Report to TODOS on the

Transforming Post-Secondary Education (TPSE) in Mathematics Conference

Hyattsville, Maryland

March 10-11, 2017

Ed Dickey, representing TODOS: Mathematics for ALL

Background:

A Common Vision for Undergraduate Mathematical Sciences Programs in 2015 explains the commitment of the American Mathematical Association of Two-Year Colleges (AMATYC), the American Mathematical Society (AMS), the American Statistical Association (ASA), the Mathematical Association of America (MAA), and the Society for Industrial and Applied Mathematics (SIAM) to modernize undergraduate programs in the mathematical sciences. This short book makes the case that "The status quo is unacceptable" and lays out a plan to "update curricula, scale up the use of evidence-based pedagogical methods, and establish stronger connections with other disciplines" (p.35).

Transforming Post-Secondary Education in Mathematics (TPSE Math) is an organization sponsored by Carnegie Corporation of New York, the Alfred P. Sloan Foundation, and the National Science Foundation, that aims to effect constructive change in mathematics education at U.S. community colleges, 4-year colleges and research universities.

> **Vision**: Post-secondary education in mathematics will enable any student, regardless of his or her chosen program of study, to develop the mathematical knowledge and skills necessary for productive engagement in society and in the workplace.
>
> **Mission**: TPSE Math will facilitate an inclusive movement to strengthen post-secondary education in mathematics by working closely with--and mobilizing when necessary--faculty leaders, university administrations, membership associations, and relevant disciplinary societies in the pursuit of mathematically rich and relevant education for all students, whatever their chosen field of study. TPSE Math will identify innovative practices where they exist, advocate for innovation where they do not, and work with and through partners to implement and scale effective practices.

TPSE Math Chairs+1 Conference #2: Broadening the Discussion: a follow up to the October Chairs+1 conference, Program Report

Approximately 150 Attendees including other Conference Board of the Mathematical Sciences professional societies such as NCTM, AMS, MAA, Benjamin Banneker, NCSM, AMATYC, ASSM (https://d3n8a8pro7vhmx.cloudfront.net/math/pages/172/attachments/original/1488849830/Chairs__1__2_participants_3_17.pdf?1488849830)

Agenda
(https://d3n8a8pro7vhmx.cloudfront.net/math/pages/172/attachments/original/1488556460/Chairs__1__2_agenda_3_17.pdf?1488556460

Welcome: *Brit Kirwan*, Chancellor Emeritus University System of Maryland and TPSE Math Senior Advisor

Attendees were primarily mathematics department chairs from colleges and universities working to transform post-secondary math curriculum and teaching. This conference focused on upper division courses.

Challenge: How to make math more attractive and relevant by relating it to careers? Broadening graduate education through:

-National Academy of Sciences studying graduate education in STEM

-National Science Foundation perspective

-new teaching strategies

NOTE: SACNAS is well known in the higher education mathematics community at this conference and might benefit from outreach and collaboration with TODOS: https://sacnas.org/

NOTE: Big Math Network connecting mathematical scientists in business, industry, and academia. Bigmathnetwork.wordpress.com. Opportunities for students, faculty, mentors, and departments.

Upper-Division Pathways

Uri Treisman, Dana Center and *Tanya Garcia*, Georgetown University Center for Education and the Workforce

Uri Treisman: Tennessee has implemented multiple math pathways greatly increasing college student participation in college math. Lots of activity in math departments but not well coordinated to allow sharing and collaboration.

Tanya Garcia, Georgetown University Center on Education and the Workforce spoke on the

Economic value of upper division pathways cited.

Quantitative literacy: students good at calculations, converting information to equations and words. Not good at making and evaluating assumptions, making judgments, drawing conclusions all based on mathematical information

Georgetown Center Data: math knowledge needed by workers. 33% require Algebra 2, 9% calculus or higher, 58% less than Algebra 1. Below is graph of math needed by professions.

Mismatch between high school and college mathematics and the mathematical literacy needed for careers.

