduated 1963 through 1968.

The F-values in Table 4, for the trend and quadratic component were .260 and .827. Both were less than 2.425 and 4.055 respectively, which are the required values for significance at the 5% level.

Graph 3 presents the information in Table 5 graphically and indicates a sinusoidal pattern. However, Table 6 presents the analysis of the data and indicates no significant trend for these data. The F-value obtained in Table 6 was 2.143, which was less than 2.425 the required value for significance at the 5% level.

TABLE 4

ANALYSIS OF DATA ON MATHEMATICS GRADUATES[a]

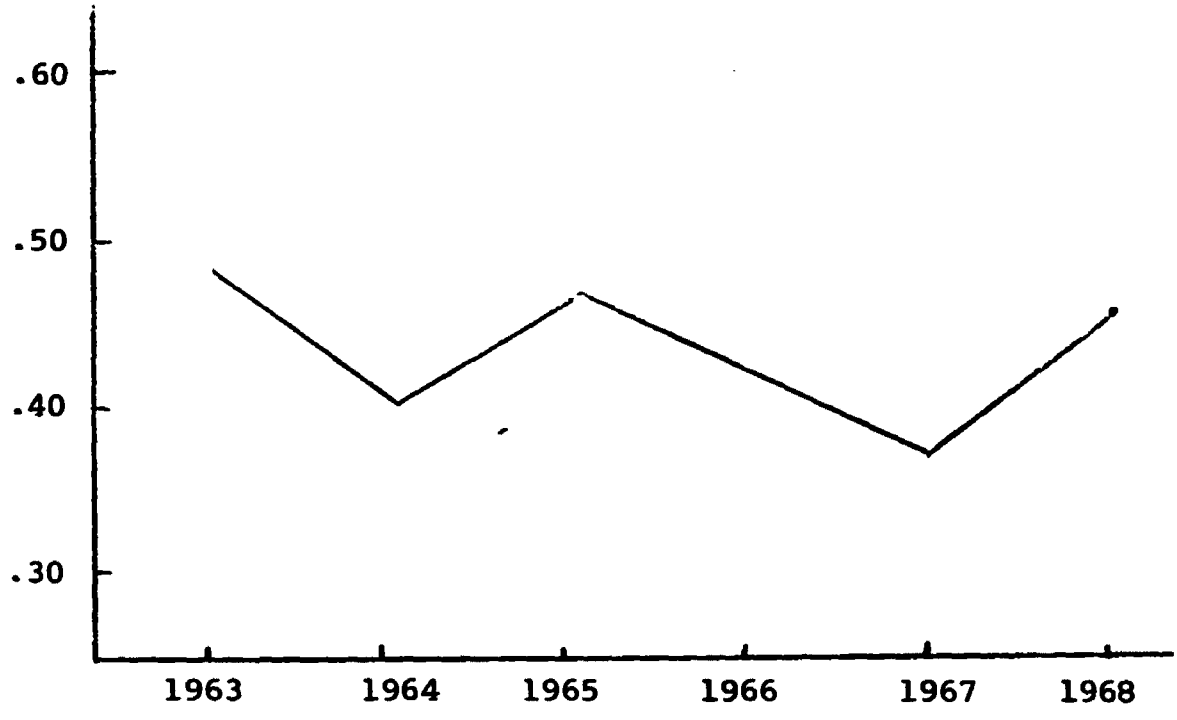
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	$F_{.05}(5,45)=2.425$ $F_{.05}(1,45)=4.055$
Years	39.68	5	7.94	.260 n.s.
Schools	24,155.48	9	2683.94	
Error	1,375.82	45	30.57	
Total	25,570.98	59		
Linear Component	1.29	1	1.29	.041 n.s.
Quadratic Component	25.28	1	25.28	.827 n.s.

TABLE 5

THE RATIOS OF THE NUMBER OF MATHEMATICS TEACHING GRADUATES TO THE NUMBER OF MATHEMATICS GRADUATES

Year	CSC	ECSC	NESC	NWSC	PSC	SESC	SWSC	OBU	PU	OU	TOTAL
1963	.25	.83	.68	.20	.44	.76	.44	.80	0	.28	.48
1964	.21	.42	.55	.40	.25	.68	.48	0	0	.32	.40
1965	.16	.72	.67	.38	.38	.74	.52	.75	.20	.29	.47
1966	.05	.64	.73	.57	.64	.63	.29	.50	.29	.30	.41
1967	.13	.44	.56	.38	0	.80	.37	.50	.40	.20	.36
1968	.17	.59	.85	.46	.50	.65	.53	.67	.33	.26	.46

[a]Bartlett's test of homogeneity of variance yielded a chi square of 1.15 which was less than 11.07 the value required for significance at the 5% level.



Graph 3. The Ratios of the Total Number of Mathematics Teaching Graduates to the Total Number of Mathematics Graduates.

TABLE 6

ANALYSIS OF THE RATIOS OF THE NUMBER OF MATHEMATICS TEACHING GRADUATES TO THE NUMBER OF MATHEMATICS GRADUATES[a]

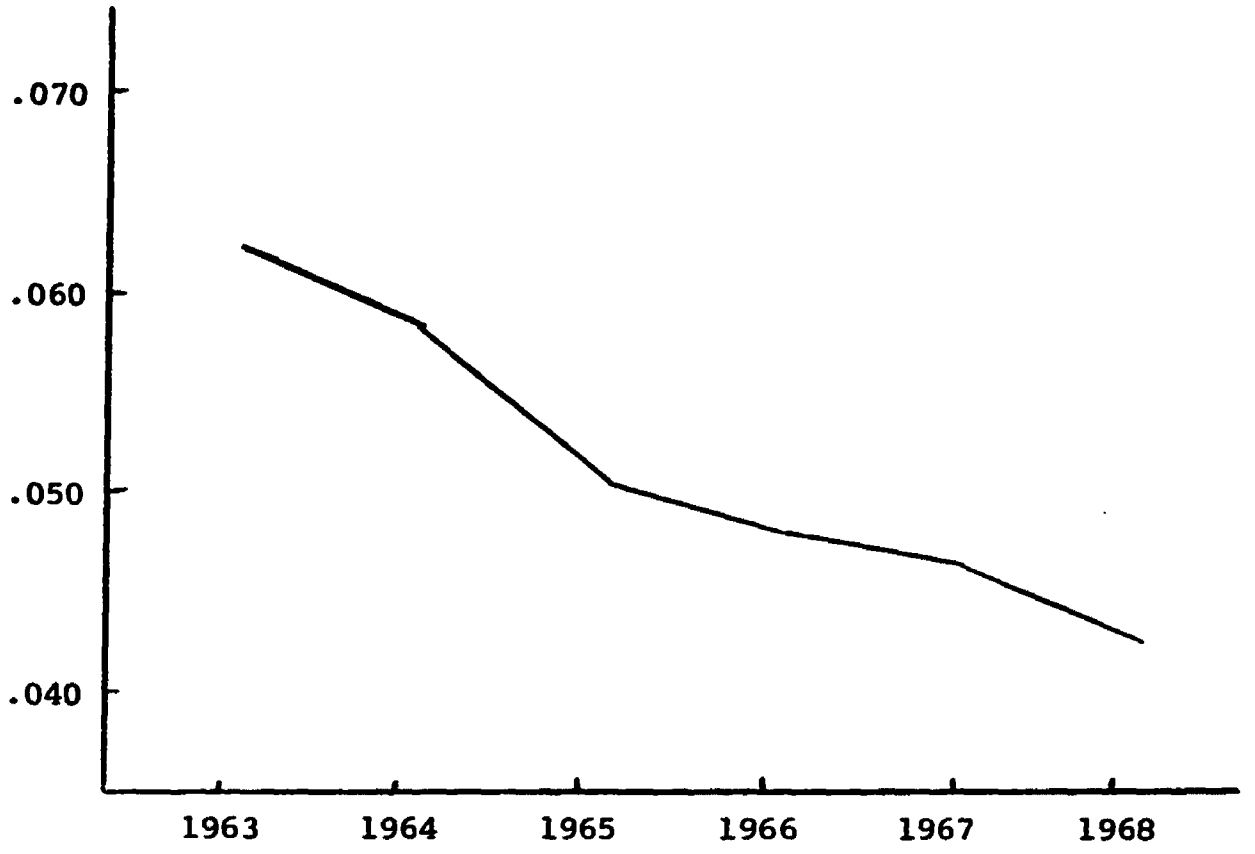
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	$F_{.05}(5,45)=2.425$ $F_{.05}(1,45)=4.055$
Years	.224	5	.045	2.143 n.s.
Schools	1.990	9	.221	
Error	.953	45	.021	
Total	3.167	59		
Linear Component	.012	1	.012	.571 n.s.
Quadratic Component	.015	1	.015	.719 n.s.

Graph 4 indicates the linear downward trend that is indicated by the total ratios in Table 7.

Table 8 presents the statistical verification of the trend indicated by the graph. The F-value of 11.11 for the linear component of the trend was greater than 7.225, which indicated significance at the 1% level.

From these statistics it can be concluded that the number of bachelor degrees granted in mathematics as a

[a]Bartlett's test of homogeneity of variance yielded a chi square of 1.253 which was less than 11.07 the value required for significance at the 5% level.



Graph 4. The Ratios of the Number of Mathematics Majors Graduated to the Total Number of Bachelor Degrees Granted.

TABLE 7

THE RATIOS OF THE NUMBER OF MATHEMATICS MAJORS GRADUATED AT THE BACHELOR DEGREE LEVEL TO THE TOTAL NUMBER OF BACHELOR DEGREES GRANTED EXPRESSED AS PERCENTAGES

Year	CSC	ECSC	NESC	NWSC	PSC	SESC	SWSC	OBU	PU	OU	TOTAL
1963	4.92	10.45	10.43	6.54	6.92	8.33	8.13	2.60	3.38	4.78	6.30
1964	7.47	11.11	10.02	6.14	6.56	7.36	7.30	1.69	1.99	3.53	5.93
1965	5.81	5.92	9.45	7.78	9.70	6.74	5.66	2.38	2.67	2.87	5.08
1966	6.11	4.29	6.66	6.09	7.91	7.79	5.44	3.33	3.70	3.39	4.91
1967	3.94	7.04	7.21	6.96	4.72	5.45	4.98	2.27	2.70	3.54	4.70
1968	4.51	5.30	4.80	7.52	5.00	7.25	4.98	5.23	2.88	3.11	4.40

TABLE 8

ANALYSIS OF THE RATIOS OF THE NUMBER OF MATHEMATICS GRADUATES TO THE TOTAL NUMBER OF GRADUATES[a]

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	$F_{.05}(5,45)=2.425$ $F_{.01}(1,45)=7.225$
Years	.00245	5	.00049	2.37 n.s.
Schools	.0202	9	.00224	
Error	.00930	45	.000207	
Total	.0319	59		
Linear Component	.00230	1	.00230	11.11
Quadratic Component	.0000405	1	.0000405	.196 n.s.

percentage of the total number of bachelor degrees granted for the schools in this study was declining in the period 1963-68. This was exactly opposite the trend that was predicted for the nation by the U. S. Office of Education.[56]

Requirements for Majors in Mathematics

In this section the requirements for mathematics majors at each school will be presented. The changes that have occurred in these programs will be indicated with

[a]Bartlett's test of homogeneity of variance yielded a chi square of 7.523 which was less than 11.07, the value required for significance at the 5% level.

