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# AN ANALYSIS OF THE QUALIFICATIONS OF THE MATHEMATICS INSTRUCTORS AND OF THE CONTENT OF THE MATHEMATICS COURSES IN THE COMMUNITY COLLEGES OF NORTH CAROLINA

by

Ruth Youngblood Sharrock

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the Faculty of the Graduate School at
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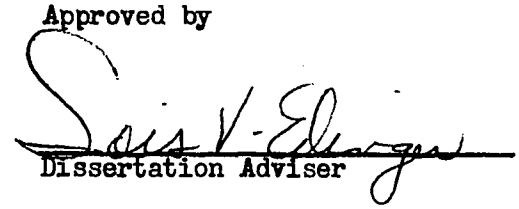

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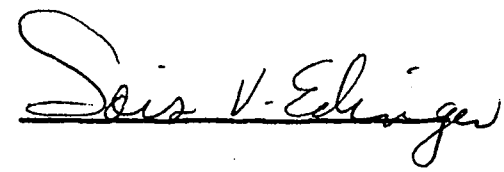
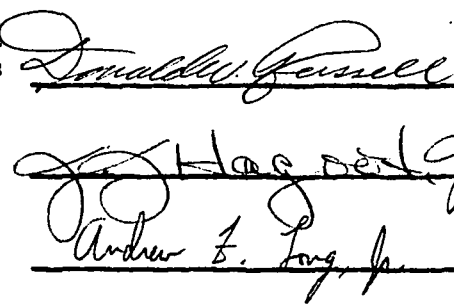
Dissertation Adviser 

Oral Examination Committee Members 

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SHARROCK, RUTH YOUNGBLOOD. An Analysis of the Qualifications of the Mathematics Instructors and of the Content of the Mathematics Courses in the Community Colleges of North Carolina. (1972)
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It was the purpose of this study to investigate the qualifications of the mathematics instructors in the community colleges of North Carolina and to determine the content of the mathematics courses in the college transfer programs at these institutions. The increase of the number of students transferring from the community colleges to the senior institutions of North Carolina created the need for a study to be made of the mathematics departments of these two year institutions in the state. The criteria used in the analysis of the qualifications of the instructors and of the content of the courses were recommendations made by the Committee on the Undergraduate Program in Mathematics of the Mathematical Association of America and guidelines prepared by the Joint Committee on College Transfer Students of North Carolina.

The data relative to the mathematics instructors were collected by a questionnaire constructed by the investigator. The academic preparation and the professional activities of the instructors were the two major categories in the questionnaire sent to the instructors teaching college transfer courses in the community colleges of North Carolina during the fall of 1971. These instructors, the chairman of the mathematics department of each of the fifteen institutions, and the catalogue of the individual institutions were the sources of the data collected relative to the mathematics courses taught in the college transfer programs.

The findings indicated that the academic preparation of the mathematics instructors varied widely. All of the instructors had earned a master's degree of some type. The average instructor had taken less than nine of the eighteen courses recommended by CUPM. The professional activity participation data showed that the majority of the instructors had participated in three of the six categories of activities which are indicative of professional growth.

The content of the freshman level mathematics courses was different between schools. Approximately seventeen courses of this type were described in the catalogues of the institutions. The calculus sequence was nearly standard in the number of hours credit offered but the topics of the calculus and the sequence of the topics were divergent. Eight courses, designed by an institution to meet a need which is peculiar to the community of the institution, are offered.

As a result of the analysis of the data recommendations were made by the investigator. The universities should be cognizant of the academic needs of the present two year college mathematics teacher and of the prospective instructors of this level of education, and then their curriculum should be planned to meet these needs. The community colleges of North Carolina should evaluate the mathematics curriculum in the college transfer programs and bring them more close to the recommendations of CUPM. The administrators of both levels of higher education should provide support to the instructors for activities conducive to professional growth.

## ACKNOWLEDGEMENTS

I wish to express my appreciation to the director of this study, Dr. Lois V. Edinger, for her guidance and encouragement. The other committee members, Dr. Donald W. Russell, Dr. Andrew F. Long, Jr., and Mr. James J. Hagood, Jr., have been most helpful to me in this investigation.

My sincere thanks are extended to my husband, W. Roger, and to my children, Barry, Susan, Mark, and Renee, for their patience, understanding, and assistance to me during the time of this study. I wish to express gratitude to my parents for motivation to learn and succeed which they instilled in me.

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# CHAPTER I

## INTRODUCTION

### I. Problem and its Significance

In the fall of 1970 the number of transfers from two year colleges in North Carolina to four year institutions comprised forty-four per cent of all transfers made within the state.[1] The transfers from community colleges to public institutions increased in 1970 over 1969 by thirty-five and three tenths per cent.[2] The students who transfer expect a minimum loss of credits and to be able to complete a baccalaureate degree in two years after graduation from a community college.

Efforts within the past two decades have resulted in better preparation of public school mathematics instructors and in the upgrading of the public school curriculum in mathematics. The open door policy of admission to a community college of North Carolina enables a person to enter with a minimum set of requirements; that is, to be admitted to a community college of North Carolina a person must be

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[1] "Undergraduate Transfers in North Carolina Colleges and Universities, Fall, 1970," Higher Education in North Carolina, VI (February 12, 1971) 1.

[2] Ibid., 2.

eighteen years of age and have a high school diploma or its equivalent. Because of this minimum set of requirements it is to be expected that some potential transfer students will have deficiencies to be made up before going into a major program at a senior institution even though instruction in high school mathematics has improved in the past twenty years.

Several concerns of the educators and students of the community colleges and senior institutions provide the basis for this study. Those concerns are: the increase in the number of students transferring from community colleges to senior colleges, the students transferring who have deficiencies to be made up, the students transferring who plan to major in mathematics or science at a senior institution, the qualifications of the mathematics instructors of the community colleges of North Carolina and the content of the college transfer courses of the community colleges of North Carolina.

Statement of the Problem. -- The investigator had one primary purpose in making this study of the community college in North Carolina: to examine and evaluate the academic qualifications of the mathematics instructors and the content of the mathematics courses in the college transfer programs, using as criteria the recommendations of the Committee of the Undergraduate Programs in Mathematics of the Mathematical Association of America and the guidelines of the Joint Committee on College Transfer Students of North Carolina.

The Committee on the Undergraduate Program in Mathematics (CUPM) of the Mathematical Association of America is composed of leading mathematicians who make recommendations concerning the mathematics curriculum in colleges and universities. The studies made by this committee (CUPM) were begun in the 1950's and were funded by the National Science Foundation. The committee soon found that it needed to turn its attention to the qualifications and preparation of teachers of undergraduate programs. More recently the increase in the number of two year institutions, the growth of the student population in two year colleges and the resultant increase in enrollment in two year colleges indicated the need for a panel of CUPM to be created to study and make recommendations relative to the mathematics programs in these two year institutions. The Panel of the Mathematics Programs in Two Year Colleges conducted a study and, in 1969, made recommendations for the academic qualifications of the teachers of university parallel courses. The academic preparation of the teachers is not the only concern of CUPM, as the following indicates:

> It should be understood that no academic program or degree in itself qualifies an individual to teach effectively at any level unless this preparation is accompanied by a genuine interest in teaching and by professional activities reflecting continuing mathematical growth.[3]

Concurrently with the study of the teacher qualifications, the content

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[3]Ad Hoc Committee on the Qualifications for a Two Year College Faculty in Mathematics, Report of the Committee, Committee on the Undergraduate Program in Mathematics, Qualifications for Teachers of University Parallel Courses in Two Year Colleges (Berkeley, Calif.: Mathematical Association of America, 1969), p. 4.

of the university parallel courses in mathematics has been studied by CUPM and recommendations made relative to the curricula of the two year colleges in the United States.

In 1963 the General Assembly of North Carolina enacted a law establishing a system of post-high-school educational institutions throughout the state of North Carolina. These institutions were to offer courses of instruction in one or more of the areas of two year college parallel, technical, vocational and adult education programs. The institutions were to be supported by state funds, local taxes and local bonds. An institution was to be established only if an education need existed within the proposed administrative area which was not being met by existing public and private post-high-school institutions in the area.[4] At the present time, December, 1971, there are fifteen community colleges which have been established in North Carolina under this act. As far as this investigator can determine no study has been made as to the qualifications of mathematics instructors (in college transfer programs) and of the content of the mathematics courses in the college transfer programs of the publicly supported community colleges in North Carolina.

Because of the variety of problems encountered by students as they transfer from one college to another, a study committee of the

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[4]Thad Eure, Public School Laws of North Carolina (Charlottesville, Virginia: The Michie Company, 1965), pp. 172-173.

North Carolina Association of Colleges and Universities made recommendations concerning the problems of the transferring student. These recommendations, which were made in 1963, sought to eliminate unnecessary variability in transfer procedures. In order to deal with the increase in transfers and the accompanying problems, the Joint Committee on College Transfer Students (JCCTS) was created by the North Carolina Association of Colleges and Universities, State Board of Higher Education, and North Carolina Association of Junior Colleges. After two state-wide articulation conferences, articulation committees for nine different areas (mathematics was one of the nine) recommended guidelines. The guidelines for all areas were approved by the Joint Committee on College Transfer Students on November 1, 1967.[5] The guidelines for mathematics were reviewed and revised on May 14, 1971.

The guidelines approved by the Mathematics Articulation Committee of JCCTS have also been used in this study as criteria for the content of college transfer mathematics programs of the community colleges of North Carolina. As far as can be determined a study of this concern has not been previously made.

The criteria of the Panel on Two Year Colleges of CUPM and of the Joint Committee on College Transfer Students (JCCTS) will be used

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[5]John F. Corey and Gordon B. Pyle, "Joint Committee Approves Articulation Guidelines," Higher Education in North Carolina, II (December 1, 1967), 1-3.

in evaluating the content of the college transfer programs in mathematics.

## Significance of the Study

The revisions made in the mathematics programs of the public schools during the 1950's and 1960's required more training for beginning teachers and the upgrading of academic preparation of the teachers in service. Until CUPM turned its attention to the small colleges in 1963 very little had been done concerning the development of a mathematics curriculum that would be feasible for small four year colleges and two year colleges. By the middle of the 1960's the problem of the upgrading of college faculties and curriculum became acute because of the lack of trained personnel. The colleges and universities intensified their programs and, as a result, the lack of trained people is now not so evident. In fact, in some areas of the country and some areas of the curriculum there is an overabundance of prepared teachers even at the doctorate level.

There are various programs in mathematics in the two year colleges. Some of those are remedial mathematics, basic courses in mathematics for general education, teacher training courses, technical mathematics, and the pre-calculus and calculus series. The focus of this investigation was concerned with the university parallel courses in mathematics taught in the community colleges of North Carolina, basic courses in mathematics for general education, teacher training courses, and the pre-calculus and calculus series.

Many of those teaching in the community colleges are well-qualified and yet there has been no study made comparing the academic preparation of the community college mathematics instructors of North Carolina and their professional growth to the guidelines and recommendations of CUPM.

Since the enrollment in community colleges is increasing, the number of students transferring from community colleges is also increasing. As the student transfers a problem arises as to which courses in the community colleges are comparable to courses that are offered in the senior institutions to which the student expects to transfer. This study will make an analysis of the content of the college transfer courses in mathematics in all of the community colleges in North Carolina using recommendations of CUPM as published in A Transfer Curriculum in Mathematics for Two Year Colleges as criteria.[6] In addition the college transfer programs for each institution will be compared to the guidelines which have been set up by the Mathematics Articulation Committee of the North Carolina Joint Committee on College Transfer Students.[7] At the meeting of the Committee, in May 1971, one of the questions discussed was: are courses listed in the North Carolina community colleges

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[6] Committee on the Undergraduate Program on Mathematics, Report of the Committee, A Transfer Curriculum in Mathematics for Two Year Colleges, (Berkeley, Calif., Mathematical Association of America. 1969) pp. 6-9.

[7] "Articulation Guidelines," Higher Education in North Carolina, II (December 1, 1967), 9.

catalogues as college credit courses although the content of the courses is on the secondary school level of mathematics? This question is to be considered in this investigation.

Questions to be answered by this study.

A. The first set of questions to be answered relates to the instructors of mathematics of the college transfer courses in the community colleges of North Carolina.

1. What are the qualifications of these instructors?
2. How many of these instructors qualify on the basis of the CUPM recommendations for academic preparation?
3. What type of degrees have these instructors earned? What per cent of the instructors held a master's degree different from the Master's in Education?
4. At what level do these instructors participate in activities which reflect professional growth in their field?
5. Do they encounter obstacles to professional growth? If so, what are some of those obstacles?
6. What was the work experience of these instructors immediately prior to their present position?
7. What are some of the actions which could be taken to improve the academic background of the individual instructor and to promote his professional growth?

B. The second set of questions to be answered relates to the content of the college transfer programs in mathematics in the community colleges of North Carolina.

1. How many of the schools participating in the study offer the basic courses as recommended by CUPM for university parallel courses?
2. How many of these schools offer the optional courses as recommended by CUPM for university parallel courses?
3. What are the mathematics courses offered by the schools covered by this study in addition to those in the recommendations of CUPM?
4. What per cent of the schools covered by this study offer the mathematics courses required by the guidelines of JCCTS?

This study will be of significance to: 1) the two year college administrators as they evaluate their present staff and as they plan their future staffing needs, 2) the university mathematics departments as they plan programs for the training and upgrading of the two year college mathematics teachers, and 3) the senior institutions in the evaluation of the mathematics courses which students wish to transfer from a community college.

## II. Definitions of Terms Used

The term community college is defined by the action of the General Assembly of North Carolina as an educational institution operating under the provision of Chapter 115A of the Public School Laws of North Carolina issued in 1965 by Thad Eure, Secretary of State. The community college is dedicated primarily to the educational needs of the particular area for which it was established, and

a. which offers the freshman and sophomore courses of a college of arts and sciences,
b. which may offer organized curricula for the training of technicians,
c. which may offer vocational, trade and technical specialty courses and programs, and
d. which may offer courses in general adult education.[8]

The Committee on the Undergraduate Program in Mathematics (CUPM) is defined as a committee of the Mathematical Association of America which directs its attention to the improvement of the mathematics curricula of colleges and universities and to the qualifications of mathematics teachers for the curricula at all levels.

The Joint Committee on College Transfer Students (JCCTS) is defined as a committee which seeks to reduce problems of students' transferring from junior and community colleges to senior institutions or transferring from one senior institution to another senior institution. JCCTS is sponsored by the North Carolina Association of Colleges and Universities, the North Carolina Association of Junior Colleges, the State

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[8]Eure, Public School Laws of North Carolina, p. 172

Board of Higher Education, and the State Board of Education.

General Curriculum in Mathematics for Colleges is a report of the Committee on the Undergraduate Program in Mathematics which recommends a program for general mathematics which is compact enough to be within the means of a small four year college. The program is designed to be flexible enough to meet the needs of students taking mathematics for various reasons.

University parallel mathematics courses are defined to be those courses taught in a two year college which a student can expect to transfer to a senior institution with minimum loss of credit.

College transfer programs in any of the North Carolina community colleges are the courses which a student can expect to transfer from a community college to a senior institution with minimum loss of credit.

Qualifications for teaching university parallel mathematics courses in two year colleges are recommendations which are made by CUPM. The qualifications are composed of two distinct components: 1) an undergraduate foundation of courses in analysis and algebra with additional courses in geometry, computer science, and probability to provide a broad background, and 2) the graduate component of courses needed to provide competency to teach university parallel courses and to develop new courses as the need arises.[9]

Apprenticeship in teaching is defined to be a supervised teaching activity which will help provide for prospective teachers an

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[9]Ad Hoc Committee on the Qualifications for a Two Year College Faculty in Mathematics, Qualifications for Teaching University Parallel Mathematics Courses, pp 5-9.

understanding of the teaching and learning processes as these processes apply to the two year college program.[10]

Mean as used in this paper is defined to be the arithmetic mean.

## III. Limitations

This study was confined to the mathematics instructors in community colleges of North Carolina who were teaching at least one college transfer mathematics course in the fall of 1971. No attempt was made to evaluate the classroom performance or the actual competence and efficiency of individual instructors or departments as a whole except as might have been indicated by comparisons made with the data collected. The pre-college courses and technical mathematics courses were not considered in this study except as they were parallel to courses described in the guidelines of the Joint Committee on College Transfer Students. The analysis of the textbooks and syllabi of the college transfer courses is limited to those schools which supplied this data.

## IV. Organization for the Remainder of the Study

The second chapter is devoted to a review of the related literature. Procedures used in the study, including the sources, the methods of collection and the treatment of the data are outlined in chapter three. In the fourth chapter the analysis of the data on academic qualifications and professional growth of the instructors and on the content of the courses in the college transfer courses is presented. The final chapter contains the investigator's summary, conclusions and recommendations.

