ME | ET THE MATHEMATICAL EDUCATION OF ELEMENTARY TEACHERS

The Mathematical Education of Elementary Teachers (ME.ET) Project

http://meet.educ.msu.edu

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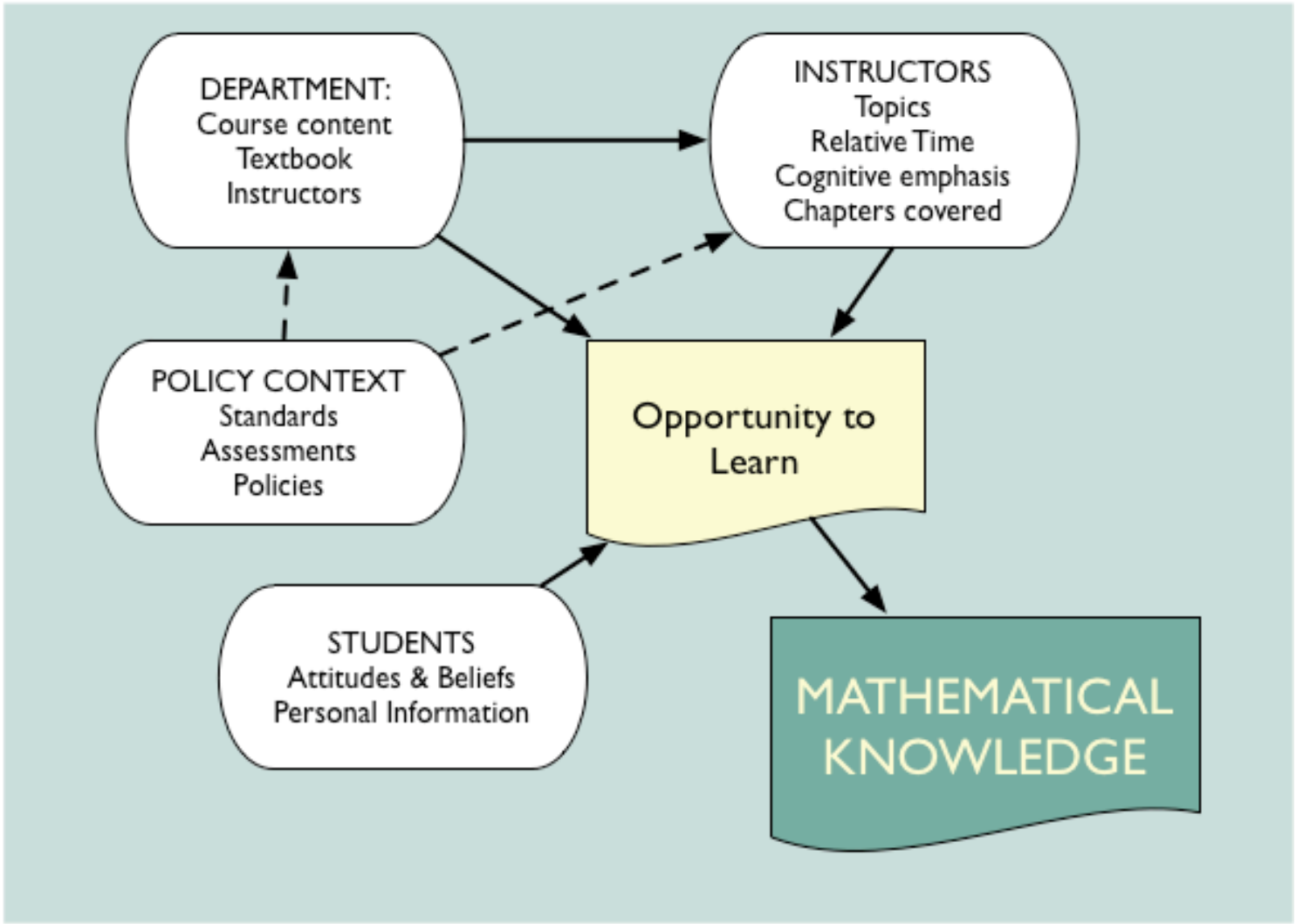