[56]U. S. Office of Education, loc. cit., 32-34.

regard to the effects that they may have had on persons deciding to major in mathematics or mathematics teaching. A summary of the data presented in this section is located in Table 9.

To obtain a Bachelor of Science in Education with a major in mathematics at Central State College, a student must complete thirty-three semester hours of mathematics. The program must include at least eighteen semester hours above the calculus and must include six semester hours each of geometry, algebra and statistics, and two semester hours in the history of mathematics. In effect, this requires twenty semester hours above the calculus.

A student must also complete twenty-one semester hours of education and psychology courses, which includes a course in the methods of teaching mathematics. An overall grade point average of 2.25 is required for admission to teacher education and a 2.5 grade point average in mathematics is required before student teaching is attempted.

The completion of the program is accomplished, as of the 1968-69 school year, by completing the prescribed courses. A proposed change would make three semester hours of geometry and three semester hours of statistics optional and would potentially allow six semester hours to be taken as mathematics electives.

A student seeking a Bachelor of Science degree in mathematics is offered two choices. Pattern A requires

10-13 semester hours of analytic geometry and calculus, Differential Equations, Matrix Algebra and electives beyond the calculus to total thirty-two semester hours. Pattern B requires thirty-eight semester hours and is essentially Pattern A with a computer science emphasis. Additional course work required for Pattern B includes statistics, algebra, Numerical Analysis, Intermediate Analysis and Digital Computers.

The school has had a computer since 1963 and has been approved for a computer science major within the mathematics department. The programs presented have been in effect for at least the past five years.

The Bachelor of Science in Education degree at East Central State College requires 28-40 semester hours depending upon the student's high school preparation. A student who started with the combined course in college algebra and trigonometry would normally be required to complete thirty-three semester hours which would include fourteen semester hours above the calculus. A student beginning with analytic geometry would need to complete only twenty-eight semester hours. The program includes three semester hours each of geometry and algebra, two hours of mathematics for the secondary teacher and six hours of post calculus electives.

A student must also complete twenty-five semester hours of education and psychology, including a course in the methods of teaching mathematics. Prior to 1968-69,

students were required to have a 2.0 overall average for admission to the teacher education program. As of the 1968-69 school year, they must have a 2.25 overall grade point average for admission to teacher education and a 2.25 overall average and in mathematics for admission to the professional semester.

The Bachelor of Science in mathematics requires 29-38 semester hours depending upon the high school courses presented by the student. Required courses are Statistics, Modern Algebra, Differential Equations or Intermediate Analysis and six semester hours of post calculus electives.

A computer became available in 1966 and the students have had computer electives available since that time.

A change to combined courses in analytic geometry and calculus occurred in 1962. This move was judged by the department to be unsatisfactory and the courses were separated again in 1964.

The Bachelor of Science in Education with a major in mathematics at Northeastern State College requires a minimum of thirty-two semester hours. Students are required to take courses in college geometry and modern algebra after completing the calculus sequence. The electives may vary from 6-15 semester hours depending upon the starting point in the pre-calculus sequence. If a student received college credit for College Algebra and Trigonometry, he would only

be required to take six hours of electives. If a student started with Analytic Geometry or Pre-Calculus Analysis he would need twelve hours of electives.

In addition to these requirements, a physics course must be taken and 21-30 semester hours in education and psychology must be completed. Prior to 1968, a 2.0 overall average was required for admission to teacher education. As of the 1968-69 school year, a 2.25 average in mathematics and in the professional education courses are also required for admission and retention in the program.

The Bachelor of Science in mathematics requires a minimum of thirty semester hours and at least one course in physics. It must include Theory of Equations, Differential Equations and Intermediate Analysis. The electives may vary from 3-11 hours depending upon the starting point in the pre-calculus sequence.

This program has remained essentially the same since 1962 with the exception of the offering of the Pre-Calculus Analysis in lieu of Analytic Geometry.

The Bachelor of Science in Education with a major in mathematics at Northwestern State College requires thirty-six semester hours. This requirement has been in effect since 1964, when three hours of electives were added to the previous total of thirty-three semester hours. The major includes College Geometry, Probability and Statistics I,

and Modern Algebra. Nine hours of electives are required, but three hours must be chosen from Matrix Algebra, Probability and Statistics II, and Fundamental Concepts of Geometry.

Twenty-one semester hours of professional education are required, which includes a course in the methods of teaching mathematics. An overall grade point average of 2.0 is required for admission to the teacher education program. A 2.5 grade point average is required in mathematics and in the professional courses, for admission to the professional semester.

The Bachelor of Science degree in mathematics requires thirty-six semester hours of which, eighteen are electives. Three hours of the electives must be selected from senior level courses.

A computer has been available since 1967, but no mathematics courses have been offered in computer science. Courses in computer science and number theory have been added beginning in 1969. An advanced course on the system of real numbers was added in 1964.

The Bachelor of Science in Mathematics at Panhandle State College, in the certificate program, requires thirty-seven semester hours. It includes the courses College Geometry, Probability and Statistics, Modern Algebra, Matrix Algebra, The Teaching of Mathematics, Fundamental Concepts

of Geometry and three semester hours of advanced mathematics or related courses.

Twenty-one hours of professional education are also required for certification. A 2.25 grade point average is required for admission to the teacher education program and a 2.5 grade point average in mathematics is required for admission to student teaching.

The Bachelor of Science in mathematics, without certification, requires thirty-five semester hours of mathematics with eighteen semester hours of electives. Six of the eighteen hours may be taken in related fields.

The course offerings have been available since 1962, but Linear Algebra is expected to be available in 1970. No computer science courses are offered in the mathematics department.

To obtain a Bachelor of Science in Education at Southeastern State College, a student must complete from 28-40 semester hours depending upon the starting point in the pre-calculus sequence. The requirements for certification stated that thirty semester hours is a minimum. The major includes 12-18 semester hours of approved electives above the calculus.

Twenty-one hours of professional education courses, which includes a course in the methods of teaching mathematics, are required. A 2.2 grade point average in

mathematics and overall are required for admission to the teacher education program.

The Bachelor of Science in mathematics has the same requirements as the Bachelor of Science in Education in mathematics with the exception of the professional education requirements.

As of 1967, students can minor in computer science. No other significant changes in the programs have occurred in the past six years.

The Bachelor of Science in Education at Southwestern State College requires thirty-five semester hours of mathematics. Prior to 1964, only thirty semester hours were required. As of the 1968-69 school year, the major requires College Geometry and fifteen additional semester hours of post calculus electives. The change in electives from nine to fifteen semester hours in 1964, and the combining of six semester hours of college algebra and trigonometry into a five semester hour course, caused an increase of five semester hours in the total hours required for the major.

In addition, twenty-six semester hours of professional education courses are required. This includes three semester hours of special methods in the teaching of mathematics during the professional semester. An overall grade point average of 2.10 is required for admission to the teacher certification program. A 2.25 grade point average

overall and in mathematics is required for admission to the professional semester.

The Bachelor of Science degree with a major in mathematics requires thirty-five semester hours. This was a change from thirty semester hours in 1964 along with the change in the Bachelor of Science in Education degree with a major in mathematics. No computer sciences courses are offered by the mathematics department.

Some changes have been proposed in the major for the Bachelor of Science in Education degree. Among these is a proposal to allow an intuitive calculus sequence as an alternative to the regular sequence. Courses in modern algebra, the foundations of mathematics and geometry would be required of all majors seeking this degree. This would reduce the number of electives to nine semester hours and the total hours required to thirty-four. This action was prompted by the belief that the number of students selecting this degree had declined significantly.

The major in mathematics at Oklahoma Baptist University requires twenty-eight semester hours. The student is expected to complete at least six semester hours requiring calculus as a prerequisite. Modern Geometry or Modern Algebra must be included as part of the six semester hour requirement. However, a student graduating from Oklahoma Baptist University would have at least ten semester hours

of post calculus courses because of the limited number of pre-calculus courses that could be offered.

Students who desire a teaching certificate usually minor in education. This requires twenty-one semester hours of professional education and includes a course in the teaching of mathematics. A grade point average of 2.0 is required for admission to the teacher education program. A 2.5 grade point average in mathematics as well as a 2.0 overall grade point average is required for admission to student teaching.

Courses added to the program in 1968 were Probability and Statistics, Linear Algebra, and Foundations of Mathematics. Theory of Numbers was dropped because of a lack of qualified staff to teach this course. No computer science courses are offered in the mathematics department.

At Phillips University the mathematics major leading to a Bachelor of Arts degree consists of thirty-four semester hours of mathematics. It includes six hours of abstract algebra, six hours of advanced calculus and nine additional hours of post calculus electives.

The mathematics major leading to a Bachelor of Science in Education requires twenty-eight semester hours. It offers a student a choice of two plans after completing the calculus sequence. However, both plans require a course in mathematical statistics. One plan requires Modern

Algebra, Matrix Algebra and Modern Geometry. The second plan requires Modern Geometry I and II and Abstract Algebra.

This degree also requires twenty-three semester hours of professional education courses. No special methods of teaching mathematics are required as a separate course for this degree. Admission to the teacher education program requires a 2.25 overall grade point average. Admission to student teaching also requires a 2.25 overall grade point average.

All requirements and offerings have been in effect since 1963.

At the University of Oklahoma a student is required to complete thirty-one semester hours of mathematics for a secondary teaching certificate in mathematics. The major includes Introduction to Abstract Algebra, College Geometry, Principles of Mathematical Statistics I, Fundamental Concepts and Methods-Teachers' Course and three additional hours chosen from Foundations of Geometry, Principles of Mathematical Statistics II, and Linear Algebra.

Twenty-one semester hours of professional education are also required for a secondary teaching certificate in mathematics. This does not include special methods of teaching mathematics as a separate course. A 2.0 overall grade point average is required for admission to the teacher education program. Increments of 0.5 of a grade point are

required for retention in the program up to 105-124 semester hours when a 2.25 overall grade point average is required.

A student may earn either a qualified or unqualified degree of Bachelor of Arts or Bachelor of Science in the College of Arts and Sciences. The major for the unqualified degree includes Introduction to Abstract Algebra, Engineering Mathematics or Differential Equations, Principles of Mathematical Statistics I, Foundations of Analysis and an additional three semester hour elective from prescribed courses. To obtain a qualified degree the student must also satisfactorily complete a six hour sequence of higher algebra or advanced calculus.

