Teaching Math* in the 21st Century

*mathematical sciences = math / stats / data sciences

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Transforming
Post-
Secondary
Education in
Mathemetics

AMS
American Mathematical Society
Committee on Education

14 October 2016

Outline

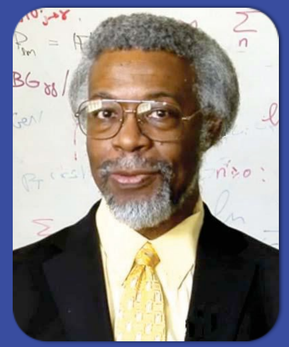
- Change is coming
- TPSE Math Strategic Priorities
- TPSE Math Actions (Present / Future)
- Finale

TPSEMath Leadership

Transforming Post-Secondary Education in Mathematics

Phillip Griffiths
IAS

Eric Friedlander
USC



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Carnegie Corporation of New York

Alfred P. Sloan Foundation

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TPSEMath Vision

Transforming Post-Secondary Education in Mathematics

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.

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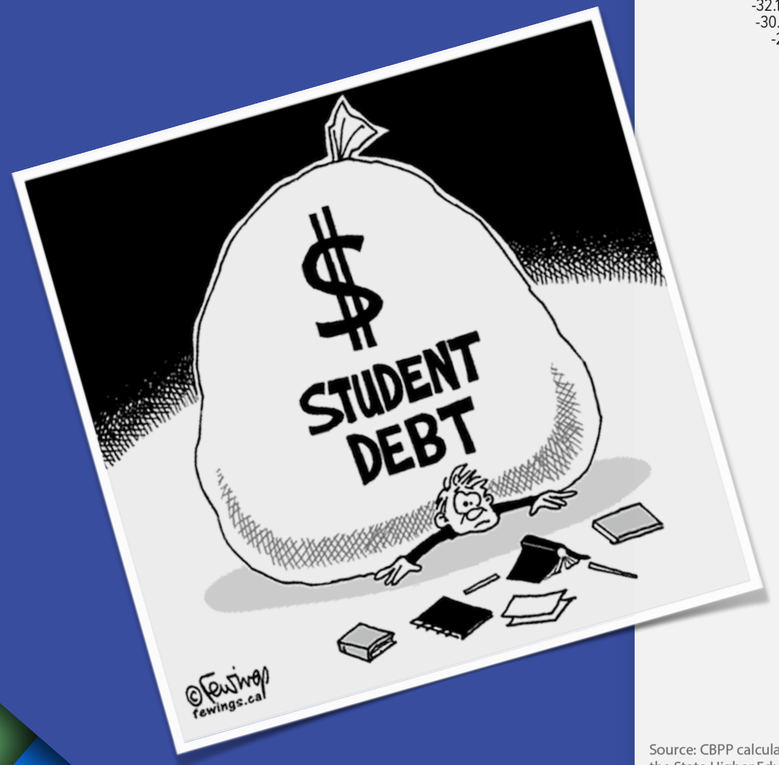
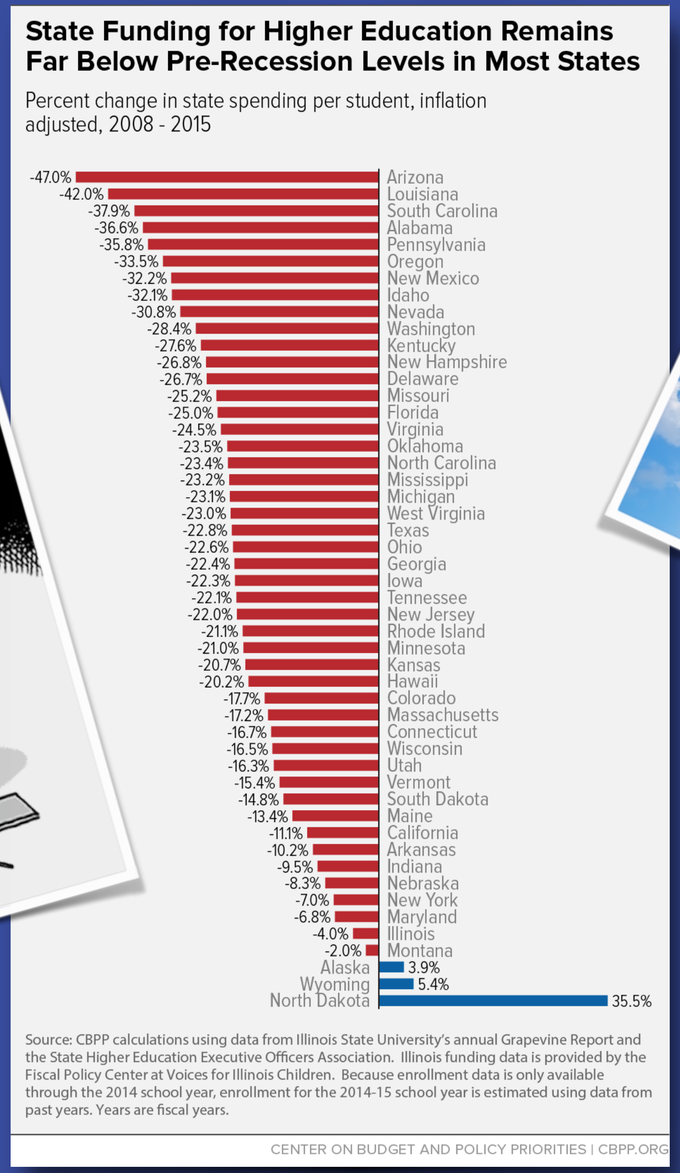
Change is coming

