



Council on Undergraduate Research
Learning Through Research

Broadening Participation in Undergraduate Research

Practical strategies for building sustainable programs

96th AAC&U Annual Meeting
January 21, 2010

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Presenters



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Goals



- Make the case for broadening participation in undergraduate research
- Share the range of strategies that have been used to engage underrepresented students
- Provide examples of activities and efforts that broaden participation in undergraduate research
- Initiate plans of action for moving forward

Making the Case



The mandate to broaden participation:

“...there are large and complex societal problems to solve... Solutions to these problems require the best minds...”

Committee on Equal Opportunities in Science and Engineering (CEOSE). Broadening Participation in American's Science and Engineering Workforce. The 1994-2003 Decennial & 2004 Biennial Reports to Congress. Arlington, VA: National Science Foundation; 2004.

Making the Case



The need for engaged-learning practices:

“Building the 21st century workforce will require different educational approaches, including inquiry-based learning and research opportunities.”

Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future. Washington, DC: National Academies Press; 2007.

Making the Case



The need to involve those who have not traditionally been involved:

- Underrepresented ethnic and racial groups
- Students with disabilities
- Females
- Students of lower socioeconomic status
- First- and second-year students
- Others



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Making the Case

The need to institutionalize undergraduate research, scholarship, and creative activity:

- Across institution types
 - Community colleges
 - Primarily undergraduate institutions
 - Comprehensive universities
 - Research universities
- Across disciplines
 - Natural and social sciences
 - Arts and humanities

Making the Case



The definition of undergraduate research:

“Undergraduate research is an inquiry or investigation conducted by an undergraduate in collaboration with a faculty mentor that makes an original intellectual or creative contribution to the discipline.”

Statement developed at a CUR Dialogues workshop in 1997: Wenzel, T. J., “What is Undergraduate Research?,” Council on Undergraduate Research Quarterly, 1997, 17, 163.

Making the Case



The benefits of undergraduate research:

- Students
 - Fosters cognitive, intellectual, professional, and personal growth
- Faculty
 - Provides new/different perspectives
- Institutions
 - Builds community of scholars
 - Deepens relationships with alumni

Osborn, JM, Karukstis, KK. The Benefits of Undergraduate Research, Scholarship and Creative Activity. In Boyd, MK and Wesemann, JL, eds. *Broadening Participation in Undergraduate Research: Fostering Excellence and Enhancing the Impact*. Washington, DC: Council on Undergraduate Research; 2009.

Sharing Strategies



Lessons learned

- Models for broadening participation in undergraduate research
 - One size does not fit all
 - Institutional context is key
 - Approaches can be adapted across institutional types
- Practical strategies for building sustainable programs
 - Design and implement plans
 - Lead change
 - Maximize investments

Sharing Strategies



Building Engineering and Science Talent (BEST)

- Created public-private partnership in 2002
- Dedicated to building stronger, more diverse STEM workforce
- Undertook systematic investigation of 124 undergraduate STEM programs to determine what works and why
- Identified 12 exemplary and promising programs
- Distilled 8 common elements that played an integral role in successful outcomes (2 more since added)

A Bridge for All: Higher Education Design Principles to Broaden Participation in Science, Technology, Engineering and Mathematics. San Diego, CA: BEST; 2004.
www.bestworkforce.org

Initiating Action Plans

Taking the next steps

- Consider which BEST design principles are in place
- Identify and engage key stakeholders/partners
- Review and discuss key steps
- Identify next steps appropriate for context
- Implement next steps
- Continue the conversation

BEST Design Principles*



1. Institutional leadership	6. Enriched research experience
2. Targeted recruitment	7. Bridging to the next level
3. Engaged faculty	8. Continuous evaluation
4. Personal attention	9. Comprehensive financial assistance
5. Peer support	10. Evidence-based approaches

*10 essential components; not a menu

BEST Design Principles



Enriched research experience

- Proven and powerful practice
 - Enhances educational outcomes
 - Expands frontiers of knowledge
 - Builds capacity
- Examples of design principle in action
 - Summer undergraduate research programs
 - Academic year research
 - Authentic research modules that replace standard experiments
 - Vertical integration through curriculum

BEST Design Principles



Targeted recruitment

- Purposeful efforts to engage those who have not traditionally participated in undergraduate research
- Connected to institutional mission, vision, and needs
- Examples of design principle in action
 - Building research programs for first- and second-year students
 - Establishing research collaborations with faculty at minority-serving institutions and two-year colleges
 - Providing programs designed for deaf and hard-of-hearing
 - Linking research projects to community needs
 - Providing science vans to high schools