Table 9 is a summary of the preceding information. The table indicates the courses offered and the semester hours of credit assigned to these courses, e.g. 2 (6) indicates two courses for a total of six semester hours of credit.

Table 9 also extends the information to include a comparison of the courses offered at each school with the courses recommended for Level III by the Panel on Teacher Training of the Committee on the Undergraduate Program in Mathematics.[57] It should be noted that the courses offered are not necessarily the courses required for teacher certification.

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[57]Mathematical Association of America, Recommendations for the Training of Teachers of Mathematics, 9-10.

TABLE 9

SUMMARY AND COMPARISON OF THE PROGRAMS

Courses Offered	CSC	ECSC	NESC	NWSC	PSC	SESC	SWSC	OBU	PU	OU	CUPM
Pre-calculus	8(27)	6(21)	7(23)	4(14)	4(13)	4(14)	7(23)	2(8)	4(12)	5(15)	1(3)
Calculus	3(13)	2(10)	3(11)	3(13)	2(10)	3(13)	3(13)	3(13)	3(13)	3(14)	3(9-12)
Abstract or Linear Algebra	4(12)	2(6)	2(6)	2(6)	2(6)	2(6)	2(6)	2(6)	2(6)	5(4)	2(6)
Geometry	2(6)	2(6)	2(6)	2(6)	2(6)	2(6)	1(3)	1(3)	2(6)	2(6)	2(6)
Probability and Statistics	2(6)	1(3)	1(3)	2(6)	1(3)	2(6)	1(3)	1(3)	1(3)	3(9)	2(6)
Computer Science	4(12)	2(6)				4(11)				1(3)	1(3)
Electives from the Following											2(6)
Applications of Mathematics	3(9)	2(6)	2(6)	2(6)		4(12)	2(6)		1(3)	7(20)	
Real Variables										2(6)	
Number Theory	1(3)		1(3)	1(3)		1(3)	1(3)			2(6)	
Topology	1(3)								1(3)	1(3)	
History of Mathematics	1(3)	1(2)	1(2)	1(2)	1(3)	1(2)	1(2)	1(3)	1(3)	1(2)	
CUPM Courses Offered	13	12	11	12	10	13	10	9	11	13	13

TABLE 9 (Continued)

	CSC	ECSC	NESC	NWSC	PSC	SESC	SWSC	OBU	PU	OU	CUPM
Semester Hours Required for Mathematics Teaching	33	(32) 28-40	32	36	37	(30) 28-40	35	28	28	31	39-42
Minimum Number of Hours Above the Calculus	20	14	9	18	18	12	18	10	12	11	27
Number of Hours Above the Calculus Prescribed	20	6	5-6	9	15	0	3	0	12	8	21
Mathematics Education Required[a]		2	0-2		2					2	
Professional Education Required	21	25	21-30	21	21	21	26	21	23	21	
Semester Hours for Mathematics Major Non-teaching	32	29-38	30	36	35	28-40	35	28	34	32[b]	33-36

[a]Also included as part of the total mathematics hours.

[b]Unqualified degree.

TABLE 9 (Continued)

	CSC	ECSC	NESC	NWSC	PSC	SESC	SWSC	OBU	PU	OU	CUPM
Minimum Number of Hours Above the Calculus	18	15	8	18	18[c]	12	18	10	21	14	18
Number of Hours Above Calculus Prescribed or Limited to Two Choices	6	6	8	0	0	0	0	0	12	11	18

[c]Six of the eighteen hours may be in related fields.

The significant changes that did occur in the requirements and programs for the schools in this study, occurred prior to 1964. Most of these changes involved the addition of new courses conforming to the CUPM recommendations and some increases in the number of semester hours required for the majors. The most significant increase was at Southwestern State College, where the major was increased by five semester hours. The largest producer of mathematics teaching graduates, Northwestern State College has had essentially the same curriculum since 1962.

During the School year 1968-69, two schools, Southwestern State College and Central State College, were moving toward an apparent reduction in requirements for their mathematics teaching degrees.

The University of Oklahoma has had computer science courses available in the mathematics department since 1962. Central State College offered a mathematics major with a computer science emphasis in 1965. East Central State College has offered computer science courses in the mathematics department since 1966. The students at Southeastern State College have been able to minor in computer science since 1967. Five of the ten schools presented have computers and computer science courses available for the school year 1969-70.

Questionnaire for Juniors, Seniors and Graduates

A total of 127 students graduated from the mathematics certification programs of the participating schools in January, June or August of 1968. Ninety questionnaires were received from these graduates and used in this study. The actual returns, with the number of graduates from the certificate programs in parentheses, were as follows: Central State College-3(7); East Central State College-11(13); Northeastern State College-26(35); Northwestern State College-8(11); Panhandle State College-3(4); Southeastern State College-12(13); Southwestern State College-11(18); Oklahoma Baptist University-6(6); Phillips University-2(2); the University of Oklahoma-8(18).

The number and sex classification of the respondents and non-respondents are indicated for each school in Table 10.

A total of 501 questionnaires from junior and senior mathematics majors for 1968-69 were returned and were sufficiently complete to be used in this study. Eight persons failed to indicate their sex and two persons did not indicate their college classification, but their returns were included in the tabulations when they could be placed in the proper categories.

It was estimated that there were 656 junior and senior mathematics majors in the colleges and universities

TABLE 10

THE NUMBER AND SEX CLASSIFICATION OF THE RESPONDENTS AND NON-RESPONDENTS TO THE MAILED QUESTIONNAIRE

	CSC		ECSC		NESC		NWSC		PSC		SESC		SWSC		OBU		PU		OU		TOTAL	
	R	NR	R	NR	R	NR	R	NR	R	NR	R	NR	R	NR	R	NR	R	NR	R	NR	R	NR
Male	2	2	7	2	17	8	7	2	2	1	9	1	6	5	1	0	1	0	3	3	54	24
Female	1	2	4	0	9	1	1	1	1	0	3	0	5	2	5	0	1	0	6	7	36	13

studied. Thus, the 501 respondents would represent 76.4 percent of the population studied. The actual usable returns, with the estimated number of junior and senior mathematics majors in parentheses, from each school were as follows: Central State College-56(80); East Central State College-53(58); Northeastern State College-86(95); Northwestern State College-44(44); Panhandle State College-26(26); Southeastern State College-36(60); Southwestern State College-55(80); Oklahoma Baptist University-9(10); Phillips University-16(17); the University of Oklahoma-120(186).

Table 11 presents a summary of the data from the questionnaires to the juniors and seniors and lists the number of respondents in twenty-six categories and ten different schools.

To test the null hypotheses that the number of respondents from each school in the different categories of the tables constructed could be attributed to chance alone, the chi square statistic described by Guilford was used. The basic formula used was:

$$\chi^2 = N\left[\Sigma\left(\frac{f_{ik}^2}{f_i f_k}\right) - 1\right] \quad \text{where}$$

N represents the total number of frequencies, f_i and f_k represent the sum of the frequencies in the i-th row and k-th column respectively and f_{ik} represents the frequency in the i-th row and k-th column.[57]

To facilitate the computations a Fortran IV program was written to perform the calculations and the IBM 1130 computer at the University of Oklahoma was used to make the calculations. The program contained a check to determine whether or not the expected frequency in each cell was at least as large as five.

If any cell contained an expected frequency of less than five, the column containing that cell was combined with another column to satisfy the condition that all cells have expected frequencies greater than or equal to five. If a significant chi square was obtained, at the 5% level of significance, the program was constructed to cause a search for significant differences in each column. A copy of the program is included in Appendix C.

In analyzing the 2 x 2 tables in this study, the special formula

$$\chi^2 = N\left(\frac{\left[\left|ad - bc\right| - \frac{N}{2}\right]^2}{(a + b)(a + c)(b + d)(c + d)}\right)$$

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[57] J. P. Guilford, Fundamental Statistics in Psychology and Education, (4th ed; New York: McGraw Hill Book Company, 1965), 240.

with Yates' correction was used.[58] The letter N represents the total number of frequencies and a,b,c and d represent the frequencies in each cell. These calculations were also completed on the IBM 1130 and a copy of the program can be found in Appendix C.

The statistical analysis of the data in Table 11 indicated no significant differences between the categories of male or female and junior or senior, and the schools.

In the categories of teaching or non-teaching, a significant chi square was obtained. The column search yielded significant values for East Central State College and the University of Oklahoma. The significant value for East Central State College indicated that a significantly greater number of their mathematics majors were in the teaching curriculum than in the non-teaching curriculum. The significant value for the University of Oklahoma indicated that there were fewer mathematics majors in the teaching curriculum than could be expected by chance alone.

No significant difference was found in the number of males or females who were juniors and the number of males or females who were seniors.

There were 215 students in the teaching curricula and 286 students in the non-teaching curricula. In the

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[58] Ibid.

TABLE 11

NUMBER OF RESPONDENTS BY CATEGORIES AND SCHOOLS

	CSC	ECSC	NESC	NWSC	PSC	SESC	SWSC	OBU	PU	OU	TOTAL
Male	44	38	67	37	23	28	43	6	9	85	380
Female	11	13	19	7	2	8	10	3	6	34	113
Junior	28	21	39	25	11	13	33	2	7	50	229
Senior	28	32	47	19	15	23	21	7	9	69	270
Teaching Curriculum	18	32	44	22	11	21	27	5	3	32	215
Non-teaching Curriculum	38	21	42	22	15	15	28	4	13	88	286
Male and a Junior	25	17	31	19	9	10	23	1	5	35	175
Male and a Senior	19	21	36	18	14	18	20	5	4	50	205
Male and in Teaching	10	21	29	16	9	15	21	3	0	12	136
Male and in Non-teaching	34	17	38	21	14	13	22	3	9	73	244
Female and a Junior	3	4	8	6	1	3	9	1	1	15	51
Female and a Senior	8	9	11	1	1	5	1	2	5	18	61

TABLE 11 (Continued)

	CSC	ECSC	NESC	NWSC	PSC	SESC	SWSC	OBU	PU	OU	TOTAL
Female and in Teaching	8	10	15	6	2	6	6	2	3	20	78
Female and in Non-teaching	3	3	4	1	0	2	4	1	3	14	35
Junior and in Teaching	8	15	22	15	4	8	18	1	0	15	106
Junior and in Non-teaching	20	6	17	10	7	5	15	1	7	35	123
Senior and in Teaching	10	16	22	7	7	13	9	4	3	16	108
Senior and in Non-teaching	18	15	25	12	8	10	12	3	6	53	162
Male, Junior and in Teaching	6	12	14	10	3	5	13	0	0	7	70
Male, Senior and in Teaching	4	9	15	6	6	10	8	3	0	5	66
Male, Junior and Non-teaching	19	5	17	9	6	5	10	1	5	28	105
Male, Senior and Non-teaching	15	12	21	12	8	8	12	2	4	45	139

TABLE 11 (Continued)

	CSC	ECSC	NESC	NWSC	PSC	SESC	SWSC	OBU	PU	OU	TOTAL
Female, Junior and Teaching	2	3	8	5	1	3	5	1	0	8	36
Female, Senior and Teaching	6	7	7	1	1	3	1	1	3	11	41
Female, Junior, Non-teaching	1	1	0	1	0	0	4	0	1	7	15
Female, Senior, Non-teaching	2	2	4	0	0	2	0	1	2	7	20

teaching curricula there were 136 males and seventy-eight females. In the non-teaching curricula there were 244 males and thirty-five females. The totals are not exact, because eight students did not indicate their sex classification.

