Strategies to Prepare Future Faculty to Assess Student Learning

COUNCIL OF GRADUATE SCHOOLS

Strategies to Prepare Future Faculty to Assess Student Learning

By Daniel Denecke, Julia Michaels, and Katherine Stone

Strategies to Prepare Future Faculty to Assess Student Learning

Suggested citation:

Denecke, D., Michaels, J. & Stone, K. (2017). *Strategies to Prepare Future Faculty to Assess Student Learning.* Washington, DC: Council of Graduate Schools.

Copyright © 2017 Council of Graduate Schools, Washington, DC

This publication is based upon work supported by the Alfred P. Sloan Foundation and the Teagle Foundation. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the funders.

ALL RIGHTS RESERVED. No part of this work covered by the copyright herein may be reproduced or used in any form by any means—graphic, electronic, or mechanical including photocopying, recording, taping, Web distribution, or information storage and retrieval systems—without the written permission of the Council of Graduate Schools, One Dupont Circle NW, Suite 230, Washington, DC 20036-1146.

ISBN-10 1-933042-50-8
ISBN-13 9781933042503

Printed in the United States

Contents

Foreword iv
Executive summary vi
I. Introduction 1
II. Summaries of Institutional Projects 7
III. Assessment Skills and Competencies 10
IV. Strategies That Worked 16
V. Common Challenges and Solutions 24
VI. Conclusion 29
Works Cited 31
Resources 36
Appendix A: Project Request for Proposals 42
Appendix B: Affiliate Program Links 47

Foreword

Preparing Future Faculty to Assess Student Learning was a three-year project involving close collaboration among the Council of Graduate Schools (CGS) and seven U.S. universities: Cornell University, Harvard University, Indiana University, Michigan State University, North Carolina A&T State University, the University of North Carolina at Greensboro, and the University of California, Merced. The project's goal was to identify model approaches to integrating skills in the assessment of undergraduate learning into existing programs that prepare graduate students for faculty careers. This report documents the results of these efforts with the broader goal of fostering similar enhancements across faculty preparation programs, nationally.

The skills and strategies highlighted in this report will likely be applicable to and reap similar benefits for graduate and undergraduate students on most campuses. The report details an impressive battery of effective approaches and solutions, including both those tailored to the distinct contexts of these institutions and those shared across institutions to meet common challenges. The signal "best practice" finding from the project is that work of this kind is most effective when faculty and doctoral students collaborate closely, and when the latter group is given an opportunity to demonstrate leadership. In this case, the improvements that benefit graduate and undergraduate students, faculty, and program curricula are amplified, which is a finding that has general implications for higher education reforms.

The project comes at a time when sufficient evidence has accumulated to suggest that more active learning and better learning assessment are essential to improving the quality of U.S. higher education. Despite this fact, universities continue to struggle to secure the faculty engagement required to transform teaching and learning at U.S. colleges and universities. This project supported activities to address this challenge through a focus on the preparation of graduate students in science, technology, engineering, and mathematics (STEM) fields and arts and sciences, and promises to have a lasting impact. This impact extends beyond the immediate participants—for example, to the broader public, as greater transparency in outcomes results in more equitable learning achievements for students with different learning styles, higher success rates, more innovative pedagogy, and greater accessibility to career pathways to and through graduate school.

CGS is grateful to the Alfred P. Sloan Foundation and the Teagle Foundation for supporting this project. We are also grateful to the leaders of each of our partner and affiliate institutions. We hope this report will be useful to graduate deans, directors of professional development programs, directors of teaching and learning centers, and faculty from all disciplines.

Suzanne Ortega
President
Council of Graduate Schools

Executive Summary

The assessment of student learning and the use of assessment evidence to improve teaching and learning are some of the most important skills for faculty at U.S. colleges and universities. Ensuring that faculty members have at least a basic understanding of how to measure the effectiveness of their teaching is central to improving the quality of higher education. Yet learning assessment is typically a topic to which faculty members have little or no exposure until they begin their faculty careers. Moreover, too often learning assessment is delegated to "experts" or associated primarily with accountability to regional accreditors, state boards, and other external parties. While these external stakeholders play a vital role in driving postsecondary quality improvement, meaningful faculty involvement has been difficult to achieve where learning assessment has been perceived as more about accountability than about improvement.

Securing greater faculty engagement in learning assessment across U.S. higher education institutions on a scale sufficient to make a difference in the quality of undergraduate education in arts and sciences requires institutional leadership, faculty ownership, and innovative strategies. This report describes the results of one such strategy: to prepare future faculty to assess student learning *while they are still in graduate school.* Graduate students are uniquely positioned to develop strong teaching skills through assistantships and other professional development opportunities. Once these graduate students become faculty, they are more likely to become champions of learning assessment and its benefits to undergraduate students.

The CGS Preparing Future Faculty to Assess Student Learning initiative was a three-year project to identify models for infusing undergraduate learning assessment skills into existing Preparing Future Faculty (PFF) programs. With support from the Alfred P. Sloan Foundation and the Teagle Foundation, and in collaboration with seven funded institutions and 19 affiliates, the project involved close to 1,300 graduate students and 200 faculty across the humanities, social sciences, and STEM. Funded research partners included Cornell University, Harvard University, Indiana University, Michigan State University, North Carolina A&T State University, the University of California, Merced, and the University of North Carolina at Greensboro. By participating, these institutions sought to

- prepare a cadre of skilled graduate students who would become champions for undergraduate teaching and learning upon ascension to the professoriate;

- develop and embed a portfolio of sustainable activities in existing programs for preparing future faculty; and
- improve undergraduate learning outcomes through gateway course reform and cross-disciplinary conversations.

The group made significant progress toward infusing undergraduate learning assessment into existing structures and programs. The report *Strategies to Prepare Future Faculty to Assess Student Learning* presents highlights from this work, including

- **examples of assessment skills and competencies developed by participating graduate students,** such as flipped classrooms, backward design, concept inventories, and response systems;
- **common strategies for infusing these skills into the graduate student development programs across institutions and disciplines,** such as faculty-graduate student collaborations on gateway course reforms, assessment "fellows" programs, Teaching-as-Research and assessment learning communities, and university-wide events to build an institutional culture of assessment; and
- **solutions to common challenges (e.g., low faculty engagement, graduate student recruitment, and navigating the complexities of gateway course reform),** such as engaging senior leadership and external partners, diversifying promotional materials, creating online alternatives to face-to-face opportunities, and tapping graduate students as peer leaders and collaborators with established faculty.

Through this project, CGS and its partners assembled a robust portfolio of replicable and sustainable strategies for preparing the next generation of faculty to assess undergraduate learning. By building on prior PFF and similar programs, the institutions embedded these evidence-based strategies into those programs, helping ensure their continuity beyond the life of the grant and minimizing additional costs. Most importantly, the partnering institutions successfully worked across disciplines to establish a forum for engaging both current and future faculty around undergraduate teaching and learning outcomes.

The accomplishments described in this report are intended to serve as models for other institutions seeking to enhance graduate student preparation for faculty careers while at the same time improving the quality of undergraduate student learning and raising the level of current faculty engagement in both of these areas.

I. Introduction

For the majority of Americans, college is a gateway to opportunity. College education provides civic and social benefits to the broader public and correlates with private benefits to graduates, including improved chances of employment, greater job satisfaction, higher salary, and better health. Ensuring student success through high-quality undergraduate teaching and learning can strengthen American society, diversify the workforce, and pave the road for future generations of researchers and scholars.

