

Preparing Secondary Mathematics Teachers for Teaching Algebra in the Age of the Common Core State Standards in Mathematics

AACTE Meeting – Indianapolis

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Critical Question for Teacher Education

What opportunities are mathematics teacher preparation programs providing pre-service teachers to prepare to teach what's described in the Common Core?

Today we would like to share data from a project that begins to address this question.



Preparing to Teach Algebra Project

- Collaborative work between MSU & Purdue
- Investigates OTL in **secondary** math teacher prep programs
- Focuses on preparation for teaching algebra
 - Foundation for higher mathematics
 - Gatekeeper for college and careers
 - A civil right



2013-14 PTA Research Team

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PTA Research Question

What opportunities do secondary mathematics teacher preparation programs provide to learn about

- algebra,
- algebra teaching,
- issues in achieving equity in algebra learning,
- algebra, functions, and modeling standards and mathematical practices described in the Common Core State Standards for Mathematics?



PTA Design

- National survey of institutions with programs preparing secondary mathematics teachers
- Case studies of programs at 5 institutions
 - Three Midwestern Universities selected before we began the survey
 - Two additional institutions from Southeast and West selected based on survey



PTA Timeline

Year	Survey	Case Studies
2011-12	Sample selected Survey items written Survey piloted & revised	Interview protocols Developed, piloted, & revised
2012-13	Survey administered Data analysis & dissemination began	Interviews with instructors & focus groups with PSTs began
2013-14	Data analysis completed	Data collection ended Data analysis began



Sampling and Response Rates

Institution Type	Sampled N	Responded N	Response rate	Percent of sample
Bachelors	176	52	30%	40%
Masters	160	48	30%	37%
Doctorate	64	31	48%	24%
Total	400	131	33%	100%



Characteristics of Largest Secondary Math Teacher Prep Program at Institution

- Length
 - 81 % 4- or 5-year B.A. or B.S
 - 19% post BA or MAT
- Certification
 - 3% Middle grades only
 - 22% High school only
 - 74% Combined middle and high school
- Size (average of last three years)
 - Minimum = 0; maximum 52
 - Median n = 5; mean n = 9