Figure 2: Detailed concept map

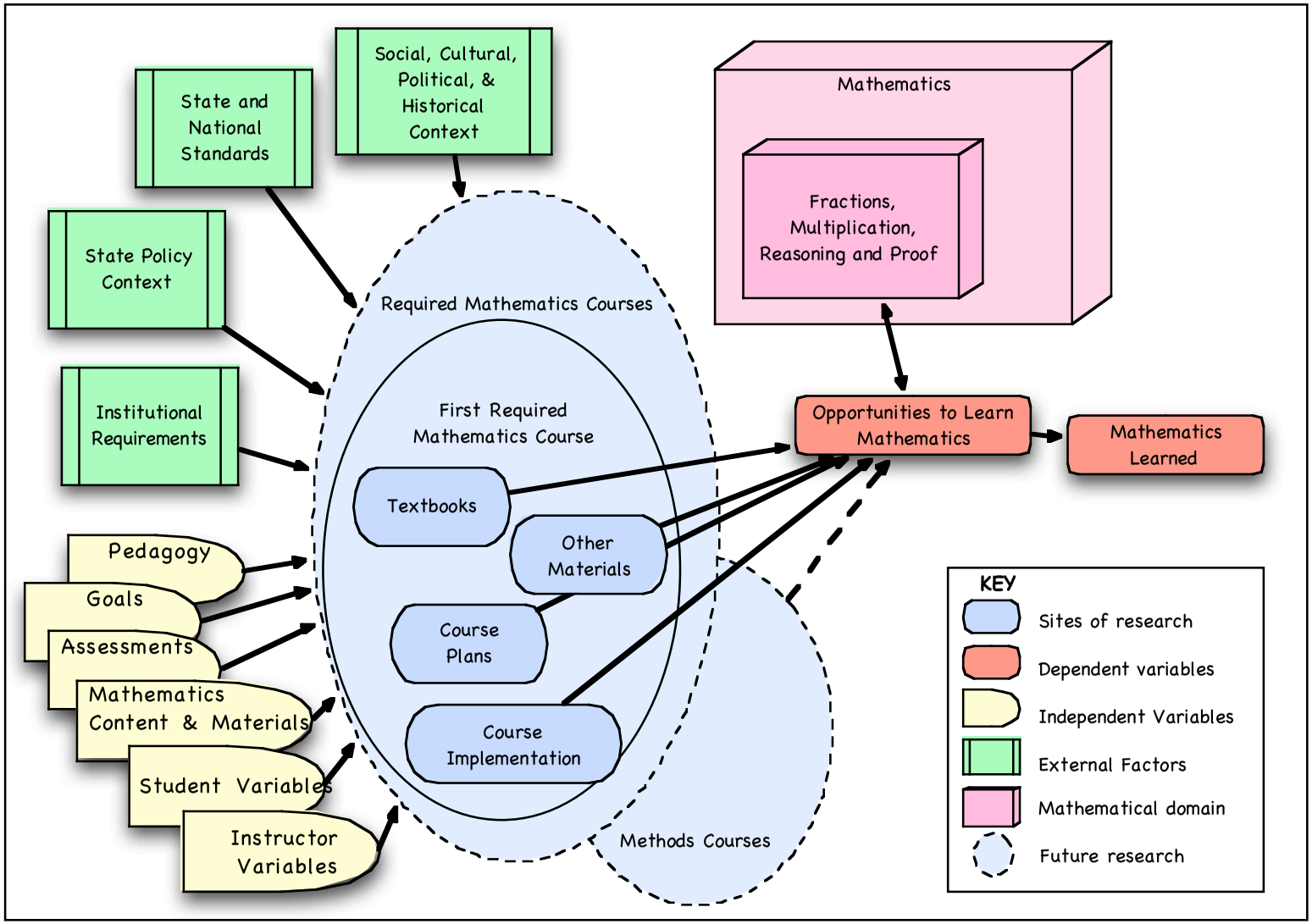

Table 1: Information by state: Certification, tests and achievement for Michigan, New York, and South Carolina

	MI	NY	SC
Number of certifying Institutions	32	118	31
Number of NCATE[1] certified institutions	16	25	22
Number of TEAC[2] certified institutions	3	24	0
Praxis required?	no	no	yes
PRAXIS Pass Rate	NA	NA	90%
State Test Required?	yes	yes	no
Quality Counts (QC) K-12 Standards grade[3]	B+	A	A
QC Teacher Quality Improvement Score[3]	66	81	92
New certifications from in-state[4]	7641	32128	2049
New certifications from out of State[4]	977	0	1514
Percent out of state	11%	0%	42%
NAEP Information[3,4]			
%Proficient and above (Math) 4th grade, 2003	38%	36%	36%
%Proficient State Test	65%	78%	34%
Difference, NAEP-State	31	45	2
NAEP 4th Math (mean, US public 237)	238	238	238
Mean for White students (US public 246)	245	247	250
Mean for Black students (US public 220)	211	222	223
NAEP 8th Math (mean, US = 278)	277	280	281
Mean for White students (US public 286)	285	290	294
Mean for Black students (US public 257)	247	259	263
Quality Counts Info[3]			
Middle School: Major or Minor in Math	minor[6]	minor	Minor
Student teaching -- min wks	6	8	12
Standards aligned with test	Y	Y	Y
Teacher Prep Accountability Process	No	No	Yes

[1] National Council for Accreditation of Teacher Education. Date from NCATE Web site, www.ncate.org

[2] Techer Education Accreditation Council. Data from TEAC Web site, www.teac.org/

[3] From Title II Web site

[4] From NCES Web site, 2005 data

[5] From Ed Weekly Quality Counts 2005 Web site

[6] Michigan requires a subject area major or 3 minors for elementary education majors