Centers for teaching and learning, individual educators, and national organizations have concluded that one of the most effective ways to advance this goal is by promoting active learning and more student-centered classrooms. As a result, faculty across U.S. colleges and universities now have access to tools and resources that can help them significantly improve student learning. However, despite the proliferation of these resources and evidence about their effectiveness, studies suggest that student engagement remains low and the public remains concerned that colleges and universities are paying insufficient attention to the quality of undergraduate teaching (Arum & Roksa, 2011; Ikenberry, Ewell, & Kuh, 2016; Kuh, 2008; Pascarella & Blaich, 2013).

So-called gateway courses, for example—through which students often must pass to pursue their intended major—present particular challenges, particularly in science, technology, engineering, and mathematics (STEM) fields. Too often such courses serve as exclusionary sorting mechanisms and barriers to further education in STEM. Students are frequently discouraged by barriers in these courses such as large class sizes, high-stakes assignments, curve-based grading practices, and lectures that position students to be passive receptacles for knowledge rather than active participants in discovery or problem-based inquiry (Handelsman et al., 2004; Handelsman Miller, & Pfund, 2007). Students in such courses may have little opportunity for active learning or personal interactions with faculty and other students, and do not receive low-risk assignments that would provide early feedback to teachers on students' comprehension of course material (Correll, Seymour, & Hewitt, 1997; Drew 2011). In some disciplines, these courses require extensive memorization and rote learning and demand a willing suspension of disbelief on the student's part that the relevance of the materials learned in these courses to research and real-world problems will become clear only years later (Mazur, 2009; Tilghman, 2010). Successful approaches to large-enrollment gateway course reforms have included early rather than deferred exposure to complex problem-based learning (Tighlman, 2010), a commitment to preserving class time for interactive discussion (as opposed

to the lecture format) with content assigned as preparatory reading (Moravec, Williams, Aguilar-Roca, & O'Dowd, 2010; Deslauriers, Schelew, & Wieman, 2011; Van Horne, Murniati, Gaffney, & Jesse, 2012; Love, Hodge, Grandgenett, & Swift, 2014), technology-assisted learning tools, and physical classroom redesign (Van Horne et al., 2012).

A particular challenge has been to increase faculty awareness and adoption of proven approaches to engaging students and assessing student learning. Assessment techniques can help faculty understand what does and does not work and where students risk falling behind or disengaging. Faculty adoption of these techniques has been a challenge for a variety of reasons, including limited time to learn unfamiliar skills and strategies, an incentive system that in many contexts rewards research over teaching, resistance to anything that might appear to compromise faculty autonomy to design and deliver curricula, and skepticism about approaches perceived to be more about accountability than improvement and more properly handled by administrators and assessment experts. Faculty may be dissuaded from engaging if approaches to learning assessment appear overly bureaucratic, promoted without sufficient evidence of their effectiveness, or ill-adapted to their fields of study (Council of Graduate Schools, 2011; Denecke, Kent, & Wiener, 2011). When these issues have been addressed, current faculty have been more supportive, but report a lack of general awareness of what works and how to bring these evidence-based strategies to scale. While faculty engagement is essential in the long run, achieving the necessary transformation in learning through development of current faculty is therefore daunting.

An alternative approach to effecting lasting change is to focus on the preparation of graduate students, or future faculty. Graduate students are at a prime stage for developing skills in learning assessment. For example, many have their first opportunities during their doctoral programs, either as teaching assistants or as lecturers, to teach undergraduates first hand. Others may seek to document for prospective academic employers that they have developed teaching skills and techniques to assess undergraduate learning even in fields where teaching assistantships are rare.

The benefits of such a focus on graduate students extend beyond the classroom or program. For example, rather than struggling to learn instructional methods on the job, new faculty who have already developed confidence in their teaching skills have more time available for research and other responsibilities. Moreover, these interventions can benefit not only graduate students themselves and undergraduates at the institutions that offer such opportunities, but also future students and faculty colleagues at the institutions where many of these graduate students will subsequently find academic employment. Those who become faculty are likely to champion thoughtful assessment. Finally, while not always feasible, by structuring opportunities for graduate students and faculty to collaborate on undergraduate student learning assessment, universities can use graduate student professional development in this area to help bring current faculty on board and integrate potentially beneficial reforms into the undergraduate curricula.

Given the many benefits of an approach to creating a culture of assessment among future faculty through a focus on current graduate students, identifying a way to bring this strategy to scale is crucial. Fortunately, such an approach can leverage a vast infrastructure of existing programs, such as those affiliated with PFF, the Center for the Integration of Research, Teaching and Learning (CIRTL), and other initiatives with a similar purpose. Many of these programs have been well established for decades and focus on topics such as pedagogy skills, the scholarship of teaching and learning, and understanding the variety of roles and responsibilities of faculty at various higher education institutions. The diversity of existing programs and the thousands of graduate students that participate in them each year provide a logical delivery mechanism for infusing new skills in learning assessment and an awareness of its role in higher education.

This report describes the results of collaboration among the Council of Graduate Schools (CGS), seven leading research universities, and graduate students and faculty to infuse skills in the assessment of undergraduate learning into PFF programs. The report identifies promising practices in structuring skills development activities and a range of replicable and scalable ways for enhancing the next generation of faculty through improvements in graduate education.

Project Overview

The CGS Preparing Future Faculty to Assess Student Learning initiative was a cross-disciplinary, collaborative effort to enhance skills and understanding of future faculty in the assessment of student learning and the effective use of student learning outcomes in the arts and sciences. The project provided opportunities for graduate students from all fields, but emphasized collaborations among graduate students and faculty in the humanities, qualitative and quantitative social sciences, and STEM fields.

Specifically, this project sought to leverage existing PFF and other, similar programs to prepare graduate students who aspire to academic careers with three skills:

- to identify needs and opportunities in their classrooms and in their programs,
- to respond through enhanced teaching and learning techniques (in assessing student learning and using student learning outcomes), and
- to engage with other graduate students and faculty in evidence-based conversations within and across the arts and sciences.

Project Goals and Accomplishments

In the short term, the project sought to accomplish the following goals:

- develop a cadre of graduate students who would become (a) skilled in techniques and strategies for using assessment strategies to enhance undergraduate learning and (b) champions of such an approach to undergraduate teaching and learning at the institutions at which they would find future academic employment;

- develop a portfolio of sustainable activities within existing structures and programs to provide these skills and qualities to future graduate students in humanities and qualitative social sciences; and
- improve undergraduate education at participating graduate degree-granting institutions through project-funded collaborations between students and faculty focused on gateway course reforms, enhanced teaching assistant training, and forums for intra-campus dialogue on learning assessment.

During the two years that universities had to launch these projects, they directly involved close to 1,300 graduate students and 200 faculty, including 433 graduate students and 61 faculty in the humanities and social sciences, and 862 graduate students and 166 faculty in STEM fields. Through the leadership of these students and faculty, and of the graduate deans who served as principal investigators, the overall initiative identified replicable and scalable strategies that will help advance these three goals beyond the lifespan of the grants that supported this work.

This report highlights the typical challenges that arose and promising solutions for overcoming them. It also describes the important roles that graduate deans and graduate school staff can play, including collaboration, networking, and convening, as well as leadership in the areas of resource allocation and professional development. Through these typical leadership roles, graduate schools addressed common challenges such as securing faculty support and incentivizing greater involvement in learning assessment. In addition, the report directs faculty and graduate students to other resources for improving teaching and learning and assessing learning outcomes.

