



ASSOCIATION *of* AMERICAN UNIVERSITIES

Using Broader Impacts to Improve Undergraduate Education and Instruction



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AAU Undergraduate STEM Initiative

The overall objective of AAU's Undergraduate STEM Education Initiative is to influence the culture of STEM departments at AAU universities so that faculty are encouraged and supported to use teaching practices proven by research to be effective in engaging student in STEM education and in helping students learn.



AAU STEM Initiative Goals

"AAU is not conducting another study or research project on STEM education. We are moving to implement the results of the latest research into science and math pedagogy."

*--Hunter Rawlings
AAU President*

Undergraduate STEM Education Initiative
Association of American Universities

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CULTURAL CHANGE
SCAFFOLDING
PEDAGOGY

Framework for Systemic Change in Undergraduate Learning

The Framework for Systemic Change in Undergraduate STEM Teaching and Learning, which AAU universities helped to develop, provides a set of key elements that need to be addressed in order to bring about broad-based and sustained reform.

Learn more about the framework

AAU STEM Initiative

AAU has launched a five-year initiative in collaboration with our member universities to improve the quality of undergraduate teaching and learning in science, technology, engineering, and mathematics (STEM) fields. This is not another study or research project on STEM education. Instead, it is an effort based on overwhelming existing research to influence the culture of STEM departments at AAU universities so that faculty members are encouraged to use student-centered, evidence-based, active learning pedagogy in their classes, particularly at the first-year and sophomore levels.

AAU
Undergraduate STEM Education Initiative



2010 America COMPETES Reauthorization

H.R. 5116 Sec. 526 Broader Impacts Review Criterion

Goals:

- Increase U.S. economic competitiveness
- Develop a globally competitive STEM workforce
- Increase participation of women and underrepresented minorities in STEM
- Increase partnerships between academia and industry
- Improve pre-K—12 STEM education and teacher development
- Improve undergraduate STEM education
- Increase public scientific literacy
- Increase national security

H. R. 5116—38

(1) collaborate with industry in the development of standards supporting trusted cloud computing infrastructures, metrics, interoperability, and assurance; and

(2) support standards development with the intent of supporting common goals.

SEC. 525. TRIBAL COLLEGES AND UNIVERSITIES PROGRAM.

(a) **IN GENERAL.**—The Director shall continue to support a program to award grants on a competitive, merit-reviewed basis to tribal colleges and universities (as defined in section 316 of the Higher Education Act of 1965 (20 U.S.C. 1059c), including institutions described in section 317 of such Act (20 U.S.C. 1059d), to enhance the quality of undergraduate STEM education at such institutions and to increase the retention and graduation rates of Native American students pursuing associate's or baccalaureate degrees in STEM.

(b) **PROGRAM COMPONENTS.**—Grants awarded under this section shall support—

(1) activities to improve courses and curriculum in STEM;

(2) faculty development;

(3) stipends for undergraduate students participating in research; and

(4) other activities consistent with subsection (a), as determined by the Director.

(c) **INSTRUMENTATION.**—Funding provided under this section may be used for laboratory equipment and materials.

SEC. 526. BROADER IMPACTS REVIEW CRITERION.

(a) **GOALS.**—The Foundation shall apply a Broader Impacts Review Criterion to achieve the following goals:

(1) Increased economic competitiveness of the United States.

(2) Development of a globally competitive STEM workforce.

(3) Increased participation of women and underrepresented minorities in STEM.

(4) Increased partnerships between academia and industry.

(5) Improved pre-K—12 STEM education and teacher development.

(6) Improved undergraduate STEM education.

(7) Increased public scientific literacy.

(8) Increased national security.

(b) **POLICY.**—Not later than 6 months after the date of enactment of this Act, the Director shall develop and implement a policy for the **Broader Impacts Review Criterion** that—

(1) provides for educating professional staff at the Foundation, merit review panels, and applicants for Foundation research grants on the policy developed under this subsection;

(2) clarifies that the activities of grant recipients undertaken to satisfy the **Broader Impacts Review Criterion** shall—

(A) to the extent practicable employ proven strategies and models and draw on existing programs and activities; and

(B) when novel approaches are justified, build on the most current research results;

(3) allows for some portion of funds allocated to broader impacts under a research grant to be used for assessment and evaluation of the broader impacts activity;



NSF Language

The **Broader Impacts criterion** encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes

- How well does the activity advance discovery and understanding while promoting teaching, training and learning?
- How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)?
- To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks and partnerships?
- Will the results be disseminated broadly to enhance scientific and technological understanding?

NSF Query of Broader Impacts

We asked, “Of the approximately 113,000 awards made by NSF (2006 – 2016), how many use the words ‘improve undergraduate education’ in their statement of broader impacts?”

Results of NSF Query

.5% of awardees (544 of the approximately 113,000 awards) fulfilled BI requirements using improving undergraduate education.