List of Textbooks

Textbooks for mathematics classes for elementary teachers used by instructors (current edition is indicated; number of schools using the book in parentheses, n=55):

Bassarear, T. (2001). *Mathematics for elementary school teachers* (2nd ed.). Boston: Houghton Mifflin. (1)
Beckmann, S. (2005). *Mathematics for elementary teachers.* Boston: Addison-Wesley. (1)
Bennett, A. B., & Nelson, L. T. (2007). *Mathematics for elementary teachers : a conceptual approach* (7th ed.). Boston: McGraw-Hill Higher Education. (1)
Billstein, R., Libeskind, S., & Lott, J. W. (2007). *A problem solving approach to mathematics for elementary school teachers* (9th ed.). Boston: Pearson Addison Wesley. (12)
Long, C. T., DeTemple, D. W., & Millman, R. S. (2007). *Mathematical reasoning for elementary teachers* (5th ed.). Boston, Mass.: Pearson. (3)
Musser, G. L., Burger, W. F., & Peterson, B. E. (2006). *Mathematics for elementary teachers: A contemporary approach* (7th ed.). Hoboken, NJ: J. Wiley. (7)
Parker, T. H., & Baldridge, S. J. (2004). *Elementary mathematics for teachers (Volume 1).* Okemos, MI: Sefton-Ash Publishing. (1)
Sonnabend, T., & Sonnabend, T. (2004). *Mathematics for teachers: An interactive approach for grades K-8* (3rd ed.). Belmont, CA: Thomson Brooks/Cole. (1)
Wheeler, R. E., Wheeler, E. R., & Wheeler, R. E. (2005). *Modern mathematics for elementary educators* (12th ed.). Dubuque, Iowa: Kendall/Hunt Pub. Co. (3)

Other textbooks mentioned by instructors (current edition is indicated):

Aufmann, R. N., Barker, V. C., & Nation, R. (2002). *College algebra* (4th ed.). Boston: Houghton Mifflin Co.
Beem, J. K. (2006). *Geometry connections.* Upper Saddle River, NJ: Pearson Education.
Bello, I. (2006). *Topics in contemporary mathematics* (9th ed.). Boston, MA: Houghton Mifflin Co.
Bittinger, M. L. (2005). *Introductory algebra* (10th ed.). Boston: Pearson Addison Wesley.
Bluman, A. G. (2005). *Mathematics in our world.* Boston: McGraw-Hill Higher Education.
Burger, E. B., & Starbird, M. P. (2005). *The heart of mathematics : an invitation to effective thinking* (2nd ed.). Everyville, CA: Key College Pub.
Cathcart, W. G. (2006). *Learning mathematics in elementary and middle schools: A learner-centered approach* (4th ed.). Upper Saddle River, N.J.: Pearson Merrill Prentice Hall.*
Jacobs, H. R. (1994). *Mathematics, a human endeavor : a book for those who think they don't like the subject* (3rd ed.). New York: W.H. Freeman.
Miles, T. J., & Nance, D. W. (1997). *Mathematics : one of the liberal arts.* Pacific Grove, Calif.: Brooks/Cole Pub.
Miller, C. D., Heeren, V. E., & Hornsby, E. J. (2004). *Mathematical ideas* (10th ed.). Boston: Addison Wesley.
Van de Walle, J. A. (2007). *Elementary and middle school mathematics: Teaching developmentally* (6th ed.). Boston, MA: Pearson /Allyn and Bacon.*

*Not included in the first list because is it usually considered to be a methods book.

Table 2: Sample of New York State certification test objectives

New York Objectives

Understand skills and concepts related to number and numeration, and apply these concepts to real-world situations

- Selecting the appropriate computational and operational method to solve a given mathematical problem
- Demonstrating an understanding of the commutative, distributive, and associative properties
- Using ratios, proportions, and percents to model and solve problems
- Comparing and ordering fractions, decimals, and percents
- Solving problems using equivalent forms of numbers and problems involving number theory
- Analyzing the number properties used in operational algorithms (e.g., multiplication, long division)
- Applying number properties to manipulate and simplify algebraic expressions

(Objectives organized by process rather than topic)

Table 3: Sample of Michigan certification test objectives

Michigan Objectives

Understand concepts and skills related to whole numbers, number theory, and numeration, and apply this knowledge in problem-solving contexts

- Recognizing and comparing properties of whole numbers and the whole number system
- Recognizing different classes of problem situations related to whole number operations
- Applying concepts of number and numeration systems to compare, order, and round
- Recognizing the logic of and relationships among mathematical operations
- Applying mathematical operations in real-world situations
- Using a variety of materials, models, and methods to explore concepts and solve problems involving whole numbers and numeration

(Objectives organized by topic with separate objectives for fractions, algebra, etc.)

The SC test (Praxis II) is also organized by topic.