Background

This project builds on more than two decades of CGS work in fostering the development and enhancement of PFF programs. Since the early 1990s, CGS has worked with member institutions and partner organizations to build a network of comprehensive programs that prepare graduate students aspiring to faculty careers. In 1993, CGS, in collaboration with the Association of American Colleges and Universities (AAC&U), launched the PFF initiative to transform the way aspiring faculty members are prepared for their careers. During a decade of grant activity, from 1993 to 2003, PFF evolved into four distinct program phases, with support from The Pew Charitable Trusts, the National Science Foundation, and The Atlantic Philanthropies. During this time, PFF programs were implemented at more than 45 doctoral degree-granting institutions and nearly 300 "partner" institutions in the United States. During the phases funded by the NSF and The Atlantic Philanthropies, CGS worked with 11 disciplinary societies to develop discipline-based PFF models that often prepared graduate students alongside centralized PFF programs.

In 2010, CGS was awarded a grant from the Teagle Foundation to explore opportunities for enhancing the preparation of future faculty to assess student learning. That one-year project examined how professional development programs such as PFF and other, similar programs might best train graduate students in the assessment of undergraduate student learning and the use of outcomes measures to improve

teaching and course design. The results of that project pointed to five specific needs (Denecke et al., 2011), which were used to inform the project described in this report:

- strategies to reach more students within universities with active PFF and similar programs;
- greater dialogue between university leadership at all levels (graduate school, faculty, staff, and graduate students) about how to integrate learning assessment into professional development programs for tomorrow's faculty in ways that are scalable, sustainable, and effective;
- more opportunities for dialogue within and across universities about best practices in the disciplines that were fostered during the PFF initiative;
- a model for evaluating the effectiveness of these programs in a way that would encourage greater participation by students, greater endorsement by faculty, and greater adoption by U.S. universities; and
- a framework for facilitating the exchange of information within and across institutions about the effectiveness and success of such programs.

The project described in this report sought to meet each of these five needs.

CGS issued a request for proposals with criteria that included collaboration and learning outcomes assessment, impact, infrastructure, and institutional commitment (see Appendix A), as well as the following priority considerations:

- institutional capacity to bring significant expertise and graduate school leadership to develop model programs with the potential to advance the national dialogue around graduate student preparation in learning assessment;
- demonstrated national expertise in college learning assessment, including learning methods, practices, and theories relevant to both humanities and qualitative social sciences and to STEM fields;
- discussion within the proposal of how
  - experience in arts and science, and STEM classrooms will be used to improve the preparation of graduate students for arts and science careers in academia;
  - discipline-specific learning assessment activities will enrich centralized PFF programming and/or institutional undergraduate learning assessment plans; and
  - differences in cultural background, including international background, of participating graduate students and/or undergraduates will be addressed;
- willingness and capacity of the graduate school to sustain successful project activities as evident by the strength of plans for scale-up and sustainability beyond the duration of the grant; and
- a plan for sharing promising practices with others on campus.

CGS received 25 proposals from universities representing a broad range of CGS member institutions. The proposals were evaluated by an external selection committee consisting of senior leaders in graduate education with experience in arts and sciences, PFF programs, learning outcomes assessment, and graduate education reform. The committee members rated the proposals based on the criteria and priority considerations, and then discussed their ratings in person. The seven universities selected were

- Cornell University,
- Harvard University,
- Indiana University (in partnership with Indiana University Bloomington and Indiana University–Purdue University Indianapolis),
- Michigan State University,
- North Carolina A&T State University,
- University of California, Merced, and
- University of North Carolina at Greensboro.

An additional 19 institutions participated as project affiliates, co-presenting on CGS sessions to the graduate community and joining in biannual meetings of project leaders. The project affiliates were The Chicago School of Professional Psychology, City University of New York Graduate Center, Clemson University, Emory University, Felician University, Florida State University, Fordham University, The Johns Hopkins University, Marquette University, Purdue University, Rensselaer Polytechnic Institute, Saint Louis University, Tufts University, The University of Missouri, The University of Missouri-Kansas City, The University of Oklahoma Health Sciences Center, The University of South Florida, Virginia Tech, and West Virginia University.

The project was supported by grants from the Alfred P. Sloan Foundation and the Teagle Foundation. The Teagle Foundation supported activities in the humanities and social sciences, while a complementary grant from the Sloan Foundation funded activities in STEM fields and economics.

II. Summaries of Institutional Projects

Research partner universities constructed rich and multifaceted projects that produced valuable resources and encouraged graduate students and faculty to be campus leaders in the assessment of undergraduate learning. The following summaries describe the main goals and achievements of each institution's project.[1]

Cornell University

Cornell University's Graduate School aimed to enhance graduate students' learning assessment skills through campus-wide dialogue and opportunities for in-depth practice and reflection. To accomplish this goal, three experts in the field of learning assessment were brought to Cornell for campus-wide public talks and targeted meetings. In addition, assessment techniques were incorporated into workshops on teaching and learning through Cornell's Center for Teaching and Excellence (CTE) program GET SET (Graduate Students, future Educators, and Teaching assistants pursuing Scholarship and Excellence in Teaching). A second goal of the project was to catalyze discipline-specific action research on student learning assessment through strategic partnerships with humanities and STEM courses. For example, the CTE and the John S. Knight Institution for Writing in the Disciplines formed a partnership to support graduate instructors of first-year writing courses. Through this ongoing partnership, graduate student fellows participate in six two-hour workshops, design small Teaching-as-Research projects to implement in their first-year writing seminars, and present their results at a campus-wide symposium.

Harvard University

Harvard University leveraged existing groups within the university to (a) create a multidisciplinary, multi-school working group focused on learning assessment; (b) develop assessment metrics for use in both undergraduate and graduate gateway courses in the life and physical sciences; and (c) develop a Teaching-as-Research course for all Graduate School of Arts and Sciences students and postdoctoral fellows that provides them with the skills required to pursue research on learning assessment. These goals were met by creating two working groups to identify and discuss the learning assessment needs of the Harvard community. Resulting activities included a university-wide retreat titled "Are My Students Actually Learning?," a five-session workshop on learning assessment for graduate students (January

1 These descriptions are modified and abbreviated from institutionally approved public summaries and institutional reports and proposals, which are viewable on the project landing page: http://cgsnet.org/preparing-future-facultypreparing-future-faculty-assess-student-learning.

2014), and a spring symposium in May 2015 which included a session on intergenerational learning. Harvard has begun implementing a plan to disseminate and institutionalize the content from these events, including creating a course for new faculty on learning assessment.

Indiana University

Indiana University integrated assessment education into the Indiana University Bloomington (IUB) and Indiana University-Purdue University Indianapolis (IUPUI) Preparing Future Faculty programs, and created a third intercampus seminar program through the University Graduate School. IUPUI's Preparing Future Faculty program introduced best practices for student, program, and institution-level assessment. At IUB, the Graduate Student Science Education Assessment (SEA) Scholars collaborated with biology faculty members to develop and integrate course-appropriate information literacy assignments and assessments throughout the curriculum. The SEA Scholars co-designed biology courses, identified learning outcomes, and prepared course development guides to help faculty members integrate information literacy activities into their classrooms. The close collaboration of faculty and SEA Scholars on assessment tools and rubrics resulted in valuable products that will inform faculty as they improve the curriculum.

Michigan State University

The goal of Michigan State University's (MSU) project was to develop a comprehensive approach for preparing graduate students and postdoctoral fellows to assess student learning outcomes. The project began by establishing Communities of Practice to convene graduate teaching assistants and faculty in eight colleges; these communities were ultimately combined into the larger MSU Assessment Network. The Assessment Network leveraged three established programs for guidance and sustainability: (a) the Certification in College Teaching Programs, (b) the NSF-funded CIRTL initiative, and (c) the Center for Academic and Future Faculty Excellence, a NSF-funded Innovation through the Institutional Integration project. A few key accomplishments from the project include promotion of gateway course redesign across the university, digital resources to help graduate students and postdoctoral fellows utilize assessment strategies in their teaching practices, and the acquisition of internal funding for "Instruct 2020," a dynamic web-based system for co-creating visual aids for use in the classroom.