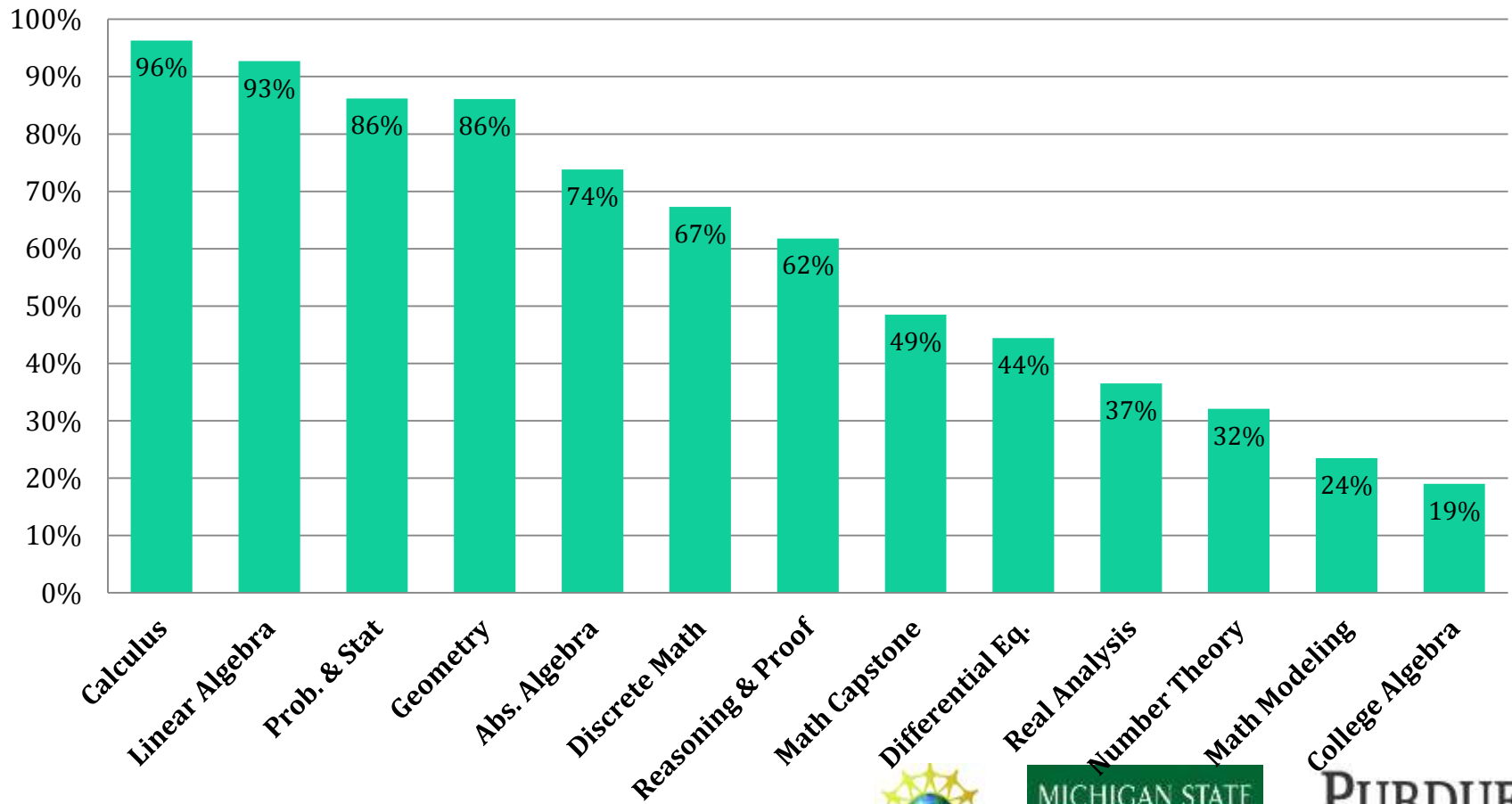
Required Courses and Credits

Type of Course	Mean Number of Courses	Mean Number of Credits
(Advanced) Mathematics	11.3	35
Mathematics primarily for Teachers	1.2	4
Mathematics Education (e.g., methods courses)	2.3	7
Other Education	9.5	27