Figure 3: Percent of institutions by number of courses required by year and type of institution (CBMS 2005)

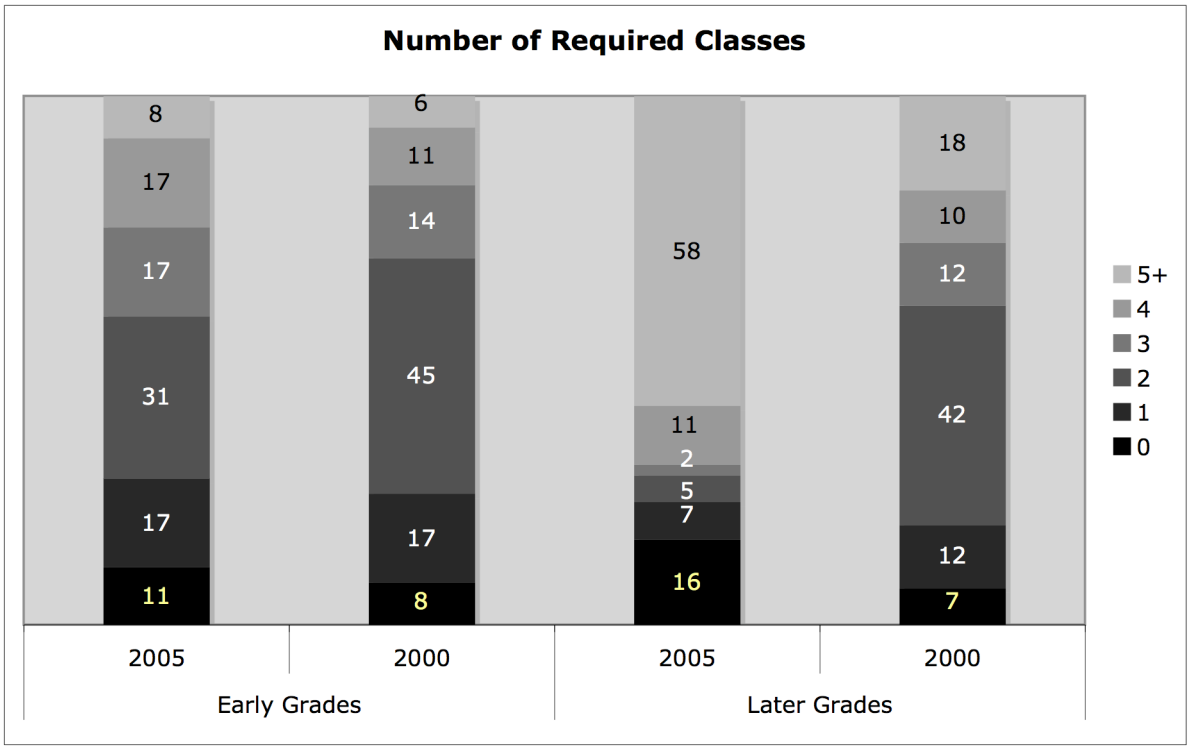

Figure 4: Qualifications of instructors, percent by type of institution, CBMS and ME.ET data

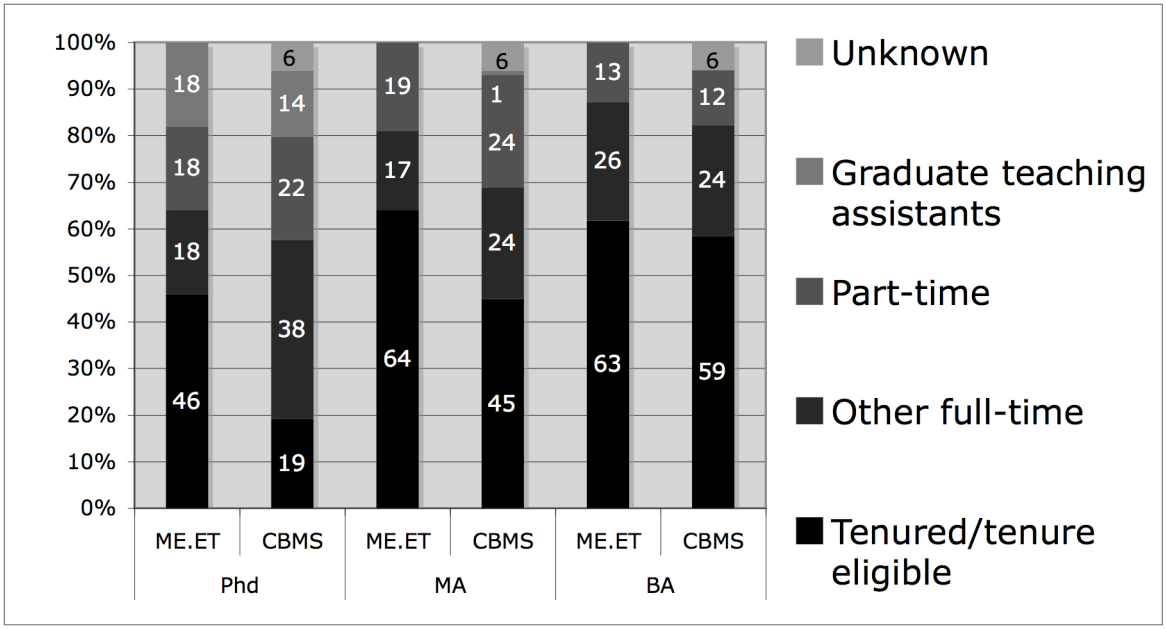

Figure 5: Instructor use of the textbook, percent of instructors by type of use (n=55)

