



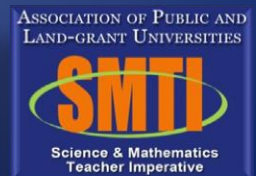
APLU Science and Mathematics Teacher Imperative

MATHEMATICS TEACHER EDUCATION PARTNERSHIP

The MTE-Partnership: Rethinking Secondary Mathematics Teacher Preparation

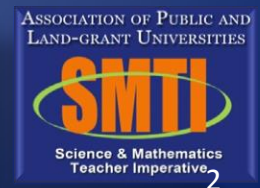
Presentation to the
Critical Issues in Mathematics
Education Workshop, MSRI

March 27, 2014



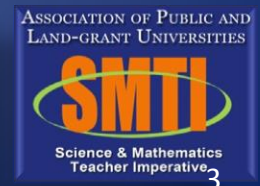
Session Goal

- To provide examples of how mathematics departments have participated in the improvement of the mathematical preparation of teachers.
- Special emphasis will be placed on the “Research Action Clusters” formed by the Mathematics Teacher Education Partnership.

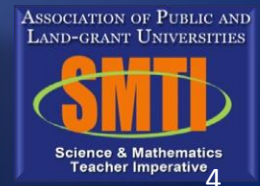


Presenters

- W. Gary Martin, Auburn University
 - Clinical Experiences RAC
- Cynthia Anhalt, University of Arizona
 - MATH (Marketing for Attracting Teacher Hopefuls) RAC
- Mike Mays, West Virginia University
 - Building Communities and Courses RAC
- Jim Lewis, University of Nebraska Lincoln
 - Actively Learning Mathematics RAC

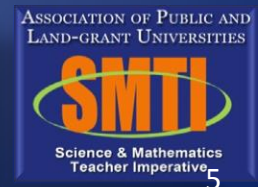


CLINICAL EXPERIENCES RAC



Auburn University: Developing a Math/Math Education Partnership

- 14-year effort to build a strong working partnership between the mathematics department and the mathematics education program.
 - Biweekly math/math education seminar – on-going for more than a decade.
- Track record with grants (NSF MSP, NSF Noyce Master Teacher, ED MSP, private gifts, ...)
 - Mathematicians serve on the PI team for each of the projects and are integrally involved in both planning and implementation.
- Sample outcomes:
 - Over 100,000 person-hours of professional development
 - Revised content courses for elementary teachers
 - New capstone course for secondary teachers

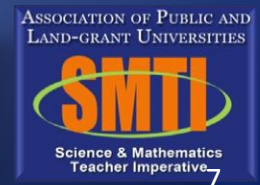


The Clinical Experiences RAC

- Problem: Inadequate supply of quality mentor teachers to oversee clinical experiences
- Solution Strategies:
 - Professional development for mentor teachers:
 - Knowledge of the Common Core
 - Building mentoring skills
 - New models for field experiences (e.g., “triad” model)
- Auburn’s team participates on this RAC, and Marilyn Strutchens serves as co-leader.

Auburn's Involvement

- Huajun Huang of the Department of Mathematics and Statistics serves on our planning team.
- Currently focusing on implementing the “triad” model.
 - Dr. Huang will plans to do a classroom observation of the pair of interns.
- Math department may become more involved as we focus more on professional development.



MATH: Marketing for Attracting Teacher Hopefuls Research Action Cluster

Building program structures for recruitment and retention

“MATH RAC”



MTE-Partnership

MATH RAC Team

- **Cynthia Anhalt**, University of Arizona
- **Laurie Cavey**, Boise State University
- **Joe Champion**, Boise State University
- **Ed Dickey**, University of South Carolina
- **Maria Fernandez**, Florida International University

The Problem

Teacher education programs at higher education institutions are not enrolling or graduating secondary mathematics teachers to satisfy the needs of U.S. middle and high schools

The Magnitude of the Problem

- APLU/MTEP institutions graduate an average of 10 secondary mathematics teacher candidates per year or about 430 annually
- A typical high school hires 2 new mathematics teachers annually
- There are over 27,000 secondary schools in the US with 50,000 mathematics hires annually
- 31% of secondary mathematics classes are taught by teachers without mathematics- related backgrounds
- Schools NEED highly qualified teachers of mathematics

Goals of this presentation

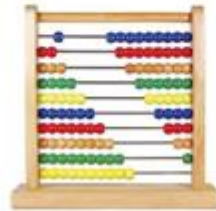
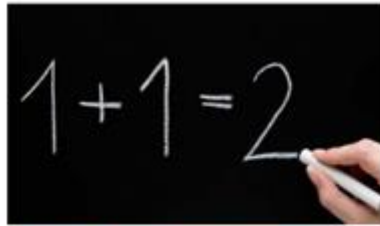
Focus on two issues for rethinking recruitment and retention