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[10] Ibid., p. 10.

## CHAPTER II

## REVIEW OF THE LITERATURE

Much work has been done to determine the proper qualifications for mathematics instructors by the professional organizations but the amount of published material on the subject is relatively small. Similarly, the curriculum of the college mathematics departments and that of the two year college departments has been investigated and updated but very little research on the content and implementations of recommendations has been reported. The literature on the qualifications of a two year college teacher of mathematics and of the courses in the mathematics curriculum of the two year college is for the most part limited to professional publications, journals and reports.

In this chapter the investigator has reviewed the literature on: 1) the academic qualifications of the two year college mathematics teacher, 2) the professional growth of the college teacher, and 3) the mathematics curriculum of the two year college.

### I. Literature on the Academic Qualifications of the Two Year College Mathematics Teacher

Four phases of the academic qualifications of the teacher of the lower division courses in mathematics were treated in the literature: the mathematics courses, an apprenticeship program, the type of degree

earned, and certification and accreditation.

## Mathematics Courses

Sneed[1] reviewed the literature on the problems of academic qualifications and preparation of junior college teachers of mathematics. The report of CUPM on the qualifications for college mathematics teachers was the most comprehensive publication which he found concerning the mathematics courses in a college teacher's preparation.

The Committee on the Undergraduate Program in Mathematics, Coon, Laible, Pikaart, Rising, and Scandura[2] have indicated courses in mathematics that a prospective two year (or junior) college teacher should have as the subject matter background in his preparation. The courses recommended by CUPM are used as criteria in this study and will be included in a later chapter. The courses listed in the publications of these

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[1]Billy Ray Sneed, "A Study of the Qualifications of Mathematics Instructors in the Regionally Accredited Public Junior Colleges of Mississippi" (unpublished Ed.D. dissertation, University of Mississippi, 1969), pp. 21-26.

[2]Ad Hoc Committee on Qualifications for a Two Year College Faculty in Mathematics, Report of the Committee, Qualifications for Teaching University Parallel Mathematics Courses in Two Year Colleges (Berkeley, Calif.: Mathematical Association of America, 1969), pp. 6-8.; Lewis Coon, "The Doctor of Education Degree in Higher Education - Mathematics at Oklahoma State University," American Mathematical Monthly, 72 (March, 1965), 307-309; J. M. Laible, "New Graduate Degree in Mathematics," American Mathematical Monthly, 76 (June-July, 1969) 687-689; Len Pikaart, "Emerging Doctoral Programs in Mathematics Education," American Mathematical Monthly, 72 (August-September, 1965) 772-773; G. R. Rising, "What Advanced Degree without Mathematics Research?" American Mathematical Monthly, 74 (October, 1967) 999-1001; J. M. Scandura, "A New Doctoral Program in Mathematics Education," American Mathematical Monthly, 74 (January, 1967) 150-151.

individuals are similar to those of CUPM but vary in number. All six of the recommended programs include an undergraduate major in mathematics with from ten to fifteen semester courses to be taken at the graduate level. None of the programs suggests more than three courses in one area of mathematics, which enforces the CUPM recommendation that the two year college teacher have a broad background of courses rather than a background which concentrates in one or two areas of mathematics.

Sneed reported that the population of his study did not measure up to the recommendations of CUPM. No member of the population had taken all of the twelve courses recommended in the undergraduate program and less than one-tenth of the population had taken any of the courses listed in the graduate component.[3]

## Apprenticeship in Two Year College Teaching

In addition to courses in mathematics the prospective teacher's training program often includes courses in related fields. CUPM, Eurich, Gleazner, Kuechle, Laible and Wilson[4] recommended an apprenticeship in two year college teaching or in teaching lower level courses in mathematics

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[3]Billy Ray Sneed, "A Study of the Qualifications of Mathematics Instructors," p. 96.

[4]Ad Hoc Committee on Qualifications for a Two Year College Faculty in Mathematics, Qualifications for Teaching University Parallel Mathematics Courses, pp. 10-11; Alvin C. Eurich, "Staffing Junior Colleges," Junior College Journal, 33 (March, 1963), 10; Edmund J. Gleazner, Jr., "AAJC Approach," Junior College Journal, 35 (September, 1964), 4; Richard Kuechle, "Improving Instruction and Upper Level Undergraduate Mathematics," American Mathematical Monthly, 73 (February, 1966), 194; J. M. Laible, "New Graduate

at a college or university. Eurich, Gleazner and Wilson[5] made proposals which apply to the preparation of all junior college teachers. These writers encouraged the universities to establish programs for the training of the two year college teacher. The administration of such a program would involve the subject area departments, the departments of education and psychology at the university and the teachers in a nearby junior college.

CUPM and Laible[6] recommended that the prospective mathematics teacher be involved in the apprenticeship activities for as much as one-quarter of his graduate program. Laible presented a plan for a three year program with the amount of teaching responsibility increasing from observation and assistance in one class in the first semester to the full responsibility of two classes in the last semester of his program.

The reviewed literature reported no statistics on the amount of preparation in an apprenticeship program in two year college teaching. Eckert and Neale in a review of the research on teaching and teachers reported that, in 1964, 91 leading universities were offering courses on

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Degree in Mathematics," pp. 687-698; Robert H. Wilson, "Junior College Student Teachers," Junior College Journal, 31 (November, 1961), 143-145.

[5]Eurich, "Staffing Junior Colleges," p. 10; Gleazner, "AAJC Approach," p. 35; Wilson, "Junior College Student Teachers," p. 144.

[6]Two Year College Faculty in Mathematics, Qualifications for Teaching University Parallel Mathematics Courses, pp. 10-11; J. M. Laible, "New Graduate Degree in Mathematics," p. 689.

college teaching or other phases of higher learning which was three times as many as were doing so in 1944.[7]

### Degrees Earned

CUPM, the Research Division of N. E. A. and Sneed[8] reported that the highest degree held most commonly by two year college teachers was the master's degree. A survey by N. E. A. showed that for the academic years of 1961-62 and 1962-63, of the four hundred mathematics teachers in the study 26.0 per cent had the doctorate or a master's degree plus one year's work. During the same period of time 12.3 per cent of the mathematics instructors had less than the master's degree.[9] Sneed reported that ninety-one per cent of the instructors in his study had earned some type of master's degree.[10]

In the literature reviewed, several new type degrees have been proposed for the prospective college teacher of mathematics. These degrees are at a higher level than the master's degree. Some are at the doctorate level and others are between the master's degree and the doctorate. Laible outlined the program for a Specialist of College Teaching (SCT)

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[7] Ruth Eckert and Daniel C. Neale, "Teachers and Teaching," Review of Educational Research, 35 (October, 1965), 305.

[8] Committee on the Undergraduate Program in Mathematics, Report of the Committee, A Transfer Curriculum in Mathematics, (Berkeley, Calif.: Mathematical Association of America. 1969), p. 5; "Needs for College Teachers Grows," N. E. A. Research Bulletin, 41 (December, 1963), 110; Sneed, "A Study of the Qualifications of Mathematics Instructors," p. 58.

[9] Ibid., N. E. A., p. 114.

[10] Sneed. "A Study of the Qualifications of Mathematics Instructors," p. 97.

with a major in mathematics.[11] Coon described a Doctor of Education in Higher Education - Mathematics offered at Oklahoma State University[12] and Scandura reviewed the proposal for a doctoral program in mathematics education research.[13] Pikaart reported that the emerging doctoral programs in mathematics education were preparing teachers of mathematics for junior college and four year liberal arts colleges but gave no statistics supporting his claim.[14] Coon stated that, at the time of writing his articles, recipients of the degree he described were in every state college in Oklahoma.

Although the master's degree is the degree most commonly held by two year college teachers the degree is of varying quality. This implies that the degree earned is not the best measure of qualification for appointment of two year college teachers, their promotion, or granting tenure.[15] The question of accreditation of institutions with programs for preparing college teachers and of certification of individuals who have completed such a program has been raised by the editors of the American Mathematical Monthly. No standards have been set

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[11]Laible, "New Graduate Degree in Mathematics," p. 688.

[12]Coon, "The Doctor of Education in Higher Education - Mathematics," pp. 306-310.

[13]Scandura. "A New Doctoral Program in Mathematics Education Research," pp. 149-150.

[14]Pikaart, "Emerging Doctoral Programs in Mathematics Education," pp. 772-773.

[15]Ad Hoc Committee on Qualifications for a Two Year College Faculty in Mathematics, Qualifications for Teaching University Parallel Mathematics, pp. 3-4.

up to begin such programs. Modified versions of the CUPM recommendations have been used as templates in assessing the preparation of individual teachers and in guiding the universities in the construction of their programs.[16]

## II. Literature on the Professional Growth of the College Mathematics Teacher

The recommendations of CUPM which relate to activities conducive to professional growth are presented in a later chapter of this study. A CUPM Newsletter of September, 1970, gave a summary of ideas being used by some colleges in order to provide favorable conditions for the scholarly growth of their faculties. The ideas reported were reduced teaching load for one semester for specific study time, strengthening the library, providing seminars and colloquia, visiting lecturers, providing expenses for attending professional meetings, establishing a policy on leaves, sabbatical and summer programs with stipends and promoting research and publications. The newsletter pointed out the value of small colleges grouping together for seminars and workshops. Some of the universities which were included in the survey indicated that they were beginning programs to use the two year college instructors on a part-time basis at the university while the instructor was upgrading his own background in mathematics.[17]

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[16]"The Question of Accreditation and Certification," American Mathematical Monthly, 77 (September, 1970), 749.

[17]"Maintaining Mathematical Momentum," CUPM Newsletter (Berkeley, Calif.: Mathematical Association Of America, September, 1970).

Christie and Wells[18] offered some suggestions as alternatives to research: reading, experimenting with new courses, work with talented students and doing research in mathematics education as well as minor research in mathematics.

Sneed used the six activities recommended by CUPM as criteria to determine the professional growth of his study populations. The highest level of participation was in professional reading and the least amount of participation was in publications. Sixty per cent of respondents had done additional coursework and sixty-eight per cent indicated they would have preferred to take more coursework. Insufficient funds and lack of time were the most frequent reasons for not taking more coursework and for not attending more professional meetings.[19]

## III. Literature on the Mathematics Curriculum of Two Year Colleges

The recommendations of CUPM for the mathematics curriculum were made by the committee after an examination of the catalogues of three hundred colleges. The summary of the survey pointed out that in an attempt to analyze course content by college catalogues three things

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[18]D. E. Christie and J. H. Wells, "Alternatives to Research," American Mathematics Monthly, 74 (October, 1967), 1002-1004.

[19]Sneed, "A Study of Qualifications of Mathematics Instructors," pp.98-99.

should be kept in mind:

i) a catalog description of a course may not be a faithful description of the course that was actually given;
ii) the available catalog may be out of date, and thus not represent the present program of a college;
iii) the course listed may be given infrequently, if at all.[20]

In the same report the junior college courses offered with the greatest frequency were: "elementary algebra, plane geometry, intermediate algebra, trigonometry, analytic geometry, mathematics of finance, and even such as shop mathematics, industrial mathematics and slide rule."[21]

Aheart[22] made a survey of the curriculum of institutions of higher learning in West Virginia. The junior colleges in his study offered the same courses as those listed in the previous study.

Linquist[23] made a survey of the undergraduate programs in mathematics for the United States Office of Education in 1961 with information gathered concerning the enrollment of the fall of 1960. The freshman mathematics courses offered most frequently were college algebra, trigonometry, and mathematical analysis. College algebra was offered

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[20]R. C. Buck, "The CUPM Catalog Survey," American Mathematical Monthly, 69 (April, 1962), 305.

[21]Ibid., p. 305.

[22]Andrew N. Aheart, "The Mathematics Curriculum at the Junior Colleges and Universities in West Virginia," American Mathematical Monthly, 71 (January, 1964), 83.

[23]Clarence B. Lindquist, "Entering Levels and College Courses in Freshman Mathematics," School Life, 54 (April, 1963) 14-17.

by 65.2 per cent of the responding institutions with trigonometry being offered by 62.9 per cent and mathematical analysis by 42.9 per cent. Twenty-eight and one-tenth per cent of those replying offered a course in basic concepts including topics in finite mathematics. The sixteen courses listed most frequently by the 877 institutions were: plane geometry, solid geometry, elementary algebra, intermediate algebra, college algebra, trigonometry, analytic geometry, analytic geometry - calculus, mathematical analysis, basic concepts, general mathematics, calculus, mathematics of finance, elementary statistics, mathematics for elementary school teachers, business mathematics.[24]

Averill made a survey in Michigan of the curricular offerings at sixteen Michigan community colleges which revealed that elementary statistics had been included in only one institution for any extended length of time. He also surveyed the graduates of that community college and the industry of the community. The conclusion of this survey was that an elementary statistics course was of value to the patrons of this college and its community because of the employment conditions.[25]

Zant reported that CUPM had made the most consistent and widespread contribution of any professional organization in the upgrading of the curriculum in college mathematics.[26]

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[24] Ibid., p. 16.

[25] Edgar Averill, "Why Offer Elementary Statistics," Junior College Journal, 34 (December, 1963), 22-25.

[26] James Zant, "The Teaching of Mathematics at the College and University Level," Review of Educational Research, 34 (June, 1964), 352.

Fisher and Lightner[27] examined the effects and the extent of implementations of the recommendations of CUPM relative to the mathematics curriculum.

Fisher made a survey of approximately one-seventh of the institutions listed in Guide to Undergraduate Programs in Mathematics. His study was limited to the implementation of the recommendations of the CUPM panel of teacher training for Level I and Level III. The conclusions of this study were that there had been an increase in the number of institutions requiring pre-service courses in mathematics for prospective teachers of elementary school. More of the institutions had a requirement of six hours than any other number of hours required in mathematics but were far from the number of hours recommended by CUPM.[28]

Lightner used the method of interview to survey the mathematics curricula of the colleges of Maryland. In the period of 1962-1967 there was reported an increase in the offerings of linear algebra, real and complex analysis and a second course in abstract algebra. A few more colleges were offering logic, geometry, topology and computer

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[27]J. J. Fisher, "The Extent of Implementation of Level I and Level III CUPM Recommendations, Panel of Teacher Training," American Mathematical Monthly, 75 (March, 1968), 290-292; J. E. Lightner, "The Effect of Recommendations of CUPM upon the Mathematics Curricula of the Colleges of Maryland," American Mathematical Monthly, 76 (June-July, 1969), 681-686.

[28]Ibid., Fisher, p. 292.

science, while a decrease was noted in the offerings in probability and statistics and in the area of numerical analysis. Lightner found that a few of the large schools had fully implemented the recommendation of CUPM and that the small schools believed the recommendations to be unrealistic for the small school.[29]

The literature reviewed by this investigator presented proposed programs for training the prospective college mathematics teacher but there was not offered a national plan for certification of teachers of mathematics nor one for accreditation of the training institutions. The professional growth activities were in the form of suggestions with no indication of empirical research on the number of mathematics instructors or the number of institutions involved in the suggested activities. The most recent nation-wide study on the mathematics programs in higher education was over ten years ago and only a few specialized studies of the mathematics curriculum content have been reported.

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[29]Lightner, "The Effect of the Recommendations of CUPM," pp. 681, 682, 686.

# CHAPTER III

## METHODS AND PROCEDURES OF THE STUDY

### I. The Study Population

The study population includes the fifteen publicly supported community colleges of North Carolina and the mathematics instructors of the college transfer courses at those institutions. As far as could be determined by the list of instructors furnished by the administration of each institution a total of fifty-nine mathematics instructors of college transfer courses were employed by the fifteen community colleges of North Carolina during the fall term of 1971. The range of the number of instructors per institution was from a low of two to a high of seven with a mean of 3.93 and a mode of four.

The mathematics courses considered in this study were those listed as college transfer courses in the catalogue of the individual institutions. These varied somewhat between institutions. Remedial work is offered in almost all of the institutions as the lowest level of mathematics. The mathematics courses recommended by CUPM as university parallel courses and/or by JCCTS as guidelines for college transfer courses are used as criteria in analyzing the programs of the fifteen institutions in the population.

## H. Methods of Collecting Data

To collect the data for this study the investigator contacted by mail three groups of people at each institution of the study population.

The first mailing was to the president of each institution: a cover letter and form asking him to list the mathematics instructors of the college transfer courses and the head of the mathematics department. The letter assured the president that anonymity would be maintained for the institution and for the individual instructor. These lists were completed and returned by all but one of the institutions. The name of that institution's department chairman was sent with the request that the questionnaires for the instructors be sent to the department chairman which was the procedure for that institution alone.

