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ABSTRACT

Data for this report came from a survey taken in 1971 of an unspecified number of colleges. Information is compiled on preparation and experience of staff, curriculum development, mathematics content covered, instructional methods and materials used, and outstanding features and needs of the various mathematics programs for elementary education majors. A brief section summarizing types and numbers of required content courses, number of semester hours required, and average class section size is included. (DT)

INDIANA STATE UNIVERSITY Terre Haute, Indiana

Department of Mathematics

A STUDY OF THE REQUIRED MATHEMATICS CONTENT COURSES FOR UNDERGRADUATE ELEMENTARY TEACHERS IN THE UNITED STATES

Dear Respondent:

Thank you for helping make this survey possible. We are sorry that this return has taken so long. If you desire more information, please feel free to contact us at Indiana State University.

Sincerely yours,

Carlos Watson
Vesper Moore
C. Thomas Pitts

SECTION I. General Information

The study of the types and number of required content courses, number of semester hours required, average class section size, and the number of elementary majors completing the program in 1971 revealed the following information:

1. There were appreciable differences between the types and number of courses being taught and those recommended by CUPM as evidenced by:
   a. The most common types of course titles were Modern Mathematics for Elementary Teachers, Basic Arithmetic, and Mathematics for General Education.
   b. One-third of the required courses were offered as a two course sequence but not necessarily covering the real number system and its subsystems.
   c. Fifty-two percent of the institutions required two courses, 10 percent required three courses, but only 3 percent required four courses as CUPM had recommended.
   d. Less than 10 percent of the institutions required a course in Geometry or Algebra.
2. There were no significant differences between the numbers and types of courses required by public and private institutions.
3. There was no significant relationship between the number of hours required and the number of students completing undergraduate mathematics content programs for elementary teachers.
4. There was no significant evidence to indicate that undergraduate mathematics content courses were being taught in large sections.

SECTION II. Staff

	Number	Percent
1. Please list the number of assistants working with undergraduate elementary teachers in mathematics content courses in each category:		
(a) Undergraduate assistants to the instructors	232	46
(b) Graduate assistants to the instructors	101	20
(c) Graduate assistants teaching content courses	176	34
Total . . .	509	100
2. Please list the number of your staff who can be classified in each of these areas:		
(a) Rank:		
(1) Graduate Assistant	176	12
(2) Instructor	321	20
(3) Assistant Professor	551	34
(4) Associate Professor	339	21
(5) Professor	215	13
Total . . .	1,602	100
(b) Undergraduate degree in:		
(1) Elementary teaching	76	5
(2) Secondary teaching	556	39
(3) Non-teaching	794	56
Total . . .	1,426	100
(c) Doctorate in:		
(1) Elementary Education	65	5
(2) Secondary Education	201	14
(3) Mathematics without teaching emphasis	310	22
Total . . .	576	41
(d) Professional experience in:		
(1) NSF Institute	602	42
(2) A modern mathematics project	326	23
Total . . .	928	65
(e) Tenure		
(1) Tenured	685	48
(2) Not tenured	741	52
Total . . .	1,426	100
(f) Teaching Experience		
(1) Elementary school	286	20
(2) Secondary school	764	57
Total . . .	1,050	77

SECTION III. Curriculum Development

1. What significant changes have been made in your program for undergraduate elementary teachers in mathematics content since 1960?

The most significant change listed was more required content. It was listed by approximately 40 percent of the schools. More geometry or a new course in geometry ranked second with about 20 percent. The other significant changes of interest were more attention to CUPM recommendations, offering electives, courses for elementary teachers only, mathematics laboratories, more algebra, and offering a minor or concentration in elementary mathematics. There were twenty-five other changes listed by 192 of the schools. Ten percent of the schools had made no significant changes in their programs.