University of North Carolina, Greensboro and North Carolina A&T State University

The University of North Carolina, Greensboro (UNCG) and North Carolina A&T State University (NC A&T) offer a joint Preparing Future Leaders program for preparing both future faculty and professionals. The overall goal of this collaborative project was to incorporate assessment training into the PFF track of the Preparing Future Leaders program for graduate students at UNCG and NC A&T. To achieve this goal, the two universities developed four integrated PFF online modules during the first

year of the project.[2] These modules were used as a foundation for a follow-up workshop, in which students were asked to apply the concepts from the modules by integrating assessment practices with course syllabi.

University of California, Merced

The University of California, Merced (UC Merced) completed a project with the following goals: (a) extending the Center for Research on Teaching Excellence's future faculty certificate program to address undergraduate learning outcomes assessment, with an emphasis on the learning needs of underrepresented students; (b) delivering a course-embedded assessment experience, during which future faculty participants apply assessment practices in the classroom; (c) developing curriculum to support teaching assistants in key gateway courses in STEM, social sciences, and humanities disciplines; and (d) engaging Faculty Assessment Organizers, course instructors, and assessment specialists as project mentors within the context of a learning community. These goals were accomplished by successfully offering and awarding the Certificate in Undergraduate Learning Outcomes Assessment: Pedagogy and Program Planning. Participants attended a pre-semester workshop series, contributed to weekly meetings of the learning community, and summarized their assessment as pedagogy projects in a final teaching essay.[3]

2 Links to these online modules, titled *Focusing on Assessment of Student Learning*, are available in the CGS Preparing Future Faculty Resource Library: http://cgsnet.org/resource-library/section/96

3 These essays and related materials are publicly available at the Center for Research on Teaching Excellence's website: http://crte.ucmerced.edu/CGS_grant

III. Assessment Skills and Competencies

The supported projects helped graduate students gain proficiency in a variety of evidence-based assessment skills and concepts. Students were provided with teaching principles, tools, and techniques that they could apply in the classroom and use to evaluate undergraduate student learning. Examples include student learning outcomes, assessment metrics and rubrics, concept inventories and conceptual models, backward design, flipped classrooms, and response systems. These skills and related approaches are already well documented and have demonstrated effectiveness in different educational settings (Chism, Angelo, & Cross, 1995; Prince, 2004; Contreras-McGavin & Kezar, 2007; Pusecker et al., 2012; Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013, Freeman et al., 2014).

The project focused on strategies for *institutionalizing* these tools, skills, and principles in contexts ranging from wholesale course reform to infusion in traditional large-format lectures. Before discussing these institutionalization strategies, brief definitions of core concepts are included below with examples highlighting how the institutions incorporated these concepts into their projects.

Student Learning Outcomes

This project sought to provide graduate students with exposure to, and experience with, student learning outcomes to address the extensively documented need for greater faculty engagement in this area (Provezis, 2010; Denecke et al., 2011; Kuh et al., 2015). The three key attributes of successful strategies for assessing student learning outcomes identified through the project include a low-stakes environment, frequent feedback, and reciprocal improvement. When student learning is assessed through high-stakes assignments such as exams and term papers, faculty receive only a partial picture of student learning, and cannot measure the fuller range of learning outcomes that would inform effective teaching (Amrein & Berliner, 2002; Eubanks, 2006). Other factors present in high-stakes environments, such as test anxiety and stereotype threat, may further complicate results of learning assessments (Hancock, 2001; Taylor & Walton, 2011). Providing abundant and frequent feedback to students reduces frustration and improves retention, particularly in STEM gateway courses (Brown, Hershock, Finelli, & O'Neal, 2009, p.5). Assessment of student learning against well-developed outcomes can inform an educator's choice of teaching strategies and provide powerful opportunities to improve learning among both students and faculty. The simultaneous enhancement of teaching and learning improves student retention and degree completion, as well as learning outcomes, particularly for students with diverse learning styles (Brown et al., 2009).

The following examples represent some of the ways in which participants addressed the broader purposes and uses of learning outcomes assessment:

- **University of North Carolina at Greensboro and North Carolina A&T State University** led students through a hands-on process of writing effective student learning outcomes in the "Using Assessment in Designing Effective Courses & Syllabi Workshop." This face-to-face workshop also taught students how to indicate the alignment of student learning outcomes with assessments on course syllabi for both current and proposed courses.
- **University of California, Merced** highlighted "assessment as pedagogy" as a central feature of its program. Rather than viewing the assessment of student learning outcomes as an accountability practice, the university framed it as both an approach to instruction and a planning tool at the course and program levels. Participating graduate students summarized their assessment-as-pedagogy projects in a final teaching essay.[4]

Assessment Metrics and Rubrics

Throughout the project, the participating institutions applied common, evidence-based assessment rubrics and discipline-specific metrics for evaluating student performance. The use of rubrics confers numerous benefits to both students and instructors. When aligned with student learning outcomes, rubrics clarify course expectations, ensure consistent assessment, and save time during the grading process. They also provide students with timely feedback that can help them adjust their progression toward learning objectives (Stevens & Levi, 2005; Reddy & Andrade, 2010). The effectiveness of rubrics in enhancing student learning is well documented (Brown et al., 2009; Pastor, 2011; Simpson-Beck, 2011). The resources section at the end of this report provides illustrative examples of these techniques, as well as links to studies of effectiveness.

The following are examples of a focus on rubrics:

- **Indiana University-Bloomington and Indiana University-Purdue University Indianapolis** created an online database, Information Literacy Instruction and Assessment Database, with assessment templates and guidelines, including the *Blueprint for Curricular Integration and Assessment of Information Literacy.* The resource is intended for instructors and librarians who are collaborating to improve student success in critical thinking, writing, and communication skills.
- **Michigan State University** compiled an online resource[4] for designing effective rubrics, with links to downloadable examples.

4 The online compendium includes example rubrics from other institutions as well as Michigan State-specific resources: http://fod.msu.edu/oir/rubrics

Concept Inventories

Concept inventories are assessment tests designed to measure the effectiveness of instruction by measuring the student's understanding of a subject's fundamental concepts (Adams & Wieman, 2011). The tests are designed to prompt the student to think like an expert in a specific subject and to evaluate the student's understanding of that subject's fundamental concepts. Originally developed as the Force Concept Inventory for undergraduate physics students, this method of assessment has expanded into multiple disciplines (Adams & Wieman, 2011). Questions in the concept inventory are formulated using previous student interviews or open-ended essay questions that have exposed misconceptions, incorrect thinking, or incomplete understanding of the concept. The test format is multiple choice, with common misconceptions inserted as choices throughout the test as distractors. Through this format, instructors are able to identify where students are lacking in mastery of a particular concept (Smith & Tanner, 2010; Boles, Goncher, & Jayalath, 2015).

Several universities incorporated concept inventories into their overhaul of STEM gateway courses. The following are two examples:

- **Cornell University** applied concept inventories in an introductory physics course to examine student misconceptions about core physics concepts, and plans to develop a similar concept inventory for use in a biology course. The inventories are accompanied by clicker questions and formative assessment training for graduate teaching assistants.
- **Harvard University** incorporated the Force Concept Inventory tool (Savinainen & Scott, 2001) into an applied physics course (Physics as a Foundation for Science and Engineering) to measure students' basic understanding of certain concepts in physics. In addition, the use of concept inventories was featured during a five-day learning assessment workshop at Harvard, during a session entitled "Use of conceptual inventories and pre/post testing to teach around students' misconceptions."