The chi square statistic for these data was significant and indicated that there was a difference in the number of females who selected the teaching curricula and the number of males who selected the teaching curricula. Sixty-nine percent of the females were in the teaching curricula as compared to thirty-six percent of the males.

No statistical differences were found in the following categories: (1) The number of juniors and seniors in the teaching curricula and the number of juniors or seniors in the non-teaching curricula; (2) The number of senior males or junior males in the teaching curricula and the number of senior males or junior males in the non-teaching curricula; (3) The number of female juniors or female seniors in the teaching curricula and the number of female juniors or female seniors in the non-teaching curricula.

Table 12 indicates the levels at which the students decided to major in mathematics.

A comparison of the male or female categories in Table 12 indicated that there was a significant difference at the junior and senior level. This indicated that significantly more males chose to become mathematics majors at

TABLE 12

THE LEVELS AT WHICH MATHEMATICS WAS CHOSEN AS A MAJOR

	Undergraduates						Graduates	
	M	F	J	S	T	NT	M	F
High School								
Freshman	28	15	22	21	16	27	6	6
Sophomore	18	9	16	11	17	10	5	5
Junior	37	17	25	30	22	34	11	4
Senior	65	22	51	36	50	37	3	10
College								
Freshman	75	23	49	50	40	59	15	9
Sophomore	113	24	58	82	56	84	10	1
Junior	32	3	6	29	11	25	2	0
Senior	10	0	0	11	2	9	2	1

the college junior and senior level than could be expected by chance alone.

The comparison of the junior and senior categories indicated that significant differences occurred at the high school senior and college junior levels. The indication was that a significantly greater number of juniors chose to major in mathematics at the high school senior level and that a significantly greater number of seniors decided to major in mathematics at the college junior level.

The statistical analysis of the teaching and non-teaching categories indicated that a greater number of the

teaching curriculum students chose their major at the high school senior level; whereas, a greater number of non-teaching students chose to major in mathematics at the college junior and senior level.

In the comparison of the teaching curriculum majors and the graduates of 1968, a significant difference was found at the college sophomore level.

These statistics indicated that seniors, males and non-teaching curriculum mathematics majors tended to select their majors later than their opposite categories. Also, the teaching curriculum majors tended to select their mathematics majors later than the graduates of 1968.

Table 13 indicates some possible explanations for these differences, when we note that more than four times as many males as females transferred to mathematics from other subjects, nearly twice as many seniors as juniors transferred to mathematics from other college majors, and almost one and one-half times as many non-teaching curriculum students as teaching curriculum students transferred to mathematics. The transfers would declare their intentions to major in mathematics at a later time and hence, would increase the numbers at these levels in their respective categories.

Table 14 indicates the reasons that were given for choosing mathematics as an undergraduate major.

TABLE 13

TRANSFERS TO MATHEMATICS FROM ANOTHER COLLEGE MAJOR

	Undergraduates						Graduates	
	M	F	J	S	T	NT	M	F
Engineering	54	1	20	37	21	36	8	0
Physical Science	21	2	5	19	8	16	2	1
Biological Science	4	1	3	2	0	5	0	1
Pre-professional	8	1	4	5	2	7	0	0
Elementary Education	1	6	1	6	6	1	0	0
Humanities	17	8	10	16	14	12	1	0
Business	5	3	3	5	3	5	2	3
Miscellaneous	4	2	4	3	4	3	1	0
Totals	114	24	50	93	58	85	14	5

The statistical examination of Table 14 revealed significant differences between the categories male or female and the items "parents," "the anticipation of a large number of job opportunities" and "my high school mathematics courses were easy." Over one-half of the males chose the item "the anticipation of a large number of job opportunities" as a first or second choice.

The data indicated that the males chose the items "the anticipation of a large number of job opportunities" and "my high school mathematics courses were easy" a

TABLE 14

THE REASONS GIVEN FOR CHOOSING MATHEMATICS AS A MAJOR

	Teaching Curriculum				Non-teaching Curriculum				Graduates	
	M	F	J	S	M	F	J	S	M	F
1. High school mathematics teacher	105	57	86	76	132	24	68	88	36	23
2. Junior high school mathematics teacher	17	14	14	17	19	3	9	13	10	7
3. High school teacher other than mathematics	9	4	6	7	3	1	2	2	4	4
4. College teacher of mathematics	37	31	35	33	53	11	36	28	17	11
5. College teacher other than mathematics	5	1	4	2	11	3	6	8	2	2
6. Parents	23	22	20	25	16	3	8	11	10	6
7. Family	10	12	9	13	15	1	8	8	1	3
8. Roommate	3	0	2	1	4	0	1	3	2	0
9. Friend	7	7	9	5	16	1	7	10	3	2
10. I have always enjoyed mathematics	110	71	87	94	195	31	103	123	48	32
11. The anticipation of a large number of job opportunities	59	15	40	34	100	9	49	60	25	9

TABLE 14 (Continued)

	Teaching Curriculum				Non-teaching Curriculum				Graduates	
	M	F	J	S	M	F	J	S	M	F
12. An aptitude test	23	16	24	15	35	4	16	23	7	3
13. My high school mathematics courses were easy	22	6	16	12	50	5	19	36	11	9
14. It would take less time to obtain this degree than others that interested me	1	1	0	2	19	2	3	18	4	2
15. Others	7	7	6	8	39	3	23	19	1	0

significantly greater number of times than did the females; whereas a significantly greater number of the females chose the item "parents."

No statistical differences existed between the categories of junior or senior.

The analysis of the categories, teaching or non-teaching curriculum, revealed significant differences between the groups on the items "parents," "my high school mathematics courses were easy" and two combined items "high school mathematics teacher and high school teacher other than mathematics" and "it would take less time to obtain this degree than others that interested me and others."

The data indicated that the teaching curriculum mathematics majors listed their high school teachers and parents as influential factors significantly more often than the non-teaching curriculum mathematics majors. Non-teaching curriculum mathematics majors tended to select the item "my high school mathematics courses were easy," and the combined item on the time factor and the "other" category more frequently than the teaching curriculum mathematics majors. The time factor item was probably influenced by the number of transfers from engineering or pre-engineering to the mathematics non-teaching curricula. Such transfers would ordinarily have a major portion of a mathematics major completed, if they transferred at the junior or senior level.

The most frequently mentioned item by all categories was "I have always enjoyed mathematics." The second most frequently mentioned item was "high school mathematics teacher" and the third most popular item was the job opportunities.

An examination of the sub-categories of teaching curriculum-male and non-teaching curriculum-male revealed significant differences on the combined item "high school mathematics teacher and high school teacher other than mathematics" and "parents." The teaching curriculum-males tended to select these items more frequently than the non-teaching curriculum-males. The non-teaching curriculum-males tended to select the combined item "it would take less time to obtain this degree than others that interested me and others" more frequently than the teaching curriculum-males.

The analysis revealed no significant differences in the categories: (1) teaching curriculum-male or male graduate; (2) teaching curriculum-female or female graduate; (3) teaching curriculum or graduate.

Because there were no significant differences in these categories and in the junior or senior categories, there was some support for the statement that the reasons for the choice of a mathematics major are not changing with the different levels of time. The differences that existed

were between the students in the teaching or non-teaching curricula and the female or male categories.

In order to determine the plans of the mathematics majors after their graduation, two questions were asked: (1) What do you plan to do during the year immediately following your graduation? and (2) After you have finished school, including graduate study if planned, and after military service, if this is a factor, what will be your most likely lifetime occupation?

The responses to these questions are presented in Tables 15 and 16.

Table 15 indicates that out of 215 teaching curriculum majors, 140 or sixty-five percent planned to teach during the academic year following their graduation. Twenty-three of the teaching curriculum majors planned to attend graduate school, but six eventually expected to teach in high school, ten expected to teach in college, four planned to enter industrial or government work and three expected to be employed elsewhere. Seventeen of the twenty-seven who planned to enter military service eventually planned to teach high school mathematics, two planned to teach in college, twelve planned to go into industrial or government work and three planned to be employed in other vocations.

A total of forty-three students or twenty percent of the juniors and seniors in the teaching curriculum did

TABLE 15

PLANNED ACTIVITY OF MATHEMATICS MAJORS THE YEAR FOLLOWING THEIR GRADUATION AND THE PRESENT OCCUPATION OF LAST YEAR'S GRADUATES

	Curriculum						
	Teaching				Non-teaching	Graduates	
	M	F	J	S	Total	M	F
Teach high school mathematics	80	60	71	69	0	28	23
Go to Graduate School	18	5	12	11	85	4	6
Enter Military Service	26	1	13	14	80	14[a]	0
Work in Industry as a Mathematician	7	4	6	5	67	6	5[b]
Others	4	7	4	7	45	1	2

TABLE 16

MOST LIKELY LIFETIME OCCUPATION

	Teaching				Non-teaching
	M	F	J	S	Total
Teaching					
Junior High School	9	8	9	7	0
Senior High School	72	49	60	61	1
College	27	8	19	16	26
Industry or Government	14	5	7	12	126
Computer Science	4	4	4	4	79
Others	8	5	5	8	47

[a]Eight out of the fourteen plan to teach after the completion of their military service.

[b]Ten of those employed in industry were computer programmers or data analysts.

not plan to teach on the secondary level following their graduation and they did not expect secondary teaching to be their lifetime occupation.

A total of 107 or seventy-six percent of the 140 juniors and seniors who planned to teach the year following their graduation, expected the teaching of high school or junior high school mathematics to be their lifetime occupation. Twenty-one students expected to teach college mathematics and twelve students planned to enter industrial or other employment for a lifetime occupation.

Thirty-six percent of the juniors and seniors in the teaching curricula did not expect the teaching of high school or junior high school mathematics to be their lifetime occupation. However, sixteen percent of the juniors and seniors do plan to teach on the college level and will not be lost to the teaching profession.

A comparison of the activity of the graduates of 1968 in their first year to the expected activity of the teaching curriculum students indicated no significant differences. Thus, the expected goals of the undergraduates seem to be realistic in terms of the activity of the graduates of 1968.

No significant differences were found between the categories of teaching curriculum male or female and the teaching curriculum junior or senior with regard to their

plans for the year following their graduation or their expected lifetime occupations.