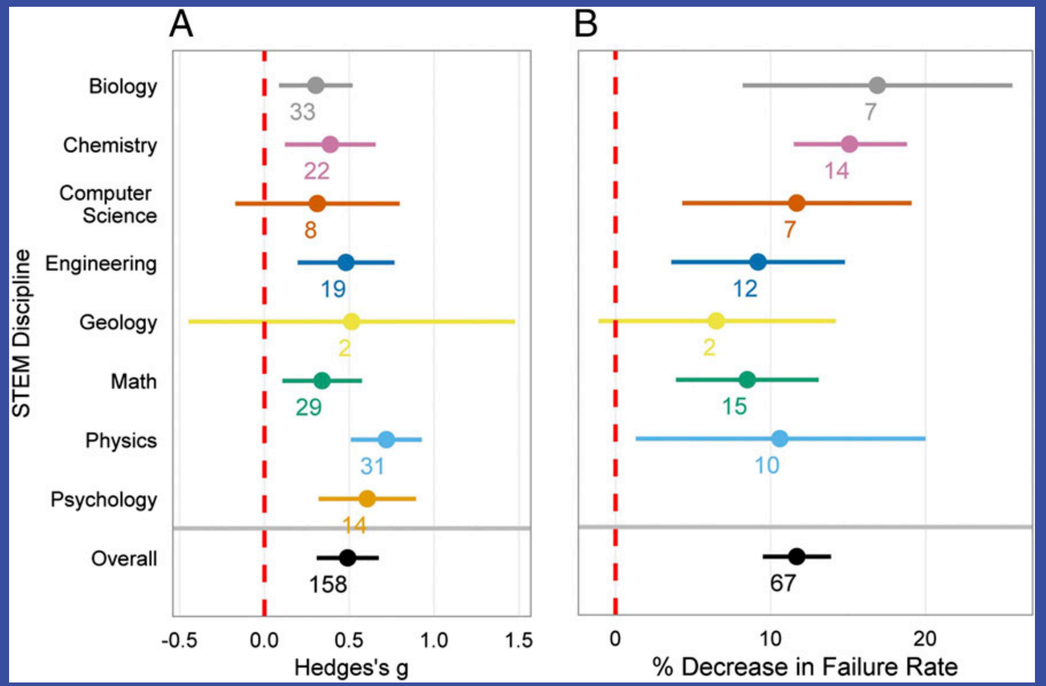




Change is coming … why now?