Backward Design

Backward design is the process of developing curriculum with the final goals and assessment metrics in mind at the beginning of the planning process. The backward design process has three stages: identify desired results, determine acceptable evidence of student understanding, and plan learning experiences and instruction. With desired results and evidence of understanding clearly defined before planning the curriculum, educators can plan learning activities that will ensure all students are prepared for the final assessment (Wiggins & McTighe, 2005). The following is an example of backward design:

- **Michigan State University** successfully incorporated backward design into several existing programs including the Teaching Assistant (TA) Program, a fellowship program offered by the Residential College in the Arts and Humanities, and a Coursera course. In 2013, MSU dedicated one day of the three-day TA orientation to focus solely on backward design and assessment. TAs did not find this information relevant, however, since the scope of their TA role did not include syllabus design or learning assessment. In response to this feedback, the 2014 workshop focused instead on the lesson (as opposed to the course) as the context within which backward design and student learning assessment was discussed. Similarly, the MSU Residential College in the Arts and Humanities Fellowship program incorporated backward design during its Preparing Future Faculty to Assess Student Learning Spring Institute. The session "What is Backward Design?" was recorded and published on the MSU YouTube channel, and was included as required viewing for a Coursera course called "An Introduction to Evidence-Based Undergraduate STEM Teaching," which has reached more than 4,000 students to date.

Flipped Classrooms

"Flipping" the classroom is a teaching technique that replaces the traditional lecture method with active learning principles. Information that students would have traditionally learned in class lectures is learned outside of class through reading assignments, recorded lectures, or podcasts (Berrett, 2012). With content delivery shifted outside of the classroom, students are then free to participate in more student-centered learning activities during class time. These activities typically include discussions, problem-based learning, group work, and peer instruction (Crouch, & Mazur, 2001; Deslauriers et al., 2011; Cook, 2016).

Several universities, such as Cornell University and University of California, Merced, incorporated flipped classroom techniques into their projects:

- **Cornell University** implemented the flipped classroom technique through a pilot project to overhaul four biology and four physics courses in the College of Arts and Sciences. The five-year pilot sought to have a university-wide impact which would extend beyond the life of the CGS project, exposing over 3,000 undergraduate students to this method of learning, and providing STEM teaching assistants with training in flipped classroom techniques (Glaser, 2013).
- **University of California, Merced** took a slightly different approach by integrating the flipped classroom concept into pre-semester workshops for Center for Research on Teaching Excellence (CRTE) certificate program participants. Content from the workshops was converted into interactive webinars to be viewed before the in-person meetings. This allowed UC Merced to not only improve learning outcomes for the CRTE certificate program but to also model the flipped classroom technique by including it in the training process.

Response Systems

Classroom response systems, also known as "clickers," polling systems, or response technologies, promote active learning. Clickers are handheld remotes assigned to each student that may be used to answer questions and record student understanding of concepts in real time (Bruff, 2009). Other similar techniques include the use of web-based software that students can access via their laptop, smartphone, or tablet. By immediately charting and recording student responses to questions asked during class, instructors are able to assess if students have misconceptions about the material being taught at that moment and clarify material that may be confusing. Classroom response systems can also increase student engagement and interaction, facilitate classroom discussion, and foster peer learning (Shuster, & Shuster, 2007; Stowell & Nelson, 2007; Zhu, 2007; Preszler, Dawe, Briggs, & Keyek-Franssen, 2010). While these systems can also be used to quiz students for a grade and take attendance, students prefer to use this technology in ways that are more directly connected to their learning. For example, faculty can use the clickers to promote both small-group and class-wide discussions or to display the immediate results of an ungraded quiz (Bruff, 2009).

Universities integrated response systems into their projects in a variety of ways, such as the following:

- Both **Indiana University Bloomington** and I**ndiana University-Purdue University Indianapolis** use a response system (called Top Hat) that allows students to respond to questions in the classroom through their own smartphones and other electronic devices. This has allowed the universities to leverage the pedagogical benefits of clickers without incurring the costs associated with purchasing additional hardware.
- **Cornell University** trained its STEM teaching assistants to use clickers for assessment purposes. Through its Center for the Integration of Research, Teaching, and Learning (CIRTL) Network, Cornell offered an online mini-course called Peer Instruction Using Clickers during the Summer 2014 Graduate Courses on Teaching and Career Preparation from CIRTL. This course helped TAs integrate peer instruction into lessons and assessments, and learn how to formulate questions that will help students think like experts in their specific disciplines.

Discipline-specific Strategies

The strategies and examples described above are general techniques that universities can use to enhance teaching and learning, and improve assessment of student learning outcomes. However, each discipline presents its own set of problems and opportunities, and the subject matter may require a different assessment approach. Embedding assessment into disciplinary practice, rather than presenting it as separate, improves both faculty buy-in and student interest (Banta, 2007; Heiland & Rosenthal, 2011).

Results from discipline-based education research show how various approaches to student learning in the discipline can lead to more successful assessment programs. For example, in the social sciences, integrating recent research on the neuroscience of learning may make programming on learning assessment particularly appealing to doctoral students in psychology (Bresciani Ludvik, 2016). In the humanities, discourse analysis has been used to conduct qualitative assessments of student writing (Barksdale, Ladd, & Rose, 1997, cited in Contreras-McGavin & Kezar, 2007), and digital storytelling is being used as an emerging pedagogical method that integrates critical thinking with creative expression (Benmayor, 2008). In STEM fields, overall, inquiry-based learning "replicates the process and excitement of research in the classroom by replacing traditional lectures with open-ended, exploratory activities that ask students to investigate problems or phenomena" (Brown et al., 2009, p.6). These active learning techniques help students construct their own understanding of concepts rather than simply memorizing information.

Each university project included discipline-specific skills and techniques, as well as more general teaching and learning techniques, such as the following:

- Michigan State University developed the Interdisciplinary Humanities Professional Learning Community, which met regularly in 2014 to discuss theoretical and practical ideas related to student learning assessment in the humanities and social sciences.
- In 2013, Indiana University Bloomington hosted a colloquium on information literacy in the humanities and social sciences.
- University of North Carolina at Greensboro and North Carolina A&T State University developed STEM-specific assessment methods and exercises for use in general education science courses. Graduate students who will be teaching STEM gateway and introductory economics courses also received preparation and feedback for teaching and implementing assessment specific to their discipline through structured PFF program requirements.
- Harvard University used STEM-specific strategies to redesign three gateway courses: an applied physics course, an introductory life science course, and a first-year biology course for doctoral students. Strategies included the Force Concept Inventory tool for physics, active learning, metacognitive practices, and the use of assessment rubrics.

Summary

As the examples above indicate, students in this project were exposed to a wide range of skills, techniques, and assessment strategies for use in the undergraduate classroom. The next section focuses on institutionalization strategies, or ways in which graduate schools sought to embed this skills development into the preparation of graduate students for faculty careers.

IV. Strategies That Worked

Each of the seven research partner universities took a different approach to integrating learning assessment skills into programs for preparing future faculty to assess student learning. These approaches were uniquely tailored to each institution's culture, available resources, and existing opportunities for graduate students. Nevertheless, eight common strategies emerged across the project:

1. Leveraging Existing Programs to Engage Faculty
2. Learning Communities, Communities of Practice, and Retreats
3. Assessment Fellows/Scholars
4. Teaching-as-Research
5. University-wide Conferences and Meetings
6. Workshops and Seminars
7. Course Reforms
8. Online Modules and Resources

Each of these strategies is discussed below, with examples from participating universities.