The second group contacted was the mathematics instructors of the college transfer programs. A letter was sent to each instructor explaining the need for the study to be made concerning the qualifications of the mathematics instructors in the community colleges of North Carolina who were teaching the college transfer courses. The instrument used in collecting the data from the instructors was a closed questionnaire of three parts: academic preparation, professional activities, and teaching assignments. A copy of this questionnaire is in Appendix E.

The portion of the questionnaire on academic preparation was constructed by the investigator by listing the courses recommended by

CUPM for teachers of university parallel courses in two year colleges.[1] The coursework which was recommended consisted of two components, the undergraduate level and the graduate level. The undergraduate component is subdivided into the lower division courses and the upper division courses. Space was provided for the respondent to list any course which he had taken that was not one of those recommended. Two other measures of an instructor's preparation included in the questionnaire were an apprenticeship in two year college teaching and the degree earned. The respondent was given the opportunity to make any unstructured comment that he wished to make.

The data on the professional activities was collected by a closed form questionnaire. It was constructed in a manner similar to a questionnaire used by Sneed in an unpublished dissertation.[2] His questionnaire was constructed using the recommendations for professional growth in a 1967 publication of the Mathematical Association of America,[3] but this investigator used those in the 1969 publication of

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[1]Ad Hoc Committee on the Qualifications for a Two Year College Faculty in Mathematics, Report of the Committee, Committee on the Undergraduate Program in Mathematics, Qualifications for Teaching University Parallel Mathematics Courses in Two Year Colleges (Berkeley, Calif.: Mathematical Association of America, 1969), p.4.

[2]Billy Ray Sneed, "A Study of the Qualifications of Mathematics Instructors in the Regionally Accredited Public Junior Colleges of Mississippi," (unpublished D.Ed. dissertation, University of Mississippi, 1969) pp. 112-115.

[3]Ad Hoc Committee on the Qualifications of College Teachers, Report of the Committee, Committee on the Undergraduate Program in Mathematics, Qualifications for a College Faculty in Mathematics (Berkeley, Calif.: Mathematical Association of America, 1967), p.2.

the Mathematical Association of America concerning the qualifications of the mathematics instructors of two year colleges.[4] Statements related to the recommended professional activities were designed to obtain measureable data in this subject.

A third portion of the questionnaire was a check list of the courses recommended by CUPM as college transfer courses. The respondent was to designate the recommended college transfer courses that he was teaching in the fall term of 1971 and those he had taught during the previous two academic years, 1969-70 and 1970-71.

Concurrently with the mailing to the individual instructors, one was sent to the department chairman or to the division chairman if the institution did not designate a department chairman. Each chairman was sent a letter citing the need for a study to be made concerning the content of the college transfer programs in mathematics in the community colleges in North Carolina. A check list of the college transfer courses recommended by CUPM in the publication of the transfer curriculum in mathematics of two year colleges[5] was enclosed with the letter.

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[4]Ad Hoc Committee on the Qualifications for a Two Year College Faculty in Mathematics, Qualifications for Teaching University Parallel Mathematics Courses, p. 4.

[5]Committee on the Undergraduate Program in Mathematics, Report of the Committee, A Transfer Curriculum in Mathematics for Two Year Colleges (Berkeley, Calif.: Mathematical Association of America, 1969), pp. 6-9.

A copy of this form can be found in Appendix H. The investigator asked that lists of textbooks used in the college transfer courses and any available syllabi for these courses which would be useful in the analysis of the data on the mathematics curriculum in the community colleges of North Carolina be sent to the investigator.

## III. Procedures Used in Reporting Data

The emphasis of this study was the extent to which the CUPM recommendations are met by the instructors and the institutions in the study population. Each institution was assigned a number at random and each instructor within each institution was assigned a number at random also.

The recommendations of academic qualifications for the instructor are presented in tabular form; for each institution the recommendations met by each instructor of college transfer courses in mathematics is indicated in the table as well as the summary for the institution. Footnotes were added where needed for clarification.

Since CUPM did not establish a minimum level of participation in activities which are indicative of professional growth, the investigator tabulated any activity that the respondents recorded on the questionnaire. Six different forms of the professional activities were considered by the investigator and an attempt to quantify the extent of participation in these activities was presented in tabular form.

The teaching assignments of the instructors were presented by a table for each institution. The university parallel courses recommended by CUPM were listed in a table for each institution. The courses taught during the fall term of 1971 and the academic years of 1970-71 and 1969-70 are indicated in the table. The community colleges of North Carolina offer mathematics courses in addition to or in lieu of those in the CUPM recommendations. The courses offered by each institution were determined either by the form returned by the department chairman or by the catalogue of the institution. A summary of the courses offered other than those in CUPM's recommendations is presented in a separate table.

In addition to the CUPM recommendations the course offerings in the college transfer programs of the institutions of the study population were compared to the guidelines of JCCTS.

The investigator made no analysis of the textbooks used in the community colleges of North Carolina nor of the syllabi of the courses at these colleges since only 26.6 per cent of the study population supplied this information.

# CHAPTER IV

## ANALYSIS OF THE DATA COLLECTED

The major emphases of this study are the qualifications of the mathematics instructors and the content of the college transfer programs in mathematics of the community colleges of North Carolina. The qualifications of the instructors as determined by the data collected are compared to the recommendations of the Committee on the Undergraduate Programs in Mathematics (CUPM) of the Mathematical Association of America. CUPM has made recommendations as to the transfer curriculum of two year colleges and this study makes a comparison of these recommendations to the courses offered in the college transfer program of the community colleges in North Carolina. Another analysis is made of the college transfer programs in the study population by comparing these offerings to the guidelines drawn up by the Joint Committee of College Transfer Students (JCCTS) for the state of North Carolina. The purpose of this chapter is to present these comparisons.

### I. Presentation of Data Related to the Instructors

The recommendations of CUPM were of two types: 1) academic training of the instructor and 2) in-service activities which promote continuing professional growth. In structuring the instrument to collect

measurable data, other items which help to characterize the instructors of the study population were included.

## Academic Qualifications

Fifty of the fifty-nine mathematics instructors returned their quesionnaires. One instructor chose not to respond to any item on the form. The academic qualifications considered were courses recommended by CUPM, other mathematics courses, and the type of degree earned.

### Academic qualifications recommended by CUPM

To facilitate the understanding of the data which are to be presented, the specific recommendations fo CUPM are reviewed. The academic recommendations are given in terms of specific courses and a short description of each course is given.

The courses in the two year college curriculum for which the instructor should have the background for teaching are referred to as the university parallel courses (elementary functions, elementary functions with algebra and trigonometry, introductory calculus, mathematical analysis, linear algebra, probability and statistics, and the structure of the number system).[1] It is the recommendation of the CUPM committee on

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[1] Ad Hoc Committee on Qualifications for a Two Year College Faculty in Mathematics, Report of the Committee, Committee on the Undergraduate Program in Mathematics, Qualifications for Teaching University Parellel Mathematics Courses in Two Year Colleges (Berkeley, Calif.: Mathematical Association of America, 1969) pp. 1-2.

qualifications for two year college teachers that the following courses (undergraduate and graduate) provide a mathematical background for the two year college teacher:

* Calculus courses in one and several variables including an introduction to differential equations. . . .
* The fundamentals of computer science, including experience in programming as well as the use of the computer. . . .
* A semester course in linear algebra employing both matrices and a basis-free, linear transformation approach. . . .
* A course in probability and statistics that presupposes a course in calculus. . . .

. . . . . .

* A semester course in advanced multivariable calculus, covering differential and integral vector calculus, including the theorems of Green and Stokes, and an introduction to Fourier series and boundary value problems. . . .
* A year's work in abstract algebra, treating the important algebraic systems (groups, rings, modules, vector spaces, and fields) and thoroughly developing the basic concepts of homomorphism, kernel and quotient construction with applications and consequences of these ideas.

. . . . . .

* A thorough year's course dealing with the important theorems in real analysis, with emphasis on rigor and detailed proofs. The treatment should use metric space notions and should lead to a detailed examination of the Riemann-Stieltjes integral. . . .
* A semester course in complex analysis, covering Cauchy's Theorem, Taylor and Laurent expansions, the calculus of residues, and analytic continuation, with application of these ideas to transforms and boundary value problems. . . .
* A semester course in applied mathematics. The student should be introduced to applications of mathematics in order that his teaching might better reflect the relevance of mathematical ideas. . . .
* A semester course in which the student studies some geometric subject such as topology, convexity, affine and projective geometries, differential geometry or a comparative investigation of Euclidean and non-Euclidean geometries. . . .
* A semester course in probability and statistics that builds on the student's lower division course in probability and statistics and reflects the growing importance of this subject to the biological and social sciences, the management sciences and engineering. . . .[2]

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[2]Ibid., pp. 5-7.

These courses are considered to be undergraduate courses; but if a prospective teacher has not completed them at the undergraduate level, then he should cover the material in graduate courses to make up his dificiency.

Three graduate courses are specifically recommended for each prospective two year college teacher: measure and integration, general topology, and advanced ordinary differential equations with applications. Other graduate courses which are appropriate for the two year college teacher of mathematics are functional analysis, complex analysis, homology and multivariable integration, topology and geometry of manifolds, Galois and field theory, ring theory and multilinear algebra, problem-oriented numerical analysis, and a seminar in applications. These courses are described in detailed outlines in the CUPM report, A Beginning Graduate Program in Mathematics for Prospective Teachers of Undergraduates.[3]

Since various colleges and universities place courses at different levels, CUPM recommends that the undergraduate and graduate levels of coursework in mathematics be considered together. The questionnaire sent to the instructors was constructed with this in mind, and thus the list of suggested courses was summarized by listing eighteen courses without designating undergraduate and graduate level. The

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[3]Committee on the Undergraduate Program in Mathematics, Report of the Committee, A Beginning Graduate Program in Mathematics for Prospective Teachers of Undergraduates, (Berkeley, Calif.: Mathematical Association of America, 1969) pp. 20-53.

CUPM report of qualifications for two year college teachers does not designate a minimum number of courses which a person must take to qualify himself as a two year college teacher.

A program of apprenticeship in teaching is of value to the prospective two year college teacher. This apprenticeship is a means by which a teacher of mathematics for two year colleges can gain an understanding of the teaching and learning processes which are peculiar to these institutions. The program of apprenticeship as recommended by CUPM would involve teaching of lower division courses in a university with the supervision of a senior colleague or teaching in a two year college under the supervision of an experienced two year teacher. This portion of the academic preparation of a two year college teacher could possibly involve as much as one quarter of the graduate work load.[4]

CUPM recommendations relative to mathematics coursework met

A table was constructed listing eighteen courses which were recommended by CUPM and which were on the questionnaire sent to the study population of instructors. Courses which were listed at both the undergraduate and graduate level were listed only one time. The data collected from this questionnaire is presented in Tables I - XV, a table for each institution in the study. Each table contains a summary of the CUPM recommendations met, and the number of semester courses in mathematics

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[4]Ad Hoc Committee on Qualifications for a Two Year College Faculty in Mathematics, Qualifications for Teaching University Parallel Mathematics Courses, p. 11.

TABLE I

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 1

| Courses Recommended by CUPM | Courses Completed by Instructor Number | |
|---|---|---|
| | 1 | 2 |
| Calculus | x | |
| Linear Algebra | | x |
| Probability and Statistics | | x |
| Computer Science | x | |
| Abstract Algebra | x | x |
| Theorems of Real Analysis | | |
| Applied Mathematics | x | x |
| Complex Analysis | x | x |
| A course in some Geometric subject | x | x |
| Measure and Integration | x | |
| Homology and Multivariable Integration | x | x |
| Galois and Field Theory | x | |
| Advanced Ordinary Differential Equations | x | |
| Functional Analysis | x | x |
| General Topology | x | |
| Topology and Geometry of Manifolds | | |
| Ring Theory and Multi-linear Algebra | x | |
| Problem-oriented Numerical Analysis | | x |
| Total CUPM Recommendations Met | 13 | 9 |
| Total Number of Semester Courses in Mathematics | 17 | 14 |
| Range of Recommendations Met | 9-13 | |
| Mean Number of Recommendations Met | 11.0 | |
| Mean Number of Semester Courses in Mathematics | 15.5 | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

TABLE II

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 2

| Courses Recommneded by CUPM | Courses Completed by Instructor Number | | | |
|---|---|---|---|---|
| | 1 | 2[a] | 3 | 4[a] |
| Calculus | x | | x | |
| Linear Algebra | x | | | |
| Probability and Statistics | x | | | |
| Computer Science | x | | | |
| Abstract Algebra | | | x | |
| Theorems of Real Analysis | x | | x | |
| Applied Mathematics | | | x | |
| Complex Analysis | | | x | |
| A course in some Geometric subject | x | | | |
| Measure and Integration | | | x | |
| Homology and Multivariable Integration | | | | |
| Galois and Field Theory | | | | |
| Advanced Ordinary Differential Equations | | | | |
| Functional Analysis | | | x | |
| General Topology | | | x | |
| Topology and Geometry of Manifolds | | | x | |
| Ring Theory and Multi-linear Algebra | | | | |
| Problem-oriented Numerical Analysis | x | | | |
| Total CUPM Recommendations Met | 7 | | 9 | |
| Total Number of Semester Courses in Mathematics | 10 | | 22 | |
| Range of Recommendations Met | 7-9 | | | |
| Mean Number of Recommendations Met | 8.0 | | | |
| Mean Number of Semester Courses in Mathematics | 16 | | | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

[a]No return from this instructor.

TABLE III

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 3

| Courses Recommended by CUPM | Courses Completed by Instructor Number | | |
|---|---|---|---|
| | 1 | 2[a] | 3 |
| Calculus | x | | x |
| Linear Algebra | | | x |
| Probability and Statistics | | | |
| Computer Science | | | |
| Abstract Alegbra | x | | x |
| Theorems of Real Analysis | x | | |
| Applied Mathematics | | | |
| Complex Analysis | x | | |
| A course in some Geometric subject | x | | |
| Measure and Integration | x | | x |
| Homology and Multivariable Integration | | | |
| Galois and Field Theory | x | | |
| Advanced Ordinary Differential Equations | | | |
| Functional Analysis | | | |
| General Topology | x | | x |
| Topology and Geometry of Manifolds | | | |
| Ring Theory and Multi-linear Algebra | x | | x |
| Problem-oriented Numerical Analysis | | | |
| Total CUPM Recommendations Met | 9 | | 6 |
| Total Number of Semester Courses in Mathematics | 14 | | 19 |
| Range of Recommendations Met | 6-9 | | |
| Mean Number of Recommendations Met | 7.5 | | |
| Mean Number of Semester Courses in Mathematics | 16.5 | | |

* An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

[a]No return from this instructor.

TABLE IV

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 4

| Courses Recommended by CUPM | Courses Completed by Instructor Number | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Calculus | x | x | x |
| Linear Algebra | | x | x |
| Probability and Statistics | | x | x |
| Computer Science | | | x |
| Abstract Algebra | | x | x |
| Theorems of Real Analysis | | | x |
| Applied Mathematics | x | | x |
| Complex Analysis | | x | x |
| A course in some Geometric subject | | x | x |
| Measure and Integration | | x | x |
| Homology and Multivariable Integration | | | x |
| Galois and Field Theory | | | x |
| Advanced Differential Equations | | x | x |
| Functional Analysis | | | x |
| General Topology | | | x |
| Topology and Geometry of Manifolds | | | |
| Ring Theory and Multi-linear Algebra | | x | |
| Problem-oriented Numerical Analysis | | | x |
| Total CUPM Recommendations Met | 2 | 9 | 16 |
| Total Number of Semester Courses in Mathematics | 13 | 19 | 26 |
| Range of Recommendations Met | 2-16 | | |
| Mean Number of Recommendations Met | 9.0 | | |
| Mean Number of Semester Courses in Mathematics | 19.3 | | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

TABLE V

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 5

| Courses Recommended by CUPM | Courses Completed by Instructor Number | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Calculus | x | | x | x |
| Linear Algebra | | x | | |
| Probability and Statistics | x | | x | |
| Computer Science | x | x | x | |
| Abstract Algebra | x | x | x | x |
| Theorems of Real Analysis | | | | |
| Applied Mathematics | x | x | x | |
| Complex Analysis | x | x | | |
| A course in some Geometric subject | x | x | | x |
| Measure and Integration | | x | | |
| Homology and Multivariable Integration | | | | |
| Galois and Field Theory | | | | |
| Advance Ordinary Differential Equations | | | x | |
| Functional Analysis | | x | | |
| General Topology | x | x | | x |
| Topology and Geometry of Manifolds | | | | |
| Ring Theory and Multi-linear Algebra | | | | |
| Problem-oriented Numerical Analysis | | x | | |
| Total CUPM Recommedations Met | 8 | 10 | 6 | 4 |
| Total Number of Semester Courses in Mathematics | 11 | 14 | 9 | 14 |
| Range of Recommendations Met 4-10 | | | | |
| Mean Number of Recommendations Met 7.0 | | | | |
| Mean Number of Semester Courses in Mathematics 12.0 | | | | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

TABLE VI

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 6

| Courses Recommended by CUPM | Courses Completed by Instructor Number | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3[a] | 4 | 5 | 6 |
| Calculus | | x | | x | x | x |
| Linear Algebra | x | x | | | x | x |
| Probability and Statistics | x | x | | x | x | x |
| Computer Science | x | x | | | x | x |
| Abstract Algebra | x | x | | x | | x |
| Theorems of Real Analysis | | | | x | | x |
| Applied Mathematics | | | | | | x |
| Complex Analysis | x | x | | x | | x |
| A course in some Geometric subject | x | x | | x | | |
| Measure and Integration | | | | x | x | x |
| Homology and Multivariable Integration | x | | | x | | x |
| Galois and Field Theory | x | | | x | | x |
| Advanced Ordinary Differential Equations | | | | | | |
| Functional Analysis | | x | | x | | x |
| General Topology | x | | | x | x | x |
| Topology and Geometry of Manifolds | | | | | | |
| Ring Theory and Multi-linear Algebra | | | | x | | x |
| Problem-oriented Numerical Analysis | x | | | x | | x |
| Total CUPM Recommendations Met | 10 | 8 | | 13 | 6 | 15 |
| Total Number of Semester Courses in Mathematics | 14 | 24 | | 18 | 13 | 23 |
| Range of Recommendations Met | 6-15 | | | | | |
| Mean Number of Recommendations Met | 12.4 | | | | | |
| Mean Number of Semester Courses in Mathematics | 18.4 | | | | | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

[a]No return from this instructor.