1. The image of the teaching profession for attracting a diverse student population
2. Strategies for increasing admission and graduation rates

Goals of the MATH RAC

- Attract and maintain an adequate supply of secondary mathematics teacher candidates
- Create a purposeful marketing plan to attract a diverse population of teacher candidates
- Address needs of different institutions and programs
- Investigate how to retain those we recruit with strong potential for teaching secondary mathematics

Traditional/Current Images of Teaching



Consider New Imagery for Teaching



Source: <http://inspireteachers.org/>

Recruitment and Retention Efforts

- Build an infrastructure to collect admission, progression, and graduation data
- Collect survey data (background information, interest, tutoring/teaching experiences, etc.)
- Analyze data by institution or program

Approaches by Institutions

- **USC** will pilot a professionally created marketing plan (which then becomes a resource to share)
- **FIU/Arizona** will develop recruiting materials and conduct targeted recruitment of STEM majors, other undergraduates, and high school students
- **Boise State** will use survey data on interest and experience to identify high-impact recruitment strategies

Our Work Thus Far

- Experiment with strategies and different models
- Structured Plan-Do-Study-Act cycles for experimenting and gathering data from various sites (Carnegie Foundation)
- Incorporate input from different perspectives
- Adapt approaches to fit local needs
- Collaboration with 100Kin10 and other STEM teacher preparation programs on rebranding and marketing
- Provide marketing and branding resources across partnership

Building Communities and Courses

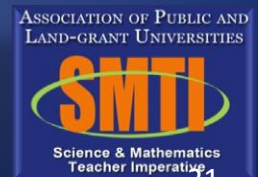
Develop mathematics or statistics courses for secondary mathematics teachers based on the METII requirements, incorporating integrative learning strategies that combine mathematics and pedagogy. Emphasis is on working collaboratively among stakeholders.

ACTIVELY LEARNING MATHEMATICS RAC



Actively Learning Mathematics RAC

- Consists of teams from five universities:
 - Auburn University (Ulrich Albrecht)
 - University of Colorado-Boulder (Eric Stade)
 - University of Nebraska at Omaha (Angie Hodge)
 - University of Nebraska-Lincoln (Jim Lewis)
 - West Virginia University (Vicki Sealey)
- Funding from Helmsley allows us to accelerate the work of this group



The Problem

- Too many students intending to be in STEM careers are not succeeding in introductory mathematics courses (focusing on precalculus and the calculus sequence). This is a barrier to STEM careers – including secondary mathematics teaching.
 - High DFW rates
 - Low rates of persistence
 - Limited exposure to mathematical practices

General Approach

- Increase students' active engagement in learning mathematics:
 - group work in class, group assignments outside of class;
 - use technology to increase practice outside class;
 - emphasis on concepts, problem solving, and motivating examples;
 - development of habits of mind (a.k.a. “mathematical practices”);
 - development of communication skills.
- Significant professional development for instructors.
- Learning Assistants



How do we motivate students to do their part?

The Carnegie Foundation's Quantway project has identified the following goals that they believe will result in *productive persistence*.

- Students have skills, habits, and know-how to succeed in a college setting
- Students believe they are capable of learning math
- Students believe the course they are taking has value
- Students believe they belong, i.e. they feel socially tied to peers, faculty, and the course
- Faculty and college support students' skills and mindsets

UNL: Transforming Instruction to Increase Student Success

The UNL team will focus work on transforming instruction in college algebra and precalculus, two courses that serve 1000 students in the fall and 500 in the spring. Our long term goal is to significantly increasing student learning and thus student success in these two courses.

- This work began with our college algebra course in Fall 2012. We invited Karen Rhea and Gavin LaRose to share the work in precalculus and calculus at the University of Michigan.
- **Benchmark:** Our five year average for student success was:
 - College Algebra – 62%
 - Precalculus – 68%
- Fall 2012 – Initial results were not good: College Algebra – **59%**

We started over

- We chose a new textbook – Connally, Hughes-Hallett, et al
- In Summer 2013, we invested in a major effort to write better lesson plans.
- We incorporated an “entry” Gateway Exam, WeBWork homework, and Team Quizzes into both courses.
- We created a professional development workshop for GTAs the week before classes
- We invested a substantial amount of faculty time to provide leadership and mentor GTAs

Fall 2013 – Much better results

College Algebra – **81%**

Precalculus – 76%

What next?

- Improving GTA professional development
 - Weeklong Professional Development Workshop
 - Ongoing Teaching Mathematics Seminar for GTAs
- Improving lesson plans
- Consider how classroom space impacts student success
 - UNL is renovating classrooms to support our instruction
- Time – Might slightly longer classes lead to student improvement?
- Understanding our students and how to motivate them
- Studying what our students do after these courses