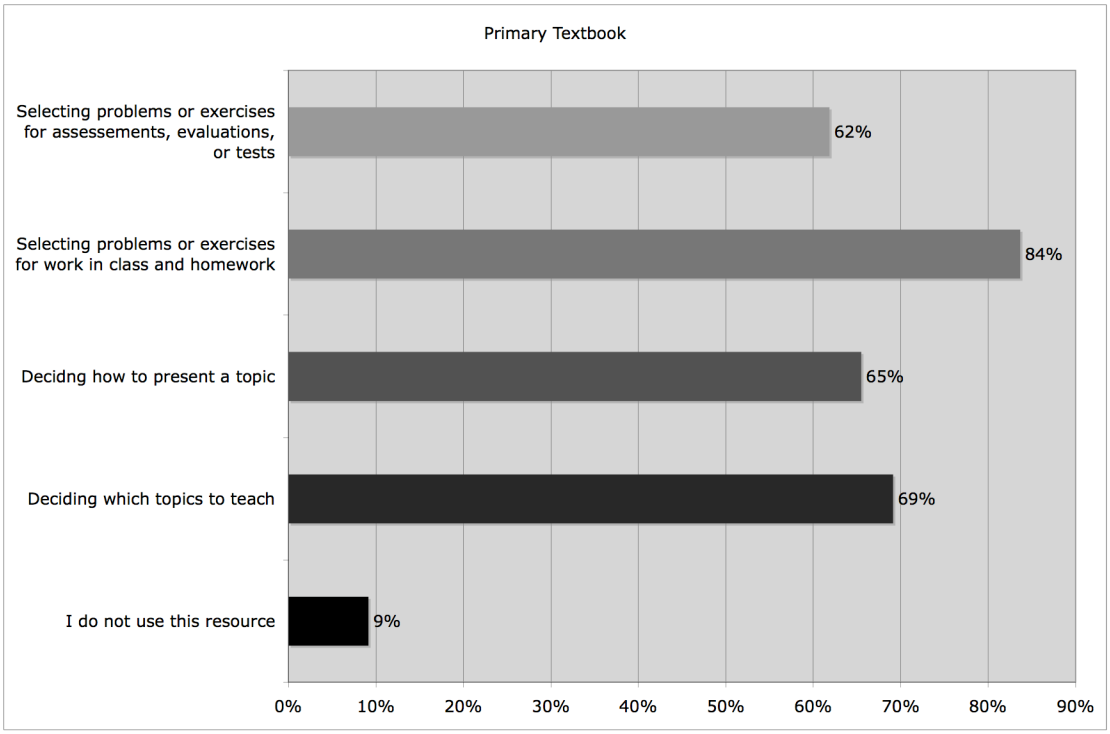

Figure 6: Instructor familiarity with key resources, percent by level of familiarity (n=55)