A total of 209 teaching curriculum students responded to the question on their plans relative to college teaching. Forty-seven planned to teach college mathematics and 162 did not plan to teach college mathematics. Eighty-three graduates of 1968 responded to this question and thirty planned to teach on the college level and fifty-three did not.

A significant chi square was obtained for this 2 x 2 table. This indicated that a significantly greater number of the graduates planned to teach on the college level as opposed to the present junior and senior teaching curriculum mathematics majors.

No significant differences were found by comparing the categories of male or female teaching curriculum, junior or senior teaching curriculum, and teaching curriculum or graduates on the question: If you plan to teach immediately upon graduation, do you expect to remain in teaching for at least five years?

Table 17 presents the data regarding the level at which the teaching curriculum mathematics majors entered the certificate programs.

The analysis revealed that a significantly greater number of females entered the certificate programs as freshman and a significantly greater number of males entered the certificate programs as juniors and seniors.

TABLE 17

THE LEVEL AT WHICH THE TEACHING CERTIFICATE PROGRAM WAS ENTERED

	Undergraduates				Graduates	
	M	F	J	S	M	F
College						
Freshman	9	15	11	12	12	5
Sophomore	48	35	42	42	20	21
Junior	67	25	48	44	18	8
Senior	8	2	0	10	3	1

No significant differences existed between the entry of juniors or seniors into the certificate programs.

A comparison of the male undergraduates in the teaching curriculum and the male graduates indicated that a significantly greater number of male graduates entered the programs as freshman than could be expected by chance alone.

Table 18 indicates the reasons why the students chose to enter the teacher certification programs.

Table 18 indicates that the reason "enjoy working with children" was given by more students than any other item. It was also the reason which was listed as a first choice most frequently. The second most frequently chosen item was "a high school teacher of mathematics." This was also the second most frequently listed reason for their choice of a mathematics major. The item,"the number of job

TABLE 18

WHY STUDENTS CHOSE THE TEACHER CERTIFICATION PROGRAM AS OPPOSED TO A NON-TEACHING PROGRAM

	Undergraduates				Graduates	
	M	F	J	S	M	F
1. High school mathematics teacher	58	32	47	44	20	11
2. High school teacher other than mathematics	19	12	14	15	8	4
3. College mathematics teacher	26	10	20	16	8	3
4. College teacher other than mathematics	13	2	7	9	2	2
5. Parents	36	16	20	27	12	12
6. Family	21	14	14	21		
7. Roommate	1	0	0	2		
8. Friend	6	2	8	0		
9. The number of job opportunities	65	17	44	37	21	10
10. The opportunity to be original and creative	30	12	16	27	12	6
11. The social service nature of teaching	34	26	36	24	12	15
12. Enjoy working with children	57	41	41	57	26	18
13. The opportunity to exercise leadership	15	3	10	8	4	1
14. The life of a teacher	27	12	21	17	8	4
15. For a woman it is a good occupation in case she is forced to support a family or would like a second income	0	40	13	26	0	18
16. Others	14	10	16	8	3	3

opportunities," was the third most frequently listed reason for selecting the teaching curriculum.

No significant differences were found when the choices were compared between the categories of male or female, junior or senior, male-teaching curriculum or male graduate, female-teaching curriculum or female graduate and total teaching curriculum or total graduates.

Table 19 indicates the reasons why the non-teaching curriculum mathematics majors did not enter the certificate programs.

In Table 19 the most frequently listed item was "The salaries in teaching are not commensurate with the educational requirements." This was also selected as the most important reason for their choice of this curriculum the greatest number of times. The second most frequently listed item was "I like mathematics, but I do not want to teach." Two items were tied for the third most frequently mentioned item. Items five and fourteen, "I personally do not feel that I could teach" and "There is very little chance for advancement in teaching" were chosen the same number of times, however, item five was listed as a first choice more frequently than item fourteen.

The statistical analysis indicated that item five, "I personally do not feel that I could teach" was chosen by females a significantly greater number of times than could be expected by chance alone.

TABLE 19

REASONS THAT WERE INFLUENTIAL IN THE CHOICE OF THE NON-TEACHING CURRICULUM

	M	F	J	S
1. I like mathematics, but I do not want to teach.	131	20	77	78
2. The salaries in teaching are not commensurate with the educational requirements.	155	12	63	106
3. I did not want to be unemployed for three months out of every year.	8	2	7	3
4. Recent teacher actions such as strikes and sanctions.	11	1	3	9
5. I personally do not feel that I could teach.	58	14	36	37
6. Teachers have low prestige in the community.	14	0	4	10
7. Too many education courses are required for certification.	47	10	17	43
8. I would rather work with ideas or things instead of people.	30	4	22	14
9. Teachers' personal freedoms are restricted.	35	4	16	23
10. The discipline problems involved in teaching.	31	7	10	29
11. An oversupply of teachers in the desirable locations.	4	1	2	3
12. High school teacher	5	0	3	2
13. College teacher	8	2	6	4
14. There is very little chance for advancement in teaching.	69	3	21	52
15. An aptitude test	2	1	3	0
16. Others	26	5	14	17

A significantly greater number of the juniors than seniors indicated that the items, "I like mathematics, but I do not want to teach," and "I would rather work with ideas or things instead of people," as reasons for selecting the non-teaching curriculum. Significantly more seniors than juniors chose item number seven, "Too many education courses are required for certification," item number ten "The discipline problems involved in teaching," and item fourteen "There is very little chance for advancement in teaching" as reasons for selecting the non-teaching curriculum.

Some of the comments as to why they did not want to take the education courses were: "They are a waste of time and repeat requirements"; "By rumor they are dull and seemingly unapplicable"; "They take up a lot of time, not of great interest"; "They are far below the level at which they are taught"; "Too many interesting math courses to take"; "I feel that you would be teaching math courses not education courses"; "Do not need them to teach in college and decided they were a waste of time."

Table 20 presents the responses of the non-teaching curriculum mathematics majors to the question: "Have you ever considered teaching on the secondary level?"

The analysis of the frequencies in Table 20 indicated no significant differences in the responses to the question between the categories of male or female and junior or senior.

TABLE 20

RESPONSES TO THE QUESTION: "HAVE YOU EVER CONSIDERED TEACHING ON THE SECONDARY LEVEL?"

	Male	Female	Junior	Senior
Yes	130	22	62	92
No	110	12	58	65

Table 21 presents the levels at which teaching on the secondary level was considered as an occupation by the non-teaching curriculum mathematics majors.

TABLE 21

THE LEVEL AT WHICH TEACHING WAS CONSIDERED

	M	F	J	S
High School				
Freshman	7	0	1	6
Sophomore	10	3	6	8
Junior	15	0	8	8
Senior	18	4	8	14
College				
Freshman	17	7	11	14
Sophomore	29	3	19	13
Junior	19	4	7	17
Senior	14	1	0	15

No statistical differences were indicated for the categories of male or female and junior or senior and the time at which they considered teaching on the secondary level.

Forty-three students in the teaching curriculum did not plan to teach on the secondary level, but only six indicated their reasons for not entering secondary teaching. Five of the six indicated the item "The salaries in teaching are not commensurate with the educational requirements." The item "Teachers' personal freedoms are restricted" was indicated by three of the six students.

Twenty-two of these students responded to the question: "What changes should be made in order that the teaching of mathematics on the secondary level would become more attractive to you?" Twenty-one mentioned higher salaries. Other comments were: "If teachers were treated more like professionals"; "More freedom for creative teaching"; "More prestige"; "Better working conditions and smaller classes"; "More stringent requirements for individuals wishing to enter the teaching profession."

A salary increase was indicated by 130, out of the 181 non-teaching curriculum mathematics majors who responded to this question, as a factor which would make teaching more attractive to them. The lowering or elimination of the educational requirements was indicated by thirty-one out of the 181 students as another factor. Some comments were: "Different approach to math"; "Teachers' attitude"; "Strengthen the educational courses or at least allow the master's degree to take the place of the teaching certificate";

"Smaller student-teacher ratio"; "Teaching certificate easier to obtain"; "No homeroom duty or study hall "; "More prestige"; "The attitude of secondary teachers toward math"; "...better chance for individual accomplishments and recogniton"; "The math courses required for this type teaching degree should be modified to include only the subjects dealt with in high school."

Thirty graduates were not teaching and did not indicate that they were planning to teach. Twelve of these graduates indicated that salaries were a factor in their decision not to teach on the secondary level. Extracurricular activities was listed five times and the freedom to teach was listed three times.

Some of their comments related to changes that would make teaching more acceptable to them were: "Wider acceptance of the professional status of teachers"; "Less burdensome administration"; "Merit salary with upgrading of teacher quality"; "More personal freedom"; "More freedom in teaching subjects."

Table 22 presents the size of the high school graduation class of the respondents.

The analysis of the male or female categories in Table 22 indicated that significantly fewer females graduated from high school in a graduation class that ranged from 101 to 200 students.

TABLE 22

THE SIZE OF THE HIGH SCHOOL GRADUATION CLASS OF THE RESPONDENTS

	Undergraduates						Graduates	
	M	F	J	S	T	NT	M	F
Less than 100	172	40	113	99	118	96	36	14
101 to 200	58	7	20	48	25	43	9	9
201 to 300	28	13	18	25	19	24	4	4
301 to 500	48	19	37	30	21	46	0	6
501 to 700	42	19	24	38	14	27	4	2
More than 700	22	12	11	22	14	20	1	0

The analysis of the junior or senior categories indicated that significantly more juniors graduated from high schools in classes with less than 100 students and significantly more seniors graduated from high schools in classes ranging from 101 to 200 students.

In the teaching curriculum or non-teaching curriculum comparison, a significant value indicated that a greater number of the teaching curriculum students graduated from high school in classes of less than 100 and a significantly greater number of non-teaching curriculum mathematics majors graduated from high school in classes of 301 to 500 and 501 to 700. These data indicated that the teaching curriculum mathematics majors tended to graduate from the smaller schools; whereas, the non-teaching curriculum mathematics majors tended to graduate from the larger high schools.

No significant differences were indicated for the size of the high school graduation class when the teaching curriculum mathematics majors were compared with the graduates of 1968.

Table 23 indicates the occupations of the parents of the respondents to the questionnaires.

Before the statistical analysis could be performed on the categories of the occupations of the fathers for males or females, it was necessary to combine the class, educator, with the professional and semi-professional class. The analysis then indicated significant differences for this combined class of educators and professionals and the class of skilled workers. A significantly greater number of the fathers of the females were educators and professionals and a significantly greater number of the fathers of the males were employed as skilled workers.

No significant differences were found when the occupations of the fathers of the juniors or seniors were compared.

The comparison of the categories of teaching or non-teaching with the occupations of the fathers, yielded a significant difference in the categories of professional or semi-professional. A significantly greater number of the fathers of the non-teaching curriculum were employed as professionals or semi-professionals.