Five innovative practices in forthcoming report. Two cited:

- Curriculum alignment with workforce requirements (Texas state technical college system)
- Program alignment with labor market demand (California CTELaunchboard, CT Training and Education Planning System)

3 hour simulation in groups of about 12 on the process of implementing change for academic programs upper division courses with math department and what resources are needed ‘

The National Academies’ *Revitalizing Graduate STEM Education for the 21st Century* project: Input from the Math Community

Alan Leshner, CEO Emeritus, AAAS, and *Layne Scherer*, Study Director, NAS

60% of new PhDs are NOT going into academic research and our grad education has not changed significantly in 100 years. NAS.edu/GradEd or stemgraded@nas.edu is seeking input on graduate STEM education for the study that has begun.

Trends in Employment for Mathematical Sciences PhDs *Michael Vogelius, NSF*

US is graduating double the number of PhD in math and stat over 15 years, 1000 to 1900.

Doubling of number of PhDs going into industry.

Big expansion of hiring for post-doc and non-tenure-track faculty.

NSF has Enriched Doctoral Training program, Mathematical Sciences Graduate Internship Program. www.orise.gov/nsf-msg

Discussing with EHR how to correctly advise/direct and fund efforts that broaden participation and bridge transition from undergraduate to graduate.

NSF INCLUDES Grant Program to broaden participation

Dean Evasius, NSF EHR Division of Graduate Education

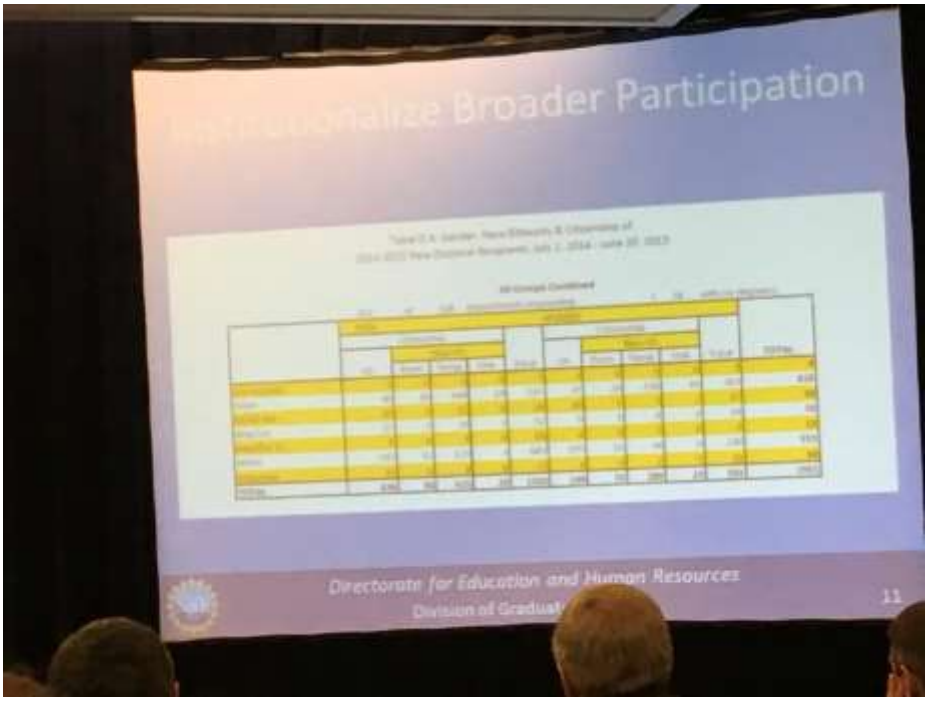
5/6 STEM Doctorates are outside tenure track

30% of new math PhDs are in doctoral granting depts.