TABLE VII

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 7

| Courses Recommended by CUPM | Courses Completed by Instructor Number | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Calculus | x | | x | | x | x | |
| Linear Algebra | x | | | | x | x | |
| Probability and Statistics | x | x | x | x | x | | x |
| Computer Science | x | | | | x | x | |
| Abstract Algebra | x | x | | | x | x | |
| Theorems of Real Analysis | x | | | | x | x | x |
| Applied Mathematics | x | | x | | x | x | |
| Complex Analysis | x | x | | x | | x | x |
| A course in some Geometric subject | | | | | x | x | x |
| Measure and Integration | | | | | | x | x |
| Homology and Multivariable Integration | | | | | | x | |
| Galois and Field Theory | | | | | | | |
| Advanced Ordinary Differential Equations | x | x | | | x | x | |
| Functional Analysis | | | | | | | x |
| General Topology | | x | | | x | | |
| Topology and Geometry of Manifolds | | | | | | | |
| Ring Theory and Multi-linear Algebra | | | | | x | x | |
| Problem-oriented Numerical Analysis | | | | | x | x | |
| Total CUPM Recommendations Met | 9 | 5 | 3 | 2 | 12 | 13 | 6 |
| Total Number of Semester Courses in Mathematics | 16 | 7 | 15 | 8 | 23 | 19 | 9 |
| Range of Recommendations Met | 2-13 | | | | | | |
| Mean Number of Recommendations Met | 7.1 | | | | | | |
| Mean Number of Semester Courses in Mathematics | 13.8 | | | | | | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

TABLE VIII

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 8

| Courses Recommended by CUPM | Courses Completed by Instructor Number | | | |
|---|---|---|---|---|
| | 1 | 2 | 3[a] | 4 |
| Calculus | | | | x |
| Linear Algebra | | x | | |
| Probability and Statistics | | | | x |
| Computer Science | | | | |
| Abstract Algebra | | | | |
| Theorems of Real Analysis | | | | |
| Applied Mathematics | | | | x |
| Complex Analysis | | | | x |
| A course in some Geometric subject | x | | | |
| Measure and Integration | | | | x |
| Homology and Multivariable Integration | | | | |
| Galois and Field Theory | | | | |
| Advanced Ordinary Differential Equations | x | | | x |
| Functional Analysis | | | | |
| General Topology | | | | |
| Topology and Geometry of Manifolds | x | | | |
| Ring Theory and Multi-linear Algebra | | | | |
| Problem-oriented Numerical Analysis | | | | |
| Total CUPM Recommendations Met | 3 | 1 | | 6 |
| Total Number of Semester Courses in Mathematics | 17 | 3 | | 13 |
| Range of Recommendations Met | 1-6 | | | |
| Mean Number of Recommendations Met | 3.3 | | | |
| Mean Number of Semester Courses in Mathematics | 11 | | | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

[a]No return from this instructor.

TABLE IX

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 9

| Courses Recommended by CUPM | Courses Completed by Instructor Number | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Calculus | x | | x | x |
| Linear Algebra | x | x | x | x |
| Probability and Statistics | x | x | x | x |
| Computer Science | x | | | |
| Abstract Algebra | x | x | x | x |
| Theorems of Real Analysis | x | | x | |
| Applied Mathematics | | x | x | |
| Complex Analysis | x | x | x | x |
| A course in some Geometric subject | x | | x | x |
| Measure and Integration | x | | | |
| Homology and Multivariable Integration | | | | |
| Galois and Field Theory | | | | x |
| Advanced Ordinary Differential Equations | | | | |
| Functional Analysis | x | | | x |
| General Topology | | x | | x |
| Topology and Geometry of Manifolds | | | | x |
| Ring Theory and Multi-linear Algebra | x | x | | x |
| Problem-oriented Numerical Analysis | x | | | |
| Total CUPM Recommendations Met | 12 | 7 | 8 | 11 |
| Total Number of Semester Courses in Mathematics | 17 | 20 | 12 | 18 |
| Range of Recommendations Met | 7-12 | | | |
| Mean Number of Recommendations Met | 9.5 | | | |
| Mean Number of Semester Courses in Mathematics | 11.7 | | | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

TABLE X

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 10

| Courses Recommended by CUPM | Courses Completed by Instructor Number | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Calculus | x | x | x | x | x |
| Linear Algebra | x | x | x | x | x |
| Probability and Statistics | x | | | x | |
| Computer Science | x | | x | | x |
| Abstract Algebra | x | x | x | | x |
| Theorems of Real Analysis | x | | | x | |
| Applied Mathematics | x | | | | x |
| Complex Analysis | x | x | | x | |
| A course in some Geometric subject | x | x | x | x | x |
| Measure and Integration | x | | | | x |
| Homology and Multivariable Integration | | | x | | |
| Galois and Field Theory | | | | x | |
| Advanced Ordinary Differential Equations | x | | | | |
| Functional Analysis | x | | x | | x |
| General Topology | x | | x | x | x |
| Topology and Geometry of Manifolds | | | | | |
| Ring Theory and Multi-linear Algebra | | | | | |
| Problem-oriented Numerical Analysis | x | | x | | |
| Total CUPM Recommendations Met | 14 | 5 | 9 | 8 | 9 |
| Total Number of Semester Courses in Mathematics | 21 | 9 | 17 | 17 | 15 |
| Range of Recommendations Met | 5–14 | | | | |
| Mean Number of Recommendations Met | 9.0 | | | | |
| Mean Number of Semester Courses in Mathematics | 16 | | | | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

TABLE XI

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 11

| Courses Recommended by CUPM | Courses Completed by Instructor Number | | | |
|---|---|---|---|---|
| | 1 | 2[a] | 3 | 4[a] |
| Calculus | | | x | |
| Linear Algebra | x | | x | |
| Probability and Statistics | x | | x | |
| Computer Science | | | x | |
| Abstract Algebra | | | | |
| Theorems of Real Analysis | | | x | |
| Applied Mathematics | | | x | |
| Complex Analysis | x | | x | |
| A course in some Geometric subject | x | | | |
| Measure and Integration | x | | x | |
| Homology and Multivariable Integration | | | | |
| Galois and Field Theory | | | x | |
| Advanced Ordinary Differential Equations | x | | | |
| Functional Analysis | | | | |
| General Topology | | | | |
| Topology of Manifolds | | | | |
| Ring Theory and Multi-linear Algebra | | | | |
| Problem-oriented Numerical Analysis | | | | |
| Total CUPM Recommendations Met | 6 | | 9 | |
| Total Number of Semester Courses in Mathematics | 9 | | 14 | |
| Range of Recommendations Met | 6-9 | | | |
| Mean Number of Recommendations Met | 7.5 | | | |
| Mean Number of Semester Courses in Mathematics | 11.5 | | | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

[a]No return from this instructor.

TABLE XII

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 12

| Courses Recommended by CUPM | Courses Completed by Instructor Number | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3[b] | 4[a] | 5 | 6 |
| Calculus | x | x | | | | x |
| Linear Algebra | | x | | | | x |
| Probability and Statistics | x | | | | | x |
| Computer Science | | x | | | | x |
| Abstract Algebra | | x | | | | x |
| Theorems of Real Analysis | | x | | | | |
| Applied Mathematics | | | | | | |
| Complex Analysis | | | | | | |
| A course in some Geometric subject | x | x | | | | x |
| Measure and Integration | | x | | | | x |
| Homology and Multivariable Integration | x | | | | | x |
| Galois and Field Theory | | | | | | x |
| Advanced Ordinary Differential Equations | | | | | | x |
| Functional Analysis | | | | | | x |
| General Topology | x | x | | | | x |
| Topology and Geometry of Manifolds | | | | | | |
| Ring Theory and Multi-linear Algebra | | | | | | x |
| Problem-oriented Numerical Analysis | | | | | | x |
| Total CUPM Recommendations Met | 5 | 8 | | | | 14 |
| Total Number of Semester Courses in Mathematics | 31 | 13 | | | | 23 |
| Range of Recommendations Met | 5-14 | | | | | |
| Mean Number of Recommendations Met | 9.0 | | | | | |
| Mean Number of Semester Courses in Mathematics | 22.3 | | | | | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

[a]No return from this instructor

[b]This instructor declined to complete the questionnaire.

TABLE XIII

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 13

| Courses Recommended by CUPM | Courses Completed by Instructor Number | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Calculus | x | x | x |
| Linear Algebra | | x | x |
| Probability and Statistics | x | x | x |
| Computer Science | | x | x |
| Abstract Algebra | x | x | x |
| Theorems of Real Analysis | x | | x |
| Applied Mathematics | | x | |
| Complex Analysis | | | |
| A course in some Geometric subject | x | x | x |
| Measure and Integration | | x | |
| Homology and Multivariable Integration | | x | |
| Galois and Field Theory | | | |
| Advanced Ordinary Differential Equations | x | | |
| Functional Analysis | x | x | |
| General Topology | x | | x |
| Topology and Geometry of Manifolds | | | |
| Ring Theory and Multi-linear Algebra | | | |
| Problem-oriented Numerical Analysis | | | x |
| Total CUPM Recommendations Met | 8 | 10 | 9 |
| Total Number of Semester Courses in Mathematics | 14 | 13 | 12 |
| Range of Recommendations Met | 8-10 | | |
| Mean Number of Recommendations Met | 9.0 | | |
| Mean Number of Semester Courses in Mathematics | 13 | | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

TABLE XIV

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 14

| Courses Recommended by CUPM | Courses Completed by Instructor Number | |
|---|---|---|
| | 1 | 2 |
| Calculus | x | x |
| Linear Algebra | | x |
| Probability and Statistics | x | x |
| Computer Science | | |
| Abstract Algebra | x | x |
| Theorems of Real Analysis | | x |
| Applied Mathematics | x | |
| Complex Analysis | | x |
| A course in some Geometric subject | x | x |
| Measure and Integration | x | x |
| Homology and Multivariable Integration | | |
| Galois and Field Theory | | x |
| Advanced Ordinary Differential Equations | x | |
| Functional Analysis | | x |
| General Topology | | x |
| Topology and Geometry of Manifolds | | |
| Ring Theory and Multi-linear Algebra | | x |
| Problem-oriented Numerical Analysis | | x |
| Total CUPM Recommendations Met | 7 | 13 |
| Total Number of Semester Courses in Mathematics | 11 | 19 |
| Range of Recommendations Met | 7-13 | |
| Mean Number of Recommendations Met | 10.0 | |
| Mean Number of Semester Courses in Mathematics | 15.0 | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

TABLE XV

ANALYSIS OF ACADEMIC QUALIFICATIONS DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 15

| Courses Recommended by CUPM | Courses Completed by Instructor Number | |
|---|---|---|
| | 1 | 2 |
| Calculus | x | x |
| Linear Algebra | x | x |
| Probability and Statistics | | x |
| Computer Science | | x |
| Abstract Algebra | x | x |
| Theorems of Real Analysis | x | x |
| Applied Mathematics | x | x |
| Complex Analysis | x | x |
| A course in some Geometric subject | x | x |
| Measure and Integration | x | x |
| Homology and Multivariable Integration | x | |
| Galois and Field Theory | x | |
| Advanced Ordinary Differential Equations | x | |
| Functional Analysis | x | x |
| General Topology | | x |
| Topology and Geometry of Manifolds | | |
| Ring Theory and Multi-linear Algebra | | |
| Problem-oriented Numerical Analysis | | x |
| Total CUPM Recommendations Met | 12 | 12 |
| Total Number of Semester Courses in Mathematics | 24 | 20 |
| Range of Recommendations Met | 12-13 | |
| Mean Number of Recommendations Met | 12.5 | |
| Mean Number of Semester Courses in Mathematics | 22.0 | |

*An x indicates that one of the eighteen academic courses recommended by CUPM has been completed.

completed by each instructor. The summary also indicates the range of recommendations met, the mean number of recommendations met and the mean number of semester courses in mathematics for the instructors of each institution.

Analysis of the data for the forty-nine respondents revealed that the number of CUPM courses taken ranged from a low of one to a high of sixteen. The mean number of course recommendations met by the instructors of the population was 8.5. The mean number of course recommendations for the institutions ranged from 3.3 to 12.5. The mean for ten of the fifteen institutions exceeded the mean for the instructors. Institution number fifteen had the greatest institutional mean, 12.5, in terms of the recommendations met by the instructors of that institution. All of the institutions had at least one instructor who had met one-half of the course recommendations.

Of the three graduate courses specifically recommended by CUPM for the two year college teacher, twenty-five instructors had received credit for measure and integration, twenty-five for general topology, and sixteen for advanced ordinary differential equations with applications.

CUPM recommendations relative to apprenticeship met

Only forty-four of the instructors of the study population made a response to the question concerning apprenticeship in two year college

teaching. Of that number three indicated that they had participated in an apprenticeship program. Three other instructors had worked as a teaching graduate assistant in a university but gave no indication that the assistantship was supervised by a college or university professor.

Coursework in mathematics

The total number of credits, undergraduate and graduate, in mathematics for an individual instructor ranged from a low of three semester courses to a high of thirty-one semester courses with 15.8 as the mean number of semester courses completed by the respondents of the study population. The mean number of semester courses of mathematics for the instructors of an individual institution had a range of eleven to 22.3. Institution eleven and institution fifteen had institutional means of more than twenty semester courses in mathematics.

Types of degrees earned

The forty-nine respondents indicated fifty-one post-baccalaureate degrees earned. All had earned some type of master's degree. A summary of these data is presented in Table XVI. The most popular degree earned by the study population was the Master of Arts degree. Each of two respondents earned two types of master's degree; one earned both the Master of Arts and Master of Science while the other earned the Master of Arts and the Master of Education. None of the population had earned the Doctor of Arts or one of the other newer degrees structured for the college teacher. Two respondents had

TABLE XVI

TYPES AND NUMBER OF DEGREES EARNED BY MEMBERS OF STUDY POPULATION BY INSTITUTION

| Institution Number | Highest Degree Earned | | | | | |
|---|---|---|---|---|---|---|
| | Ph.D | Ed.S. | M.S. | M.A. | M. Ed. & M.A. in Ed. | M.A.T. |
| 1 | | | | 2 | | |
| 2 | | | 1 | | | 1 |
| 3 | | | | 2 | | |
| 4[a] | | | 1 | 2 | 1 | |
| 5 | | 1 | | 2 | | 1 |
| 6 | | 1 | 1 | 2 | | 1 |
| 7 | | | 4 | 2 | 1 | |
| 8 | | | 1 | 2 | | |
| 9 | | | 2 | 1 | | 1 |
| 10 | | | 2 | 2 | | 1 |
| 11 | 1 | | | 1 | | |
| 12[b] | | | | 3 | 1 | 1 |
| 13 | | | | 2 | 1 | |
| 14 | | | 1 | 1 | | |
| 15 | | | 1 | 1 | | |
| Totals | 1 | 2 | 14 | 25 | 3 | 6 |
| Per Cent of Total | 1.9 | 3.9 | 27.4 | 49.0 | 5.7 | 11.7 |

[a]One instructor holds both the M.A. and M.S.
[b]One instructor holds both the M.A. and M.Ed.

earned the Educational Specialist degree but in areas other than college teaching.

