

Understanding Mathematics Teacher Education

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Public Ed is Very Different

- Licensure Requirements
- Connecting to Public Ed Students
- Mathematical Connections
- Policy Connections
- Connections to the Public

Licensure Requirements

- Mathematics PLUS Pedagogy
 - Often takes 5 years or more
 - Mathematics for teaching
 - Teaching mathematics
- Vary from state to state
 - Highly Qualified Status
- Undergraduate vs. Alternative Routes
- Bureaucracy

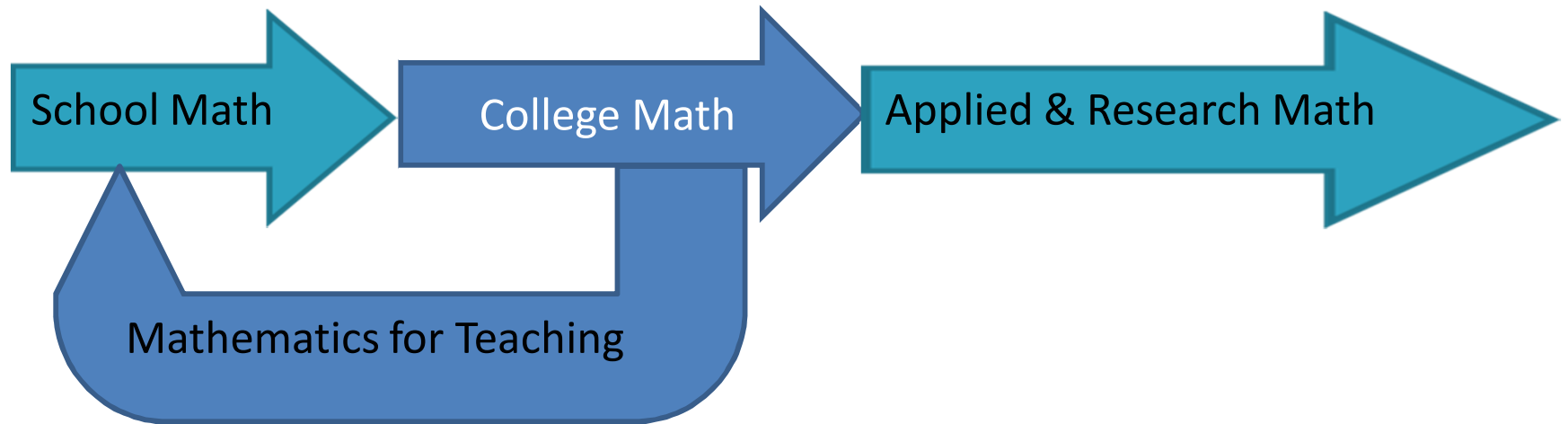
Nature of the Students

- Surprise! The students are not necessarily drawn to mathematics
- Empathy



Mathematical Connections

- Need to see connections to future mathematics in addition to building from foundations



- Making connections to other disciplines in teaching is different from learning mathematics as a tool for those disciplines

Making Policy Connections

- The role of the state department in pre-service programs
- Designing curriculum
- Providing professional learning experiences
- Supporting alternate routes
- Policy discussions and agreements
- Working with the College of Education

Connecting to the Public

- Isolation
- Parents
- Policy-Makers



What Can Mathematics Departments do?

- Recognize common goals
- Intentionally build connections within mathematics and to other fields
- Help teachers understand and remember what mathematics is really about
- Intentionally build relationships with public education and Colleges of Education
- Participate in in-service professional learning experiences
- Design mathematics courses targeted at future teachers

Understanding Mathematics Teacher Preparation

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NATIONAL COUNCIL OF
TEACHERS OF MATHEMATICS

NCATE/TEAC — CAEP

- A voluntary peer review process that involves a comprehensive evaluation of the professional education unit that is primarily responsible for the preparation of teachers and other professional school personnel.
- The review is based on the NCATE Unit Standards, a set of research-based national standards developed by all sectors of the teaching profession.
- Accreditation requires an on-site review of the unit and a review of the individual programs within the unit.
- on-site visit to evaluate the capacity to effectively deliver its programs.
- The review of individual programs is a review conducted by the state or electronically through NCATE and the specialized professional organizations.

Regrettably

- Even with the recent creation of CAEP (merger of NCATE and TEAC to form CAEP) **less than half** the nation's programs that prepare professional educators for the schools are formally accredited.