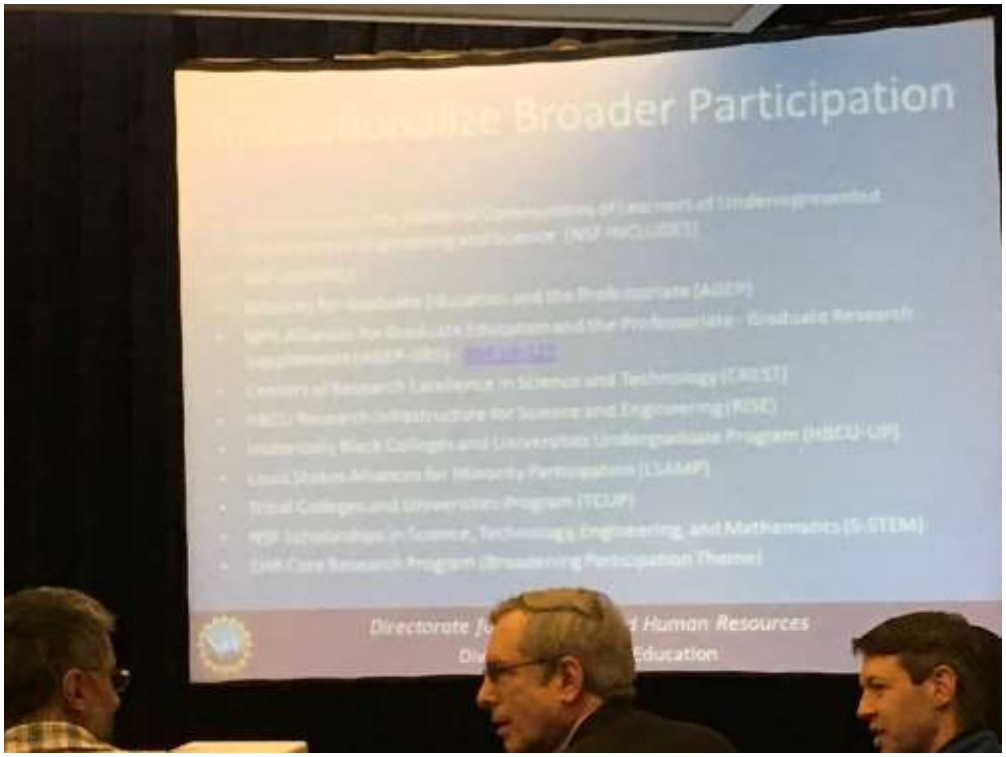
NSF programs focusing on Professional Development listed on slide below:

Percentage of females with math PhD is flat at 30

6% from underrepresented groups.



NSF programs to broaden participation listed in slide below:



Karen Saxe from American Mathematical Society: spoke of new teaching strategies described in the Common Visions book. Active learning through problem based instruction.