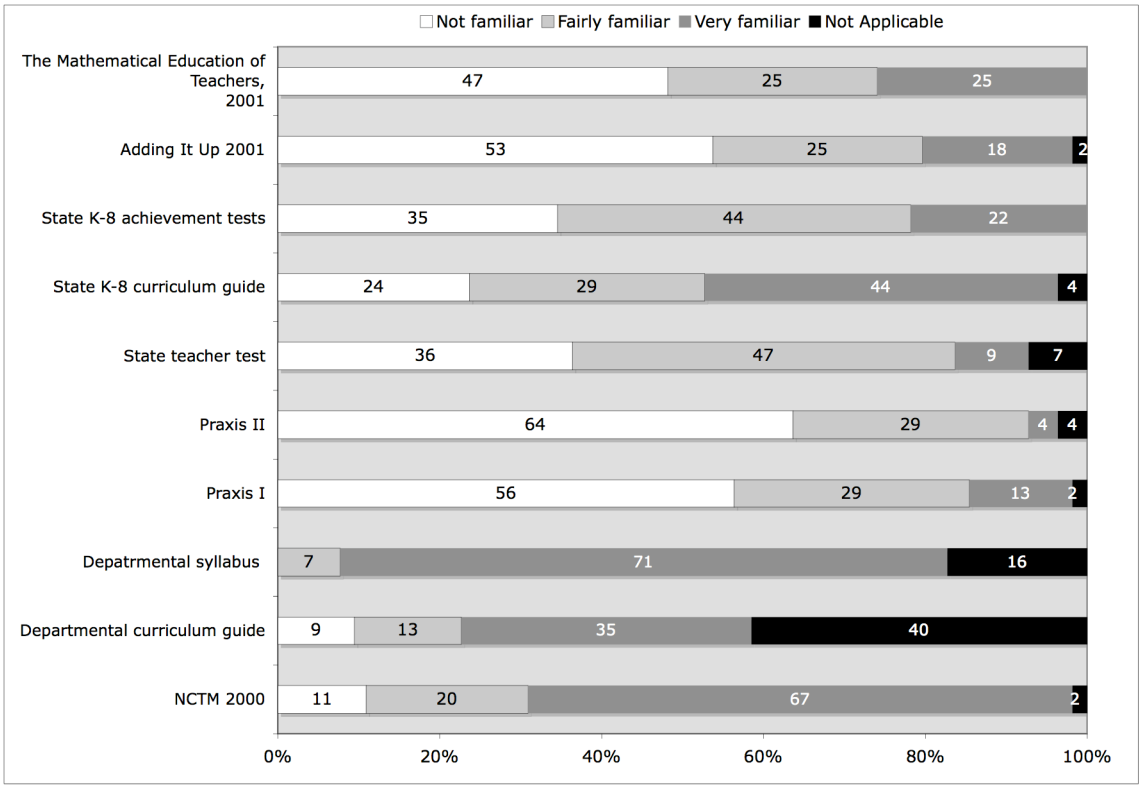

Figure 7: Percent of instructors who DO NOT use a give resource (n=55)

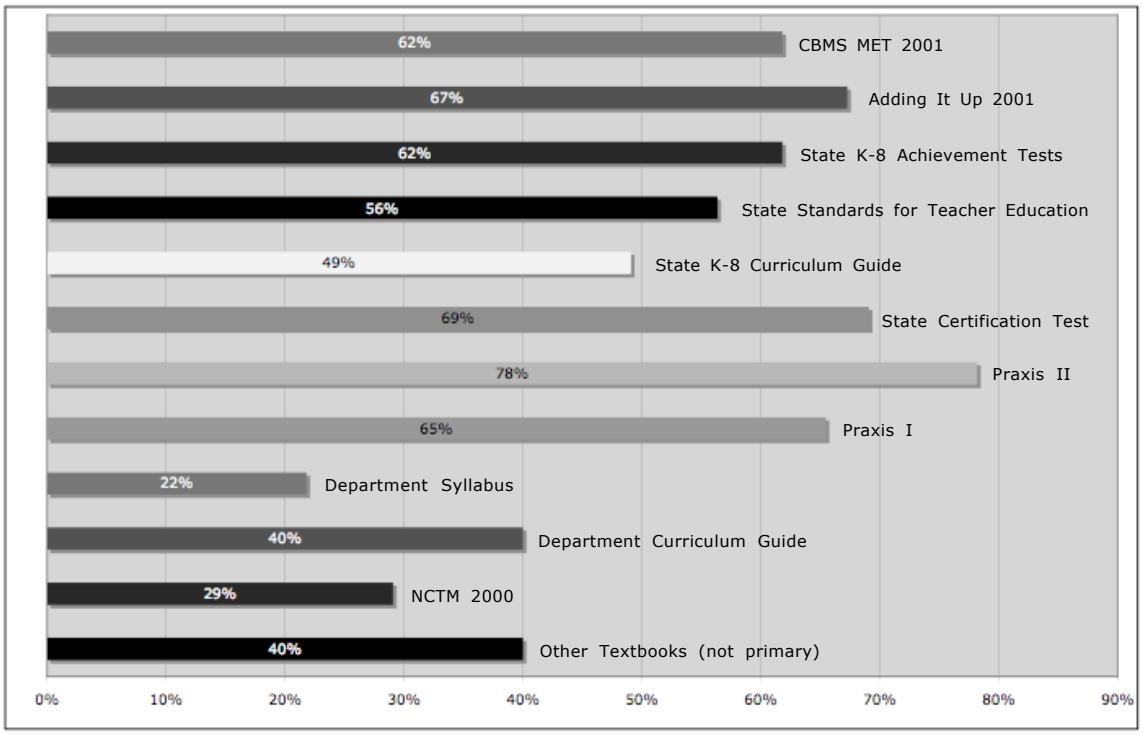

Figure 8: Percent of instructors who use a resource for a given purpose (n=55)