Answer 1

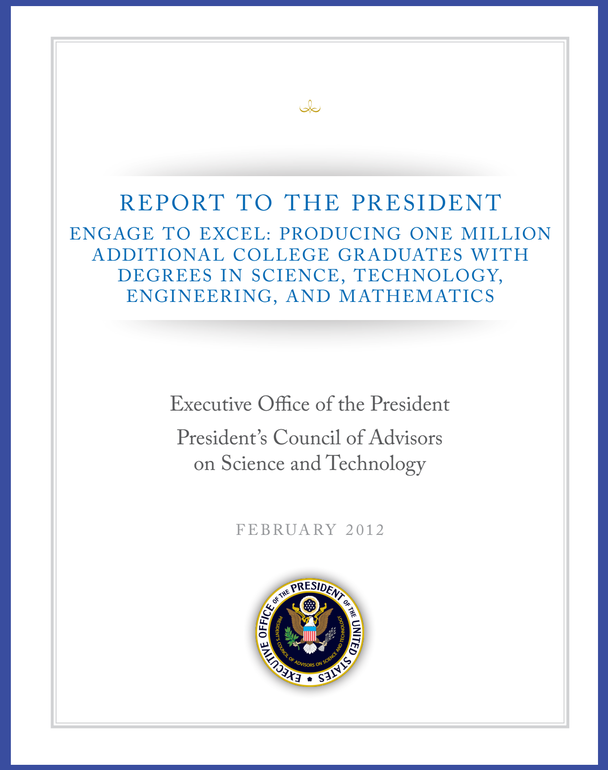
Discipline-based education research, which matured in the 1980s and 90s, has produced significantly new ways of understanding knowledge, thinking and learning.

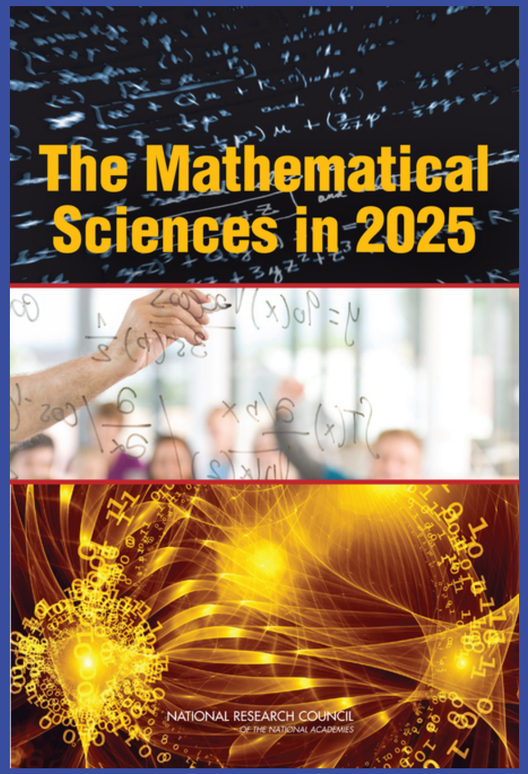


Change is coming … why now?

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 …"

Source: Major Decisions: What Graduates Earn Over Their Lifetimes, Hershbein & Kearney, September 2014 .

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.

TPSEMath Strategic Priorities

Transforming Post-Secondary Education in Mathematics

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

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TPSEMath Action Underway

Transforming Post-Secondary Education in Mathematics

- 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

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TPSEMath Mobilizing Chairs

Transforming Post-Secondary Education in Mathematics

- Mathematics Advisory Group
- Chairs + 1 Meetings - October / March
- Dig more deeply into Upper Division pathways
- Hear from other STEM areas
- Analyze the “demand side”

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TPSEMath Strategic Priorities

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The challenge: Enhancements to graduate education are needed to better prepare students for careers in an evolving environment.

