

# The Signal and the Noise: Changing Teacher Preparation

[MSRI](#)

[Critical Issues in Mathematics Education](#)

[The role of the mathematics department in the  
mathematical preparation of teachers](#)

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March 26, 2014

1. Enormous societal forces affecting higher education
2. Inexorable change: our institutions and how we provide education
3. Challenges and Opportunities for mathematics education and teacher preparation

# 1. Cacophonous Societal Forces

- Globalization of employment =necessity of globally competitive educated workforce;
- Severe gap in economic opportunity
- Escalating college costs, affordability
- Dramatic cuts in funding and Increase in accountability by state and federal governments
- Technology: new forms of course delivery, student assessment, institutional use of big data

5.6 million

1.75 million

187 thousand

# Since Recession

HS – lost additional 230k jobs

Some college – 1.6M GAIN

College plus – 2M GAIN

# Chasm in Education Success

Of those 24 years old:

in the *top economic quartile* -- **~80%** hold at least a four-year college degree

in the *bottom economic quartile* **~10%** hold a 4-year college degree

# Societal Forces

- Globalization of employment = necessity of globally competitive educated workforce
- Economic opportunity
- Escalating college cost
- Cuts in funding/increase in accountability
- Technology: courses, assessment, big data

# Our competitors will eat our lunch





Then parade it in front of all others



## 2. Inexorable (and noisy) Change

- Degree completion
- Institutional transformation/erosion of boundaries
- Enhance and measure student learning
  - PCAST: Prepare and Inspire/Engage to Excel
  - Plethora of initiatives
- Partnerships in workforce development

# Degree Completion

Gates/Lumina

APLU/AASCU

AACC

Obama Administration

Carnegie Foundation Pathways

Institutions: Georgia State, Arizona State, FIU

# Institutional Transformation

Gates/USU-APLU

Gates/university systems

The Alliance/Lumina

AAU undergraduate STEM initiative

# Transforming Student Learning

- Cal State/Keck/PKAL STEM Education Effectiveness Framework Project
- AAC&U-- “Teaching to Increase Diversity and Equity in STEM”
- AAU Improving undergraduate STEM education: Brown, Davis, Arizona, MSU, Penn, WUSTL, UNC, Boulder
- Integration of Strategies that Support STEM Education” (ISSUES) -- science and mathematics societies
- Centers for the Integration of Research on Teaching and Learning (CIRTL)
- Bay View Alliance - -BVA
- Carnegie’s Networked Improvement Communities and their mathematical pathways projects
- APLU – MTE-Partnership

# Change is happening



### 3. Opportunity for Change – A clear signal --GRAB it!

Global economic and workforce changes  
&  
University attention to degree completion and  
institutional reform  
=  
Critical need to transform  
mathematics education

Grab the reins and take off!





# Friedlander's Challenges

- A.) Revision of pathways leading to higher retention and completion, especially for underprepared students.
- B.) Revisions of curricula, especially in first two years of College mathematics, suiting the changing landscape of mathematics-intensive subjects.
- C.) Increased cooperation with other disciplines to better support STEM careers.
- D.) Revisions of teaching methodology leading to more engagement by our students.
- E.) Revisions of graduate training in light of changes in the professoriate.

# Transforming Post Secondary Education in Mathematics:

[tpsemath.org](http://tpsemath.org)

initiated by Eric Friedlander, Jim Gates, Mark Green, Phillip Griffiths, Tara Holm, and Uri Treisman