1. Leveraging Existing Programs to Engage Faculty

All seven partner institutions took advantage of established faculty development programs and integrated learning assessment content into existing activities. These programs included active PFF programs, CIRTL network programs in STEM fields; the Higher Learning Commission's Academy for Assessment of Student Learning; faculty workshops offered by regional accreditors on the use of student learning outcomes; and a range of initiatives by organizations such as the Lumina Foundation, the Association of American Colleges and Universities, the Association of Public and Land-grant Universities, and the Association of American Universities. This strategy of leveraging existing programs enabled partners to leverage their current investments and human resources and ensure that those practices which proved effective would be sustainable.

Examples include the following:

- **Cornell University** revised workshops associated with its GET SET and CIRTL programs to include learning assessment activities. During this project, the principal investigators determined there was sufficient demand to create an additional workshop series and assessment certificate program run by project staff. Participation in the series now leads to a certificate in Assessing Learning and Teaching.
- **Michigan State University** leveraged three existing programs for strategic enhancements: the Certification in College Teaching Program, the NSF-funded CIRTL initiative, and the Center for Academic and Future Faculty Excellence, an NSF-funded I3 project. The Certification in College Teaching Program is an annual, intensive two-day program covering topics such as teaching with technology, assessing student learning outcomes, and creating effective learning environments. The I3 project convened a panel of distinguished cognitive scientists in April 2014 to discuss the latest research in learning and memory and the application of this research to the postsecondary classroom. MSU also enlisted graduate faculty, graduate students, and postdoctoral fellows as peer leaders to map and track existing assessment efforts across campus. As it is on most campuses, graduate education is decentralized at MSU, and evaluating existing programs across disciplines helped the university leverage its assets toward new goals for undergraduate learning assessment.
- Finally, **Indiana University Bloomington, University of California, Merced, University of North Carolina at Greensboro,** and **North Carolina A&T State University** collaborated with their schools' Centers for Teaching and Learning to enhance preexisting workshops and certificate programs. IUB collaborated with the Scholarship of Teaching and Learning program to give scholars exclusive access to nationally recognized experts on teaching and learning. UC Merced's project added a Graduate Certificate in Undergraduate Learning Outcomes and Assessment at its Center for Research on Teaching Excellence. UNCG and NC A&T added a new assessment component to their existing Preparing Future Leaders program.

2. Learning Communities, Communities of Practice, and Retreats

Multiple institutions developed learning communities, or communities of practice, and/or held interdisciplinary faculty and student retreats that featured undergraduate learning assessment. By forming such communities, the institutions reduced isolation among faculty champions, inspired other faculty to improve their teaching skills, and fostered a shared sense of responsibility for student learning outcomes. These communities also allowed faculty to work more efficiently, pooling their knowledge around learning assessment to accelerate change. The following are a few representative examples:

- As noted in the project summary above, **Harvard University** held a university-wide, multidisciplinary learning assessment retreat titled "Are My Students Actually Learning?" The 75 attendees learned about assessment and evaluation tools already in use across the university, shared best practices and innovative strategies, and identified areas of opportunity for training and collaboration among current and future faculty.
- **Indiana University** developed a community of practice where participants created and applied for Planning and Institutional Improvement Program Review and Assessment Committee Grants. This committee establishes guidelines for comprehensive program review for academic and administrative units and provides guidance for student outcomes assessment throughout the institution. The committee also provides a forum for the exchange of program review and assessment information and strategies among graduate programs, undergraduate programs, and administrative units.
- **Michigan State University** also established communities of practice involving graduate teaching assistants and faculty in eight colleges; these communities were later transformed into a larger MSU Assessment Network. The network promoted gateway course reform and disseminated digital resources, including visual aids for use in the classroom through Instruct 2020.
- **UC Merced** developed a learning community of experts from the Office of Institutional Assessment and the Merritt Writing Program. The learning community held pre-semester workshops and weekly meetings, which helped to advance an innovative and robust campus culture around the evaluation of student learning.

RESOURCE HIGHLIGHT

The Faculty Learning Communities (FLCs) at Indiana University Bloomington are cohorts of faculty members, often from different disciplines or fields of study, who ask questions about teaching and learning, try out teaching innovations, assess student learning, create new models of practice, and publish scholarship about their work. FLC members co-create products for assessing student learning within a collegial framework that offers peer review and support. The Center for Innovative Teaching and Learning sponsors multiple FLCs each year; past topics include creating active learning spaces, enhancing visual literacy, using backward course design, and developing inclusive teaching practices.

3. Assessment Fellows/Scholars

Graduate student engagement and leadership were essential to the success of the project. Nearly all participating universities leveraged existing fellowship or scholarship structures or created new fellows programs to incentivize and recognize student participation in high-intensity programs that require advanced understanding of assessment skills and concepts. This is illustrated by the following examples:

- **Harvard University** designated two learning assessment fellows, who coordinated with speakers and learning center leadership to develop a five-session workshop for graduate students and postdoctoral fellows titled "What are My Students Learning?"
- **Michigan State University's** Future Academic Scholars in Training program engaged doctoral students interested in teaching, learning, and assessment in higher education whose college or department has an approved Certification in College Teaching Program. Students selected for this one-year program participated in group meetings and workshops with fellowship recipients, and heard from outside speakers on topics related to teaching and learning. Fellowship recipients also proposed and conducted a small scholarly project on a topic of their choice related to the scholarship of teaching. Each fellow received $2,000 to help support project expenses and/or travel to a conference to disseminate findings.
- Finally, **Indiana University's** graduate student Science Education Assessment (SEA) Scholars worked in teams with faculty to develop rubrics to measure information literacy learning outcomes for each course and exercise, and developed and implemented an Undergraduate Research Skills Assessment Survey in courses across the biology curriculum. SEA Scholar program assessment occurred through written guided reflections that informed the project leaders about the productive elements of the training process, the needs for additional resources, and the overall effect of the program on graduate students' practice of evidence-based instruction.

RESOURCE HIGHLIGHT

The Certificate in Undergraduate Learning Outcomes Assessment: Pedagogy and Program Planning at UC Merced is a semester-long professional development opportunity that prepares current graduate students, and future faculty, to assess undergraduate learning. Offered each fall and spring by the Center for Engaged Teaching and Learning, the certificate program includes a three-day workshop, weekly learning community meetings, a curriculum development project, and a final reflective essay ("teaching essay"). Participants earn a stipend and must have a current TA appointment. Sample final teaching essays are published on the certificate program's website.

4. Teaching-as-Research

Teaching-as-Research, a core idea in the CIRTL initiative, involves "the deliberate, systematic, and reflective use of research methods to develop and implement teaching practices that advance the learning experiences and outcomes of students and teachers" (Vanderbilt University, 2017). Building on established practices of

evidence-based teaching such as the Scholarship on Teaching and Learning, a common component of many PFF programs, Teaching-as-Research can provide an accessible point-of-entry to faculty and graduate students as the effectiveness of teaching practices becomes a matter for research inquiry (Wieman, 2007; Potter & Kustra, 2011). Several universities included Teaching-as-Research in their projects, contributing to the scholarly knowledge base around teaching and learning while simultaneously improving graduate student teaching skills in real time. The following are two examples:

- **Cornell University** recruited a cohort of 10 mid-stage to advanced graduate students from various humanities fields (English, medieval studies, philosophy) for a new semester-long CGS-Cornell University Assessment Fellowship, in partnership with the Knight Institute for Writing in the Disciplines. Together, fellows completed five Teaching-as-Research projects and five "peer collaborations" on assessing student writing. In 2014, a second cohort of four humanities fellows completed a semester-long Preparing Future Faculty Assessment Fellowship program in which they attended six two-hour workshops, designed small Teaching-as-Research projects to implement in their first-year writing seminars, and presented their results at a university-wide symposium.[5]
- UC Merced co-hosted an assessment symposium with colleagues from the University of California, Santa Cruz to exchange ideas and practices regarding course and program level assessment. Teaching-as-Research was a unifying theme for the symposium, with assessment as the framework for advanced, evidence-based pedagogy and program planning. The UC Merced team writes that "proficiency with Teaching-as-Research is essential to cultivating sustainable assessment practices that have the desired impact on student learning."