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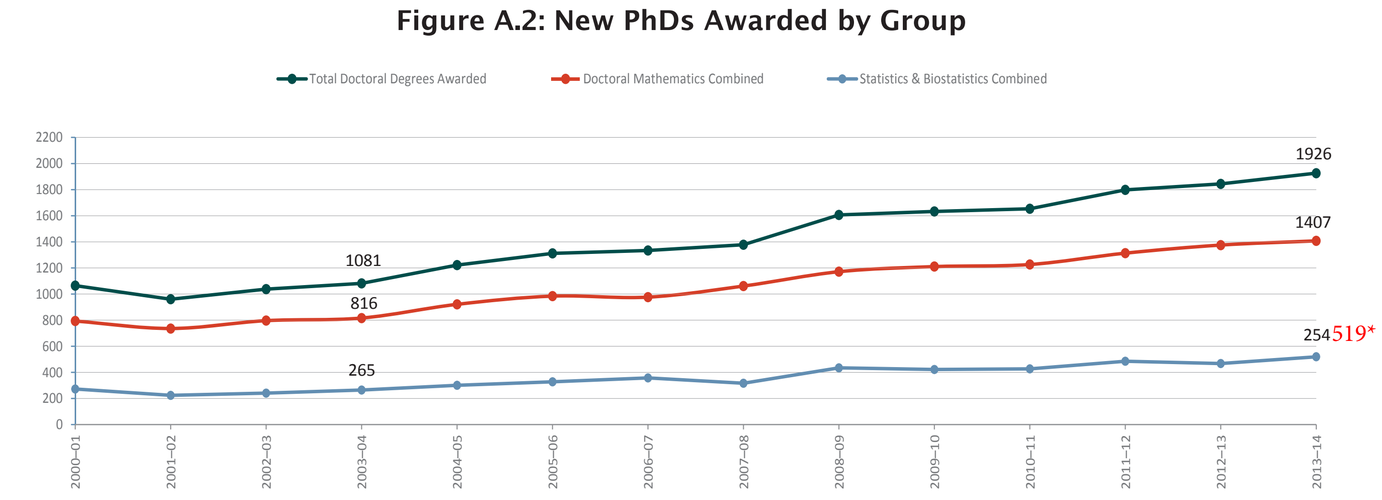
TPSEMath Graduate Education

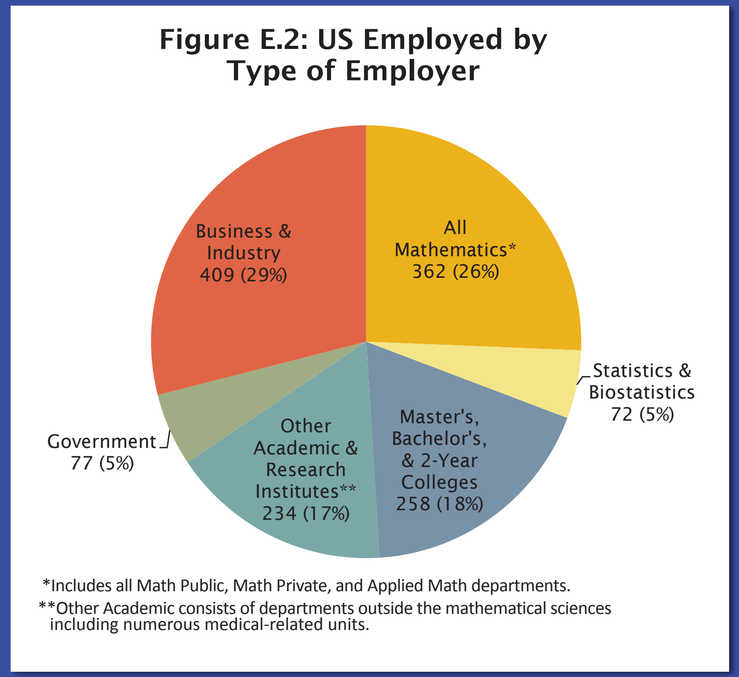
Transforming Post-Secondary Education in Mathematics

"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*)