# Gobstein's addendum

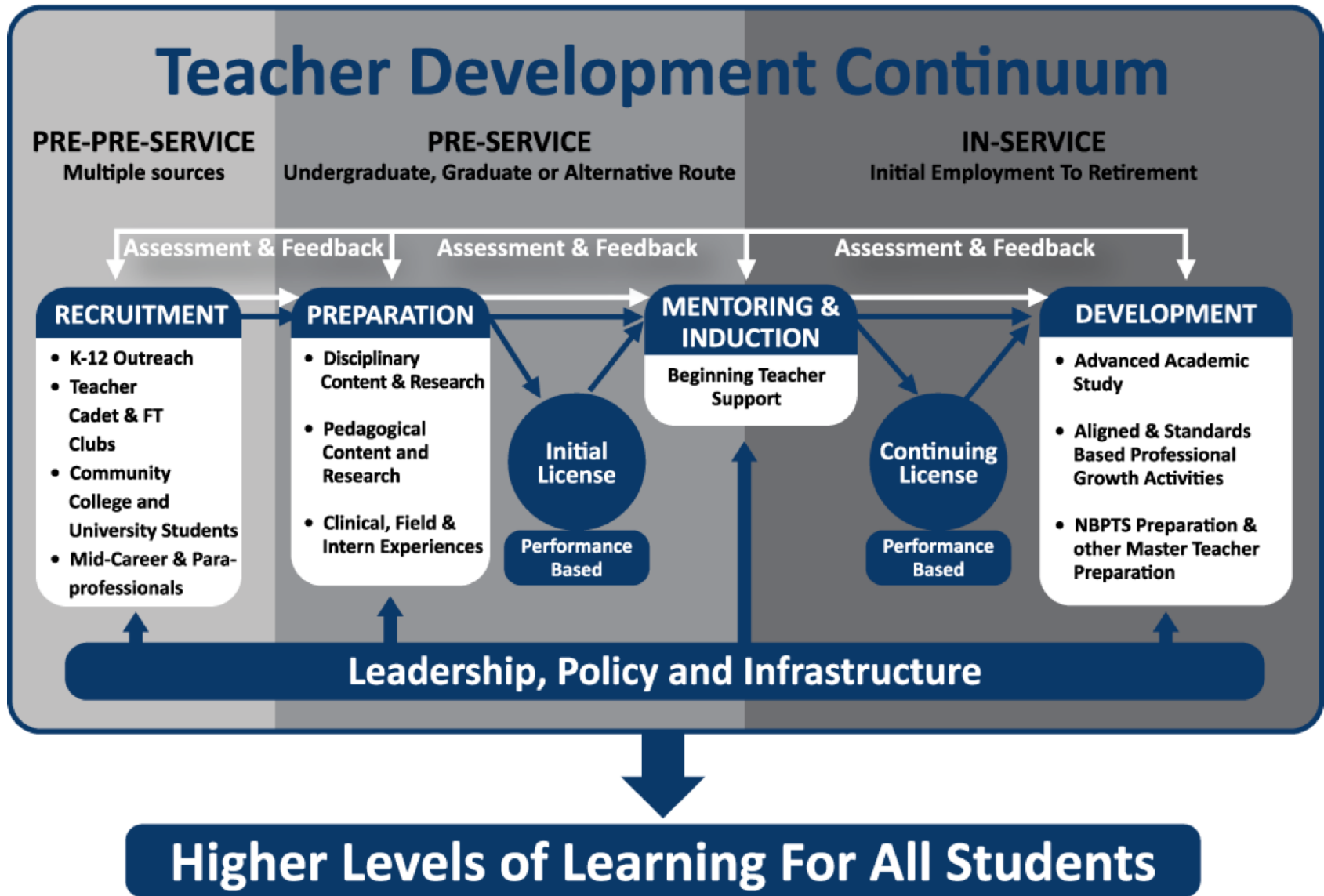
Is your institution focusing on enhancing degree completion?

- What role would greater success in mathematics courses contribute to institutional objectives? Does your Department know the DFW rates in courses? Do you and your colleagues attempt to improve those rates?
- How would better high school mathematics preparation help incoming students succeed in your courses?
- Are there institutional objectives to which your department might contribute by improving mathematics instruction and participating in teacher preparation?

Is your institution engaged in any of the national or regional initiatives for stem reform?

- How might the mathematics department contribute to the institution's participation in this project?

Figure 1. Teacher Development Continuum



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# METII offers you an extraordinary role – recruitment -> clinical experience

How might you “*PREPARE AND INSPIRE*” (PCAST, 2010) the students taking your mathematics classes to enhance student interest in learning mathematics, and in teaching?

Might you adopt programs such as Learning Assistants to give undergraduates an opportunity to experience teaching as they assist their student peers in learning course material?

# Preparation

How might pedagogical practice in mathematics courses model practices we hope teacher candidates might employ?

How well do mathematics concepts and courses align to progressions as contained in METII and CCSS?

# Clinical

Does your institution have partnerships with K-12 districts?

How do math professors collaborate with math educators to provide professional development for mentor teachers and meet mutual education goals with school systems?