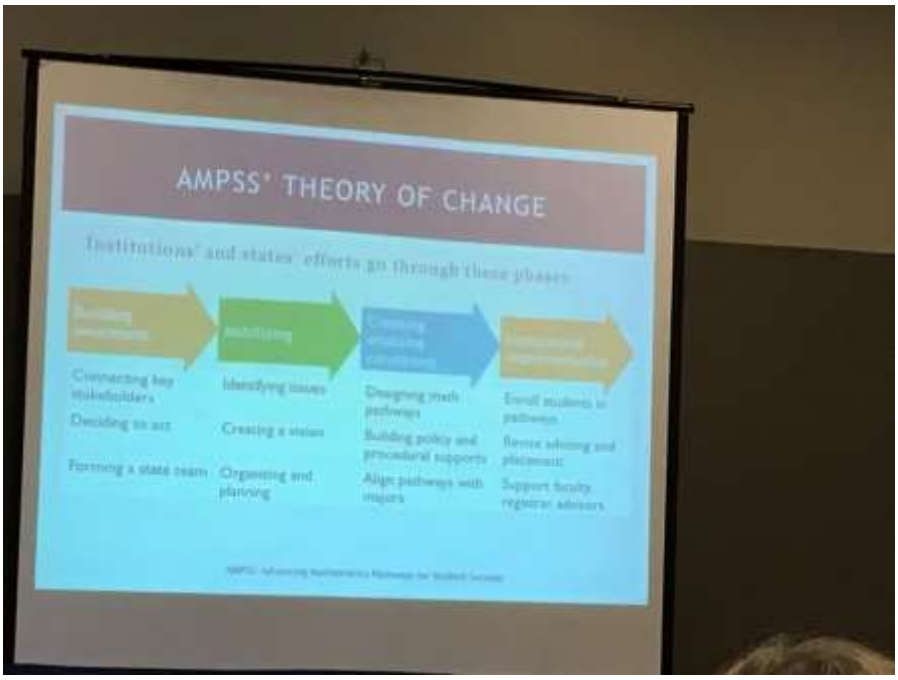
Workshops

Modernizing Math Pathways: Network Nationally & Plan Locally, *Heather Ortiz*, Dana Center and *David May,* APLU and Advancing Mathematics Pathways for Student Success (AMPSS).

NOTE: Participated with Katherine Sophia Merow, now AMS writer, who has worked with Diane.

Math is barrier to degree completion. 45% D-F-W in college algebra. Remediation, Relevance, and Transfer all contribute to the barrier. Solution is modernize math pathways... examples statistical or quantitative reasoning along with college algebra and calculus.

Evidence of promise from Quantway and Statway. Increase from 6 to 48% in course completion. Even larger increases among underrepresented groups. In Tennessee passing went up 4 times for all and 6 times for underrepresented groups.

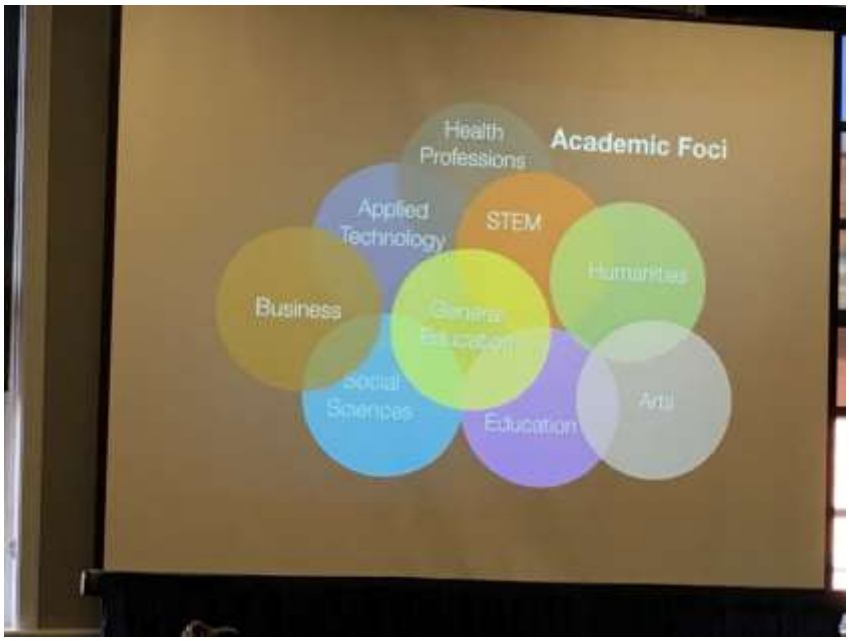


Corequisite Remediation and Math Pathways, *Tristan Denley*, Tennessee Board of Regents

Deciding on a major in first year impact college completion positively

Tennessee created academic focus areas.

Courses in areas are optimized to allow courses that count in many areas. Declared majors has increased from 68% to 83%. First year students taking 9 credits in focus have more than twice the chance of graduating.