## Professional Qualifications

Forty-nine of the fifty-one mathematics instructors of the study population returned a completed or partially completed questionnaire. One of these instructors did not complete any of the section on professional activities. Table XVII presents the number of questionnaires returned by each institution and the per cent of return for the study population of instructors.

### Professional activities recommended

Academic preparation of a two year college teacher is not the only means of qualifying an individual to teach effectively. Professional activities of various forms contribute to continuing mathematical growth. The committee on the qualifications for two year college teachers in mathematics of CUPM suggested several forms of these professional activities. The forms of activities which were included in the questionnaire designed for this study are:

(a) taking additional course work,
(b) reading and studying to keep aware of new developments and to explore new fields,
(c) engaging in research for new mathematical results (even when unpublished)
(d) developing new courses, new ways of teaching and new classroom material,
(e) publishing expository or research articles,

TABLE XVII

NUMBER AND PERCENTAGE OF QUESTIONNAIRES RETURNED BY MATHEMATICS INSTRUCTORS AT EACH INSTITUTION

| Institution Number | Number of Mathematics Instructors | Number of Questionnaires Returned | Per Cent |
|---|---|---|---|
| 1 | 2 | 2 | 100 |
| 2 | 4 | 2 | 50 |
| 3 | 3 | 2 | 67 |
| 4 | 3 | 3 | 100 |
| 5 | 4 | 4 | 100 |
| 6 | 6 | 5 | 83 |
| 7 | 7 | 7 | 100 |
| 8 | 4 | 3 | 75 |
| 9 | 4 | 4 | 100 |
| 10 | 5 | 5 | 100 |
| 11 | 4 | 2 | 50 |
| 12 | 6 | 4 | 67 |
| 13 | 3 | 3 | 100 |
| 14 | 2 | 2 | 100 |
| 15 | 2 | 2 | 100 |
| Totals | 59 | 50 | 85* |

*This figure represents the overall percentage of returns and is not a column total.

(f) participating in the activities of professional mathematical organizations.[5]

Professional activities of the study population

The purpose of the second portion of the questionnaire was to determine the extent to which members of the study population engaged in activities which are conducive to professional growth. Tables XVIII - XXXII are designed to present the data collected by the questionnaire on professional growth. The respondent was to indicate any of the activities in which he had participated within the previous five years.

A review of the tables indicated that for the population of instructors the number of activities in which any one instructor was involved ranged from one to six activities. Only one instructor had been engaged in all six of these forms of activities. The highest mean of suggested activities for an institution was four and the mean for the forty-eight instructors responding to this portion of the questionnaire was 3.0.

Table XXXIII summarizes the data collected by listing the six activities and noting the number participating in each activity and the per cent of participation. The activities are ranked according to participation. Professional reading was the most frequently indicated activity of the list. The least amount of participation was in the

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[5]Ad Hoc Committee on Qualifications for a Two Year College Faculty in Mathematics, Qualifications for Teaching University Parallel Mathematics Courses, p. 4.

TABLE XVIII

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 1

| Activities Recommended by CUPM | Instructor Number 1 | 2 |
|---|---|---|
| Additional Coursework | - | - |
| Semester hours in mathematics | | |
| Semester hours in education | | |
| Semester hours in other areas | | |
| Publications | - | - |
| Number of articles published in mathematics journals | | |
| Number of articles published in other journals | | |
| Professional Affiliations | x | x |
| Number of memberships | 2 | 2 |
| Number of meetings attended | 1 | 1 |
| Professional Reading | x | x |
| Number of journals read regularly | 1 | 4 |
| Average number of books on mathematics read regularly | 2 | 8 |
| Original Research | - | - |
| Number of research projects | | |
| Development of New Courses | x | - |
| Number of new courses developed | 1 | |
| Total Number of CUPM Recommendations Met | 3 | 2 |
| Range of Recommendations Met 2-3 | | |
| Mean Number of Recommendations Met 2.5 | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

TABLE XIX

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 2

| Activities Recommended by CUPM | Instructor Number 1 | 2[a] | 3 | 4[a] |
|---|---|---|---|---|
| Additional Coursework | x | | x | |
| Semester hours in mathematics | 6 | | 40 | |
| Semester hours in education | 2 | | 50 | |
| Semester hours in other areas | | | | |
| Publications | - | | - | |
| Number of articles published in mathematics journals | | | | |
| Number of articles published in other journals | | | | |
| Professional Affiliations | x | | x | |
| Number of memberships | 1 | | 2 | |
| Number of meetings attended | 2 | | 4 | |
| Professional Reading | x | | x | |
| Number of journals read regularly | 3 | | 5 | |
| Average number of books on mathematics read regularly | 8 | | 10 | |
| Original Research | - | | - | |
| Number of research projects | | | | |
| Development of New Courses | - | | x | |
| Number of new courses developed | | | 7 | |
| Total Number of CUPM Recommendations Met | 3 | | 4 | |
| Range of Recommendations Met | 3-4 | | | |
| Mean Number of Recommendations Met | 3.5 | | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

[a]No return from this instructor.

TABLE XX

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 3

| Activities Recommended by CUPM | Instructor Number | | |
|---|---|---|---|
| | 1 | 2[a] | 3 |
| Additional Coursework | x | | - |
| Semester hours in mathematics | 6 | | |
| Semester hours in education | | | |
| Semester hours in other areas | | | |
| Publications | - | | - |
| Number of articles published in mathematics journals | | | |
| Number of articles published in other journals | | | |
| Professional Affiliations | x | | - |
| Number of memberships | 1 | | |
| Number of meetings attended | 1 | | |
| Professional Reading | x | | x |
| Number of journals read regularly | 1 | | 2 |
| Average number of books on mathematics read annually | 2 | | 2 |
| Original Research | - | | - |
| Number of research projects | | | |
| Development of New Courses | x | | - |
| Number of new courses developed | 1 | | |
| Total Number of CUPM Recommendations Met | 4 | | 1 |
| Range of Recommendations Met 1-4 | | | |
| Mean Number of Recommendations Met 2.5 | | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

[a]No return from this instructor.

TABLE XXI

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 4

| Activities Recommended by CUPM | Instructor Number | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Additional Coursework | x | - | x |
| Semester hours in mathematics | 10 | | 52 |
| Semester hours in education | | | |
| Semester hours in other areas | | | |
| Publications | - | - | - |
| Number of articles published in mathematics journals | | | |
| Number of articles published in other journals | | | |
| Professional Affiliations | x | x | x |
| Number of memberships | 2 | 1 | 2 |
| Number of meetings attended | 2 | | 4 |
| Professional Reading | x | x | x |
| Number of journals read regularly | 4 | 2 | 4 |
| Average number of books on mathematics read annually | 2 | | 5 |
| Original Research | - | - | - |
| Number of research projects | | | |
| Development of New Courses | x | - | x |
| Number of new courses developed | 3 | | 3 |
| Total Number of CUPM Recommendations Met | 4 | 2 | 4 |
| Range of Recommendations Met 2-4 | | | |
| Mean Number of Recommendations Met 3.3 | | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

TABLE XXII

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 5

| Activities Recommended by CUPM | Instructor Number | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Additional Coursework | - | x | - | - |
| Semester hours in mathematics | | 2 | | |
| Semester hours in education | | 4 | | |
| Semester hours in other areas | | | | |
| Publications | x | - | - | - |
| Number of articles published in mathematics journals | | | | |
| Number of articles published in other journals | 9 | | | |
| Professional Affiliations | - | x | - | - |
| Number of memberships | | 3 | | |
| Number of meetings attended | | 3 | | |
| Professional Reading | x | x | x | x |
| Number of journals read regularly | 1 | 2 | 2 | 1 |
| Average number of books on mathematics read annually | 2 | 5 | 2 | 2 |
| Original Research | - | - | - | - |
| Number of research projects | | | | |
| Development of New Courses | x | - | - | - |
| Number of new courses developed | 1 | | | |
| Total Number of Recommendations Met | 3 | 3 | 1 | 1 |
| Range of Recommendations Met 1-3 | | | | |
| Mean Number of Recommendations Met 2.0 | | | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

TABLE XXIII

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 6

| Activities Recommended by CUPM | Instructor Number | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3[a] | 4 | 5 | 6 |
| Additional Coursework | - | x | | - | x | x |
| Semester hours in mathematics | | 18 | | | 6 | 15 |
| Semester hours in education | | 39 | | | | 45 |
| Semester hours in other areas | | | | | | |
| Publications | - | - | | - | - | - |
| Number of articles published in mathematics journals | | | | | | |
| Number of articles published in other journals | | | | | | |
| Professional Affiliations | x | x | | x | - | - |
| Number of memberships | 1 | 1 | | 1 | | |
| Number of meetings attended | | 2 | | | | 2 |
| Professional Reading | x | - | | x | - | x |
| Number of journals read regularly | 2 | | | 1 | | 2 |
| Average number of books on mathematics read annually | 10 | | | 2 | | 10 |
| Original Research | x | - | | - | - | - |
| Number of research projects | 2 | | | | | |
| Development of New Courses | - | x | | - | - | - |
| Number of new courses developed | | 3 | | | | |
| Total Number of CUPM Recommendations Met | 3 | 3 | | 2 | 1 | 3 |
| Range of Recommendations Met 1-3 | | | | | | |
| Mean Number of Recommendations Met 2.4 | | | | | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

[a]No return from this instructor.

TABLE XXIV

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 7

| Activities Recommended by CUPM | Instructor Number | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Additional Coursework | - | - | - | - | - | x | x |
| Semester hours in mathematis | | | | | | 20 | 5 |
| Semester hours in education | | | | | | | |
| Semester hours in other areas | | | | | | | |
| Publications | - | - | - | - | - | - | x |
| Number of articles published in mathematics journals | | | | | | | |
| Number of articles published in other journals | | | | | | | 1 |
| Professional Affiliations | x | x | x | x | x | x | x |
| Number of memberships | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Number of meeting attended | | | | 3 | 3 | 1 | 1 |
| Professional Reading | x | x | x | x | x | x | x |
| Number of journals read regularly | 1 | 3 | 1 | 3 | 2 | 5 | 1 |
| Average number of books on mathematics read annually | 2 | 5 | 5 | 2 | 10 | 10 | 5 |
| Original Research | - | - | - | - | - | x | x |
| Number of research projects | | | | | | 3 | 3 |
| Development of New Courses | - | - | - | - | - | - | x |
| Number of new courses developed | | | | | | | 2 |
| Total Number of CUPM Recommendations Met | 2 | 2 | 2 | 2 | 2 | 4 | 6 |
| Range of Recommendations Met 2-6 | | | | | | | |
| Mean Number of Recommendations Met 3.0 | | | | | | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

TABLE XXV

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 8

| Activities Recommended by CUPM | Instructor Number | | | |
|---|---|---|---|---|
| | 1 | 2 | 3[a] | 4 |
| Additional Coursework | x | x | | - |
| Semester hours in mathematics | 6 | 26 | | |
| Semester hours in education | 3 | | | |
| Semester hours in other areas | | | | |
| Publications | - | - | | x |
| Number of articles published in mathematics journals | | | | |
| Number of articles published in other journals | | | | 9 |
| Professional Affiliations | x | x | | - |
| Number of memberships | 1 | 3 | | |
| Number of meetings attended | | 1 | | |
| Professional Reading | x | x | | x |
| Number of journals read regularly | 3 | 4 | | |
| Average number of books on mathematics read annually | 5 | 5 | | 8 |
| Original Research | - | x | | - |
| Number of research projects | | 2 | | |
| Development of New Courses | x | x | | x |
| Number of new courses developed | 1 | 1 | | 1 |
| Total Number of CUPM Recommendations Met | 4 | 5 | | 3 |
| Range of Recommendations Met 3-5 | | | | |
| Mean Number of Recommendations Met 4.0 | | | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

[a]No return from this instructor.

TABLE XXVI

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 9

| Activities Recommended by CUPM | Instructor Number | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Additional Coursework | x | x | x | x |
| Semester hours in mathematics | 10 | 6 | 6 | 12 |
| Semester hours in education | | 2 | | |
| Semester hours in other areas | | | 6 | |
| Publications | - | - | - | - |
| Number of articles published in mathematics journals | | | | |
| Number of articles published in other journals | | | | |
| Professional Affiliations | x | - | - | x |
| Number of memberships | 1 | | | 1 |
| Number of meetings attended | | | | |
| Professional Reading | x | x | x | x |
| Number of journals read regularly | 2 | 3 | | 4 |
| Average number of books on mathematics read annually | 2 | 10 | 2 | 8 |
| Original Research | - | x | - | - |
| Number of research projects | | 1 | | |
| Development of New Courses | x | x | - | - |
| Number of new courses developed | 2 | 1 | | |
| Total Number of CUPM Recommendations Met | 4 | 4 | 2 | 3 |
| Range of Recommendations Met 2-4 | | | | |
| Mean Number of Recommendations Met 3.2 | | | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

TABLE XXVII

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 10

| Activities Recommended by CUPM | Instructor Number | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5[a] |
| Additional Coursework | x | x | x | x | |
| Semester hours in mathematics | 21 | 4 | 6 | 18 | |
| Semester hours in education | | | 45 | | |
| Semester hours in other areas | | | 6 | | |
| Publications | - | - | - | x | |
| Number of articles published in mathematics journals | | | | 4 | |
| Number of articles published in other journals | | | | | |
| Professional Affiliations | - | x | x | x | |
| Number of memberships | | 1 | 5 | 2 | |
| Number of meetings attended | | 2 | 10 | 10 | |
| Professional Reading | x | x | x | x | |
| Number of journals read regularly | 1 | 2 | 5 | 4 | |
| Average number of books on mathematics read annually | 5 | 2 | 5 | 5 | |
| Original Research | - | - | x | x | |
| Number of research projects | | | 2 | 2 | |
| Development of New Courses | - | x | - | - | |
| Number of new courses developed | | 1 | | | |
| Total Number of Recommendations Met | 2 | 3 | 4 | 5 | |
| Range of Recommendations Met 2-5 | | | | | |
| Mean Number of Recommendations Met 3.5 | | | | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

[a]Instructor did not respond to this section of the questionnaire.

TABLE XXVIII

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 11

| Activities Recommended by CUPM | Instructor Number | | | |
|---|---|---|---|---|
| | 1 | 2[a] | 3 | 4[a] |
| Additional Coursework | x | | x | |
| Semester hours in mathematics | 12 | | 9 | |
| Semester hours in education | | | | |
| Semester hours in other areas | 6 | | | |
| Publications | - | | x | |
| Number of articles published in mathematics journals | | | | |
| Number of articles published in other journals | | | 2 | |
| Professional Affiliations | x | | - | |
| Number of memberships | 2 | | | |
| Number of meetings attended | | | | |
| Professional Reading | x | | - | |
| Number of journals read regularly | 1 | | | |
| Average number of books on mathematics read annually | 2 | | | |
| Original Research | - | | - | |
| Number of research projects | | | | |
| Development of New Courses | - | | - | |
| Number of new courses developed | | | | |
| Total Number of CUPM Recommendations Met | 3 | | 2 | |
| Range of Recommendations Met | 2-3 | | | |
| Mean Number of Recommendation Met | 2.5 | | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

[a]No return from this instructor,

TABLE XXIX

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 12

| Activities Recommended by CUPM | Instructor Number | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3[b] | 4[a] | 5[a] | 6 |
| Additional Coursework | x | x | | | | - |
| Semester hours in mathematics | 8 | 10 | | | | |
| Semester hours in education | | | | | | |
| Semester hours in other areas | | | | | | |
| Publications | - | - | | | | - |
| Number of articles published in mathematics journals | | | | | | |
| Number of articles published in other journals | | | | | | |
| Professional Affiliations | x | x | | | | x |
| Number of memberships | 1 | 1 | | | | 3 |
| Number of meetings attended | | | | | | 6 |
| Professional Reading | x | x | | | | x |
| Number of journals read regularly | 2 | 2 | | | | 2 |
| Average number of books on mathematics read annually | 5 | 10+ | | | | |
| Original Research | - | - | | | | - |
| Number of research projects | | | | | | |
| Development of New Courses | x | x | | | | x |
| Number of new courses developed | 3 | 1 | | | | 1 |
| Total Number of CUPM Recommendations Met | 4 | 4 | | | | 3 |
| Range of Recommendations Met 3-4 | | | | | | |
| Mean Number of Recommendations Met 3.7 | | | | | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

[a]No return from this instructor.

[b]Instructor declined to complete the questionnaire.