It may feel you are slogging... but





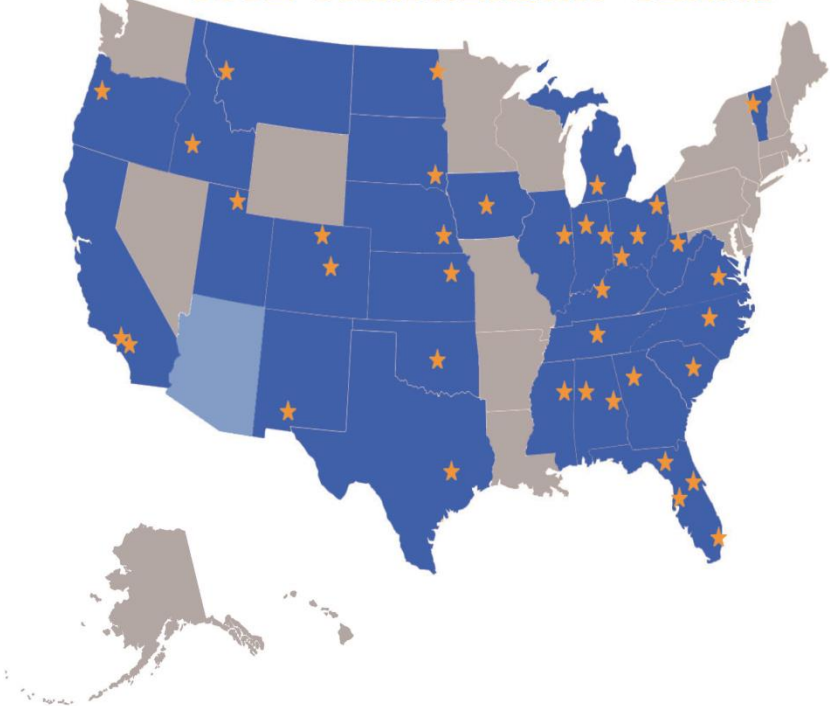
# You are not alone



# APLU – SMTI and MTE-Partnership States



**MTE-PARTNERSHIP TEAMS**



# Your Vested Interests

## (with some thanks, again, to Friedlander)

- The size of your math dept determined by teaching demands
- Mathematics is largest gateway course on many campuses -- most students in math courses seek math education for their (non-mathematics) future careers.
- Future dept funding determined in part by your success in retaining and inspiring students who are not self-motivated to study mathematics. Your students will become the Community College and K12 instructors who educate your future students.
- University administration increasingly gains acknowledgement from state leaders for collaborating with school systems – as in providing well prepared teachers
- The stature of your profession in the scientific community will be much influenced by the successful interactions you have with faculty and students in mathematics intensive disciplines. (Shot across your bow – PCAST report recommended increased mathematics course instruction by non-mathematician faculty from other math-intensive disciplines)

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2. Inexorable higher education change
3. Opportunities for mathematics education and teacher preparation

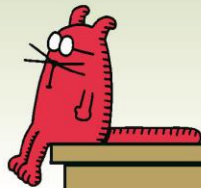
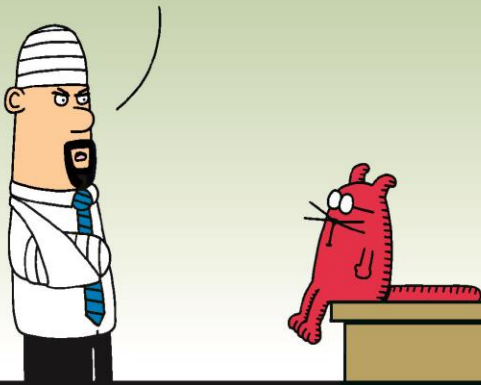
# Mathematics is KEY to education success

Whatever you do

However you do it

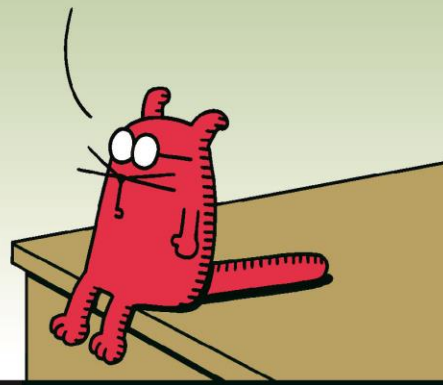
You **MUST** change the cultural norms around learning mathematics

ALICE BROKE MY  
ARM. YOU NEED TO  
DO SOMETHING  
ABOUT THIS.



Dilbert.com DilbertCartoonist@gmail.com

OKAY. I'LL COMPARE  
ALICE'S ECONOMIC  
VALUE TO YOURS AND  
DECIDE WHO TO FIRE.



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NO FAIR!  
SHE'S AN  
ENGINEER!



YOU GOT  
BEAT UP BY  
SOMEONE  
WHO IS ALSO  
BETTER AT  
MATH?



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