Current Accreditation Assessments include

- Mathematical content knowledge (typically Praxis or a state's assessment) similar data)
- Mathematical content knowledge (GPA's, portfolio)
- Pedagogical and professional knowledge (Unit Plan)
- Pedagogical and professional knowledge (Student Teaching)
- Impact on Student Achievement
- Pedagogical and professional knowledge and skills

Mathematics Standards for NCATE

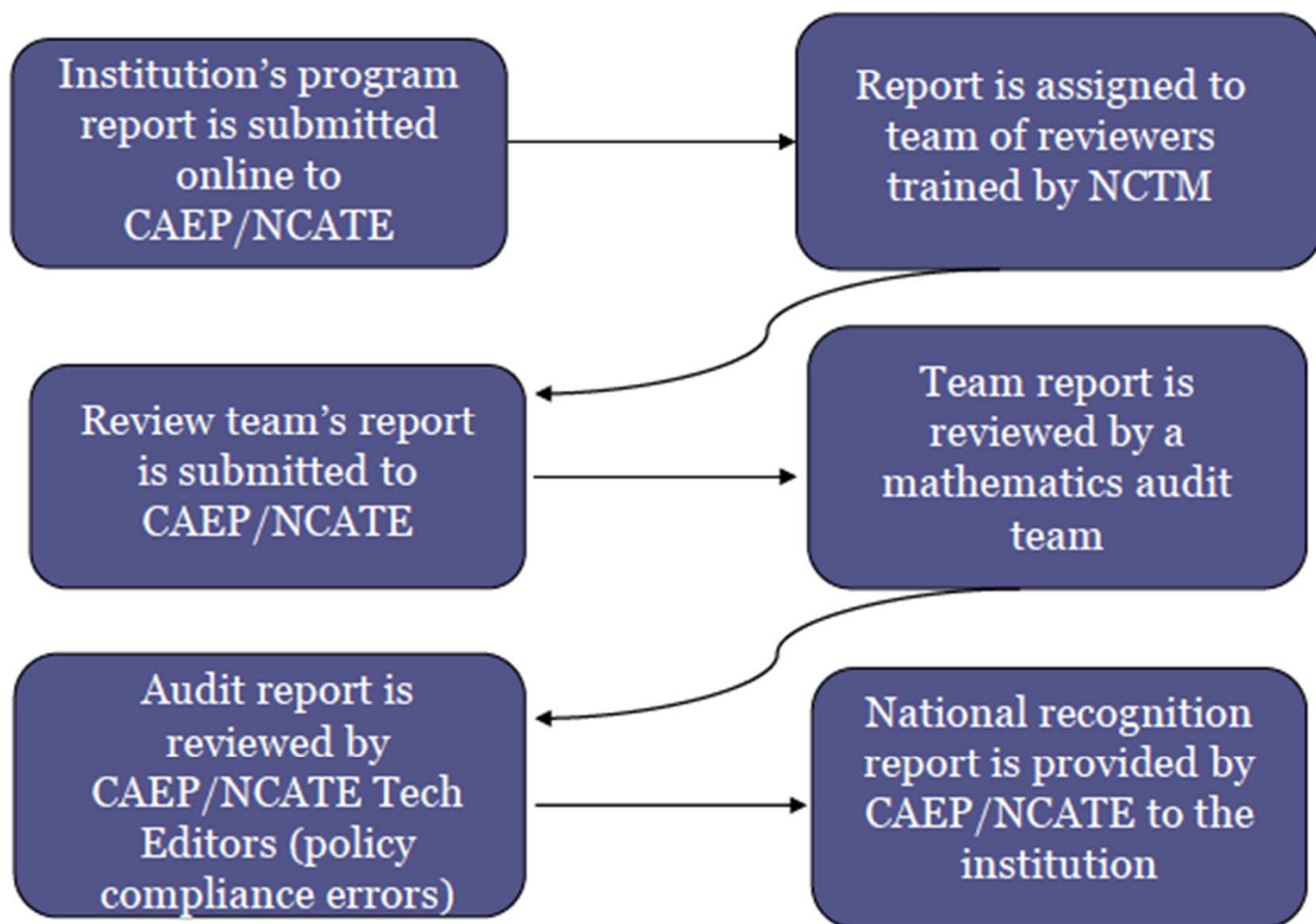
- NCTM appointed group to work on the standards for
 - Middle School Mathematics
 - Grades 7-12 (most popular program – submission wise)
 - Elementary Mathematics Specialist (now post baccalaureate (check spelling!)/endorsement)
- ACEI
 - Elementary standards
- NAEYC
 - Early childhood standards

Accreditation comprises two parts

- NCATE approval for broad standards
- Submission to Specialized Professional Associations (e.g. NCTM) for program approval
- Program report compiler training is available

<http://www.nctm.org/profdev/content.aspx?id=404>)

Program Review Process



Additional information on the Standards and Scoring Rubrics

Mathematics Standards

- <http://www.nctm.org/standards/content.aspx?id=2978>

Preparing the content report

- http://caepnet.files.wordpress.com/2013/09/nctm_program_report.pdf

Principles to Actions

ENSURING MATHEMATICAL SUCCESS FOR ALL



Mathematics Teaching Practices

Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.

Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.

Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.

Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.

Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.

Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

What Can Mathematics Departments Do?

- Work closely with mathematics education faculty.
- Observe student teachers
- Talk to practicing K-12 mathematics teachers.
- Co-facilitate professional learning experiences for classroom teachers.
- Examine publications that support your work with teachers (MET II, Common Core State Standards, Principles to Actions)



Teacher Preparation: The Big Picture

- What we have to understand in order to improve the quality of teachers' training
- Why solving this is a moral imperative, and involves significant political and practical issues

Long history of despair but also of weak investment and effort

“How America prepares its teachers has been a subject of dismay for many years. . . . There are 3.3 million public school teachers in America, and they probably can’t all be trained by start-ups. Raising up the standards of our university programs should be an urgent priority. But one reason for the widespread mediocrity is that universities have had a cozy, lucrative monopoly. It’s about time the leaders of our education schools *did* feel threatened.”

Bill Keller, *New York Times*, October 20, 2013

<http://www.nytimes.com/2013/10/21/opinion/keller-an-industry-of-mediocrity.html>

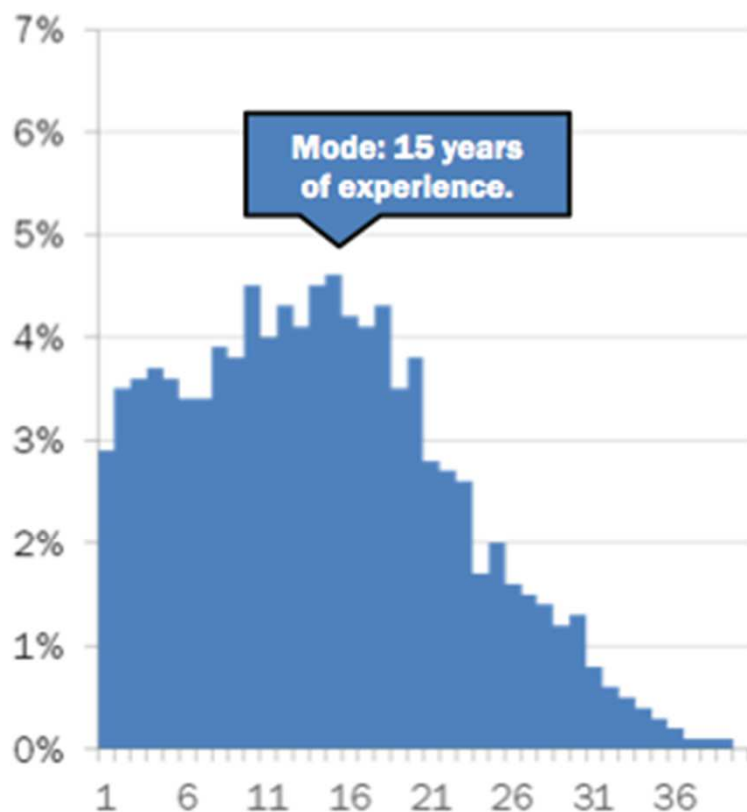
No professionally-grounded common system for preparing teachers

- Over 3,000 independent providers of initial teacher training
- No common specific curriculum for preparation for initial teaching
- A reliance on conventional academic credentials as the standard content knowledge
- Licensure weakly linked to practice
- No common standard of performance for entry to independent practice with (on) young people