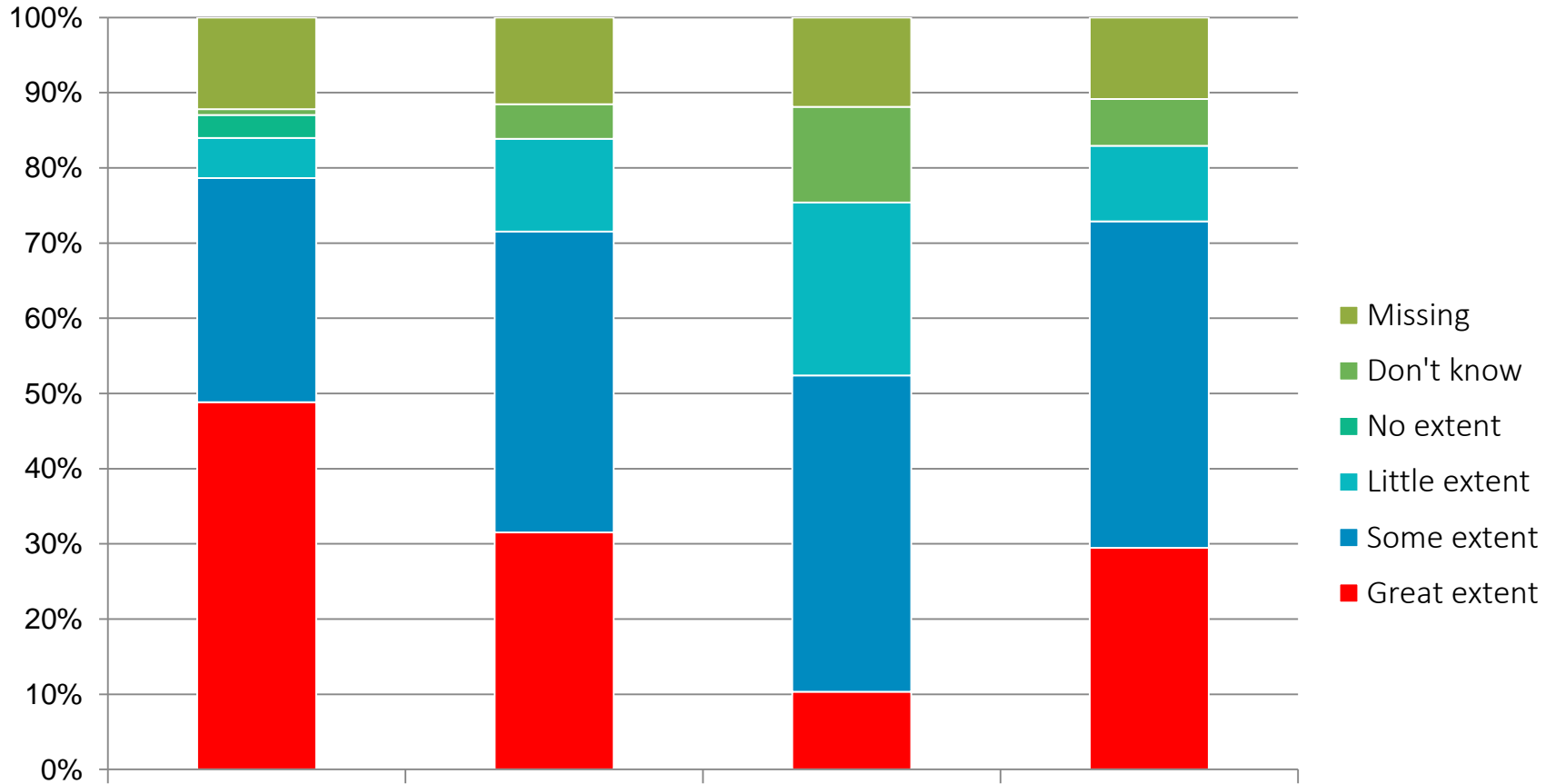


Required Mathematics Courses

% of Responses Answering the Course is Required



Opportunities to Learn



Algebra

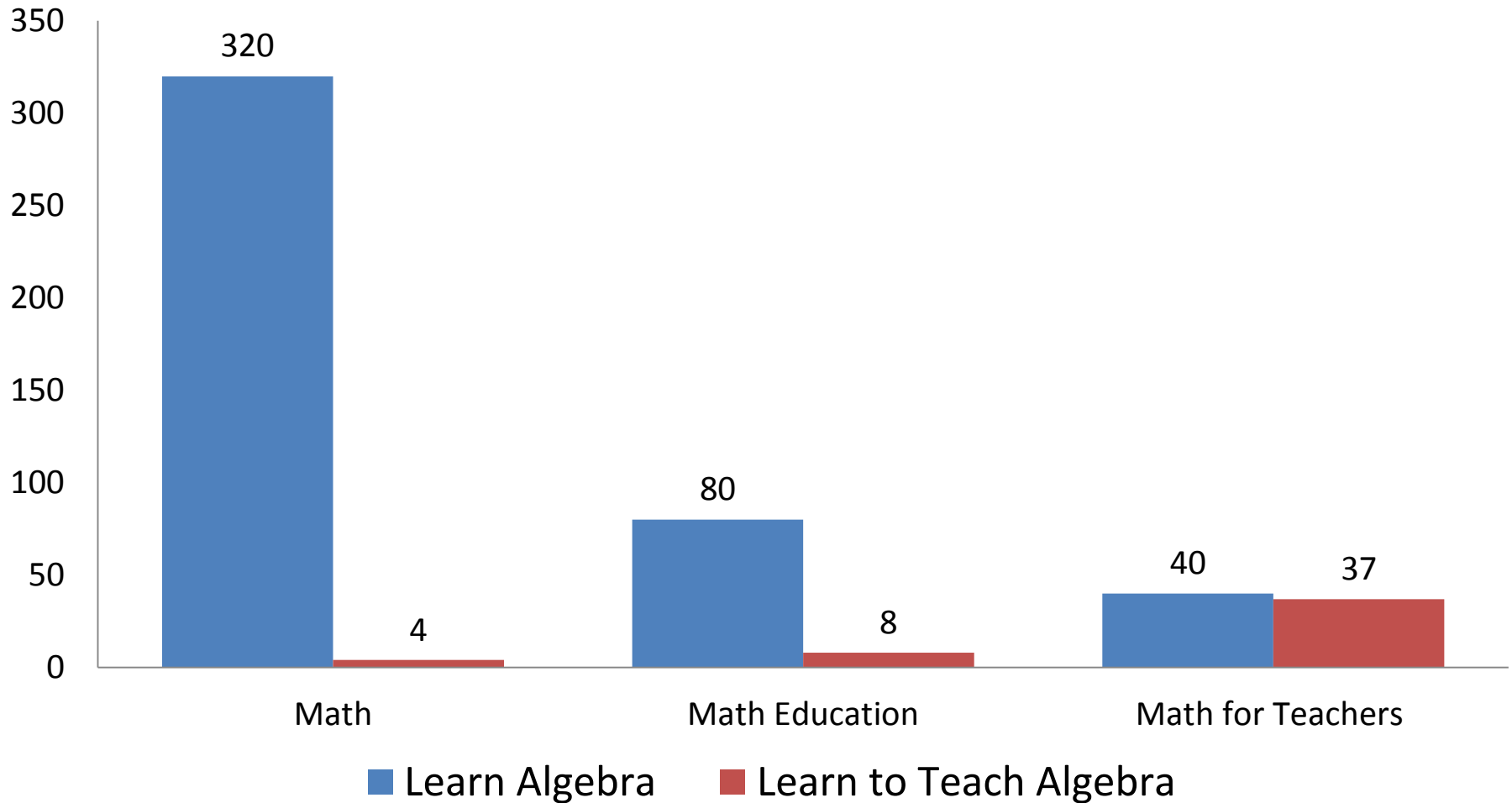
Algebra
teaching

Equity

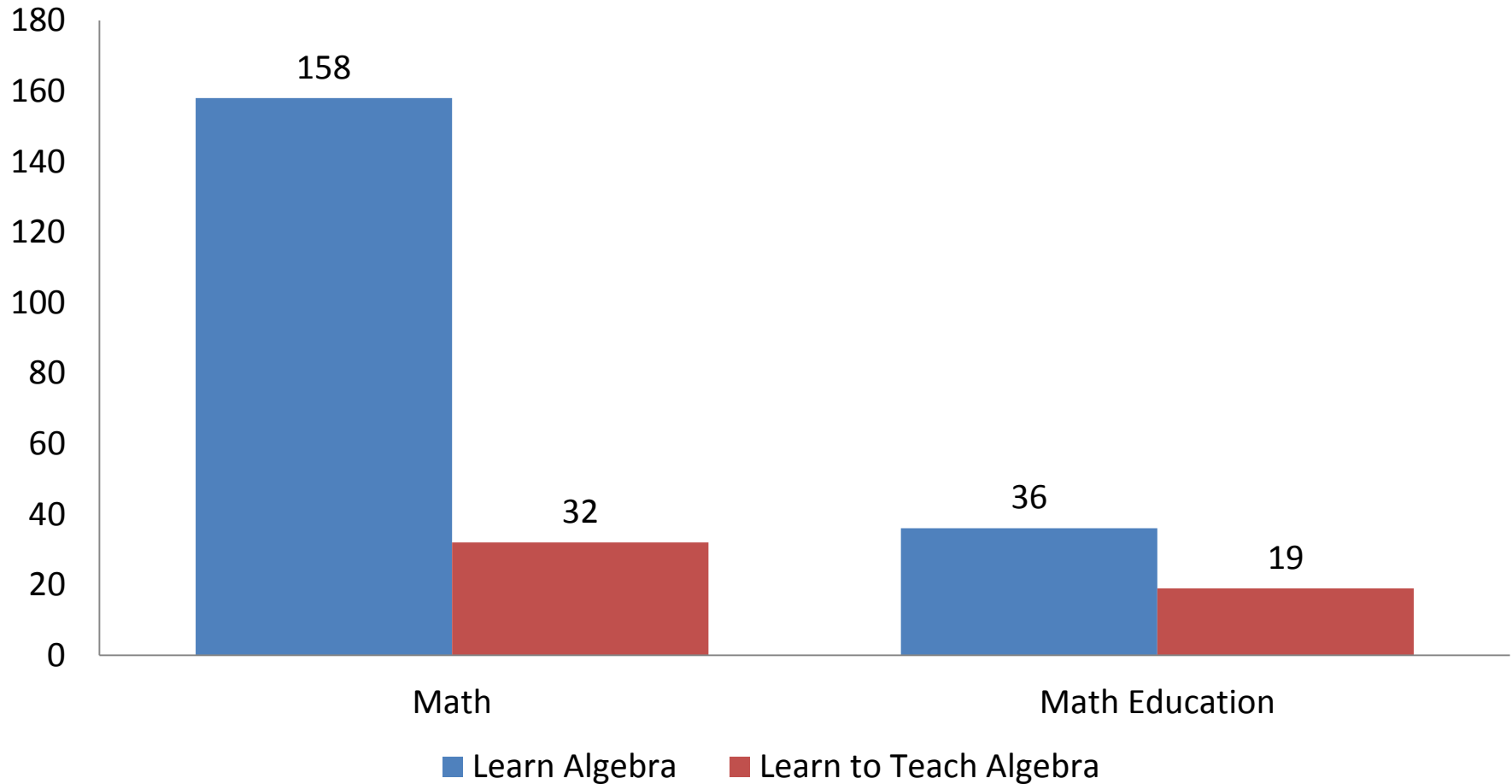
CCSSM



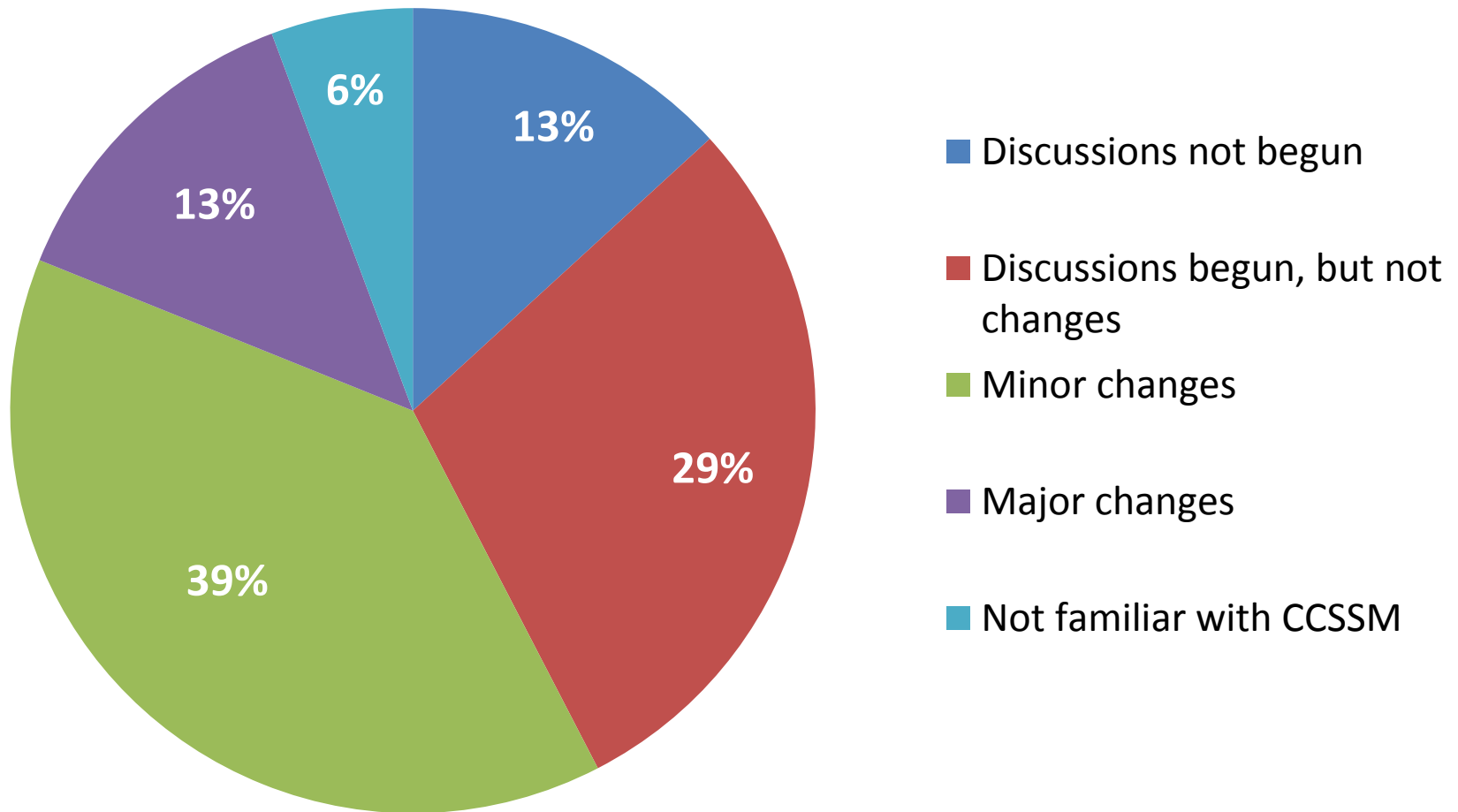
Number of Opportunities Mentioned by Instructors at University Beta



Number of Opportunities Mentioned by Instructors at University Kappa



Changes based on CCSSM



Changes Influenced by the CCSSM

Location	Implemented %	Planned %
Math Education Courses	82	68