TABLE XXX

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 13

| Activities Recommended by CUPM | Instructor Number | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Additional Coursework | - | x | - |
| Semester hours in mathematics | | 18 | |
| Semester hours in education | | 1 | |
| Semester hours in other areas | | | |
| Publications | -- | - | - |
| Number of articles published in mathematics journals | | | |
| Number of articles published in other journals | | | |
| Professional Affiliations | - | x | x |
| Number of memberships | | 1 | 1 |
| Number of meetings attended | 5 | 3 | |
| Professional Reading | x | x | x |
| Number of journals read regularly | | 2 | 1 |
| Average number of books on mathematics read annually | 2 | 2 | 2 |
| Original Research | x | x | - |
| Number of research projects | 1 | 1 | |
| Development of New Courses | x | x | - |
| Number of new courses developed | 2 | 2 | |
| Total Number of CUPM Recommendations Met | 3 | 5 | 2 |
| Range of Recommendations Met | 2-5 | | |
| Mean Number of Recommendations Met | 3.3 | | |

*An x indicates that one of the six CUPM recommendations on professioanl growth has been met.

TABLE XXXI

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 14

| Activities Recommended by CUPM | Instructor Number 1 | 2 |
|---|---|---|
| Additional Coursework | x | - |
| Semester hours in mathematics | 12 | |
| Semester hours in education | | |
| Semester hours in other areas | | |
| Publications | - | - |
| Number of articles published in mathematics journals | | |
| Number of articles published in other journals | | |
| Professional Affiliations | x | x |
| Number of memberships | 1 | 1 |
| Number of meetings attended | 3 | |
| Professional Reading | x | x |
| Number of journals read regularly | 2 | 1 |
| Average number of books on mathematics read annually | 2 | 2 |
| Original Research | - | - |
| Number of research projects | | |
| Development of New Courses | - | - |
| Number of new courses developed | | |
| Total Number of CUPM Recommendations Met | 3 | 2 |
| Range of Recommendations Met | 2-3 | |
| Mean Number of Recommendations | 2.5 | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

TABLE XXXII

ANALYSIS OF PROFESSIONAL GROWTH DATA IN TERMS OF CUPM RECOMMENDATIONS MET* BY MATHEMATICS INSTRUCTORS AT INSTITUTION NUMBER 15

| Activities Recommended by CUPM | Instructor Number 1 | 2 |
|---|---|---|
| Additional Coursework | x | x |
| Semester hours in mathematics | 10 | 4 |
| Semester hours in education | | 4 |
| Semester hours in other areas | | 2 |
| Publications | - | - |
| Number of articles published in mathematics journals | | |
| Number of articles published in other journals | | |
| Professional Affiliations | x | - |
| Number of memberships | 1 | |
| Number of meetings attended | 3 | |
| Professional Reading | x | x |
| Number of journals read regularly | 3 | 2 |
| Average number of books on mathematics read annually | 2 | 5 |
| Original Research | - | - |
| Number of research projects | | |
| Development of New Courses | x | x |
| Number of new courses developed | 2 | 5 |
| Total Number of CUPM Recommendations Met | 4 | 3 |
| Range of Recommendations Met 3-4 | | |
| Mean Number of Recommendations Met 3.5 | | |

*An x indicates that one of the six CUPM recommendations on professional growth has been met.

publication of articles or books. Research had been done in the past five years by only 18.4 per cent of the population.

TABLE XXXIII

NUMBER AND PER CENT OF RESPONDENTS PARTICIPATING IN ACTIVITIES REFLECTING PROFESSIONAL GROWTH

| Activities Recommended by CUPM | Number of Respondents Participating to Some Extent in Each Activity | Per Cent | Rank |
|---|---|---|---|
| Professional Reading | 46 | 93.8 | 1 |
| Professional Affiliations | 35 | 71.4 | 2 |
| Additional Coursework | 29 | 59.1 | 3 |
| Development of New Courses | 21 | 42.8 | 4 |
| Original Research | 9 | 18.4 | 5 |
| Publications | 6 | 12.2 | 6 |

The structure of the questionnaire provided additional information in the various forms of professional activities.

Professional reading.—Two types of reading materials were included in the questionnaire, professional journals and books of mathematical nature. The Mathematics Teacher and the Junior College Journal were read by more of the study population than any other professional journal. Twenty-one respondents indicated that they read one to three books annually, thirteen read four to six books annually, three read seven to nine books and seven read ten or more books of a mathematical nature.

Professional affiliations.--Table XXXIV presents the data collected concerning the population's membership in professional mathematical organizations. The table shows that more instructors (who responded to this item) were members of the National Council of Teachers of Mathematics than any other professional mathematical organization. Three instructors indicated that they were members of the North Carolina Council of Teachers of Mathematics. Approximately one-fourth of the respondents were not members of any mathematical professional organization.

TABLE XXXIV

MEMBERSHIP IN PROFESSIONAL MATHEMATICAL ORGANIZATIONS

| Organization | Number of Respondents Holding Memberships | Per Cent |
|---|---|---|
| Mathematical Association of America | 20 | 40.8 |
| American Mathematical Society | 1 | 2.0 |
| National Council of Teachers of Mathematics | 21 | 42.9 |
| Others | 10 | 20.4 |
| None of the above | 13 | 26.5 |

Additional coursework.--Fifty-nine and one tenth per cent of the respondents indicated that they had earned additional credit in mathematics during the past five years. Fifty-eight per cent of these indicated that they had earned some credit while paying their own way. The mean number of semester hours of coursework completed was 13.4.

Thirty-two of the respondents indicated that they would have preferred to have taken more coursework over the past five years. The most frequent reasons given for not taking additional coursework were the lack of time and financial considerations.

Development of new courses.--The majority of the respondents had developed new courses within the past five years. Most of these had worked on the new courses individually but some new courses were developed by the entire department of a given institution. One individual reported that he had developed seven new courses. In the development and teaching of the new courses for a community college, the instructors reported that they wrote their own class notes.

Original research.--The eight instructors who reported doing original research worked on a total of fourteen projects. Two instructors had worked on three projects each, three had worked on two projects, and the other two had each worked on one project.

Publications.--The articles published by the study population were published in mathematics journals, education journals and space science publications. Each of two of the respondents indicated that they had published a total of nine or more articles. None of the instructors had a textbook published within the period of time covered by this study.

Experience prior to becoming a community college mathematics instructor

Table XXXV presents the information collected from the population pertaining to the experience of the instructors before they began teaching in a community college. Not all of the returned questionnaires had a response for this item. Of those responding, the largest percentage, 24 of 47, had been teachers at the senior high school level. The next largest group was those who had served as graduate assistants. This group comprised 21.3 per cent of the respondents. As previously noted, the graduate assistantship did not, in every case, involve work as an apprentice in two year college teaching.

TABLE XXXV

EXPERIENCE OF RESPONDENTS PRIOR TO BECOMING TWO YEAR COLLEGE MATHEMATICS TEACHERS

| Type of Experience | Number of Respondents | Per Cent |
|---|---|---|
| Senior High School Teacher | 24 | 51.5 |
| Full-time Student | 2 | 4.2 |
| Junior High School Teacher | 3 | 6.3 |
| Graduate Assistant | 10 | 21.3 |
| Full-time Four Year College or University Instructor | 4 | 8.4 |
| Other* | 4 | 8.4 |
| Total | 47 | |

*Includes a mathematics cousultant, a space engineer, a quality control engineer, and a technical institute instructor.

## II. Presentation of Data Related to the Mathematics Courses in the College Transfer Programs

Each of the instructors of the study population who returned his quesionnaire completed a form indicating the courses which were recommended by CUPM that he had taught in the two previous academic years and that he was teaching in the fall term of 1971. Two other sources were used to analyze the offerings in the college transfer programs in mathematics. Those were the form returned by the department chairman and the catalogue of each institution.

The analysis of the data collected relative to the mathematics courses in the college transfer programs will be discussed in this portion of this chapter. The outline of the topics is:

A. Courses recommended by CUPM for two year colleges

1. Courses recommended by CUPM being taught

B. Guidelines recommended by JCCTS

1. Courses recommended by JCCTS being taught

C. Other mathematics courses in the college transfer programs

### Courses Recommended by CUPM for Two Year Colleges

The minimal set of offerings which is recommended by CUPM is described in four categories: 1) calculus preparatory, 2) calculus and linear algebra, 3) business and social science and 4) teacher training. The courses in the various categories are described in

the report of CUPM relative to the transfer curriculum in mathematics.[6] To facilitate the understanding of the analysis of the data these courses are outlined here. Additional offerings, which may be used to complete the curriculum of a two year college with students who have special interests, are described also. In this outline of the course offerings the term "GCMC" refers to the booklet, A General Curriculum in Mathematics for Colleges.[7]

BASIC OFFERINGS

I. Calculus Preparatory
   (a) Elementary Functions and Coordinate Geometry, Mathematics 0 (as in GCMC).
   (b) Elementary Functions and Coordinate Geometry, with Algebra and Trigonometry, Mathematics A.

   One or both of these should be offered by every two-year college.

II. Calculus and Linear Algebra
   (a) Introductory Calculus, Mathematics B. (An intuitive course covering the basic concepts of single variable calculus. Similar to GCMC Mathematics 1.)
   (b) Mathematical Analysis, Mathematics C. (A more rigorous course completing the standard calculus topics, as in GCMC Mathematics 2, 4.)
   (c) Linear Algebra, Mathematics L. (An elementary treatment similar to GCMC Mathematics 3, but parallel to, rather than preceding, the last analysis course.)

Categories I and II constitute the basic pre-science offerings and should be offered by every two-year college with a transfer program.

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[6] Committee on the Undergraduate Program in Mathematics, Report of the Committee, A Transfer Curriculum in Mathematics for Two Year Colleges (Berkeley, Calif.: Mathematical Association of America, 1969).

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

III. Business and Social Science
Probability and Statistics, Mathematics PS. (An introductory course stressing basic statistical concepts.)

IV. Teacher Training
Structure of the Number System, Mathematics NS. (A year course as recommended by the Panel on Teacher Training for the preparation of elementay school (Level I) teachers.
The second year of preparation algebra and geometry should also be offered wherever possible. ... .)

. . . . . .

1. Finite Mathematics, Mathematics FM (A course of considerable interest and utility, especially for students of the non-physical sciences.)
2. Intermediate Differential Equations, Mathematics DE.
3. Differential Equations and Advance Calculus, Mathematics DA.
4. Probability Theory, Mathematics PR. (A calculus based course in GCMC, Mathematics Np.)
5. Numerical Analysis, Mathematics NA.[8]

Courses recommended by CUPM being taught

Tables XXXVI through L present the courses taught by the instructors of the study population during the fall term of 1971 and the two preceding academic years. An entry in a column indicates that at least one of the instructors who responded had taught the course.

The investigator, using the course descriptions in the CUPM publications, and in the catalogue of each institution, compared the lists of courses offered by each institution with the courses recommended by CUPM. Where a catalogue description varied in many items with the descriptions of a CUPM course, the investigator did not count this course

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[8]Committee on the Undergraduate Program in Mathematics, A Transfer Curriculum, pp. 6-8.

TABLE XXXVI

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 1

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | X | X | X |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | X | X | X |
| Introductory Calculus (1 semester) | X | X | X |
| Mathematical Analysis (2 semesters) | | | |
| Linear Algebra | | | |
| Probability and Statistics | | | |
| Structure of Number Systems (2 semesters) | | | |
| Algebra and Geometry (2 semesters) | | | |
| Numerical Analysis | | | |
| Finite Mathematics | | | |
| Intermediate Differential Equations | | | |
| Differential Equations and Advance Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XXXVII

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 2

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | X | X | |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | X | X | X |
| Introductory Calculus (1 semester) | | | X |
| Mathematical Analysis (2 semesters) | | | |
| Linear Algebra | | | |
| Probability and Statistics | | | |
| Structure of Number Systems (2 semesters) | X | X | X |
| Algebra and Geometry (2 semesters) | X | X | X |
| Numerical Analysis | | | |
| Finite Mathematics | | X | X |
| Intermediate Differential Equations | | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XXXVIII

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 3

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semster) | | | |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | X | X | X |
| Introductory Calculus (1 semester) | | X | X |
| Mathematical Analysis (2 semesters) | | | |
| Linear Algebra | | | |
| Probability and Statistics | | | |
| Structure of Number Systems (2 semesters) | X | X | X |
| Algebra and Geometry | | | |
| Numerical Analysis | | | |
| Finite Mathematics | | | |
| Intermediate Differential Equations | | X | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XXXIX

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 4

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | X | X | X |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | X | X | X |
| Introductory Calculus (1 semester) | X | X | X |
| Mathematical Analysis (2 semesters) | X | X | X |
| Linear Algebra | | | |
| Probability and Statistics | | | |
| Structure of Number Systems (2 semesters) | X | X | X |
| Algebra and Geometry (2 semesters) | | | |
| Numerical Analysis | | | |
| Finite Mathematics | | | |
| Intermediate Differential Equations | | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XL

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 5

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | X | X | X |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | X | X | X |
| Introductory Calculus (1 semester) | | X | X |
| Mathematical Analysis (2 semesters) | | X | X |
| Linear Algebra | | | |
| Probability and Statistics | | X | X |
| Structure of Number Systems (2 semesters) | | | |
| Algebra and Geometry (2 semesters) | X | X | |
| Numerical Analysis | | | |
| Finite Mathematics | | | |
| Intermediate Differential Equations | | | X |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XLI

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 6

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | X | X | X |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | X | X | X |
| Introductory Calculus (1 semester) | X | X | X |
| Mathematical Analysis (2 semesters) | | | |
| Linear Algebra | | | |
| Probability and Statistics | X | X | X |
| Structure of Number Systems (2 semesters) | X | X | X |
| Algebra and Geometry (2 semesters) | X | X | X |
| Numerical Analysis | | | |
| Finite Mathematics | | | |
| Intermediate Differential Equations | | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XLII

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 7

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | X | X | X |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | X | X | X |
| Introductory Calculus (1 semester) | | X | X |
| Mathematical Analysis (2 semesters) | X | X | X |
| Linear Algebra | | X | |
| Probability and Statistics | X | | |
| Structure of Number Systems (2 semesters) | | | |
| Numerical Analysis | | | |
| Finite Mathematics | | | |
| Intermediate Differential Equations | | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XLIII

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 8

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | | | |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | X | X | X |
| Introductory Calculus (1 semester) | X | X | X |
| Mathematical Analysis (2 semesters) | | | |
| Linear Algebra | | | |
| Probability and Statistics | | X | |
| Structure of Number Systems (2 semesters) | X | | |
| Algebra and Geometry (2 semesters) | X | X | |
| Numerical Analysis | | | |
| Finite Mathematics | X | X | X |
| Intermediate Differential Equations | | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XLIV

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 9

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | | X | |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | X | X | X |
| Introductory Calculus (1 semester) | X | X | X |
| Mathematical Analysis (2 semesters) | | X | X |
| Linear Algebra | | | |
| Probability and Statistics | | | X |
| Structure of Number Systems (2 semesters) | X | X | X |
| Algebra and Geometry (2 semesters) | | | |
| Numerical Analysis | | | |
| Finite Mathematics | | | |
| Intermediate Differential Equations | | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XLV

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 10

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | X | X | |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | | X | |
| Introductory Calculus (1 semester) | X | X | X |
| Mathematical Analysis (2 semesters) | | X | |
| Linear Algebra | | | |
| Probability and Statistics | | | |
| Structure of Number Systems | X | X | X |
| Algebra and Geometry (2 semesters) | | | |
| Numerical Analysis | | | |
| Finite Mathematics | X | X | |
| Intermediate Differential Equations | | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XLVI

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 11

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | | | |
| Elementary Functions and Coordiante Geometry with Algebra and Trigonometry (2 semesters) | | X | X |
| Introductory Calculus (1 semester) | X | | |
| Mathematical Analysis (2 semesters) | | | |
| Linear Algebra | | | |
| Probability and Statistics | | | |
| Structure of Number Systems (2 semesters) | | | |
| Algebra and Geometry (2 semesters) | | | |
| Numerical Analysis | | | |
| Finite Mathematics | X | | |
| Intermediate Differential Equations | | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XLVII

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 12

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | | | |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | X | X | X |
| Introductory Calculus (1 semester) | X | | X |
| Mathematical Analysis (2 semesters) | | X | |
| Linear Algebra | | | |
| Probability and Statistics | X | | |
| Structure of Number Systems (2 semesters) | | | |
| Algebra and Geometry (2 semesters) | X | X | |
| Numerical Analysis | | | |
| Finite Mathematics | X | | |
| Intermediate Differential Equations | X | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE XLVIII

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 13

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | | | |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | | | |
| Introductory Calculus (1 semester) | X | X | X |
| Mathematical Analysis | | | |
| Probability and Statistics | | X | X |
| Structure of Number Systems (2 semesters) | X | X | X |
| Algebra and Geometry (2 semesters) | | | |
| Numerical Analysis | | | |
| Finite Mathematics | X | X | X |
| Intermediate Differential Equations | | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE IL

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 14

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | X | | |
| Elementary Functions and Coordiante Geometry with Algebra and Trigonometry (2 semesters) | X | X | |
| Introductory Calculus (1 semester) | X | X | X |
| Mathematical Analysis (2 semesters) | | | |
| Linear Algebra | | | |
| Probability and Statistics | | X | |
| Structure of Number Systems (2 semesters) | X | X | X |
| Algebra and Geometry (2 semesters) | X | X | X |
| Numerical Analysis | | | |
| Finite Mathematics | | | |
| Intermediate Differential Equations | | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

TABLE L

COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM BEING TAUGHT OR TAUGHT DURING THE PAST TWO YEARS AT INSTITUTION NUMBER 15

| Name of Course | Fall 1971 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | X | | X |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | X | X | |
| Introductory Calculus (1 semester) | X | | X |
| Mathematical Analysis (2 semesters) | X | | |
| Linear Algebra | | | |
| Probability and Statistics (2 semesters) | X | X | |
| Algebra and Geometry (2 semesters) | | | |
| Numerical Analysis | | | |
| Finite Mathematics | | | |
| Intermediate Differential Equations | | | |
| Differential Equations and Advanced Calculus | | | |
| Probability Theory (based on calculus) | | | |

as one which met the recommendations of CUPM. Thus there are some discrepancies between the information in the tables for each institution, Tables XXXVI through L, and Tables LI and LII. The information presented in Tables LI and LII summarizes the data collected from the instructors, the department chairmen, and the catalogues of the institutions. The pre-calculus courses offered by most institutions did not have the same description as the pre-calculus courses in the report of CUPM. The topics concerning functions are to be given a central role in the content of the two semester pre-calculus course. The catalogue descriptions of some of the institutions' pre-calculus courses were of the traditional algebra and trigonometry sequence even though the sequence was labeled as "Integrated Algebra and Trigonometry." The pre-calculus course descriptions also omitted topics in coordinate geometry and basic logic. Few of them specifically listed the goal of developing the ability to understand and use deductive reasoning.