5. University-wide Conferences and Meetings

Universities also used project participation to support new conference and meeting activities, and enhance regular convenings within existing programs. These meetings provided a rare opportunity for faculty across disciplines to share their knowledge around teaching, learning, and assessment. In addition to these meetings breaking down disciplinary siloes, recordings of the meetings captured new knowledge for institutions to share externally with their peers. The following are examples of university-wide conferences and meetings:

- **Indiana University-Purdue University Indianapolis** hosted the Educational Training for Teaching Associates Fall Conference in August 2014, which combined interactive workshops, group work, and experiential learning. IUPUI also hosts the Edward C. Moore Symposium on Excellence in Teaching, an annual event which convenes the Indiana higher education community to examine teaching

5 More information about Cornell University's PREPARE program is available at http://blogs.cornell.edu/prepare.

excellence and instructional strategies for encouraging student learning across disciplines.

- **UNCG & NC A&T** held once-a-semester network meetings at UNCG and NC A&T's Joint School of Nanoscience and Nanoengineering.
- **Michigan State University** held its inaugural Assessment of Student Learning Spring Institute in 2013. Video recordings of full-length sessions and topical clips from the institute plenary can be found in our CGS Preparing Future Faculty Resource Library, at http://cgsnet.org/resource-library/section/96.
- For information about H**arvard University's** university-wide retreat, see the project summary, above.

6. Workshops and Seminars

All partner institutions incorporated some type of workshop or seminar into their projects. These intensive experiences enabled students to set aside dedicated time to improving their teaching and assessment skills. Even when the workshops took place online, their hands-on nature allowed students to immediately apply what they learned in a supportive and motivating environment. The following are just two examples:

- **UNCG & NC A&T** created a follow-up workshop to the online modules, Using Assessment to Design Effective Courses and Syllabi. Although it was originally planned as a once-a-semester face-to-face workshop, students relayed that they would have difficulty meeting at planned times due to their busy schedules. The universities recorded the workshop as a webinar to allow students to access the content at their convenience. UNCG & NC A&T have also allowed PFF participants to receive credit for attending UNCG's Executive Leadership Challenge series of workshops offered by the Office of Leadership and Service Learning.
- H**arvard University** created a five-session workshop in January 2014 for graduate students titled "What are My Students Learning?" Course objectives included exposing the participants to different types of learning assessment methods that could be used across disciplines and learning how to apply these methods in the classroom. Participants also had the opportunity to develop at least one assessment technique that they could use in their own teaching.

RESOURCE HIGHLIGHT

The Bok Seminars (hosted by the Derek Bok Center for Teaching and Learning at Harvard University) offer graduate students and scholars the opportunity to explore an area of interest in teaching and learning over multiple sessions. These in-person seminars vary in length and intensity based on their focus areas and goals. Summer 2017 seminars include topics such as "Teaching and the Job Market: Getting from TF to Colleague," "Public Speaking for Teachers and Scholars," and "How am I Doing? Using Feedback to Improve your Teaching."

7. Course Reforms

Institutions used their participation in this project as an opportunity to revise an extensive array of undergraduate courses, addressing the fact that, increasingly, the traditional lecture model of delivering gateway courses is not meeting student needs. Redesigning these courses to integrate active learning and opportunities for formative assessment will have the longer-term effect of improving student retention and success. While the revision of STEM gateway courses was an explicit target for the STEM portion of many sub-award projects, several non-STEM courses, such as the following, were also identified and reformed:

- **Cornell University** developed a new, non-credit-bearing series of six two-hour workshops to support graduate instructors of First-Year Writing Seminars in designing and implementing mini Teaching-as-Research projects. Cornell also redesigned and taught a new class session on "Designing Rubrics" for two sections of "Teaching in Higher Education" in Fall 2013.
- Although **Harvard University** did not include any gateway humanities or social sciences courses in its original proposal, graduate student participants learned about assessments being developed for use in social sciences and humanities courses from discussions with their multidisciplinary, multi-school working group. Students from these disciplines participated in the May retreat and January workshop and are part of the group that will be tracked to evaluate future faculty success.

CGS PREPARING FUTURE FACULTY RESOURCE LIBRARY

All seven partner institutions developed resources and materials (both print and online) that are available for viewing in the CGS Preparing Future Faculty Resource Library. The library does not provide an exhaustive list of resources. Rather, the intent is to provide high-value information to institutions, deans, and program directors seeking to prepare graduate students for faculty careers and/or develop a future faculty program on campus.

To access the library, visit http://cgsnet.org/resource-library/section/96.

8. Online Modules and Resources

Participating universities created a robust online presence with PFF websites, YouTube videos, and Vimeo channels. These online resources collected actionable knowledge around undergraduate learning assessment in one convenient location, and delivered that knowledge in a shareable format. Creating these resources also helped institutions expand their reach to include more graduate students in a wide variety of disciplines.

Three projects specifically used online modules to enhance their PFF programs:

- **Indiana University,** for example, used Lesson.ly, an online training platform for peer instruction and microteaching, to help SEA Scholars plan assignments, design rubrics, and execute campus workshops and seminars.
- **Michigan State University** purchased a license for a set of eight online courses to help graduate students and postdoctoral fellows get timely support for their teaching. The Teaching Essentials for Careers in Higher Education courses covered a variety of topics including best practices in student learning assessment, grading, creating rubrics that are aligned with student learning outcomes, and feedback strategies. These online courses are designed to simulate the experience of being part of a workshop and engage the participant in exercises, videos, lectures, and reading. The courses are available in the CGS Preparing Future Faculty Resource Library, at http://cgsnet.org/resource-library/section/96.
- **UNCG and NC A&T** partnered to create four online modules titled "Focusing on Assessment of Student Learning." Module 1 introduces general principles and purposes of assessment, including the ethical use of assessment for educational planning and continuous improvement. Module 2 covers the process of identifying and articulating effective student learning objectives, determining which evidence to collect, and designing effective rubrics. Module 3 teaches students how to design assessment devices for specific disciplinary, program, and institutional contexts. Module 4 shows students how to distinguish among the variable uses of assessment data that are fair, responsible, ethical, and useful for improving student learning. All participating UNCG and NCA&T students were required to complete the four integrated online modules designed to walk users through designing and implementing the steps of the assessment cycle. Each module begins with a video in which hired actors representing students and faculty interact on assessment principles explained in the module.

Summary

The common strategies described above encompass a wide range of approaches. Universities seeking to adapt the models described here are encouraged to consider existing resources, programs, networks, and resources that can be leveraged to embark on this work effectively and efficiently.

V. Common Challenges and Solutions

Universities met with different challenges depending on whether or not there was already an active culture of assessment in place on campus and on the scope and definition of their goals. Some of these challenges were addressed simply by deploying new communications methods and tactics, while others required leadership, networking, and openness to offering skills development activities in multiple formats. Below are some of the most common challenges cited by the institutions and the solutions they developed to overcome those challenges.