Results: Education Requirement

Breakdown of the 544 awards fulfilling BI by improving undergraduate education:

- 62% require an education component
 - 46 CAREER Awards
 - 291 Education and Human Resources Awards
- 38% do NOT require an education component

Results: Breakdown by Discipline



52 – Biological Sciences



28 – Computer & Information Sciences



73 – Engineering



60 – Mathematical & Physical Sciences



12 – Social, Behavioral & Economic Sciences



21 – Geosciences

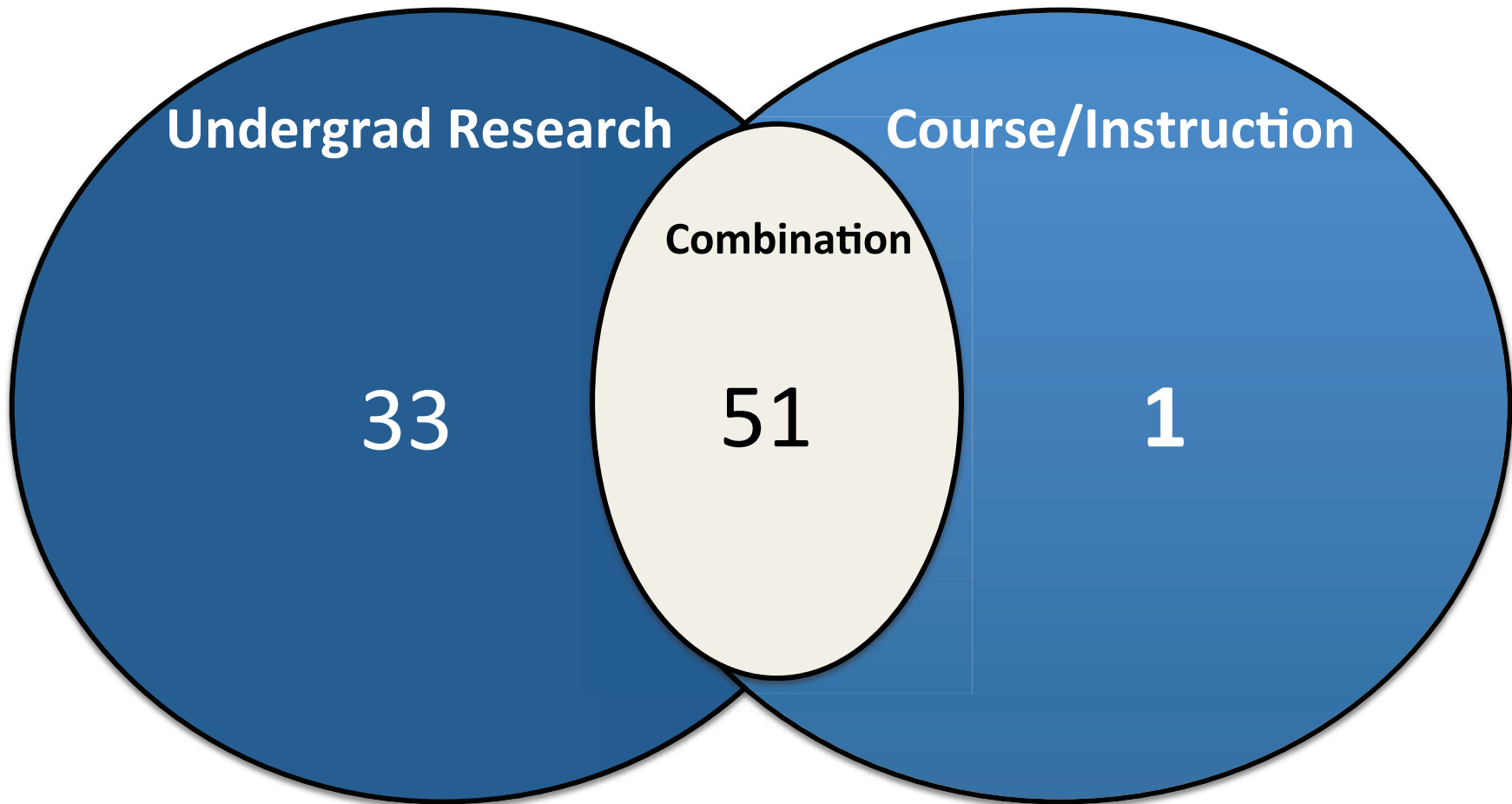


7 – Office of the Director

* These numbers include CAREER awards. They do NOT include EHR.



Results: Breakdown by Improvement Type



* These numbers include CAREER awards. They do NOT include EHR.



Challenges to Using BI to Improve Undergrad Education

- Many researchers are not aware that improving undergrad education is a legitimate means to fulfill BI.
- When it is used, focus is usually involving undergrads directly in research.
- NSF is not prescriptive in how to interpret and assess what is and is not a legitimate BI.
- BI experts cannot predict how review panel will interpret what counts as BI (subjective) and review panels are not well instructed.
- Research community/NSF reviewers see “teaching” as a required component of faculty work and not a “broader impact.”

Challenges to Using BI to Improve Undergrad Education

- BI offices/other campus resources (Teaching & Learning Centers) have not actively promoted undergrad education as a means to fulfill BI requirements.
- Researchers and review panelists are confused as to if BI must be new, innovative and transformative, and therefore are afraid to employ methods, which based upon past research, we know can have a broader impact.
- Campus & NSF culture makes change difficult.

Conclusion

There is no reason why having a broader impact should not begin with the undergraduate students that faculty teach in their classes.

Contact Information

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