The course, Mathematics 0, is taught as a five quarter course in some of the institutions but a majority of them required a year's work in pre-calculus.

The calculus sequence varied greatly within the study population. One of the institutions offers three quarters of five quarter hours credit, one has four quarters in the sequence with three terms of work carrying five quarter hours credit and the fourth term carrying three quarter hours credit, and thirteen institutions offer twenty quarter hour credit for the calculus sequence. Other courses taught in

TABLE LI

SUMMARY OF BASIC COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM OFFERED BY EACH INSTITUTION

| Course Title | Institution Number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Elementary Functions and Coordinate Geometry (1 semester) | x | x | | x | x | x | x | | | | | x | x | | |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | x | x | x | x | x | x | x | x | | x | | | | | x |
| Introductory Calculus (1 semester) | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Mathematical Analysis (2 semesters) | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Linear Algebra | x | | | | | | x | | | | | | x | | |
| Probability and Statistics | | | x** | | | | | | | | | x | | | x |
| Structure of Number Systems | x | x | x | x | | x | | x* | x | x | | | | | x |

*A one quarter course at this institution.

**Taught by the Business Department at this institution.

TABLE LII

SUMMARY OF OPTIONAL COLLEGE TRANSFER COURSES RECOMMENDED BY CUPM OFFERED BY EACH INSTITUTION

| Course Title | Institution Number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Finite Mathematics | | | | | | | | | | | | | | | |
| Intermediate Differential Equations | x | | x | x | | x | | | | | x | | | x | |
| Probability Theory | | | | | | | | | | | | | | | |
| Numerical Analysis | | | | | | | | | | | | | | | |

calculus and analysis are presented on page 102 of this study.

The Probability and Statistics course recommended by CUPM is offered as a mathematics course by two institutions and in one other institution the course is taught by the business department.

Linear Algebra is offered by only three institutions of the study population, but some topics in linear algebra are included in the Calculus IV course at one institution.

The Structure of the Number System is offered by eight institutions as the first year of preparation for prospective elementary school teachers as recommended by CUPM. One other institution offers a one quarter course in the number systems. The two types of courses are designated in the summary table.

Three courses of the optional offerings recommended by CUPM, Probability Theory, Numerical Analysis, and Finite Mathematics, are not offered by any institution of the study population. One institution stated that Numerical Analysis had been dropped from their curriculum because of the lack of interest in the course. Another institution indicated that Probability Theory had been dropped for the same reason. Finite Mathematics is offered as a one term course in none of the institutions. Some instructors indicated that they had taught the course but an analysis of the catalogue descriptions of their institutions showed that topics in finite mathematics were included in some of the

courses at the freshman level yet a course, Finite Mathematics, was not in the catalogue.

Differential Equations is offered at various levels in six institutions. One department chariman commented that his institution was considering the possibility of dropping the courses from its curriculum and another commented that this had been done. At least one of the institutions indicated that its course was at the elementary level instead of at the intermediate level.

## Guidelines Recommended by JCCTS

The articulation guidelines approved by JCCTS in the area of mathematics are reported in Appendix I. These guidelines are set up as optional requirements for the two year college student whose program will lead to an associate degree. Two types of students are considered in these guidelines: 1) those whose curriculum requires a sequence of two or more calculus courses and 2) those whose curriculum does not require the calculus sequence. For students who do require the calculus sequence, the guidelines state that the courses in their program should be nine semester hours of calculus and three semester hours of linear algebra, or the equivalent in quarter hours. The content of the calculus sequence is to be the same as that of the courses recommended by CUPM listed in category II above. Since many of the students of the community colleges of North Carolina are not prepared to take the calculus when they enroll at the two year institution the pre-calculus work is the first mathematics coursework those students will take. For those

students and for those whose curriculum does not require the calculus sequence the guidelines list a requirement of six semester hours or nine quarter hours of mathematics with topics similar to those covered in the course labeled as Mathematics A in the CUPM recommendations for a two year college curriculum. Some students will be ready for the calculus sequence after only one semester of pre-calculus work.

Courses recommended by JCCTS being taught

The guidelines of JCCTS recommended at least a year's work in mathematics infer that as many as four freshman tracts are needed: 1) the pre-calculus course, 2) introductory calculus, 3) prospective elementary and secondary teachers' courses and 4) all other freshmen. Each of the fifteen institutions offered courses which would satisfy the suggested guidelines for the pre-calculus course, for the year's basic course in mathematics, and for the calculus sequence. However, only three of the institutions offer a course in linear algebra. The data collected concerning the freshman level courses in mathematics revealed much variation in the content of these courses. Table LIII presents the data on the courses in the JCCTS guidelines.

## Other Mathematics Courses in the College Transfer Programs

Table LIV presents the data collected relative to the mathematics courses in the college transfer programs which are not parallel to the courses recommended by CUPM. One of the basic tenets in the

TABLE LIII

COURSES WHICH ARE IN THE GUIDELINES OF
JCCTS OFFERED BY EACH INSTITUTION

| Course Title | Institution Number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Basic Mathematics (2 semesters) | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Calculus (3 semesters or 4 quarters) | x | x | x | x | x | x | | x* | x | x | x | x | x | x | x |
| Linear Algebra (1 semester) | x | | | | | | x | | | | | | x | | |

*A fifteen quarter hour course at this institution.

TABLE LIV

MATHEMATICS COURSES OFFERED IN COLLEGE TRANSFER PROGRAMS OF THE INSTITUTIONS OF THE STUDY POPULATION WHICH ARE NOT ON THE CUPM LIST

| Course Title | Institution Number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Business Mathematics for Secretaries | | | x | | | | | | | | | | | | |
| Textile Mathematics | | | x | | | | | | | | | | | | |
| Symbolic Logic | | | x | | | | | | | | | | | | |
| Engineering Graphics I,II, & III | | | | x | | | | | | | | | | | |
| Introductory Calculus for non-science and non-math majors | | | | | | | x | | | | | | | | |
| Technical Mathematics | | | | | | | | x | | | | | | | |
| Construction Mathematics | | | | | | | | x | | | | | | | |
| Numbering System and Boolean Algebra | | | | | | | | x | | | | | | | |
| College Algebra | | x | x | x | x | x | x | | x | | | | x | x | |
| Trigonometry | | x | x | x | x | x | x | | x | | | | x | x | |
| Integrated Algebra and Trigonometry | | | | | | | | | | | x | | | x | x |

Table LIV (Continued)

MATHEMATICS COURSES OFFERED

| Course Title | Institution Number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| Analytic Geometry | x | | | | | | | | | | | | | | |
| Topics in Analysis | | | | | | | | | | | | | | | x |
| Business Mathematics | | | x | x | | | | x | | | x | | | x | |
| Introductory Mathematics Modern Concepts of Mathematics | | | | | | | | x* | | | x | | | x | x |
| Statistics | | | | | x | | x | x | x | | x | | x | x | |

*This is a one quarter course.

philosophy of the community college system in North Carolina is that each institution be adapted to its community. This is reflected in the mathematics courses which are unique in content but are relevant in their individual institution.

Nine of the institutions offer separate courses in college algebra and trigonometry in the traditional form. The descriptions of these courses do not include as much work in coordinate geometry as the CUPM course Mathematics 0 nor is the concept of functions the emphasis of the courses. Three institutions offer a two quarter sequence in integrated algebra and trigonometry. As described by the catalogues this course was of traditional form, that is, greater focus seemed to be on computation than on conceptualization. Only one institution offers analytic geometry as a separate course instead of it being included in either a pre-calculus sequence or a calculus sequence. Topics in Analysis is a course offered in one institution for those students who have completed the calculus sequence. The content of this course varies from year to year. Business Mathematics is taught at five institutions with college transfer credit given for the course.

Four institutions have developed a three quarter sequence of mathematics for the freshman course. These have different titles of similar content and are designed primarily for the non-science majors. The topics include sets, elementary logic as well as algebra, number systems and trigonometry.

Statistics, with a minimum of work in probability, is offered in seven institutions. Applications which are relevant to the degree program of the individual institution are an integral part of these courses.

# CHAPTER V

## SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND NEEDS FOR FURTHER STUDY

### I. Summary

The investigator's purposes of this study were to determine the qualifications of the mathematics instructors of the college transfer courses and the content of the college transfer courses in the community colleges of North Carolina.

The qualifications of the instructors were examined in terms of: 1) mathematics courses for which the instructor of the population had received credit, 2) the professional activities in which the instructor participated, 3) the types of degrees earned, and 4) the instructor's experience immediately preceding his position as a community college instructor. The first two facets were compared to the recommendations of the Committee on the Undergraduate Program in Mathematics of the Mathematical Association of America. The data on each of the four items were gathered by use of a questionnaire sent to each instructor.

The content of the mathematics courses in the college transfer programs of the community colleges of North Carolina was compared to the recommendations for the Committee on Undergraduate Program in Mathematics for the two year college curriculum. The college transfer curriculum of each institution was determined by: 1) the courses the

instructors had taught, 2) analysis of the institution's catalogue, and 3) a form completed by the department chairman of each institution.

## II. Conclusions

The following conclusions were derived from the analysis of the data reported in the preceding chapters.

### Mathematics Instructors of the College Transfer Programs

The conclusions pertaining to the instructors of the study population are listed in two areas: the academic qualifications and the professional qualifications.

#### Academic qualifications

1. The mathematics instructors of the community colleges of North Carolina are at a minimum level of preparation as measured by the criteria of CUPM.

2. No one instructor of the population had taken all of the recommended courses. The greatest number of courses taken by an individual instructor was sixteen.

3. Less than one-half of the population had taken the three graduate courses recommended for the two year college teacher.

4. The mean number of CUPM recommendations met by the population, 8.5, is less than one-half of the eighteen suggested courses.

5. Institution fifteen had the largest institutional mean number of recommendations met, 12.5.

6. All of the institutions had at least one instructor who had met one-half of the course recommendations.

7. Only three of the population indicated participation in an apprenticeship program in two year college teaching.

8. Ten instructors in the study population have had less than twelve semester courses in mathematics.

9. The instructors in institution twelve were better prepared in terms of coursework in mathematics and in CUPM recommendations met (according to the data collected) than any other institution. However, only fifty per cent of the instructors listed by the president of this institution responded.

10. All of the instructors had earned a master's degree of some type.

11. Three instructors had earned the M. Ed. or the M.A. with a major in Education and six had earned the M. A. T.

12. Three instructors had degrees above the master's degree.

Professional qualifications

1. The number of activities recommended by CUPM for professional growth in which the population participated ranged from one to six.

2. The professional growth activity participated in by most of the population was professional reading.

3. Only one instructor had engaged in all of the suggested activities.

4. The mean number of activities for the population was 3.0.

5. The least amount of participation was in publications.

6. Indications are that some instructors are not interested in participating in professional activities.

7. Twenty-four of the population had been high school instructors before they became instructors in the community colleges.

8. Twelve of the respondents had been students or graduate assistants before their present position.

9. Three of the respondents had not been teaching immediately prior to their becoming two year college mathematics teachers.

## Mathematics Courses of the College Transfer Programs

The conclusions concerning the mathematics courses of college transfer programs include statements which refer to the CUPM recommended courses, the courses in the guidelines of JCCTS and other mathematics courses taught in the institutions of the study population.

1. The pre-calculus course taught at most of the institutions of the population did not include all of the topics of the CUPM courses Mathematics 0 and/or Mathematics A.

2. The introductory course in calculus is taught in all of the institutions.

3. One institution offered a course in introductory calculus for those who need no other work in calculus.

4. Fourteen of the institutions offered three additional quarters in calculus.

5. Most of the institutions included analytic geometry in the calculus sequence instead of including it in the pre-calculus sequence.

6. Probability and Statistics is taught by the business department in one institution.

7. Linear Algebra is taught in three institutions.

8. The Structure of the Number System is offered in eight institutions.

9. Probability Theory, Numerical Analysis, and Finite Mathematics, as described by CUPM, are not offered in any of the institutions.

10. A course in Differential Equations is offered in six institutions.

11. At least one course is offered in each institution which will satisfy the year's work in mathematics listed in the guidelines of JCCTS.

12. The calculus sequence recommended by JCCTS is taught by each institution.

13. College Algebra and Trigonometry are taught as separate courses in nine of the institutions.

14. Eight mathematics courses are unique courses taught only by their institution to satisfy a community need.

15. The freshman level mathematics course varies in content between institutions.

16. Business mathematics is taught as a college level course in five institutions.

17. Statistics is taught at various levels of difficulty at seven institutions.

## III. Recommendations

The findings of this study have led to the following recommendations:

### Mathematics Instructors of the College Transfer Programs

#### Academic qualifications

1. The community college administrators provide aid and encouragement to the instructor who needs to upgrade or to fill in the gaps in his academic background using the recommendations of CUPM as a goal.

2. The mathematics departments of the universities actively plan courses which will serve as in-service work for those presently employed as community college teachers. The curriculum of each college and university should be compared to the recommendations of CUPM.

3. The universities implement a program in apprenticeship for the two year college teacher following the recommendations of CUPM. This program should be an inter-school effort; education-mathematics-psychology at the university level, and community college - university effort between institutions.

Professional qualifications

1. The administrator of the community college provide financial assistance and/or released time for the instructors to participate in professional activities.

2. The department in the community college seek to build a good professional library and plan to establish a mathematics laboratory.

3. Each university and the community colleges nearby plan lectures and colloquia together.

4. The mathematics instructors actively support an organization for two year college mathematics teachers.

## Mathematics Courses of the College Transfer Programs

1. The administrator of each community college lead the mathematics department in revising the curriculum of the college transfer program using the recommendations of CUPM, and of JCCTS, and the needs of the community as guides. He should be willing to provide assistance of any type needed to accomplish this goal.

2. The department chairman in each institution encourage his instructors to use innovative materials and techniques to improve their courses even before a curriculum revision is implemented.

3. The instructors use the course descriptions in the CUPM publications to revise their class presentations.

4. The community colleges, colleges and universities exchange textbook lists and syllabi as an aid in articulation between the institutions.

5. Where needed, the department of the institution develop a course in remedial mathematics. For suggestions in the construction of such a course the department chairman should refer to a recent CUPM report.[1]

## Further Studies Needed

The data collected has revealed other areas which need to be studied. Studies need to be made to guide in better articulation between the two year colleges and the senior institutions and to aid in the planning for preparations of the two year college mathematics instructors.

The specific studies which this investigation has indicated are:

1. The programs for training the college mathematics teachers be examined.

2. The content of the following mathematics courses of the community colleges be analyzed and evaluated using the recommendations of CUPM:

   a. Remedial mathematics courses

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[1]Committee on the Undergraduate Program in Mathematics, Report of the Committee, A Course in Basic Mathematics for Colleges, (Berkeley, Calif.: Mathematical Association of America, 1971), pp.2-4,9-15.

b. Basic freshman mathematics courses

c. The calculus sequence

3. A study of the methods of instruction in the mathematics classes of North Carolina community colleges be made.

4. A study be made by each institution of the mathematics curriculum of the public schools from which the institution recruits students.