2. Which of the organizations listed below have directly influenced changes (within the last ten years) in your undergraduate program for elementary teachers in mathematics content? Please rank in order of importance and omit those without influence. (One is the most important influence)

Organizations	Percent of Time Ranked							Not Ranked
	1	2	3	4	5	6	7	0
State Department of Education	14	15	7	5	3	2	1	53
State Mathematics Organizations	2	8	14	6	3	1	1	65
CUPM	42	22	14	3	1	0	0	18
CCTT	1	4	52	2	1	8	14	18
NCTM	6	7	33	2	1	10	7	34
University curriculum committee	5	3	41	1	0	9	4	37
Others (such as) Mathematics Department, NSF Institute, Department Curriculum Committee, Modern Mathematics Projects Staff Education Department, and other Universities	3	2	50	0	0	1	0	44

SECTION IV. Content

1. Do you endorse the 12 semester hour Level I recommendation for undergraduate elementary teachers made by CUPM?

   (a) yes -- 69%
   (b) no -- 21%
   (c) not familiar with recommendations -- 10%

2. Do you believe that the Cambridge Conference Goals for Teacher Training are realistic for elementary teachers?

   (a) yes -- 22%
   (b) no -- 39%
   (c) not familiar with report -- 39%

3. Listed below are the content units recommended by CUPM and CCTT for undergraduate preparation of elementary teachers. Please indicate how each of these units fits in your present program: (a) presented, (b) not presented, but appropriate, or (c) not presented and not appropriate.

	Percent		
	a	b	c
I. Structure of the Number System			
The language and nature of deductive reasoning	81	17	2
Elements of set theory	97	1	2
The whole numbers	95	4	1
Additional operations and relations	93	5	2
Numerational systems	91	3	6
The positive rational numbers	97	3	0
Introduction of negative rational numbers	91	5	4
Elementary number theory	80	15	5
Decimals and the real numbers	91	9	0
Total . . .	91	7	2
II. Algebra			
Properties of the real numbers	84	11	5
Linear equations and linear inequalities	62	33	5
Quadratic equations and inequalities	26	47	23
Systems of linear equations and inequalities	32	48	20
Modular arithmetic	79	18	3
Complex numbers	22	37	41
Polynomials	30	43	27
Algebraic structures	54	31	15
Functions	61	33	6
	50	33	17

	Percent		
	a	b	c
III. Geometry			
Experimental and formal geometry	56	37	7
Sets, points, lines, planes, space	78	19	13
Elementary theorems and proofs	69	27	4
Congruence and measurement of segments and angles	64	33	3
Congruence of triangles	56	39	5
Geometric constructions	47	48	5
Parallels and parallelograms	61	34	5
Space figures	53	39	8
Similarity	54	38	8
Trigonometry	16	34	50
Area and volume measurement	68	30	2
Measurements related to circles	54	38	8
Elements of spherical geometry	10	31	59
Plane coordinate geometry	41	43	16
The postulational method	47	34	19
Total . . .	51	35	14
IV. CCTT Units			
Vectors (in line, plane, and space)	11	42	47
Topology (network moebius strip, 4-color problems)	17	37	46
Computational matrix theory and applications	7	26	67
Symmetry	42	40	18
Probability	38	47	15
Statistics	28	52	20
Logic	58	31	11
Metric system	40	45	15
Determinants	7	28	65
Intuitive calculus	5	22	73
Linear transformations	5	23	62
Rings and unique factorization	13	22	65
Isometrics and symmetric groups	8	22	70
Quadratic forms and conics	6	21	73
Elementary computer science	9	53	38
Numerical analysis	3	23	74
Total . . .	18	34	48

SECTION V. Procedures and Materials

Please indicate the significance of the role that each of the following plays in the instruction of the courses listed in Section I, Question 1. Please fill column one with responses for course one, column two for course two, etc. Use a 1 to 5 scale to show the extent of significance.

