Teaching Math* in the 21st Century

*mathematical sciences = math / stats / data sciences

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Transforming Post-Secondary Education in Mathematics

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Outline

- Change is coming
- TPSE Math Strategic Priorities
- TPSE Math Actions (Present / Future)
- Finale
TPSEMath Leadership
Transforming Post-Secondary Education in Mathematics

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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.

We believe that a collective effort by the mathematical sciences community will be required to achieve that vision.
Change is coming
Change is coming ... why now?

Answer 1

Discipline-based education research, which matured in the 1980s and 90s, has produced significantly new ways of understanding knowledge, thinking and learning.
Change is coming … why now?

Answer 2
There is renewed federal interest in higher education in general, and undergraduate STEM in particular.
Change is coming … why now?

Answer 3
It has become a question of social justice. Higher education is key to social mobility. Mathematics classrooms are among the most segregated in the United States.

“… over the entire career, the typical bachelor’s degree graduate worker earns $1.19 million, which is twice what the typical high school graduate earns …”

Some surprising statistics

- How much more likely are women than men to choose not to continue beyond Calc 1, even when Calc 2 is required for their major?  
  About twice as likely

- What % of bachelor’s degrees in math are earned by women? 41%

- What % of PhDs in math+stats are earned by women? 32%

- What % of postdocs in math went to women? 25%

- What % of tenured faculty in doctoral math departments are women? 14%

- What % in top 50 research departments? 11%
Some surprising statistics

- # Associates degree granting institutions: 1113
- # Baccalaureate degree granting institutions: 991
- # Master’s degree granting institutions: 741
- # PhD degree granting institutions: 335
Some surprising statistics

Who here, as an undergraduate, took (math) courses at more than one institution?

- What % of undergraduate students attend 2-year colleges? 42%
- What % 4-year college students had enrolled in a 2-year college? 46%
- What % of low-income students attend a 2-year college? 44%
- What % of high-income students attend a 2-year college? 15%
Some surprising statistics

Who here, as an undergraduate, took (math) courses at more than one institution?

- What % of students attending 2-year colleges take math courses that are not credit-bearing? > 60%
- What % of those never complete a math course? > 70%

Over 40% of students who start at a 2-year college never finish simply due to the math barrier.
TPSE Math Strategic Priorities

- Coherent Pathways (lower division)
- Enhanced/Alternative Pathways (upper division)
- New Teaching Strategies
- Graduate Education
Multiple pathways and improved completion rates: Dana Center, APLU/AASCU

Creating an administrative center at Maryland

Building an action network beyond the math community:

- Administrators
- Funders
- State governments and officials
- NSF / Federal agencies
- Employers and other stakeholders
Mobilizing Chairs

Mathematics Advisory Group

Chairs + 1 Meetings - October / March

Dig more deeply into Upper Division pathways

Hear from other STEM areas

Analyze the “demand side”
Strategic Priorities

- Coherent Pathways (lower division)
- Enhanced / Alternative Pathways (upper division)
- New Teaching Strategies
- Graduate Education

The challenge: Enhancements to graduate education are needed to better prepare students for careers in an evolving environment.
"The United States is the pre-eminent hub for academic training."

(Senior policy analyst Neil G. Ruiz of the Brookings Institution in The Geography of Foreign Students in US Higher Education)

**Doctoral Degrees Awarded**

**Figure A.2: New PhDs Awarded by Group**

- Total Doctoral Degrees Awarded
- Doctoral Mathematics Combined
- Statistics & Biostatistics Combined

**Figure E.2: US Employed by Type of Employer**

- All Mathematics*: 362 (26%)
- Business & Industry: 409 (29%)
- Government: 77 (5%)
- Master’s, Bachelor’s, & 2-Year Colleges: 258 (18%)
- Other Academic & Research Institutes**: 234 (17%)
- Statistics & Biostatistics: 72 (5%)

*Includes all Math Public, Math Private, and Applied Math departments.
**Other Academic consists of departments outside the mathematical sciences including numerous medical-related units.
Graduate Education
Graduate Education
Graduate Education

TPSE Math
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Finale – What can TPSE do?

What additional resources would be most useful for your Department? What input from other Departments would be most helpful?

- Make a note on a TPSE sheet
- Discuss with your table
- Report out – any commonalities?
Let’s work together …..

Thank you!!

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