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# APPENDIX A

## LIST OF COMMUNITY COLLEGES INCLUDED IN THE STUDY

Caldwell Community College and Technical Institute
Hudson, North Carolina

Central Piedmont Community College
Charlotte, North Carolina

Coastal Carolina Community College
Jacksonville, North Carolina

College of the Albemarle
Elizabeth City, North Carolina

Davidson County Community College
Lexington, North Carolina

Gaston College
Dallas, North Carolina

Isothermal Community College
Spindale, North Carolina

Lenior Community College
Kinston, North Carolina

Rockingham Community College
Wentworth, North Carolina

Sandhills Community College
Southern Pines, North Carolina

Southeastern Community College
Whiteville, North Carolina

Surry Community College
Dobson, North Carolina

Wayne Community College
Goldsboro, North Carolina

Western Piedmont Community College
Morganton, North Carolina

Wilkes Community College
Wilkesboro, North Carolina

# APPENDIX B

## LETTER SENT TO PRESIDENTS OF COMMUNITY COLLEGES INCLUDED IN THE STUDY

P. O. Box 438
Jamestown, North Carolina
September 30, 1971

As reported in the February 12, 1971, issue of Higher Education in North Carolina the number of transfers from community colleges to senior institutions has increased within the past few years and this trend is expected to continue. Therefore, some of the mathematics departments of the senior colleges and universities are interested in (1) the qualifications of the mathematics instructors in the community colleges of North Carolina and (2) the content of the college transfer courses in Mathematics. Articulation guidelines for mathematics courses approved by the Joint Committee on College Transfer Students in November, 1967, were reviewed and revised in May, 1971, at a conference at East Carolina State University. One of the recommendations was that a formal study be made to determine the current content of mathematics programs in the community colleges in North Carolina.

I have chosen to study these two areas in the community college system of North Carolina as a dissertation project for the completion of my studies at the University of North Carolina at Greensboro. I plan to use publications of the Committee on Undergraduate Programs in Mathematics (CUPM) of the Mathematical Association of America as well as the guidelines mentioned in the above paragraph in the analysis of the data collected.

I am asking the cooperation of each community college president in securing the information needed in this study. Will you assist me by completing the enclosed form? I need the names of those in your Mathematics Department who teach the college transfer courses and the name of the chairman of the department so that I may send to each of them a questionnaire to be completed and returned to me.

The report of the results of this study will not include the names of the schools but each may request a copy of the results along with instructions for identifying that school in the report.

Thank you for your cooperation.

Sincerely,

Ruth Y. Sharrock (Mrs. W. Roger)

# APPENDIX C

## FORM SENT TO PRESIDENTS OF COMMUNITY COLLEGES INCLUDED IN THE STUDY

Please complete and return in the enclosed envelope.

Institution _____

Names of the instructors who teach the college transfer courses in mathematics:

Name of the head of the department or division: _____

_____.

## APPENDIX D

### COVER LETTER SENT WITH QUESTIONNAIRE TO MEMBERS OF STUDY POPULATION

P. O. Box 438
Jamestown, North Carolina
October 10, 1971

Dear Mathematics Instructor:

In 1969 the Committee on the Undergraduate Programs in Mathematics (CUPM) published a booklet in which they made recommendations concerning the qualifications for the teachers of university parallel (college transfer) mathematics courses in two year colleges. While the academic work is important to the successful teacher, the committee believes that professional activities which reflect continuing mathematical growth are also important to the successful teacher.

As a part of my dissertation project for the completion of my studies at the University of North Carolina at Greensboro, I am attempting to examine these two phases of qualifications for the instructors of college transfer courses in the community colleges of North Carolina. In order to help me I am asking you to take a few minutes and to complete the enclosed questionnaire. As a teacher I understand your busy schedule and I apologize for this imposition but I know of no other way to get this information.

Simply for purposes of checking off each teacher as his questionnaire is returned, I have numbered each questionnaire. (I may need to send a reminder to some.) If you object to this procedure simply erase the number on your questionnaire before returning it. You may be assured that under no circumstances will any individual or school be identified in the report of the findings. Complete anonymity will be maintained.

Space is designated for any pertinent comment which you would like to make.

A stamped, addressed envelope is enclosed for your convenience and I would greatly appreciate it if you would complete and mail this questionnaire within ten days.

Thank you for your cooperation.

Sincerely,

Ruth Y. Sharrock (Mrs W. Roger)

# APPENDIX E

## QUESTIONNAIRE SENT TO STUDY POPULATION

### Academic Preparation

Courses listed in this form are recommended in the CUPM publication, Qualifications for a Two Year College Faculty Teaching University Parallel Courses. List other courses in your undergraduate and graduate program which do not parallel any of those in the recommendations. Descriptions of the undergraduate component are in the CUPM booklet, A General Curriculum in Mathematics for Colleges and those of the graduate component are in A Beginning Graduate Program in Mathematics for Prospective Teachers of Undergraduates.

Basic Component (undergraduate preparation)

Lower Division

Calculus courses in one and several variables including introduction to differential equations. 3 or 4 semesters

1 semester_____ 2 semesters_____ 3 semesters_____ 4 semesters_____

_____ Fundamentals of computer science, including experience in programming as well as use of the computer.

_____ Semester in linear algebra employing both matrices and a basis-free, linear transformation approach.

_____ A course in probability and statistics which presupposes a course in calculus.

Upper Division

_____ A year's work in abstract algebra.

_____ A thorough year's course dealing with the important theorems of real analysis with emphasis on rigor and detailed proofs.

_____ A semester course in complex analysis.

_____ A semester course in applied mathematics.

_____ A semester course in some geometric subject (topology, affine and projective geometries, comparative investigations, etc.)

Questionnaire (Continued)

_____ A semester of probability and statistics which builds on the previous course in the subject.

Other undergraduate courses.

Graduate Component (one semester courses which are especially appropriate)

_____ Measure and Integration

_____ Complex Analysis

_____ Homology and Multivariable Integration

_____ Galois and Field Theory

_____ Advanced Ordinary Differential Equations

_____ Functional Analysis

_____ General Topology

_____ Topology and Geometry of Manifolds

_____ Ring Theory and Multi-linear Algebra

_____ Problem-oriented Numerical Analysis

Other Graduate Courses in Mathematics

Degree(s) earned and date received:_____

Did you participate in an apprenticeship in two year college teaching?_____

If so, at what institution did you receive this training?

_____

Comments:

Questionnaire (Continued)

## Professional Activities

Please answer the following questions by checking or filling in the blank spaces provided with each question. Specific instructions are given where appropriate.

1. Have you taken additional course work (other than that required to get and/or to hold your present position) within the last five years?
   Yes _____
   No _____

   If yes, indicate the number of hours (semester or quarter) taken in each of the following areas:

| | Semester hours | Quarter hours |
|---|---|---|
| Mathematics | _____ | _____ |
| Education | _____ | _____ |
| Other(give department designation) | _____ | _____ |

   If additional course work has been taken within the last five years, please indicate the number of hours earned in each category listed below:

| | Semester hours | Quarter hours |
|---|---|---|
| In an academic year institute | _____ | _____ |
| In a summer institute | _____ | _____ |
| While on fellowship | _____ | _____ |
| While paying your own way | _____ | _____ |
| Other (please specify) | _____ | _____ |

   Would you have preferred to have taken more additional course work than was taken within the last five years?
   Yes _____
   No _____

   If yes, check the appropriate reasons for not taking more course work.
   Lack of time _____
   Financial considerations _____
   Other (please explain) _____

2. Have you had published any articles or research reports within the last five years?
   Yes _____
   No _____

Questionnaire (Continued)

If yes, indicate the number of articles published in each of the following types of publications.
Mathematics journals _____
Educational journals _____
Other (please name publication and give number of articles)

_____

3. Check each of the following professional organizations of which you are a member and indicate the number of professional meetings of each organization which you attended in the last five years.
Mathematical Association of America ____, meetings attended ____;
American Mathematical Society ____, meetings attended ____;
National Council of Teachers of Mathematics ____, meetings attended ____; Other (name of organization and number of meetings attended _____

Would you have preferred to attend more meetings of the professional organizations?
Yes ____
No ____

4. Please check each of the following professional journals which you read regularly:

American Mathematical Monthly ____
Mathematics Teacher ____
Junior College Journal ____
Two Year College Mathematics Journal ____
Other (please name) _____

Please indicate the approximate average number of books of a mathematical nature read each year for the last five years or since you have been a community college teacher (whichever is the shorter period of time). Check one of the following:

1-2 books annually ____
4-6 books annually ____
7-9 books annually ____
10 or more books annually ____

5. Are you now or have you, within the last five years, been engaged in any research for new mathematical results (whether published or unpublished)?

Yes ____
No ____

Questionnaire (Continued)

If yes, please indicate total number of such research projects on which you worked in this period. _____

6. Have you, within the last five years, developed a new course in your community college?
Yes _____
No _____

If yes, how many? _____

Did you write your own notes for class presentation?
Yes _____
No _____

Have you had a textbook published within the last five years?
Yes _____
No _____

If yes, for what course or courses? _____

Have you, within the last five years, made use of any techniques of instruction which were new to you in teaching one of your courses?
Yes _____
No _____

If yes, please give a short description of your procedures.

7. Please indicate the nature of the job you were holding immediately prior to becoming a community college teacher. Check one of the following:

Elementary school teacher _____
Junior high school teacher _____
Senior high school teacher _____
Four-year college or university teacher (full-time) _____
Graduate assistant _____
Full-time student _____
Other (please specify) _____

Questionnaire (Continued)

Teaching Assignments

Which of these college transfer courses recommended by CUPM are you teaching or have taught in the last two years. Please check.

| | Fall-71 | 1970-71 | 1969-70 |
|---|---|---|---|
| Elementary Functions and Coordinate Geometry (1 semester) | ___ | ___ | ___ |
| Elementary Functions and Coordinate Geometry with Algebra and Trigonometry (2 semesters) | ___ | ___ | ___ |
| Introductory Calculus (1 semester) | ___ | ___ | ___ |
| Mathematical Analysis (2 semesters) | ___ | ___ | ___ |
| Linear Algebra | ___ | ___ | ___ |
| Probability and Statistics | ___ | ___ | ___ |
| Structure of Number Systems (2 semesters) | ___ | ___ | ___ |
| Algebra and Geometry | ___ | ___ | ___ |
| Numerical Analysis | ___ | ___ | ___ |
| Finite Mathematics | ___ | ___ | ___ |
| Intermediate Differential Equations | ___ | ___ | ___ |
| Differential Equations and Advanced Calculus | ___ | ___ | ___ |
| Probability Theory (based on Calculus) | ___ | ___ | ___ |

# APPENDIX F

## FOLLOW-UP LETTER ON QUESTIONNAIRE

P. O. Box 438
Jamestown, North Carolina
November 3, 1971

Dear Mathematics Instructor:

I have been pleased with the response to the questionnaire I recently sent to the community college mathematics instructors of North Carolina. However, I have not received a response from you. As a college instructor I can well realize that you are very busy and I apologize for taking up your time this way, but it is very important to my study that your response be included. I also realize that this may be a particularly busy time of the year for you, but I would greatly appreciate your taking the necessary few minutes to complete and return the enclosed questionnaire as soon as possible.

A stamped, addressed envelope is enclosed for your convenience. I am also enclosing a copy of the original letter of explanation in case you somehow failed to get the first one.

Thank you for your cooperation.

Sincerely,

Ruth Y. Sharrock (Mrs. W. Roger)

## APPENDIX G

## COVER LETTER SENT WITH FORM TO MATHEMATICS DEPARTMENT CHAIRMEN OF COMMUNITY COLLEGES

P. O. Box 438
Jamestown, North Carolina
October 5, 1971

Dear Department Chairman:

The Panel on Mathematics in Two Year Colleges of the Committee on Undergraduate Programs in Mathematics (CUPM) has made recommendations for basic offerings in the university (college) transfer programs. These were published in 1969 in the booklet, A Transfer Curriculum in Mathematics for Two Year Colleges. Since each year in North Carolina the number of students transferring from community colleges to senior institutions is more than the previous year a need exists for the determination of the content of the mathematics courses in the college transfer programs of the community colleges. Also such a study was recommended by a conference on college transfer programs in mathematics in May, 1971, at East Carolina State University, Greenville, North Carolina.

Thus as a dissertation project for the completion of my studies at the University of North Carolina at Greensboro, I am attempting to determine the content of the university (college) transfer courses in mathematics which are offered by the community colleges of North Carolina. I am asking for your cooperation in securing information needed for this study. I apologize for this imposition but I know of no other way to obtain the information. On the enclosed form please indicate the courses which are offered at your institution and give the title by which each is listed in your current catalogue. Please list those courses which you offer for college transfer credit that do not parallel any of the courses recommended by CUPM.

It would be an aid to my analysis if you would also send me a list of the textbooks used in these courses and any syllabi for the courses which your department may have developed.

The number on the form is for identification purposes only. The report of the results of this study will not include the names of the schools but each may request a copy of the results along with the instructions for identifying that school in the report.

Thank you for your cooperation.

Sincerely,

Ruth Y. Sharrock (Mrs. W.Roger)

# APPENDIX H

## FORM SENT TO MATHEMATICS DEPARTMENT CHAIRMEN OF COMMUNITY COLLEGES

Please indicate the courses which your institution offers.

Description of these courses is given in A Transfer Curriculum in Mathematics for Two Year Colleges published by the Committee on the Undergraduate Programs in Mathematics in 1969. Space is provided for you to fill in the title of any courses which parallel the course listed.

Basic Offerings

Calculus Preparatory

___ Elementary Functions and Coordinate Geometry. A study of elementary functions, their graphs and applications, including polynomials, rational and algebraic functions, exponential, logarithmic and trigonometric functions, and introduction to three dimensional analytic geometry.
One semester.

___ Elementary Functions and Coordinate Geometry, with Algebra and Trigonometry. Reviews of topics from arithmetic, algebra and geometry including the topics listed in the course above.
Two semesters.

Calculus and Linear Algebra

___ Introductory Calculus. An intuitive course covering the basic concepts of single variable calculus.

___ Mathematical Analysis. A more rigorous course completing the standard calculus topics.
Two semesters.

___ Linear Algebra. An elementary treatment similar to GCMC* Mathematics 3, but parallel to, rather than preceding the last analysis course.
One Semester.

* A General Curriculum in Mathematics for Colleges. CUPM, 1965.

Business and Social Science

___ Probability and Statistics. An introductory course stressing basic statistical concepts.
One semester.

Teacher Training

___ Structure of the Number System. A year course is recommended by the Panel on Teacher Training for the preparation of elementary school teachers.
Two semesters.

Additional Offerings (Optional)

___ Finite Mathematics.

___ Intermediate Differential Equations.

___ Differential Equations and Advanced Calculus.

___ Probability Theory. A calculus based course.

___ Numerical Analysis.

List college transfer courses offered at your institution which are not listed above.

# APPENDIX I

## ARTICULATION GUIDELINES
Approved by the Joint Committee on College Transfer Students
November 1967

## MATHEMATICS

Freshman and/or Sophomore Years

1. For non-science majors whose curriculum does not require a sequence of two or more calculus courses:
Requirement of six semester hours or nine quarter hours of mathematics for graduation with content selected from most of the following topics: fundamentals of algebra; sets, relations, and functions; the real number systems; finite mathematical systems (modulo arithmetic); logic; statistics and probability with simple applications to the social sciences; analytic geometry of the plane; graphs of relations; other geometries; basic notions of elementary integral and differential calculus.

2. For students whose curriculum requires a sequence of two or more calculus courses:
The offering is to follow the Mathematical Association of America's A General Curriculum in Mathematics for Colleges (1965), page 9 (see Guideline 3 below);
   - calculus with analytic geometry (nine semester hours or equivalent quarter hours)
   - linear algebra (three semester hours or equivalent quarter hours)

Other Guidelines

1. The topics in item 1 above are to be covered at a level sufficient to prepare the student to take either 1) a moderately rigorous calculus course, 2) a moderately rigorous course in modern algebra or linear algebra, or 3) a moderately rigorous course in modern algebra.

2. For science and mathematics majors it is desirable that the minimum high school pre-requisite for the course content be two years of algebra, one year of geometry, and one-half year of trigonometry.

3. Mathematics 1, Introductory Calculus (three semester hours or equivalent quarter hours).
Mathematics 2, 4, Mathematical Analysis (three semester hours or equivalent quarter hours each).
Mathematics 3, Linear Algebra (three semester hours or equivalent quarter hours). [1]

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[1] "Articulation Guidelines," Higher Education in North Carolina, II (December 1, 1967), 9.