1 - most significant role
2 - a lesser, but still significant role
3 - of some significance
4 - of little significance
5 - of no significance

	1	2	3	4	5
Lecture	280	85	38	15	27
Lecturing on television	4	5	3	15	418
Question-answer recitation	140	69	64	26	46
The mathematics laboratory	24	40	72	52	257
Individual projects	18	61	115	88	167
Discovery experiences	51	106	137	60	91
Class group discussions	85	148	109	44	59
Small group discussions	33	61	69	91	191
Help sessions outside the classroom	61	110	152	53	69
Programmed instruction	11	20	25	62	327
Computer assisted instruction	0	4	10	27	404
Others (such as) laboratory sessions field trips and tutoring	6	6	7	0	426
Films	6	20	87	74	258
Slides	3	10	44	46	342
Film strips	3	11	47	63	321
Overhead projector	41	64	108	45	187
Charts or bulletin boards	8	39	81	77	240
Others (such as) computers, calculators, and elementary textbooks	9	7	9	3	417
Using elementary school materials	46	63	114	43	179

SECTION VI. Outstanding Features and Needs of Your Program

1. What do you consider to be the outstanding features of your program?

The eleven most frequently listed outstanding features of the required content content courses were in rank order: (1) content or more content, (2) competent staff, (3) lab work, (4) reduces student fears, (5) interest in students, (6) smaller classes, (7) rigorous program, (8) courses specifically designed for elementary teachers, (9) program exposes students to what they will be teaching, (10) integrated methods and content, and (11) program offers a minor or concentration in elementary mathematics. More content and competent staff were the only outstanding features listed in more than 5 percent of the institutions with 10 and 8 percent respectively. Forty-five more features were listed by 232 institutions and there were 120 other institutions which listed no features.

2. What changes are needed to significantly improve your mathematics content program for prospective elementary teachers? (Please list them in order of their importance.)

More required hours was the most frequent need listed. Thirty-four percent of the sample ranked it first among their needs. The other needs listed in order of frequency were: a geometry course, more mathematics laboratory experiences, a mathematics laboratory, better prepared students, an algebra course, and a means of handling individual differences. The percentage range of these needs was from 13 to 4 percent. Some other needs listed were better textbooks, better teaching, closer relationships between mathematics and education departments, smaller classes, integration of mathematics content and methods, and more discovery teaching. Only twelve institutions listed four or more needs in their programs.

SECTION VII. Conclusions

1. There are appreciable differences between the types of courses being taught and those recommended by CUPM.

2. There are no appreciable differences between the number of CUPM-type courses required by public and private colleges and universities in the United States.

3. The number of students completing the required mathematics content program has no appreciable effect on the number of hours required by the institution.

4. The CUPM recommendation of 12 semester hours has been accepted as desirable by the majority of colleges and universities in the United States, however only approximately half of the recommended hours have been implemented.

5. The CUPM content units recommended for elementary teachers in mathematics have been implemented by the majority of colleges and universities in the United States in a six hour two-course program instead of the twelve hour four-course program recommended by CUPM.

6. The separate course in geometry recommended by CUPM has not been implemented in the colleges and universities but the recommended content of the geometry course has been implemented by a majority of the institutions.

7. The CCTT recommendations are not acceptable to the majority of the colleges and universities in the United States.

8. All CCTT content units except logic recommended for elementary teachers in mathematics are not acceptable to the majority of the colleges and universities in the United States.

9. The required undergraduate mathematics content courses for elementary teachers are being taught by staff of low status as evidenced by rank, tenure, training and experience.

10. Lecturing is the major technique or procedure used by instructors in the required undergraduate mathematics content courses for elementary teachers and the instructors make no significant use of teaching aids or materials.

11. The outstanding features reported by the respondents do not seem to show new and different ideas to solve the problem of preparing undergraduate elementary teachers in mathematics.

12. The pattern of needs listed by the respondents of more content, more ability to handle student problems, and more laboratory experiences seems to call for more of the same mainly content and a possibility of higher entrance requirements to cut down individual differences among the students with the laboratory approach thrown in to make it practical.