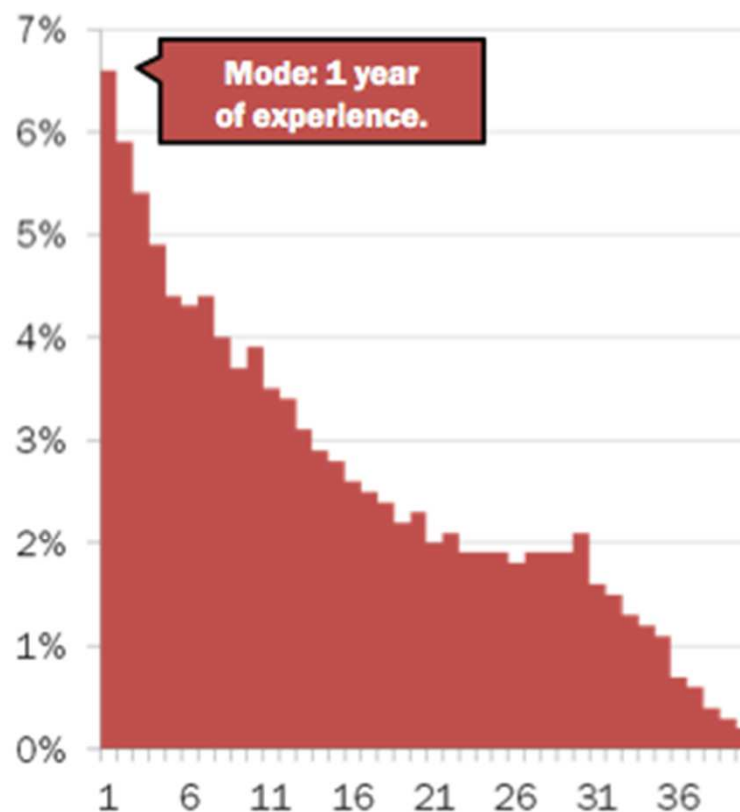
Beginning teaching on the rise

Teacher Experience as Share of Workforce

1987-1988



2007-2008



SOURCE: Thomas G. Carroll and Elizabeth Foster, "Who Will Teach? Experience Matters" (Washington, D.C.: National Commission on Teaching and America's Future, January 2010).

Entry-level teaching as a critical focus

1. More U.S. schoolchildren have a first-year teacher than a teacher with any other number of years of experience.
2. Evidence that beginning teaching is on average significantly less effective
3. Distribution of beginning teaching is concentrated disproportionately in low-income and high-minority schools.

Why is this the case? Two main threads from our nation's history

The construction and development of the occupation of teaching in the U.S.: eased entry, cellular structure, and easy replacement

- Lack of shared codified professional knowledge, lack of shared standards for teaching quality
- Lack of investment in professional training

The development of localism: cultural diversity, parental rights

- Democratic political authority and governance of schooling
- School management and unionization
- Highly varied and inequitable opportunities and outcomes for students

A special moment for change

OPPORTUNITIES

1. “Teacher quality” of more interest than ever
2. Higher education teacher education dominates the market
3. Teacher shortages

CHALLENGES

1. Lack of belief in and concern about teacher preparation (e.g., public reaction to NCTQ report)
2. Dominance of individualism in education and ed reform

Moving forward to a professional system of teacher preparation

- *Build on basic agreements about domains of teaching and evidence about content knowledge for teaching:* Identify **key specific practices of teaching** and **high-leverage content** essential for responsible entry-level practice
- *Build on commitment to clinical preparation:* Develop **specific approaches to training** beginners to carry out those practices, along a **continuum of contexts** for learning and practicing practice
- *Build on commitment to performance assessment:* Develop **performance assessments of specific practices and content** and require individuals to demonstrate entry-level standard of practice before beginning

Examples of high-leverage practices

- Leading a whole-class discussion
- Eliciting and interpreting individual students' thinking
- Explaining and modeling core content
- Establishing norms and routines for classroom discourse
- Recognizing particular common patterns of student thinking
- Setting up and managing small group work
- Selecting and using specific methods to check understanding and monitor student learning
- Composing, selecting, adapting quizzes, tests, and other methods of assessing student learning of a chunk of instruction
- Conducting a meeting about a student with a parent or guardian

Content knowledge **for teaching*

- Knowing the content that the students are supposed to learn
- Knowing ways to unpack, represent, and make that content learnable
- Knowing how students think about the specific content
- Knowing ways to teach the specific content

(Ball, Thames, and Phelps, 2008, *JTE*)

Ethical practice and the commitment to equity and diversity

- Inequity is reproduced inside of instructional practice.
- Teachers have leverage at strategic points in their work.
- This depends on joining concerns for equity with the daily and minute-to-minute work of teaching.

(Ball, Shaughnessy, Mann, Farmer, 2014)

To whom should teacher preparation hold itself accountable?

- To the students in the classrooms of first-year teachers.
- To the families of those students.

To what should teacher preparation hold itself accountable?

- To the quality of entry level teaching.
- To the ability of their first-year graduates as first-year teachers to continue to learn in and from practice, and from the contexts in which they work.

It won't be easy.

- The scale of the enterprise is vast and the U.S. has weak educational infrastructure.
- It will take a movement to build a rigorous system of professional training for the responsibility of teaching our nation's youth, in order to achieve fairness in common access to skilled teaching.
- This argument focuses on ***teaching***, not ***teachers***. It focuses on building capacity, not finding talent and firing.
- It is not the “American way”—it is detailed (even prescriptive), not individually discretionary, common.

But it is our moment.

- Teaching is more broadly understood as crucial to children's life chances.
- There's more attention to teacher preparation than ever before.
- We've done more as a community in the last couple of decades (InTASC, edTPA, AACTE, CCSSO. . .)