TABLE 23

OCCUPATIONS OF THE PARENTS OF THE RESPONDENTS

	Male		Female		Junior		Senior		Teaching		Non-Teaching		Graduates	
	FA	M	FA	M	FA	M	FA	M	FA	M	FA	M	FA	M
Educator	16	22	4	12	9	14	12	21	14	16	8	19	8	7
Professional or Semi-professional	37	11	21	5	25	4	33	12	18	4	41	12	9	3
Farmer or Rancher	63	0	19	0	44	0	39	0	42	0	41	0	18	0
Proprietor, Executive or Manager	41	8	15	4	24	4	32	8	22	2	34	10	11	0
Skilled worker	141	78	27	24	78	45	92	57	73	48	96	55	30	14
Housewife	0	243	0	67	0	152	0	162	0	138	0	178	0	66
Military, Deceased, Retired or Not Given	70	6	25	0	40	1	57	5	43	1	59	5	14	0

No significant differences were found in the comparison of the father's occupation and the mathematics teaching curriculum students with the graduates of 1968.

None of the comparisons in the categories of non-teaching curriculum or teaching curriculum, male or female, junior or senior, teaching curriculum mathematics majors or graduates with the occupations of the employed mothers were significant.

The responses to a question concerning the prestige of the secondary teacher of mathematics are presented in Table 24.

TABLE 24

RESPONSES TO THE QUESTION: "WHICH OF THE FOLLOWING OCCUPATIONS DO YOU FEEL HAS THE MOST PRESTIGE AMONG YOUR FRIENDS AND CLASSMATES?"

	Undergraduates						Graduates	
	M	F	J	S	T	NT	M	F
Secondary Teacher of Mathematics	74	18	42	53	55	40	10	6
Computer Programmer	288	87	182	197	153	229	40	29

A significant difference was found between the categories of teaching or non-teaching curricula. Significantly more non-teaching curriculum majors felt that a computer programmer had more prestige than a secondary teacher of mathematics.

The comparisons of the categories of male or female, junior or senior, teaching curriculum or graduate did not indicate any significant differences.

The response of the majors to a question about the professional status of teachers are presented in Table 25.

TABLE 25

RESPONSES TO THE QUESTION: "WOULD YOU CLASSIFY TEACHERS AS PROFESSIONALS OR SKILLED WORKERS?"

	Undergraduates						Graduates	
	M	F	J	S	T	NT	M	F
Professionals	332	99	101	116	191	245	43	33
Skilled Workers	42	8	125	147	20	30	6	1

None of the comparisons in Table 25, between male or female, junior or senior, teaching curriculum or non-teaching curriculum, and teaching curriculum or graduates were significant.

The responses to a question concerning the demand for the employment of mathematics majors, are presented in Table 26.

The statistical analysis indicated no significant differences when the categories of male or female, junior or senior, teaching curriculum or non-teaching curriculum, and teaching curriculum or graduates were compared.

Table 27 indicates the responses of the majors to a question concerning their plans for graduate school.

TABLE 26

RESPONSES TO THE QUESTION: "WHERE DO YOU FEEL THAT THE GREATEST DEMAND FOR THE EMPLOYMENT OF A MATHEMATICS MAJOR (NOT NECESSARILY YOURSELF) EXISTS?"

	Undergraduates						Graduates	
	M	F	J	S	T	NT	M	F
Teaching	166	48	101	116	103	116	25	15
Non-teaching	209	59	125	147	107	162	28	17

TABLE 27

RESPONSES TO THE QUESTION: "DO YOU PLAN TO GO ON TO GRADUATE SCHOOL WITHIN FIVE YEARS OF YOUR GRADUATION?"

	Undergraduates						Graduates	
	M	F	J	S	T	NT	M	F
Yes	285	85	174	200	173	202	47	31
No	77	26	47	58	36	70	6	4

A significant difference was found in the number of teaching curriculum mathematics majors who planned to go on to college within five years of their graduation. A significantly greater number of the teaching curriculum majors planned to go on to college within five years of their graduation.

No significant differences were found when the categories of male or female, junior or senior, and teaching curriculum or graduates were compared.

Table 28 indicates the responses to a question concerning the teaching of mathematics on the college level.

TABLE 28

RESPONSES TO THE QUESTION: "IS YOUR GOAL TO TEACH MATHEMATICS ON THE COLLEGE LEVEL?"

	Undergraduates						Graduates	
	M	F	J	S	T	NT	M	F
Yes	68	16	40	45	47	38	20	10
No	298	94	184	215	162	240	30	23

Significant differences were indicated in Table 28 when the categories of teaching curriculum or non-teaching curriculum and teaching curriculum or graduate were compared. The differences indicated that a significantly greater number of mathematics teaching curriculum majors have as a goal the teaching of mathematics on the college level than do the non-teaching mathematics students and that a significantly greater number of graduates have as a goal the teaching of mathematics on the college level than do the teaching curriculum students.

Table 29 indicates the responses of the students to a question about their plans for leaving teaching as an occupation.

None of the comparisons of the categories of male or female, junior or senior, and teaching curriculum or

graduates were significant.

The indicated occupations for those leaving teaching after a few years were: industry-19; computer programming-13; farming-6; housewife-4; and miscellaneous-12.

TABLE 29

RESPONSES TO THE QUESTION: "DO YOU PLAN TO GO INTO SOME OTHER TYPE OF WORK AFTER YOU HAVE TAUGHT FOR A FEW YEARS?"

	Undergraduates				Graduates	
	M	F	J	S	M	F
Yes	27	15	20	22	10	8
No	85	49	69	65	30	24

Table 30 indicates the responses to a question about the length of time the majors planned to stay in teaching.

TABLE 30

RESPONSES TO THE QUESTION: "IF YOU PLAN TO TEACH IMMEDIATELY UPON GRADUATION, DO YOU EXPECT TO REMAIN IN TEACHING FOR AT LEAST FIVE YEARS?"

	Undergraduates				Graduates	
	M	F	J	S	M	F
Yes	96	57	77	76	39	24
No	13	10	12	11	3	6

The statistical analysis of the categories male or female, junior or senior, and teaching curriculum or graduate indicated no significant differences.

Table 31 indicates the responses of the graduates to a question concerning the most valuable and least valuable courses in their certificate programs.

TABLE 31

SUMMARY OF THE RESPONSES OF NINETY GRADUATES OF 1968 AS TO THE MOST VALUABLE AND THE LEAST VALUABLE COURSES REQUIRED IN THEIR CERTIFICATION PROGRAM

	Most Valuable	Least Valuable
Introduction to Education	3	30
Psychology in Education or Educational Psychology	12	25
History and Philosophy of Education	4	1
General Methods, Curriculum and Instruction	11	15
Psychology of Adolescents	8	5
Student Teaching	19	0
Tests and Measurements	10	10
Audio Visual	2	2
Humanities	0	7
Seminar in Student Teaching	1	3
Pre-Calculus Mathematics	5	2
Calculus	2	1
Post-Calculus Mathematics	9	3
Mathematics Methods	23	4

The courses listed most frequently as the most valuable were mathematics methods and student teaching. The courses listed most frequently as the least valuable were introductory education courses and the courses in the psychology of education.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study was concerned with the trends in the number of persons graduated from the mathematics teaching certificate programs in selected colleges and universities in Oklahoma.

The data collected, indicated no significant trend in the number of mathematics majors who graduated from the certificate programs over the last six years. However, the data did indicate that the ratio of the number of mathematics graduates to the total number of bachelor degrees awarded in each year was declining significantly. This result was contrary to the predicted national trend.[59]

The evidence also indicated that the percentage of mathematics majors who had graduated from the certificate programs was not increasing or decreasing significantly. Since this percentage was relatively stable, an increase in the number of mathematics majors would also increase the mathematics graduates from the certificate programs.

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[59]U. S. Office of Education, loc. cit., 32-34.

Thus, to increase the number of graduates from the certificate programs, it would be necessary to increase the number of mathematics majors and/or to increase the percentage of majors who select the certificate programs.

This study obtained information related to the problem of increasing the number of graduates from the mathematics certification programs by determining the reasons that influenced the students to become mathematics majors. It also sought to determine why they selected or did not select the teaching curricula and the reasons why some students, who graduated from the teaching curricula, did not enter teaching.

A questionnaire was designed at the exploratory level and was administered to the junior and senior mathematics majors during the academic year 1968-69 to determine the possible reasons for their various decisions. A similar questionnaire was mailed to the graduates of the certificate programs in January, June or August of 1968.

The analysis of the questionnaires indicated that East Central State College had a significantly greater number of mathematics majors in the teaching curriculum than could be expected by chance alone and that the University of Oklahoma had significantly fewer mathematics majors enrolled in the teaching curriculum than could be expected by chance alone.

The data indicated that a significantly greater percentage of the female mathematics majors, sixty-nine percent, were enrolled in the teaching curricula as opposed to thirty-six percent for the males.

The information regarding the size of the high school class at the time of graduation indicated that a significantly greater number of the teaching curriculum students graduated from high school in classes of less than 100. Also a significantly greater number of non-teaching curriculum students graduated from high school in classes of 301 to 500 and 501 to 700.

The analysis indicated that college seniors, males and non-teaching curriculum majors tended to select their mathematics major later than the college juniors, females and teaching curriculum majors. The teaching curriculum majors of 1968-69 tended to select their major later than the graduates of 1968.

A total of 143 out of the 501 respondents transferred to mathematics. Fifty-seven of the transfers were from engineering or pre-engineering curricula. The male transfers outnumbered the female transfers and the senior and non-teaching transfers outnumbered the junior and teaching curriculum transfers.

The analysis indicated that the job opportunities, and the small amount of difficulty that they experienced

with their high school mathematics courses, were significantly greater factors for males than for females in their choice of a mathematics major; whereas, the parents were significantly greater factors for the females.

The teaching curriculum mathematics students were influenced significantly more in their decision to major in mathematics by their high school teachers and parents than were the non-teaching curriculum mathematics majors. The non-teaching curriculum mathematics majors were influenced significantly more than the teaching curriculum mathematics majors by the reason that it would take less time to obtain a mathematics degree than other degrees that they were interested in and the fact that they experienced little difficulty in their high school mathematics courses. The time factor was a typical response for the transfers from an engineering curriculum.

The most frequently given reasons for choosing to major in mathematics, in rank order, were: (1) I have always njoyed mathematics; (2) high school mathematics teacher; and (3) the number of job opportunities.

There were 215 students in the mathematics teaching curricula and 286 students in the non-teaching curricula. Sixty-five percent of the students in the teaching curricula felt that they would teach on the secondary level during the academic year following their graduation.

Twenty percent of those in the teaching curricula did not feel that they would teach during the academic year following their graduation, nor did they see teaching on the secondary level as a lifetime occupation.