Math Courses	11	19
Math for teachers courses	07	13

Focus	Implemented %	Planned %
CCSSM Mathematical Practices	52	64
CCSSM Mathematical Content	35	21
Assessments Associated with CCSSM	13	15



Example Changes

- Primarily through assignments in upper level mathematics courses in which students connect the mathematics in their college courses to that specified in the CCSS for MS and HS.
- Requiring students to connect lesson plans to CCSSM
Comparing SMPs to NCTM process standards. Watching videos looking for evidence of SMPs Locating tasks to meet particular CCSSM standards.
- We have planned some courses that will be primarily focused on teaching middle school mathematics. These will be available to any who want to be certified to teach secondary mathematics. We are piloting Geometry for middle school teachers in Spring 2013. The set of courses will focus on knowledge for teaching mathematics and CCSS Math.



Summary of Key Findings

- Significant variation in the paths to be secondary mathematics teachers within and between institutions
- PSTs have extensive coursework to provide OTL algebra in advanced mathematics courses
- Programs are less likely to provide OTL to teach algebra or to learn about the algebra, functions & modeling strands in CCSSM
- Programs are generally not providing opportunities to learn about equity issues in algebra
- Many programs have made changes to address some aspects of CCSSM



PTA Publication

Newton, J., Maeda, Y., Senk, S. L., Alexander, V. (2014). How well are secondary mathematics teacher education programs aligned with the recommendations made in *MET II*? *Notices of the American Mathematical Society*, 61(3), 292-5.



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