

National Science Foundation Models for Funding Undergraduate Research



**First Australian Summit on the Integration
of
Research, Teaching, and Learning
November 2009**



NSF Strategic Goals



Discovery

Advance the frontiers of knowledge

Learning

Cultivate a world-class, inclusive science and engineering workforce and a scientifically literate public



Research infrastructure

Build research capability via advanced instrumentation, facilities, cyberinfrastructure and experimental tools



Stewardship

Support excellence and ensure a capable and responsive organization



**NSF as a federal agency:
Its focus is on enabling basic
research –
it is not one of the “mission
agencies”**

**How does that play out in STEM
education?**

**We see our role as research and
development.**

Internal Structure of NSF

Education and Human Resources

Research and Related Activities

BIO

OCI

CISE

OER

ENG

OIA

GEO

OISE

MPS

OPP

SBE



Internal Structure of NSF

**Research and
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Activities**

BIO

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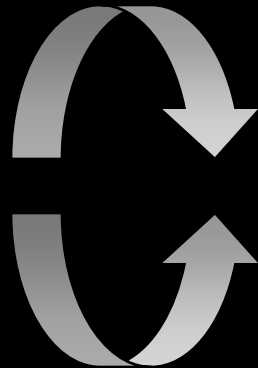
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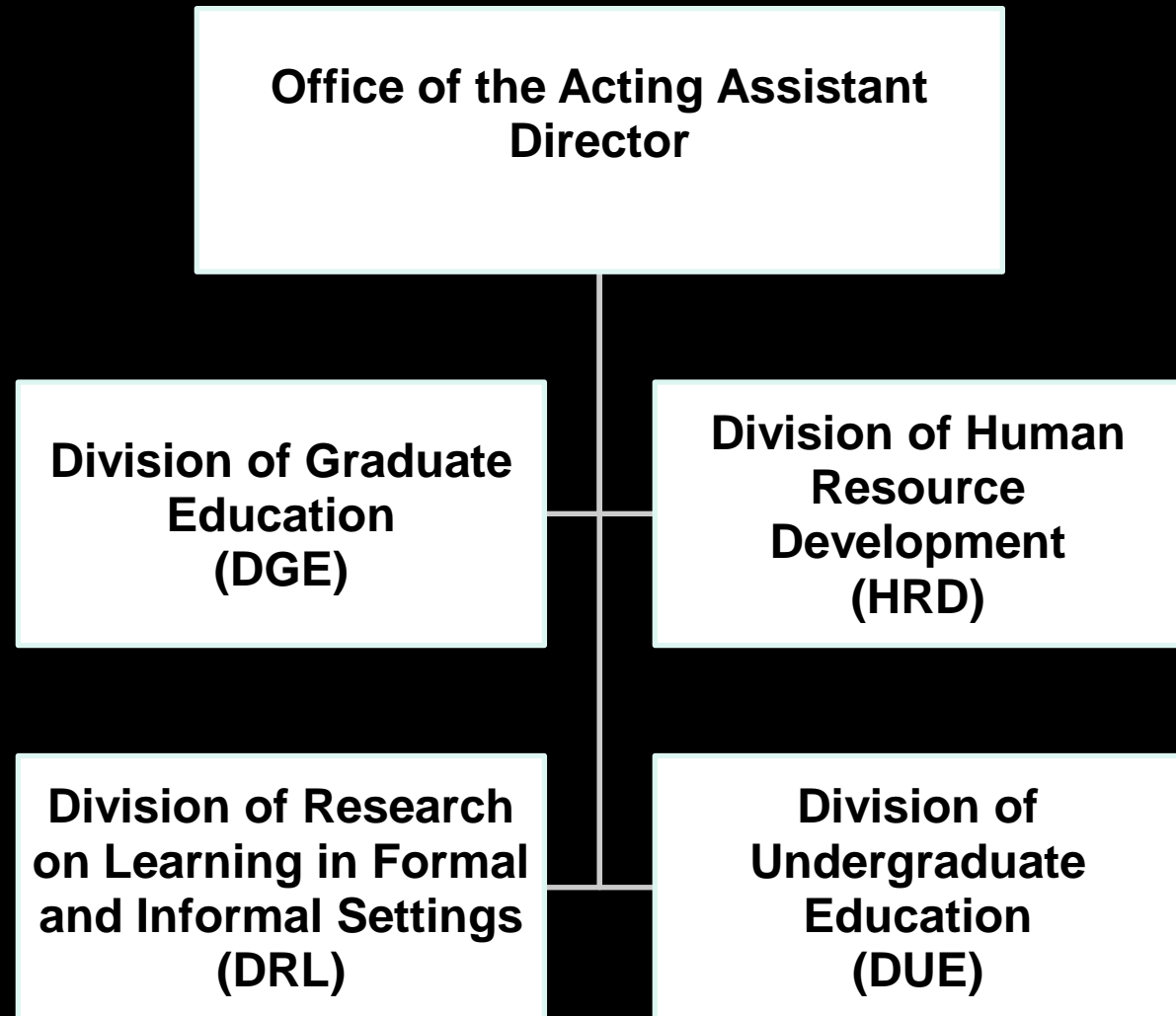
SBE