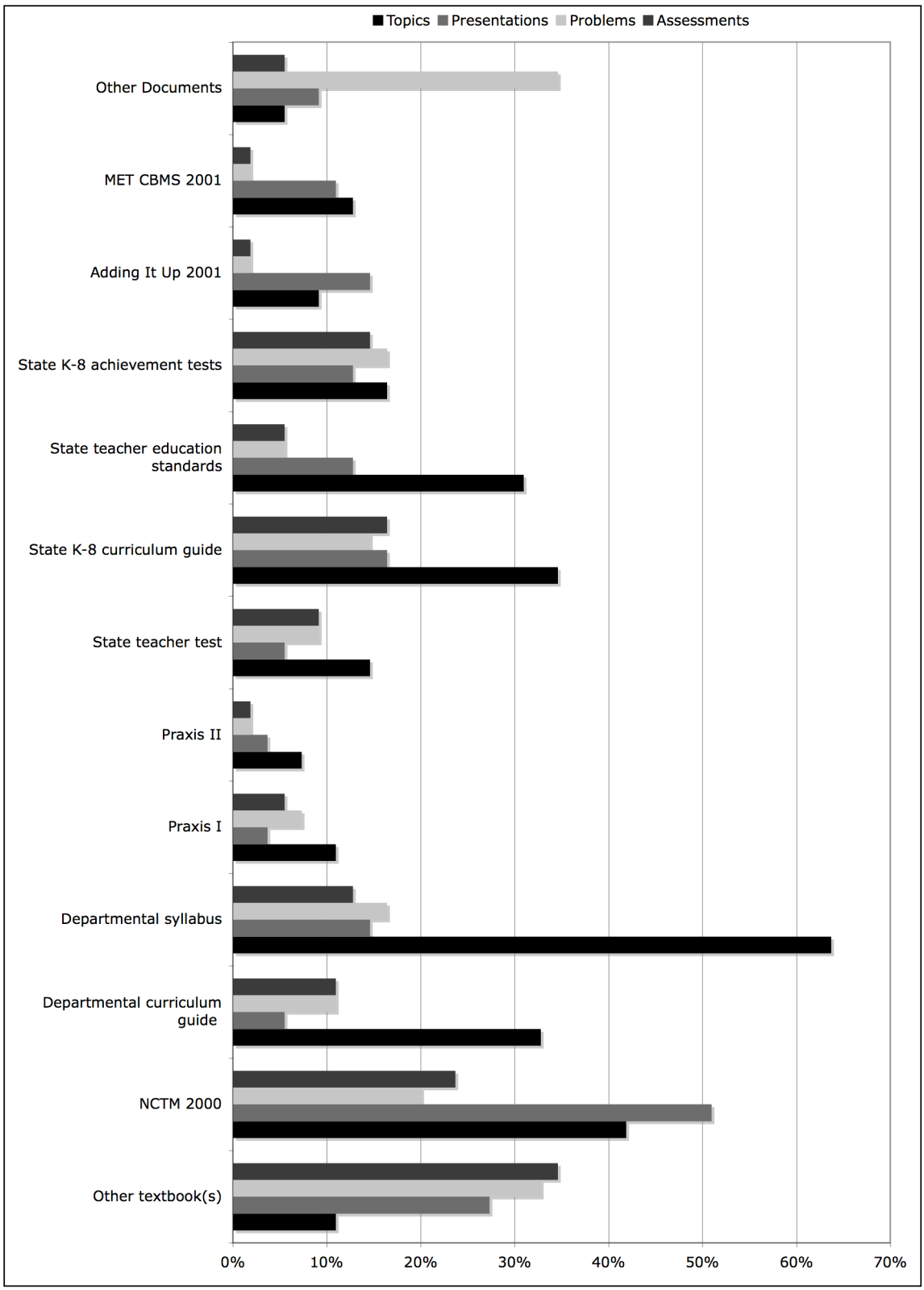

Table 5: CBMS FY1. Percentage of sections (excluding distance-learning sections) of certain introductory-level courses taught by various types of instructors in mathematics departments in fall 2005, by type of department. Also average section sizes.

	Percentage of sections taught by																			
	Tenured/ tenure-eligible %			Other full- time (total) %			Other full-time (doctoral) %			Part-time %			Graduate teaching assistants %			Unknown %			Average section size		
Course & Department Type	PhD	MA	BA	PhD	MA	BA	PhD	MA	BA	PhD	MA	BA	PhD	MA	BA	PhD	MA	BA	PhD	MA	BA
Mathematics for Liberal Arts	18	36	43	19	13	16	5	4	4	28	38	32	25	3	0	11	10	9	46	34	25
Finite Mathematics	17	49	31	32	28	14	7	4	4	12	17	55	23	0	0	16	6	0	74	34	23
Business Math (non-calciulus)	14	30	36	20	23	30	9	5	11	21	41	32	43	2	0	2	3	3	47	34	26
Math for Elem Sch Teachers	19	45	59	38	24	24	10	2	3	22	24	12	14	1	0	6	6	6	29	27	22
College Algebra	4	24	34	25	36	31	3	5	3	21	26	29	44	6	0	6	7	5	46	41	27
Trigonometry	10	31	30	26	36	32	3	0	2	19	19	39	43	0	0	2	14	0	37	31	27
College Alg & Trig (combined)	6	26	61	45	8	29	10	2	8	19	36	11	29	30	0	1	0	0	57	28	25
Elem Functions, Precalculus	7	32	43	22	21	22	8	3	0	24	33	35	40	10	0	7	4	0	48	31	25
Intro to Math Modeling	25	36	11	75	14	78	38	0	22	0	50	11	0	0	0	0	0	0	81	31	20
Total All Intro Level Courses	**11**	**33**	**41**	**26**	**25**	**24**	**6**	**4**	**4**	**21**	**30**	**30**	**34**	**5**	**0**	**7**	**7**	**4**	**48**	**34**	**25**

Note: 0 means less than one half of 1%.

