

THE MATHEMATICAL EDUCATION
OF ELEMENTARY TEACHERS

MATHEMATICS CLASSES FOR ELEMENTARY TEACHERS

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WHAT IS THE PROBLEM?

- Mathematical knowledge for teaching
 - What is it?
 - What does research say about it?
 - How do teachers get it?
 - What do policies suggest?
- The role of teacher preparation programs
 - Mathematics content courses
 - Mathematics departments



WHAT DO WE KNOW?

Very little!

Why so little information about the mathematics courses taught to elementary ed majors?

1. Obvious
 2. Common Sense
- BUT...**



WHAT DO WE KNOW?

- Big differences even at a superficial level
 - eg.,
 - Schools that require only general education classes
 - v.
 - Schools that offer a sequence for elementary ed majors



QUESTIONS

- How many classes?
- How many students?
- Who teaches?
- With what materials?
- Do they they collaborate with education?
- What are the main topics of the classes?



<http://www.cbmsweb.org/>

- Conference Board of the Mathematical Sciences (CBMS) Survey every five years
- Data from a national probability sample
- Separate surveys of 2 and 4 year colleges
- In four year institutions, 87% of mathematics departments are in institutions that certify teachers.
- A few questions about mathematics teacher education



ME.ET DATA

- Five year study of mathematics classes for teachers
- Three states: Michigan, New York (city only), and South Carolina
- *Quality Counts 2006* grades on efforts to improve teacher quality:
 - MI: D
 - SC: A
 - NY: B
- Grades reflect differences in policy



ME.ET DATA, CONT.

- 70 institutions that offer undergraduate elementary certification
- In mathematics classes required for certification, sample size goal:
 - 200 instructors
 - 2000 students in a sample of 60 classes
- Current samples:
 - 130 instructors
 - 800 students in 25 classes
 - 57 mathematics departments



HOW MANY CLASSES?

CBMS 2005 Preliminary Data	Separate requirements		Single req.
	K-4/5-8 (44%)		(56%)
	Early Grades	Middle Grades	All K-8
PhD	3.3	5.5	2.4
MA	3.3	6.9	2.5
BA	2.5	5.3	2.0
Avg	2.7	5.6	2.1

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HOW MANY CLASSES?

# of Classes	ME.ET*	CBMS**		
	K-8	K-3	K-8	5-8
0	5%	11%	4%	16%
1	19	17	26	7
2	42	31	37	5
3	26	17	22	2
4	4	17	11	11
5+	4	8	0	58
AVG	2.2	2.7	2.1	5.6

*Mathematics Departments in 57 schools (81% of 70 possible)

**Random sample of all (~1600) mathematics departments in the U.S.

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HOW MANY STUDENTS?

- Students per class (ME.E
- Mean 25.2, SD 8.5
- Mode 25
- CBMS 2005 Preliminary
- 29 PhD 48
- 27 MA 34
- 22 BA 25

Contrast with average class size in other introductory classes:

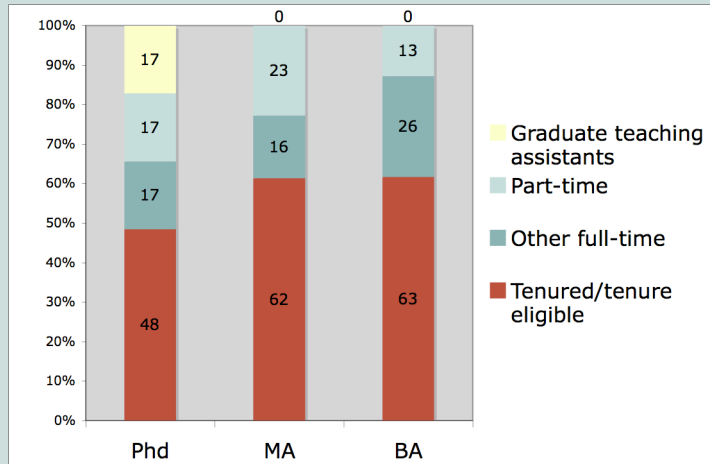
WHO TEACHES?