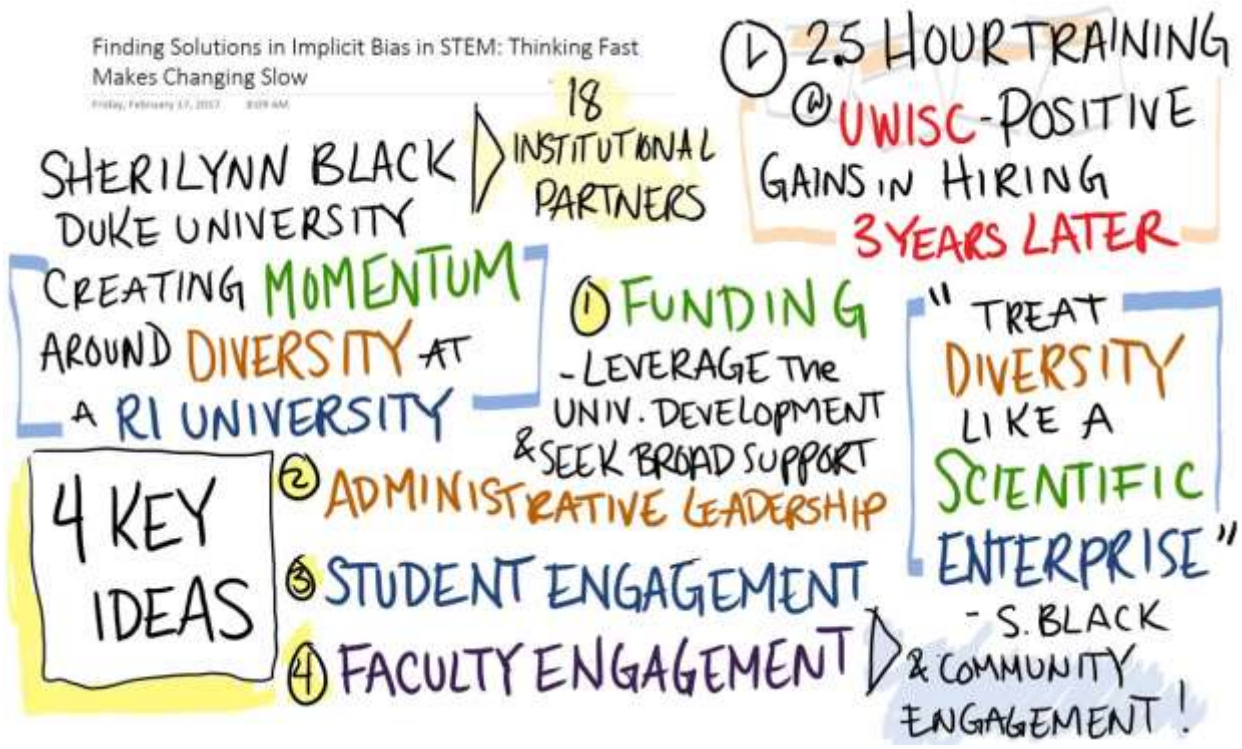
Corequisite remediation has allowed students to earn credit and progress. 20% pass rates to 70% at two year colleges. Even greater impact for minority students. 7% to 47%. Corequisite remediation costs about half of prerequisite remediation. Those not succeeding are impacted by factors other than preparation and more so by life challenges.

Shared through Twitter:

Six Ways Mathematics Instructors Can Support Diversity and Inclusion, *Natalie Hobson*, University of Georgia

http://blogs.ams.org/matheducation/2017/03/06/six-ways-mathematics-instructors-can-support-diversity-and-inclusion/#sthash.2FlCoSn5.dpbs

Finding Solutions to Implicit Bias in STEM *Layne Sherer* and *Sherilynn Black*:
https://twitter.com/LayneScherer/status/833023512642256896/photo/1


Finding Solutions in Implicit Bias in STEM: Thinking Fast Makes Changing Slow
SHERILYNN BLACK
DUKE UNIVERSITY
18 INSTITUTIONAL PARTNERS
1) 2.5 HOUR TRAINING @ UWISC - POSITIVE GAINS IN HIRING 3 YEARS LATER
CREATING MOMENTUM AROUND DIVERSITY AT A RI UNIVERSITY
4 KEY IDEAS
1) FUNDING - LEVERAGE THE UNIV. DEVELOPMENT & SEEK BROAD SUPPORT
2) ADMINISTRATIVE LEADERSHIP
3) STUDENT ENGAGEMENT
4) FACULTY ENGAGEMENT
" TREAT DIVERSITY LIKE A SCIENTIFIC ENTERPRISE "
- S. BLACK
& COMMUNITY ENGAGEMENT !