Education and Human Resources



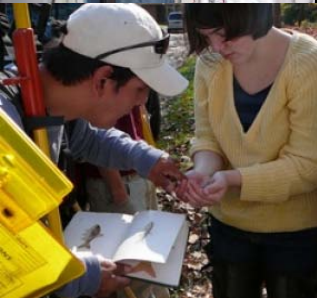
Education and Human Resources



Core DUE Programs



- **Advanced Technological Education (ATE)**
- **Course, Curriculum and Laboratory Improvement (CCLI)**
- **Federal Cyber Service: Scholarship for Service (SFS)**
- **Math and Science Partnership (MSP)**
- **National STEM Education Distributed Learning (NSDL)**
- **NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM)**
- **Robert Noyce Teacher Scholarship Program (NOYCE)**
- **Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP)**
- **Interdisciplinary Training for Undergraduates in Biological and Mathematical Sciences (UBM)**



NSF's mission – to fund the cutting edge, creates a challenge in bringing about widespread implementation of good teaching practice.

Within education:

- K – grad is of interest**
- priorities often set by Congress or the President**

Collaboration between EHR and the disciplinary directorates is at a high point and growing

Models for Funding Undergraduate Research

As a core program:

Research Experiences for Undergraduates

As a concept:

Embedded in multiple other programs, and using multiple approaches.

Research Experiences for Undergraduates



REU sites

- Cohort of students
- Draw from outside the applicant institution
- Coherent theme
- Summer or academic year
- 1–5 years; \$70,000 - \$110,000/yr

REU supplements

- For participation in research funded by an NSF award
- 1-2 students

Research Experiences for Undergraduates



REU Program Management

- Committee with representatives from all research directorates.
- Funding comes from appropriate disciplinary budgets.
- Committee is chaired by the EHR representative.
- \$67,700,000 anticipated in FY2010
- 170 new sites; 1650 new supplements/yr
- Department of Defense and Department of Energy are partners.

<http://www.nsf.gov/pubs/2009/nsf09598/nsf09598.pdf>

Other programmatic approaches

Pipeline programs

**STEM Talent Enhancement
Program (STEP)**

Scholarships in STEM (S-STEM)

**Both use a cohort approach, and
typically incorporate research
opportunities.**



Other programmatic approaches

Undergraduate Biology and Mathematics (UBM)

- Work at the intersection of biology and mathematics
- Cohort model
- Research immersion – must be longer than a semester or summer
- 3 – 5 year awards. Longer awards include curriculum development.
- Managed jointly by DUE, BIO, and Math



Other programmatic approaches

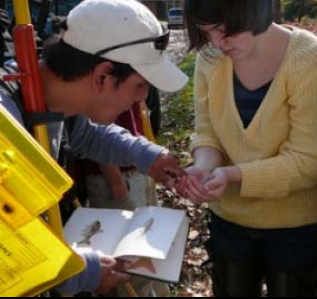
Making large data bases available

- **NEON**

<http://www.neoninc.org/education/framework>

- **GalaxyZoo**

<http://www.galaxyzoo.org/>



Embedding Authentic Research In Course Work



A growing number of CCLI projects embed research in courses

- **remote instrumentation**
- **genetics and ecology projects lend themselves to this approach**
- **engineering uses instrumented sites**
- **math creates tools that open up areas students can approach**
- **creative use of ladder of expertise**

Questions for discussion



What are the elements of an authentic research experience? What are the costs of putting these elements in place?

When is it age appropriate to begin?

How does the experience vary by field?

How can we incorporate mentoring into cyber-based experiences?