- Most often taught by regular tenure-stream faculty

ME.ET	% of total
Tenure stream	59%
Other full time PhD	5
Full time, non PhD	13
Part-time	20
Grad Asst	4

WHO TEACHES?

But it varies by type of institution (from ME.ET data)



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WHO TEACHES?

Difficulty of finding instructors

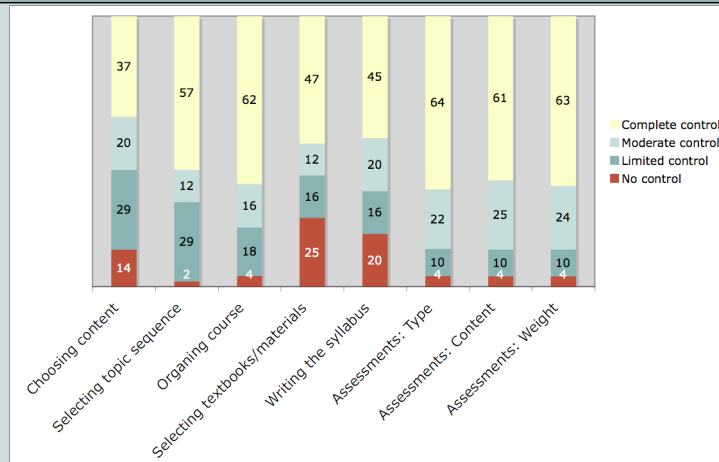
Easy to find instructors	57%
Somewhat difficult	24
Very difficult	19
Could not fill vacancy	0

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WHO TEACHES?

- Department home:
 - Mathematics 80%
 - Education 3%
 - Other 18% (mostly adjuncts, not in a dept.)
- First time instructor: 7%

INSTRUCTOR CONTROL



TEXTBOOKS

- ME.ET: 100% use the same textbook(s) for all sections (CBMS: 97%)

	Book	# of departments
	Billstein et al	12
	Musser et al	7
	Self developed	8
	Other text written for this kind of class	13
	Other math textbook not written for this kind of class	11

TEXTBOOKS

- Those mentioned (See Web site for complete citations: <http://meet.educ.msu.edu>)
 - Bassarear 1
 - Bennett 2
 - Long 3
 - Parker 2
 - Sonnabend 2
 - Wheeler 3

COLLABORATION WITH EDUCATION

- How much does your department collaborate with education? (Scale is none, limited, moderate, a great deal)

	None	A great deal
Planning courses	28%	28%
Designing overall curriculum	36	16
Teaching together	74	6
Coordinating methods and content	35	25
Research	52	9

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COLLABORATION WITH EDUCATION

	% with moderate or great deal of collaboration		
	BA	MA	PhD
Planning courses	50	52	55
Designing overall curriculum	36	36	36
Teaching together	21	8	0
Coordinating methods and content courses	21	50	20
Collaborating on research	21	28	30

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COURSE CONTENT

- Primary focus: FIRST course SECOND Course

Number and operations	53%	10%
Problem solving	19	5
Logic and/or set theory	13	0
Number theory	12	5
Algebra and pre-algebra	12	5
Geometry and measurement	9	41
Data and statistics	6	26



COURSE CONTENT

- Primary focus over ALL required courses:

Number and operations	25%
Geometry and measurement	22%
Data and statistics	17%
Problem solving	10%
Algebra and pre-algebra	8%
Number theory	7%
Logic and/or set theory	6%



NEXT STEPS

- Instructor survey
- Student* assessment data
- Modeling opportunity to learn and student* achievement
- Another round of student* and instructor data collection, Fall 2007
- IRB's in New York

*Student = Pre-service teacher



DISCUSSION

- Much to learn
- Suggestions from these data
 - More mathematics is being required
 - More schools are moving toward later grades requirements
- Mathematics department chairs were knowledgeable about the programs, esp in smaller schools
- Mathematics and education schools are intertwined in many institutions



QUESTIONS

- What would you like to know that our data might be able to answer?
 - Eg., what do you want to know from/about instructors?
- What institutional differences are likely to matter?
- E.g., we have used “TYPE”:
 - 50% of MA institutions report high levels of coordination of methods and content.
 - Numbers for BA 21%, PhD 20%. We don’t have an explanation.