The most frequently given reasons for selecting the teaching curricula, in rank order, were: (1) enjoy working with children; (2) high school mathematics teacher; and (3) the number of job opportunities.

The most frequently listed reasons for the selection of the non-teaching curricula, in rank order, were: (1) The salaries in teaching are not commensurate with the educational requirements; (2) I like mathematics, but I do not want to teach; (3)-(4) I personally do not feel that I could teach and there is very little chance for advancement in teaching.

Significantly more females than males chose the reason "I personally do not feel that I could teach" for not selecting the teaching curricula.

A significantly greater number of juniors than seniors chose the items, "I like mathematics, but I do not want to teach" and "I would rather work with ideas or things instead of people" as their reasons for not entering the teaching curricula. A significantly greater number of seniors than juniors chose the items, "Too many education courses are required for certification," "The discipline

problems involved in teaching" and "There is very little chance for advancement in teaching" as their reasons for not entering the teaching curricula.

Only six of the students who were in the teaching curricula and did not plan to teach secondary mathematics, indicated their reasons for this decision. The salaries and the restriction of their personal freedoms were the most frequently listed reasons.

The responses to the question, "What changes should be made in order that the teaching of mathematics on the secondary level would become more attractive to you?" were concerned most frequently with the salary of teachers. The second most frequently mentioned area was the education requirements, which they felt should be lowered or eliminated.

The results of this study indicated that the high school mathematics teachers were important influences in the student's choice of mathematics as a major and in the choice of the teaching curriculum. Further research should attempt to determine the characteristics of those teachers who do inspire their students to major in mathematics in college and to enter the teaching curricula. After the determination of these characteristics, it should be determined whether or not these characteristics could be instilled in persons preparing to teach secondary school mathematics.

The data regarding the reasons that students who were planning to graduate from a teaching curriculum, but

did not plan to teach was limited. Since this group represents about twenty percent of the potential teachers of mathematics, research should be directed to this group in an effort to obtain better data.

The fact that ten of the ninety graduates of 1968 who responded to the questionnaire were employed as computer programmers or data analysts indicates a potential loss to the teaching profession, which shows every indication of becoming larger.

The differences in salary between teaching in the secondary schools and the other occupations open to mathematics majors is a factor that influences their decisions.

Specific data regarding the number of years a student actually stays in teaching should be sought in follow-up studies over the next five years for the graduates of 1968. Such information would be helpful in determining the need for mathematics teachers in the future.

Finally, the need exists to determine how many teachers in Oklahoma are teaching mathematics, but do not have the necessary qualifications. Such information is necessary to determine how many teachers need to be upgraded or replaced to improve the instruction of mathematics in Oklahoma on the secondary level. This information is needed to determine the potential demand for new teachers of mathematics.

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APPENDIX A

QUESTIONNAIRE

Your answers to this questionnaire will help to determine the potential supply of new secondary mathematics teachers in Oklahoma and the factors which influence students to become secondary mathematics teachers. Since the evidence indicates that the shortage of secondary mathematics teachers is becoming more acute, the information that you contribute may materially assist your school and the schools of Oklahoma in providing an adequate number of mathematics teachers for the secondary schools of Oklahoma.

INSTRUCTIONS AND DEFINITIONS: In this questionnaire teaching curriculum will mean that you are now planning to complete or have completed the education courses that would be necessary to become certified as a secondary mathematics teacher in Oklahoma. Non-teaching curriculum is any program that does not include the completion of the education courses. (If you have taken some of the courses, but do not plan to complete all of them, then you would be in the non-teaching curriculum.)

PART A
TO BE COMPLETED BY ALL MATHEMATICS MAJORS

1. Junior ☐ Senior ☐

2. Male ☐ Female ☐

3. Teaching curriculum ☐ Non-teaching curriculum ☐

4. Father's Occupation _____

Mother's Occupation _____

5. Size of high school graduation class

less than 100 ☐ 301 to 500 ☐
101 to 200 ☐ 501 to 700 ☐
201 to 300 ☐ more than 700 ☐

6. When did you decide to become a mathematics major?

Freshman	H.S. ☐	College ☐
Sophomore	H.S. ☐	College ☐
Junior	H.S. ☐	College ☐
Senior	H.S. ☐	College ☐

7. If you transferred from another major in college, please indicate that major here.

_____

8. Please indicate with a check mark, those items which you feel were important or influential in your decision to major in mathematics. If applicable, check up to four items.

___High school mathematics teacher
___Junior high school mathematics teacher
___High school teacher other than mathematics
___College teacher of mathematics
___College teacher other than mathematics
___Parents
___Family
___Roommate
___Friend
___I have always enjoyed mathematics.
___The anticipation of a large number of job opportunities
___An aptitude test (If you check this item, please indicate when you took this test.)_____
___My high school mathematics courses were easy.
___It would take less time to obtain this degree than others that interested me.
___Others (Please specify)_____

NOW THAT YOU HAVE CHECKED ALL OF THE ITEMS THAT APPLY, PLEASE GO BACK AND INDICATE THE MOST IMPORTANT ITEM BY PLACING A 1 IN THE BLANK TO THE LEFT OF THE ITEM. INDICATE THE SECOND MOST IMPORTANT ITEM BY PLACING A 2 IN THE BLANK TO THE LEFT OF THE ITEM.

9. Would you classify teachers as professionals or skilled workers?

Professionals ☐ Skilled workers ☐ Others_____

10. Where do you feel that the greatest demand for the employment of a mathematics major (not necessarily yourself) exists?

Teaching ☐ Non-teaching ☐

11. What do you plan to do during the year immediately following your graduation?

Teach high school mathematics ☐
Go to graduate school ☐
Enter military service ☐
Work in industry as a mathematician ☐
Others_____

12. Do you plan to go on to graduate school within five years from your graduation?

Yes ☐ No ☐

13. Is your goal to teach mathematics on the college level?

Yes ☐ No ☐

14. After you have finished school, including graduate study if planned, and after military service, if this is a factor, what will be your most likely lifetime occupation?

Teacher
Junior H.S. ☐
Senior H.S. ☐
College ☐

Actuary ☐
Computer Scientist ☐
Statistician ☐

Mathematician, other than those listed, in:
Industry ☐
Government ☐
Others_____

15. Which of the following occupations do you feel has the most prestige among your friends and classmates?

Secondary teacher of mathematics ☐ Computer programmer ☐

PART B

TO BE COMPLETED ONLY BY TEACHING CURRICULUM MATHEMATICS MAJORS. IF YOU ARE IN THE NON-TEACHING CURRICULUM, PLEASE OMIT THIS PART AND PROCEED TO PART C, ITEM NUMBER 24.

16. When did you enter the teacher certification program?

Freshman ☐ Sophomore ☐ Junior ☐ Senior ☐

17. Do you plan to teach during the academic year immediately following your graduation? Yes ☐ No ☐

18. If you do not plan to teach immediately following graduation, do you expect to do so within five years of the date of your graduation? Yes ☐ No ☐

19. If you plan to teach immediately upon graduation, do you expect to remain in teaching for at least five years? Yes ☐ No ☐

20. Do you plan to go into some other type of work after you have taught for a few years? Yes ☐ No ☐

21. If you answered "yes" please state the type of work or activity you plan to be engaged in after leaving teaching.

22. Please indicate with a check mark, those items which you feel were important or influential in your decision to enter the teaching curriculum. (This refers specifically to the influences that caused you to enter the teaching curriculum and not the influences that may have caused you to become a mathematics major.) If applicable, check up to four items.

___High school mathematics teacher
___High school teacher other than mathematics
___College mathematics teacher
___College teacher other than mathematics
___Parents
___Family
___Roommate
___Friend
___The number of job opportunities
___The opportunity to be original and creative
___The social service nature of teaching
___Enjoy working with children
___The opportunity to exercise leadership
___The life of a teacher
___For a woman it is a good occupation in case she is forced to support a family or would like a second income.
___Others (Please specify)_____

NOW THAT YOU HAVE CHECKED ALL OF THE ITEMS THAT APPLY, PLEASE GO BACK AND INDICATE THE MOST IMPORTANT ITEM BY PLACING A 1 IN THE BLANK TO THE LEFT OF THE ITEM. INDICATE THE SECOND MOST IMPORTANT ITEM BY PLACING A 2 IN THE BLANK TO THE LEFT OF THE ITEM.

23. If your plans for the future do not include teaching at any time, then please go to PART C question 26 and check those items which you feel were important or influential in your decision. Continue on to question 27.

PART C

TO BE COMPLETED ONLY BY NON-TEACHING CURRICULUM MATHEMATICS MAJORS

24. Have you ever seriously considered teaching on the secondary level?

Yes ☐ No ☐

25. If you answered "yes", indicate the time you considered this idea.

Freshman H.S. ☐ College ☐
Sophomore H.S. ☐ College ☐
Junior H.S. ☐ College ☐
Senior H.S. ☐ College ☐

26. Please indicate with a check mark, those items which you feel were important or influential in your decision to enter the non-teaching curriculum. If applicable, check up to four items.

___I like mathematics, but I do not want to teach.
___The salaries in teaching are not commensurate with the educational requirements.
___I did not want to be unemployed for three months out of every year.
___Recent teacher actions such as strikes and sanctions
___I personally do not feel that I could teach.
___Teachers have low prestige in the community.
___Too many education courses are required for certification. (If this is one of your reasons, please indicate why you did not want to take the education courses.)_____
_____
___I would rather work with ideas or things instead of people.
___Teachers' personal freedoms are restricted.
___The discipline problems involved in teaching
___An oversupply of teachers in the desirable locations
___High school teacher
___College teacher
___There is very little chance for advancement in teaching.
___An aptitude test (If you check this item, please indicate when you took this test.)_____
___Others (Please specify)_____

NOW THAT YOU HAVE CHECKED ALL OF THE ITEMS THAT APPLY, PLEASE GO BACK AND INDICATE THE MOST IMPORTANT ITEM BY PLACING A 1 IN THE BLANK TO THE LEFT OF THE ITEM. INDICATE THE SECOND MOST IMPORTANT ITEM BY PLACING A 2 IN THE BLANK TO THE LEFT OF THE ITEM.

27. What changes should be made in order that the teaching of mathematics on the secondary level would become more attractive to you?_____

School_____

QUESTIONNAIRE

DIRECTIONS: Place check marks in the appropriate boxes. If you feel that it is impossible to make a choice, you may qualify your answer on the questionnaire.

PART A
TO BE COMPLETED BY ALL GRADUATES

1. Male ☐
   Female ☐

2. When did you enter the teacher certification program?
   Freshman ☐ Junior ☐
   Sophomore ☐ Senior ☐

3. Father's Occupation
   _____
   Mother's Occupation
   _____

4. Size of high school graduation class:
   less than 100 ☐ 301 to 500 ☐
   101 to 200 ☐ 501 to 700 ☐
   201 to 300 ☐ more than 700 ☐

5. When did you decide to become a mathematics major?

Freshman	H.S. ☐	College ☐
Sophomore	H.S. ☐	College ☐
Junior	H.S. ☐	College ☐
Senior	H.S. ☐	College ☐

6. If you transferred from another major in college, please indicate that major here.
   _____

7. Please indicate with a check mark, those items which you feel were important or influential in your decision to major in mathematics. If applicable, check up to four items.

