Overview

Research and reports about transforming undergraduate STEM education highlight the need to implement research-based practices and to learn from that process, expanding the research base.

These three projects, all funded by the National Science Foundation in 2018:

• address cross-cutting issues shared among the physical and mathematical sciences
• involve partnerships across disciplines
• build on and contribute to the research base

Impact Indicators and Instruments for Individual Development Plans (I3IDP)

**Partners:** American Chemical Society, University of Massachusetts Medical School, American Association for the Advancement of Science, Graduate Career Consortium

**PI team:** Jodi Wesemann*, Joerg Schlatterer*, Corrie Kuniyoshi*, Cynthia Fuhrmann

**Timeframe:** September 2018–August 2021

**Supported by:** NSF Innovations in Graduate Education (NSF IGE) program (NSF-1806607)

**Goal:** To build a foundation for determining how and why the individual development plan (IDP) process is effective for graduate students

**Activities:**
1. Define core goals and measureable outcomes for the IDP process.
2. Develop and test a set of instruments for demonstrating changes in student actions and attitudes resulting from use of the IDP process.
3. Recommend strategies for building a base of evidence on how and why the IDP process works in various contexts.

**Research basis:** career development, education, social psychology, mentoring

**Research questions/hypotheses:**
• A core set of instruments can be developed to measure the impacts of the IDP process across various contexts
• Engaging a range of stakeholders, nationally and at academic institutions, in developing and testing this set of instruments will form a cadre that is interested and invested in using the project findings, resources, and recommendations to build a broader and more robust research base on the effective use and impact of the IDP process on graduate students.

**Chemistry relevance:** The I3IDP tool-kit may be used to enhance ChemIDP (chemidp.org) and other IDP platforms. Engaging the cadre of stakeholders will increase the visibility and use of IDPs.

**Website:** http://i3idp.org/ (under development)

Get the Facts Out

**Partners:** The American Chemical Society, American Association of Physics Teachers, American Physical Society, and Mathematical Association of America are joining the Colorado School of Mines.

**PI team:** Wendy Adams, Douglas Ensley, Monica Plisch, Terri (Taylor) Chambers*, Rebecca Vieyra

**Timeframe:** July 2018–June 2023

**Supported by:** NSF Improving Undergraduate STEM Education (NSF IUSE) program (NSF-1821710 and NSF-1821462)

**Goals:**
• Change perceptions about the K–12 mathematical and physical sciences teaching professions among faculty, students, and parents;
• Increase the frequency of faculty engaging in practices recommended in the Get the Facts Out toolkit; and
• Increase the numbers of mathematics, chemistry, and physics majors who enroll in a teacher certification program.

**Activities:**
1. Develop and refine a "Get the Facts Out" campaign toolkit to support local faculty champions in changing the conversation about STEM teaching careers in their departments.
2. Implement the “Get the Facts Out” national campaign through interactive dissemination and support.
3. Engaging a variety of institutions as quantitative and qualitative study sites in order to learn about the impacts of the Get the Facts Out toolkit on faculty and student perceptions of the K–12 mathematical and physical sciences teaching profession

**Research basis:** behavioral theory

**Research hypothesis:** Improving students’ perceptions of the teaching profession, through the availability and usage of the Get the Facts Out toolkit material by faculty and students, will increase the number of students who choose to pursue science or math teaching as a profession.

**Chemistry specificity:** Materials customized for the chemistry context and engagement of chemistry change agents (below) will maximize the impact of Get the Facts Out in the chemistry community.

• Etta Gravely, North Carolina A&T State University
• William Hunter, Illinois State University
• Jennifer Nielson, Brigham Young University
• Ellen Yezierski, Miami University

**Website:** https://getthefactsout.org/

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Acknowledgements

Get the Facts Out material is based upon work supported by the National Science Foundation under Grant Nos. 1821710 and 1821462

I3IDP material is based upon work supported by the National Science Foundation under Grant No. 1806607

IGEN material is based upon work supported by the National Science Foundation under Grant Nos. 1834540, 1834545, 1834528 and 1834516.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

The NSF INCLUDES Alliance:

**Partners:** The primary partners are the American Physical Society, American Chemical Society, American Geophysical Union, American Astronomical Society, and Materials Research Society, as well as Graduate Education Research and Inclusive Practice Hubs. Over 30 societies, institutions, organizations, corporations, and national laboratories are part of the IGEN Alliance.

**PI team (chemistry):** Joerg Schlatterer*, Benjamin Fiore-Walker*, Terri (Taylor) Chambers*, LaTrase Garrison*

**Timeframe:** September 2018–August 2023

**Supported by:** NSF Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering & Science (NSF INCLUDES) program (NSF-1834545)

**Goals:**
• Eliminate the underrepresented racial and ethnic minority gap that exists between Bachelor and PhD degree attainment
• Institutionalize inclusive, evidence-based practices for selecting and training a diverse, innovative, and globally competitive scientific workforce

**Activities:** This project takes a full-spectrum, cross-sector approach to addressing participation and success of underrepresented students by:
1. Improving mentoring of undergraduates,
2. Transforming graduate admissions,
3. Recruiting large numbers of underrepresented racial / ethnic minority students who are qualified, but for various reasons would otherwise not enter graduate studies, through a centralized process, and
4. Improving graduate retention measures that include induction efforts, multiple mentors, "high-touch" monitoring and intervention (as needed) for students early in their academic careers, and focused attention to graduate student life.

**Research basis:** diversity & inclusion, career development, mentoring, holistic review, retention

**Selected research topics:**
• Non-cognitive factors in PhD admissions and retention
• Bridge program’s role in departmental climate
• Factors that influence time to degree

**Chemistry specificity:** The ACS Bridge Program connects students from underrepresented groups with selected graduate programs in the chemical sciences. The ACS Bridge Travel Awards support the travel of undergraduate students from underrepresented minority groups to attend professional conferences.

**Websites:** http://igenetwork.org/; www.acs.org/bridge