Providing Undergraduate Research Opportunities

Why and How?

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The World Has Changed!

Yesterday

United States was a Leader in:

- MANUFACTURING
  - Steel, Automotive, Electronics and Textiles
- SCIENCE

Today

- “World is Flat” – Thomas Friedman
  - The Play Field is Leveling
U.S. Workforce in S&E Occupations

2010 - 7.6 Million
STEM Jobs – about
1 in 18 workers

Projected Growth in
STEM Jobs of 17%
from 2008 – 2118

Bureau of Labor Statistics


Science and Engineering Indicators 2010

EPSCoR Conference  Coeur d’Alene, Idaho  October 24-27, 2011
Age Distribution of S&E Doctorates

Figure 3-24
Age distribution of S&E doctorate holders in labor force: 1993 and 2003
Density (percent)

NOTE: Age distribution smoothed using kernel density techniques.
Science and Engineering Indicators 2010
U.S. Science is **INCREASINGLY** Reliant on Foreign Talent

Source: 1990 and 2000 U.S. Census PUMS
2007 American Community Survey

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The Face of STEM in the U.S. Today

A Recently Recruited Cancer Research Team at the University of Kentucky

25 Team Members
19 Asian
6 Women

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Build a Knowledge-Based Workforce
Educational Attainment (2009)

For persons 25 years old and over

Bachelor’s Degree or Higher

Advanced Degree

STATE

Non-EPSCoR EPSCoR Adv. Deg.
Science Literacy Scores of 15-Year-Olds

- Finland
- Japan
- S. Korea
- NZ
- Canada
- Estonia
- Australia
- Netherlands
- Germany
- Switzerland
- UK
- Slovenia
- Poland
- Ireland
- Belgium
- Hungary
- US
- Average

**U.S. – 23rd Out of 65 Countries**

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Program for International Student Assessment (2009)
Organization for Economic Cooperation and Development

Math Literacy Scores of 15-Year-Olds

S. Korea, Finland, Switzerland, Japan, Canada, Netherlands, N. Z., Belgium, Australia, Germany, Estonia, Iceland, Denmark, Slovenia, Norway, France, Slovak Rep., U.S., Average

U.S. - 31st OUT OF 65 COUNTRIES

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Precollege

Fungi, Slime Molds, Lichens, and Mosses

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Undergraduate

Declining by Degree: Higher Education at Risk

2005 PBS Documentary

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Undergraduate

Academically Adrift

- 45% of Undergraduates Made NO SIGNIFICANT IMPROVEMENT in Their Critical Thinking, Reasoning or Writing Skills During Their First Two Years of College
- 36% Show NO SIGNIFICANT GAINS in “Higher Order” Thinking Skills after 4 Years of College
- Students STUDY ONLY ABOUT 12 HOURS A WEEK

*Arum and Roksa (2010)*
Where Do We Start to FIX the Problem?

Four Critical Years

Two Questions:
- Who Prepares the Precollege Teachers?
- Who Sends (or Doesn’t Send) Students on for Advanced Degrees?
Undergraduate Research

Literature Now Shows that UR:

- Enhances Intellectual Development
- Increases Number of Students who Pursue Advanced Degrees in Science
- Builds Relationships Between Faculty and Students
- Helps Students Clarify Career Path
- Develops Student Self-Confidence
- Develops a Student’s Ability to Solve Technical/Procedural Issues
Undergraduate Research

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It’s Time for a New Approach

TIME TO PhD

(Years)

0                      2                       4                         6                         8                         10

F            S             J             S            G1            G2            G3            G4            G5             G6

Undergraduate                                 Graduate

Coursework                                 Coursework

Research

Undergraduate Education: Front Door to an Advanced Degree!

NSF EPSCoR Conference       Coeur d’Alene, Idaho       October 24-27, 2011
What You Will Need to Do

Start Career Advising in the Freshman Year

- Help Undergraduates Understand that They Need to **Build a Resume!** Grades and Diplomas Aren’t “Good Enough!”
- Explain to them that they will need **Letters of Recommendation**
- Let them know that **Research/Problem Solving Skills are Highly Marketable** and that such Skills Will Help Them Get a Job, Get into a Professional School or Go to Graduate School
- Tell them what a **Masters or Ph.D.** will enable them to do.
Undergraduates Can Be an Economical and Productive Part of Your Research Workforce

- Start Students Early
- Form Research Teams

Working with Undergraduates Does NOT have to Be a Burden!
Thank You

Now Let’s Go Change Undergraduate Education and Address the STEM Workforce Challenge!