Table 5: CBMS 2005 FY2. Percentage of sections (excluding distance learning sections) in certain introductory-level courses taught using various reform methods in mathematics departments in fall 2005, by type of department. Also total enrollments (in 1000s) and average section size.

	Percentage of sections in certain Introductory Level courses taught using																				
	Graphing calculators %			Writing assignments %			Computer assignments %			On-line resource systems %			Group projects %			Enrollment in 1000s			Average section size		
Course & Department Type	PhD	MA	BA	PhD	MA	BA	PhD	MA	BA	PhD	MA	BA	PhD	MA	BA	PhD	MA	BA	PhD	MA	BA
Mathematics for Elem School Teachers	14	38	14	36	58	55	10	13	20	3	2	2	25	31	43	15	20	37	29	27	22
College Algebra	47	41	47	4	13	3	18	3	5	18	6	7	4	3	3	71	63	62	46	41	27
Trigonometry	31	51	70	1	18	5	12	0	5	15	0	5	1	7	5	17	6	7	37	31	27
College Algebra & Trig (combined)	32	57	19	4	4	0	2	0	0	12	0	0	0	4	0	18	7	9	57	28	25
Elementary Functions, Precalculus	47	50	77	2	6	13	6	2	11	17	2	4	2	7	9	47	20	25	48	31	25
Intro to Mathematical Modeling	25	59	48	25	59	44	0	0	59	0	0	4	13	0	56	1	4	3	81	31	20
All courses in FY.2	39	44	42	7	23	21	12	4	12	10	3	4	6	10	17	169	120	143	44	34	25

Note: 0 means less than one half of 1% in columns 1-15, and less than 500 in the Enrollment columns.

Table 6: CBMS Table SP6. Among mathematics departments at four-year colleges and universities having different requirements for early and later grades certification, the percentage identifying a given course as one of the three mathematics courses most likely to be taken by pre-service teachers preparing for K-3 teaching or for later grades teaching (including 5 and 6) by type of department, in fall 2005.

	Most likely for K–3 certification			Most likely for later grades certification		
Among Mathematics Departments With Different Early and Later Grades Requirements	Univ (PhD) Math	Univ (MA) Math	Coll (BA) Math	Univ (PhD) Math	Univ (MA) Math	Coll (BA) Math
Multi-term course for elementary education majors	59	70	64	28	47	38
Single term course for elementary education majors	21	37	33	16	10	12
College algebra	41	40	56	21	40	23
Precalculus	15	6	46	13	13	15
Intro to mathematical modeling	5	0	0	8	0	0
Mathematics for liberal arts	28	30	25	8	7	2
Finite mathematics	23	7	15	10	7	8
Mathematics history	5	0	0	31	23	18
Calculus	21	6	12	64	50	77
Geometry	10	24	0	43	47	53
Elementary Statistics	31	26	27	41	44	55

Table 7: CBMS SP5. Among all four-year colleges and universities with K-8 certification programs, the percentage that have different requirements for early grades (K-3) certification and for later grades (including 5 and 6) certification in terms of semester courses. Also the average number of semester mathematics departmen courses required by certification level and type of department, fall 2005. Data for fall 2000 in parentheses.

	Having different mathematics requirements for early & later grades certification		Having the same mathematics requirements for early & later grades certification
Percentage of mathematics departments with K-8 certification programs	44%		56%
	Percentage of departments with K-8 certification programs that require various numbers of mathematics courses		Percentage of departments with K-8 certification programs that require various numbers of mathematics courses
Number of mathematics courses required for certification	for early grades	for later grades	for all K-8 grades
0 required	11 (8)	16 (7)	4 (na)
1 required	17 (17)	7 (12)	26 (na)
2 required	31 (45)	5 (42)	37 (na)
3 required	17 (14)	2 (12)	22 (na)
4 required	17 (11)	11 (10)	11 (na)
5 or more required	8 (6)	58 (18)	0 (na)
Type of mathematics department	Avg number of courses required	Avg number of courses required	Avg number of courses required in combined K-8 certification program
Univ(PhD)	3.3 (2.2)	5.5 (2.5)	2.4 (na)
Univ(MA)	3.3 (3.3)	6.9 (4.1)	2.5 (na)
Coll(BA)	2.5 (2.3)	5.3 (2.8)	2 (na)
All mathematics departments	2.7 (2.4)	5.6 (3)	2.1 (na)