PhysTEC 2016

Transforming Secondary Math Teacher Preparation: Ideas for Physics Teacher Programs

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“Building Scale: Using the NIC Design to Transform Mathematics Teacher Preparation”
Improvement Science

Get Better at Getting Better

- Organize networks
- Learn through inquiry
- Embrace measurement
- See the system
- Attend to variability
- Problem-focused
Every system is perfectly designed to get exactly the results it achieves.
Why Improve? A Perfect Storm of Factors for Mathematics Teacher Preparation

Questions of teacher preparedness

College readiness

Declining US standing

New competitors

Accountability

Rising labor demand for math literacy

Changing student profiles

National attainment goals
Challenges of Complexity

- Innovation abounds!!! How to share? How to spread?
- Cause/effect not always clear
- Results take time, difficult to track, understand status
- Varying institutional buy-in to change
- Hard to share knowledge, lessons to expand impact
Present Approaches to Advance Change
INSUFFICIENT!!!

- Share news, information, practices
- Analyze issues – distribute reports
- Organize support for common goals
- Develop tools, metrics, frameworks
- Convene groups
- Recognize excellence thru awards
- Promote promising practices
Accelerating Our Capacity to Learn to Improve in Education: Networked Communities Engaged in Improvement Research

Paul LeMahieu
Senior Vice President, Carnegie Foundation for the Advancement of Teaching
Networked Improvement Communities: What are they?

Reconceiving the challenge:

• How to implement complex ideas reliably and at scale

• How to move from *fidelity* of implementation to *integrity* of implementation
Integrating Two Big Ideas

- Improvement Science
  - Collaboration toward common goal
  - Continuous improvement
  - Shared knowledge, data
  - Accelerated learning

- Networked Communities
Key Tenets

- Work is problem-specific, user-centered
- Focus on variation in performance
- Understand the system that produces the outcomes
- Cannot improve at scale what cannot be measured
- Use disciplined inquiry to drive improvement
- Accelerate learning through networked communities
Rapid Cycle of Prototyping, Testing, and Revision

- **Act**
  - What changes are to be made?
  - Next cycle?

- **Plan**
  - Objective
  - Predictions
  - Plan to carry out the cycle (who, what, where, when)
  - Plan for data collection

- **Study**
  - Analyse data
  - Compare results to predictions
  - Summarise what was learned

- **Do**
  - Carry out the plan
  - Document observations
  - Record data
Mathematics Teacher Education Partnership (MTE-Partnership)
39 Partnership Teams – 31 States:
• 100 universities and community colleges
• Over 100 school systems
The Issues

- New secondary mathematics teachers need to be prepared differently in light of the Common Core State Standards and other college- and career-ready standards, the Mathematical Education of Teachers II, and NCTM’s new Principles to Actions.

- Across the nation, there is a shortage of secondary mathematics teachers.
MTE-Partnership Goal

To *transform* secondary mathematics preparation to ensure an adequate supply of new teachers who can promote mathematical excellence in their future students.

“To set the bar for the nation in secondary mathematics teacher preparation”
Root Cause Analysis

CC Common vision across stakeholders

CC Improving content preparation

CC The nation is not producing enough new secondary mathematics teachers, who can help students achieve the Common Core State Standards for Mathematics content and practice standards.

CC Preparing & supporting mentoring teachers

CC Recruitment

CC Retention

Improving knowledge/use of educational practices for pre-service mathematics teachers
Creating a “gold standard”
Programs document that their graduates are capable of providing the ambitious instruction and deep learning compelled by CCSSM, based on benchmarks to be developed by the MTE-Partnership

More and better new teachers
To prepare <target number> of graduating secondary mathematics teachers with an emphasis on increasing diversity.

Creating a Vision
Creating a common vision of and commitment to SMTP among stakeholders

Clinical Preparation
Developing and supporting mentor teachers who can provide field experiences that support candidates’ development of instructional practices.

Content Knowledge
Developing candidates’ knowledge of mathematics needed to support student learning of content and practices

Recruitment and Retention
Attract and maintain an adequate supply of candidates

Clinical Experiences. Innovative models supporting candidates’ development of effective mathematical teaching practices.

Active Learning in Mathematics. Use of active learning strategies in introductory university mathematics courses.

MODULE(S)2 (Mathematics of Doing, Understanding, Learning and Educating for Secondary Schools). Developing modules to build particular mathematical knowledge needed to teach.

MATH (Marketing to Attract Teacher Hopefuls). Models for developing and launching marketing campaigns that rebrand teaching to appeal to more students.

STRIDES (Secondary Teacher Retention & Induction in Diverse Educational Settings). To improve teacher retention rates in early career secondary math teachers.
MTE-Partnership: Addressing the Downward Cycle In Mathematics Education

MTE-Partnership’s Research Action Clusters (RACs)

- **MATH**: Marketing for Attracting Teacher Hopefuls -- Moving beyond advertising to attract candidates
- **ALM**: Actively Learning Mathematics -- Improving instruction in introductory university mathematics classes
- **MODULES²**: Mathematics of Doing, Understanding, Learning and Educating for Secondary Schools -- Developing materials to address specific mathematical needs of secondary math teachers
- **Developing Effective Clinical Experiences**: Mentor professional development; alternative models
- **STRIDES**: Secondary Teacher Retention & Induction in Diverse Educational Setting -- Retaining new math teachers in the profession

www.MTE-Partnership.org
Design Principles

- Making a real contribution -- Improving, not just studying. Transforming, not just tweaking.
- Building a common focus and language -- see Guiding Principles.
- Continuing to build partnerships. And harnessing those partnerships in the effort.
- Being able to demonstrate our success – in a scientifically rigorous manner.
- Engaging in “continuous improvement” – improvement is a process, not an outcome.
- Then scaling improvements across the network.
- Building an infrastructure to support the network.
Measures -- An essential component of the NIC model

- Measures of candidate quality:
  - Common classroom observation protocol (piloting the MCOP2)
  - Mathematical knowledge for teaching (exploring possibilities)

- Measures of program quality (aligned with the Guiding Principles):
  - Candidate perceptions of preparedness
  - Employer perceptions of preparedness
  - Program self-evaluation
Challenges to Improvement

• Maintaining engagement:
  – This is largely a volunteer effort, which means that it adds another layer to people’s jobs.
  – Mathematicians may not see this as “Job 1” – particularly non math-content related activities.
  – K-12 personnel may not see this as “Job 1” – particularly given the pressures to improve the practices of their current teachers.
For More Information

• www.MTE-Partnership.org

• Howard Gobstein, Co-Director
• Gary Martin, Co-Director
  (and creator of many of these slides)