___High school mathematics teacher
___Junior high school mathematics teacher
___High school teacher other than mathematics
___College teacher of mathematics
___College teacher other than mathematics
___Parents
___Family
___Roommate
___Friend
___I have always enjoyed mathematics
___The anticipation of a large number of job opportunities
___An aptitude test (If you check this item, please indicate when you took this test.)_____
___My high school mathematics courses were easy.
___It would take less time to obtain this degree than others that interested me.
___Others (Please specify)_____

NOW THAT YOU HAVE CHECKED ALL OF THE ITEMS THAT APPLY, PLEASE GO BACK AND INDICATE THE MOST IMPORTANT ITEM BY PLACING A 1 IN THE BLANK TO THE LEFT OF THE ITEM. INDICATE THE SECOND MOST IMPORTANT ITEM BY PLACING A 2 IN THE BLANK TO THE LEFT OF THE ITEM.

8. Would you classify teachers as professionals or skilled workers?

Professionals ☐ Skilled Workers ☐ Others_____

9. Where do you feel that the greatest demand for the employment of a mathematics major (not necessarily yourself) exists?

Teaching ☐ Non-teaching ☐

10. Do you plan to go on to graduate school within the next five years?

Yes ☐ No ☐

11. Is your goal to teach mathematics on the college level?

Yes ☐ No ☐

12. Which of the following occupations do you feel has the most prestige among your friends and former classmates?

Secondary teacher of mathematics ☐ Computer Programmer ☐

13. What is your present occupation? Graduate School

Teacher ☐ Military Service ☐ Others_____
(Please specify)

If you are now in the military service, do you plan to teach upon your return to civilian life? Yes ☐ No ☐

PART B

TO BE COMPLETED ONLY BY THOSE GRADUATES WHO ARE TEACHING THIS YEAR OR THOSE WHO ARE PLANNING TO TEACH. IF YOU ARE NOT TEACHING AND NOT PLANNING TO TEACH AT ANY TIME IN THE FUTURE, PLEASE OMIT THIS PART AND PROCEED TO PART C.

14. Please indicate with a check mark, those items which you feel were important or influential in your decision to become a teacher. (This refers specifically to the influences that caused you to become a teacher and not the influences that may have caused you to become a mathematics major.) If applicable, check up to four items.

___High school mathematics teacher
___High school teacher other than mathematics
___College mathematics teacher
___College teacher other than mathematics
___Parents
___The number of job opportunities
___The opportunity to be original and creative
___The social service nature of teaching
___Enjoy working with children
___The opportunity to exercise leadership
___The life of a teacher
___For a woman, it is a good occupation in case she is forced to support a family or would like a second income.
___Others (Please specify)_____

NOW THAT YOU HAVE CHECKED ALL OF THE ITEMS THAT APPLY, PLEASE GO BACK AND INDICATE THE MOST IMPORTANT ITEM BY PLACING A 1 IN THE BLANK TO THE LEFT OF THE ITEM. INDICATE THE SECOND MOST IMPORTANT ITEM BY PLACING A 2 IN THE BLANK TO THE LEFT OF THE ITEM.

15. Do you expect to remain in teaching for at least five years?

Yes ☐ No ☐

16. Do you plan to go into some other type of work after you have taught for a few years?

Yes ☐ No ☐

17. If you answered "yes", please state the type of work or activity you plan to be engaged in after leaving teaching.

18. Of the course requirements for teacher certification, list by course title, the two which were the most valuable and the two which were the least valuable, based on your teaching experience to date.

Most Valuable		Least Valuable	
_____	_____	_____	_____

PART C

TO BE COMPLETED BY THOSE NOT TEACHING AND THOSE NOT PLANNING TO TEACH.

19. Please indicate with a check mark, those items which you feel were important or influential in your decision not to enter teaching. If applicable, check up to four items.

___I like mathematics, but I do not want to teach.
___The salaries in teaching are not commensurate with the educational requirements.
___Recent teacher actions such as strikes and sanctions
___I personally do not feel that I could teach.
___Teachers have low prestige in the community.
___I would rather work with ideas or things instead of people.
___Teachers' personal freedoms are restricted.
___The discipline problems involved in teaching
___An oversupply of teachers in desirable locations.
___High school teacher
___College teacher
___There is very little chance for advancement in teaching.
___An aptitude test (If you check this item, please indicate when you took this test.)_____
___Others (Please specify)_____

NOW THAT YOU HAVE CHECKED ALL OF THE ITEMS THAT APPLY, PLEASE GO BACK AND INDICATE THE MOST IMPORTANT ITEM BY PLACING A 1 IN THE BLANK TO THE LEFT OF THE ITEM. INDICATE THE SECOND MOST IMPORTANT ITEM BY PLACING A 2 IN THE BLANK TO THE LEFT OF THE ITEM.

20. What changes should be made in order that the teaching of mathematics on the secondary level would become more attractive to you?_____

APPENDIX B

Norman, Oklahoma
January, 1969

Dear

As part of a research project, I am attempting to determine the present employment of the recent graduates from the certificate programs in Oklahoma as well as their opinions about selected questions. As a graduate of a certification program, you are a vital person in this study.

Since the evidence indicates that the shortage of secondary mathematics teachers is becoming more acute, the time that you spend in completing this questionnaire may materially assist the colleges and universities of Oklahoma in providing an adequate supply of secondary mathematics teachers for the schools in Oklahoma. The chairman of the mathematics department of your school is assisting me in providing information regarding the present junior and senior mathematics majors. Your help is needed to obtain the information about the graduates of last year.

If you would like to be notified of the results of this questionnaire, please print your name and correct address at the top of the questionnaire. Your reply will be kept confidential and your cooperation will be appreciated.

Please return the completed form in the enclosed envelope.

Sincerely yours,

Elton Fors

Norman, Oklahoma
February, 1969

Dear

A few weeks ago you were sent a questionnaire concerning your opinion about selected questions related to the supply of secondary mathematics teachers in Oklahoma. The cover letter stated that this was part of a research project that I am attempting here at the University of Oklahoma. I hoped that you would assist in this study because only you can provide the information that is needed for this project.

The response has been good but, since the number of persons involved in this part of the study is relatively small, your cooperation is very important. In the event that you have mislaid the first questionnaire, I am enclosing a duplicate copy and another envelope for your reply.

The questionnaire can be completed in approximately four minutes and will give you an opportunity to contribute to a study that may assist the colleges and universities of Oklahoma in providing mathematics teachers for the secondary schools.

If you would like to be notified of the results of this questionnaire, please print your name and correct address at the top of the questionnaire.

Your reply will be confidential and will be appreciated.

Sincerely yours,

Elton Fors

APPENDIX C

Program for Computing Chi Square with 2 Rows and N Columns

```
      INTEGER DF
      DIMENSION D(2,16), SUMC(16),SUMR(2),TABLE(15),TAB(16),
     1TEST(2,16)
      READ(2,98)TABLE
   98 FORMAT(15F5.3)
   99 READ(2,100)D,N,K
  100 FORMAT(26F3.0/6F3.0, 2I3)
      DO 3 IR = 1,2
    3 SUMR(IR) = 0
      DO 4 IC = 1,N
    4 SUMC(IC) = 0
      SUM = 0
      DO 5 IR = 1,2
      DO 5 IC = 1,N
    5 SUMR(IR) = SUMR(IR) + D(IR,IC)
      DO 6 IC = 1N
      DO 6 IR = 1,2
    6 SUMC(IC) = SUMC(IC) + D(IR,IC)
      DO 7 IR = 1,2
      DO 7 IC = 1,N
    7 SUM = SUM + D(IR,IC)**2/(SUMR(IR)*SUMC(IC))
      DIFF = SUM - 1.
      TOTAL = SUMR(1) + SUMR(2)
      CHISQ = TOTAL * DIFF
      DF = N - 1
      DO 62 IC = 1,N
      DO 62 IR = 1,2
      TEST(IR,IC) = SUMR(IR)*SUMC(IC)/TOTAL
      IF(TEST(IR,IC) - 5.) 60,62,62
   60 WRITE (3,61) D(IR,IC), CHISQ, DF, TEST(IR,IC)
   61 FORMAT('FLAG =',F5.0,2X,F6.3,2X,I2,2X,F7.3)
   62 CONTINUE
      IF(CHISQ - TABLE(DF)) 10,10,103
   10 WRITE(3,101) CHISQ, DF
  101 FORMAT(' CHI SQUARE =',F6.3,2X,'NOT SIGNIFICANT',2X,
     1'DF =', I2)
```

```
200 IF(K) 99,99,102
103 WRITE(3,104) CHISQ, DF
104 FORMAT(' CHI SQUARE = 'F6.3,2X,'SIGNIF .05 LEVEL',2X,
   1'DF =', I2)
    DO 51 IC = 1,N
    TAB(IC) = (D(1,IC) - TEST(1,IC))**2/TEST(1,IC) +
   1(D(2,IC) - TEST(2,IC))**2/TEST(2,IC)
    IF(TAB(IC) - 6.635) 50,50,49
 49 WRITE(3,40) D(1,IC), D(2,IC), TAB(IC)
 40 FORMAT('0SIGNIFICANT AT .01 LEVEL', 2X,F5.0,2X,F5.0,
   12X,'CHI SQ =',F7.3)
    GO TO 51
 50 CONTINUE
    IF (TAB(IC) - 3.841) 51,51,52
 52 WRITE(3,41) D(1,IC), D(2,IC), TAB(IC)
 41 FORMAT('OSIGNIFICANT AT .05 LEVEL',2X,F5.0,2X,F5.0,
   12X,'CHI SQ =',F7.3)
 51 CONTINUE
    GO TO 200
102 CONTINUE
    CALL EXIT
    END
```

Program for Computing Chi Square for 2 x 2 Table

```
  1 READ(2,2) A,B,C,D,XN
  2 FORMAT(5F3.0)
    YN = A + B + C + D
    X = ABS(A*D - B*C)
    CHISS = YN*(X - YN/2.)**2)/((A + B)*(A + C)*(B + D)*(C + D))
    WRITE (3,4) CHISS
  4 FORMAT(' CHI SQUARE =', F10.3)
    IF(CHISS - 3.841) 10,10,20
 10 WRITE(3,5)
  5 FORMAT(' NOT SIGNIFICANT')
    GO TO 35
 20 WRITE (3,6)
  6 FORMAT(' SIGNIFICANT AT .05 LEVEL')
 35 IF(XN) 1,1,40
 40 CALL EXIT
    END
```

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