BEST Design Principles



Personal attention

- A comprehensive network of resources and activities to address the research, academic, social, and financial needs of each student
- Examples of design principle in action
 - Mentoring
 - Tutoring
 - Curricular reform
 - Supplemental instruction
 - Academic advising
 - Provide career and/or professional advice

BEST Design Principles



Comprehensive financial assistance

- Financial support frequently critical for groups that have not traditionally participated in undergraduate research
- Examples of design principle in action
 - Covering student stipends from grants
 - Using federal work-study funds to pay students
 - Covering student stipends from institutional budgets
 - Providing tuition waivers
 - Offering financial aid packages
 - Providing scholarships
 - Establishing a continuum of programs to support students

BEST Design Principles



Peer support

- Opportunities for interaction with peers and near-peers that build networks and community
- Examples of design principle in action
 - Encouraging participation in student clubs and organizations
 - Organizing community-building activities
 - Establishing vertically-integrated student research teams
 - Developing participant cohorts
 - Using peer mentors
 - Integrating student interpreters into laboratory
 - Using Peer-Led Team Learning
 - Involving peer leaders in workshops

BEST Design Principles



Bridging to the next level

- Relationships that provide pathways through key transition points
 - High school to college
 - Two-year college to four-year institution
 - Undergraduate to graduate school
- Examples of design principles in action
 - Preparing students for the next level of research activity
 - Preparing freshmen for their major
 - Creating research communities with two-year colleges
 - Connecting pre- and in-service teachers
 - Mentoring that continues after matriculation to graduate school

BEST Design Principles



Engaged faculty

- Faculty that foster development of students and programs
- Requires investment in faculty and building capacity
- Examples of design principle in action
 - Providing faculty stipends
 - Providing reassigned time
 - Aligning efforts via a coordinator or office
 - Providing mentor training and resources
 - Involving postdoctoral fellows and graduate students
 - Including student outcomes as a rewarded faculty outcome
 - Embedding undergraduate research mentoring in promotion and tenure expectations

BEST Design Principles



Institutional leadership

- Commitment to inclusiveness and excellence across the campus community at all levels
- Examples of design principles in action
 - Hiring faculty with research interests
 - Providing seed funding and cost-sharing for grants
 - Coordinating efforts among campus units
 - Creating positions or offices to coordinate undergraduate research activities
 - Recognizing faculty efforts in evaluation, promotion, and tenure
 - Including undergraduate research in excellence initiatives
 - Generating support for undergraduate research as part of an endowment campaign

BEST Design Principles



Continuous evaluation

- Ongoing assessment of process and outcomes
 - Provides formative evaluation
 - Demonstrates impact
- Examples of design principle in action
 - Obtaining funds targeted for assessment
 - Integrating support for evaluation into program structure
 - Aligning impact measures with institutional data (e.g., student outcomes, graduation rates, matriculation into graduate school)
 - Tracking students over time

BEST Design Principles



Evidence-based approaches

- Using strategies that have been attributed to observed outcomes
- Examples of design principles in action
 - Designing programs based on studies of
 - college retention and success
 - importance of peer support
 - identity and stereotype threat
 - undergraduate research and engaged-learning practices
 - Participating in discussions focused on broadening participation
 - Contributing to the literature

BEST Design Principles*



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Moving Forward

Transforming visions into sustainable programs

- Be inspired
- Gather information
- Find collaborators
- Develop skills
- Be receptive
- Align efforts
- Set the agenda
- Anticipate changes

Moving Forward

Leading change through the growth trajectory

- Developing and initiating programs
 - Period of formation and experimentation
- Strengthening and expanding programs
 - Period of standardization and expansion
- Sustaining and evolving programs
 - Period of maturity
 - Ready for significant additions or changes

Moving Forward

Integrating programs into the fabric of the institution

- Assessing past and current contexts
- Organizing change efforts
- Strategizing ways to move forward

O'Neill, N. Undergraduate Research within a Framework of Inclusive Excellence. In Boyd, MK and Wesemann, JL, eds. *Broadening Participation in Undergraduate Research: Fostering Excellence and Enhancing the Impact*. Washington, DC: Council on Undergraduate Research; 2009.

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Conclusions

- Sustainable programs must be
 - Inclusive
 - Comprehensive
 - Aligned with institutional context
- Building sustainable programs involves
 - Designing and implementing plans
 - Leading change
 - Maximizing investments
- Program design is critical and requires
 - Collective efforts
 - Focus on excellence
 - Sustained commitment



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*Broadening Participation in Undergraduate Research:
Fostering Excellence and Enhancing the Impact*

can be ordered at

<http://www.cur.org/publications/broadening.html>

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Acknowledgements

- Council on Undergraduate Research
- Contributors
- Participants