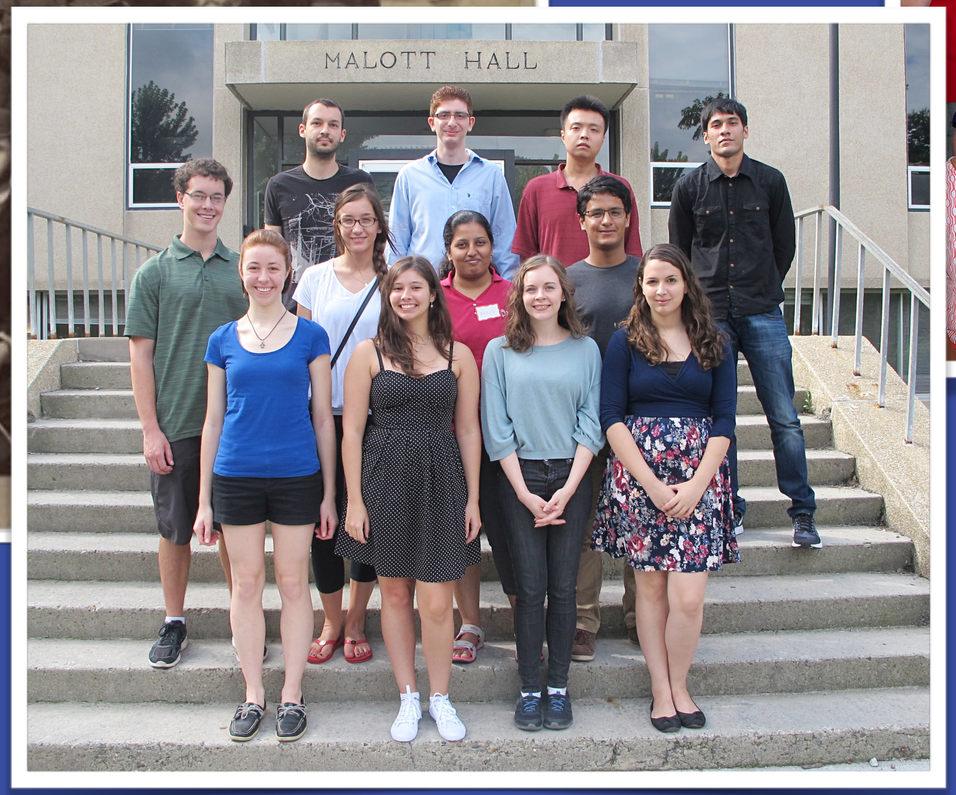
Doctoral Degrees Awarded





TPSEMath Graduate Education

Transforming Post-Secondary Education in Mathematics



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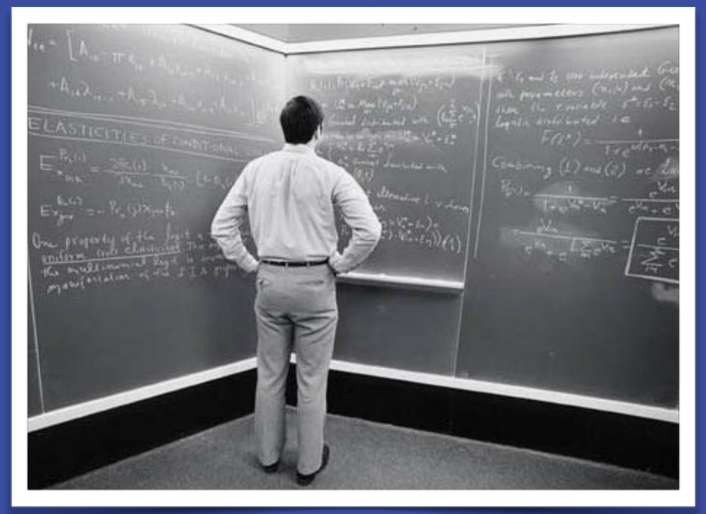

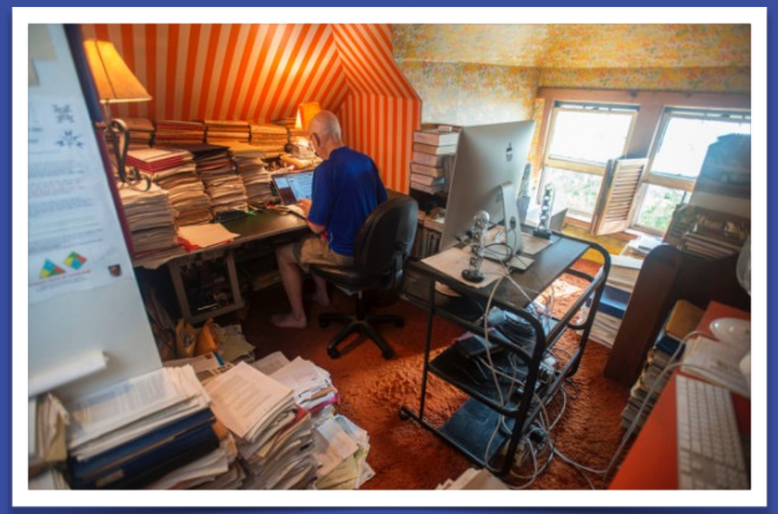

Finale – What can TPSE do?

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!!

http://www.tpsemath.org/

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