Faculty Engagement and Support

The Challenge

Although many faculty were supportive of their institution's vision to improve undergraduate learning assessment, not all were ready for change or convinced that improvement was needed. It proved difficult for some institutions to meet their goals without fuller faculty support and cooperation. Participants described this challenge as expanding the number of engaged faculty beyond an already committed "choir" of supporters; "meeting faculty where they are" in terms of their needs and goals; and defining "assessment" in ways that aligned with the values of faculty and graduate students across a diverse and decentralized graduate education enterprise.

Promising Solutions

A. Engaging Senior Leaders

Engaging senior leaders—such as the dean of the graduate school, leadership from teaching and learning centers, and faculty from different disciplines—can help raise faculty awareness and increase buy-in. As noted in Harvard's final report, "As resources will be needed to support [ongoing] activities, having these individuals engaged and leading the conversation from the start is important."

B. Learning Communities

Learning communities were also effective in overcoming the challenge of low faculty engagement and support. These communities provided graduate students and faculty with space to collaborate and engage equally in the learning process. This was especially important for associate faculty who, while less experienced, were more invested in learning about pedagogy and assessment. Providing opportunities for faculty to participate in cross-disciplinary discussions about teaching and learning was also an effective strategy for expanding "beyond the choir" of predisposed supporters.

C. Foster New Networks

Investment in new networks broadens understanding of teaching and learning principles and instills the value of assessment into the culture of future faculty preparation. Disciplinary societies can play an important role in supporting such networks by raising awareness about, and legitimizing, the intentional preparation of future faculty for teaching roles. Collaboration with disciplinary societies was a key part of CGS' strategy to develop the infrastructure for many of the original PFF programs upon which this project built. However, graduate schools and disciplinary societies need more opportunities to coordinate on an ongoing basis.[6]

Recruiting and Engaging Students

The Challenge

Another challenge was identifying graduate student participants. Some universities struggled to inform and recruit potential participants, initially, before realizing the need for direct outreach to graduate students, especially when faculty outreach and the assumption that faculty would inform students about these opportunities proved insufficient. Others reported difficulty communicating the benefits of learning assessment to students and faculty in terms that resonated with them. An additional complication was self-selection bias, as the students most likely to participate were also those most predisposed to take an interest in, and therefore already be informed about, assessment practices.

Promising Solutions

A. Fostering Graduate Student Leadership

Tapping graduate students (and postdoctoral fellows) as peer leaders, co-facilitators of workshops, and project coordinators improved faculty and graduate student engagement in learning assessment activities. This approach also provided professional development opportunities for the graduate students, as well as additional human resources to help faculty and staff.

B. Using Multiple Methods for Promotion and Communication

A mixture of promotional methods including direct mail to students, faculty, and directors of graduate study proved the most effective means of recruiting for one institution until the program had been running for several semesters. Recruitment becomes easier as the program builds a reputation among students and faculty.

C. Putting Materials Online

As UNCG and NC A&T found, creating online materials to supplement face-to-face activities can ameliorate frustrations of students who are interested but

6 For a discussion of disciplinary society involvement in Preparing Future Faculty programs, see Pruitt-Logan, Gaff, and Jentoft (2002) and Gaff, Pruitt-Logan, Sims, and Denecke (2003).

unable to attend events due to scheduling conflicts. Providing supplementary online materials can also help address differences in baseline knowledge of assessment techniques among students.

Barriers to Gateway Course Reform

The Challenge

Participants that focused on gateway course reforms occasionally met with logistical challenges including limited latitude of teaching assistants (TAs) in exercising creativity to help reform lower-level, often content-heavy courses; limited willingness of faculty or instructors to open their courses to reform and allow student input on assessment; and divergence between existing timelines for course overhauls and those of the grants funding this work.

Promising Solutions

A. Encouraging TAs to Experiment with Lessons, Not Courses

Several institutions found that empowering graduate student TAs to experiment with new teaching and assessment strategies in individual *lessons,* or *classes,* rather than the redesigning the course as a whole, made it easier for TAs to contribute to the reform of content-heavy gateway courses. By exercising creativity at a more manageable level, TAs were able to apply their knowledge of learning assessment and gain confidence in the classroom. In addition, institutions found that these small, lesson-level changes often compounded into improved student learning outcomes in the course.

B. Using an Iterative Process to Align TA and Course Reform Timelines

While the overhaul of gateway courses can take several years, TA positions are typically funded by academic year. TA assignments are often made shortly before a course begins, allowing insufficient time for input into course design. In addition, a course may have multiple TAs assigned or reassigned to it during the redesign process. Cornell University developed a solution to this problem by creating a customized TA training workshop for each iteration of the overhaul, and using the results of TA's Teaching-as-Research projects to inform future iterations.

C. Engaging Faculty

All the challenges above can be addressed through increased faculty engagement and support. When faculty share evidence with each other that flipped classrooms and other techniques result in improved student learning, that can help build consensus around the importance of curricular reform. Strategies that improved faculty engagement also allowed institutions to make greater progress toward vital course overhauls.

Sustainability and Scaling

The Challenge

A common challenge for all institutions is scaling up strategies that work and sustaining effective programs beyond the life of grant funding. The diversity of student populations at each institution, variations in institutions' mission and size, and disciplinary differences all contribute to the challenge of bringing a practice to scale. In addition, some of the most innovative faculty development and learning assessment programs are created in response to a specific funding opportunity; if not designed for long-term sustainability, those programs may atrophy once funds are exhausted.

Promising Solutions

A. Move Programs Online for Broader Dissemination

UNCG and NC A&T have posted their training modules online, where they are free and accessible to the public. Graduate students and faculty at other institutions can easily benefit from this valuable content and incorporate the videos into their own PFF programs. The costs associated with maintaining the online presence of these modules are very low; however, the universities did task a coordinator with collecting and evaluating usage data, as well as making periodic updates to the modules.

B. Incorporate Undergraduate Learning Assessment into the Accreditation Process

To ensure that undergraduate learning assessment remains a high priority for graduate schools, several universities have planned to incorporate assessment practices directly into the accreditation process. Universities are more likely to fund regular assessments and adopt effective practices when they are institutionalized into the accreditation cycle.

C. Obtain Internal Funding Commitments from Senior Leaders

Several universities obtained commitment and internal funding from senior leadership at both the graduate and undergraduate levels to support ongoing activities including workshops, conferences, and symposia, as well as graduate student training and assessment fellowships. Engaging leaders—including the graduate school dean, leadership from teaching and learning centers, and key faculty in different disciplines—is one strategy that can be used to generate interest and buy-in, with the ultimate goal of securing a funding commitment.

CGS documented, curated, and disseminated the project's results through the creation of online resources, member communications, and hosted sessions at its semi-annual meetings. In this way, CGS promoted broader adoption of promising practices throughout the project, both through the network of participating institutions and more broadly among CGS member universities. CGS also fostered broader awareness of the project and connections with complementary initiatives through

publications, webinars, and presentations at disciplinary society meetings, national graduate student professional development convenings, and annual meetings of other national education organizations, such as the Association of American Colleges and Universities.

Over the long term, CGS will work to foster broader integration of these evidence-based strategies into existing programs and structures across U.S. universities to prepare graduate students for faculty careers. Systemic change will require adoption of promising practices across the majority of institutions that prepare arts and sciences faculty of the future.

VI. Conclusion

The Preparing Future Faculty to Assess Student Learning initiative successfully built upon earlier PFF programs to develop a cadre of skilled graduate students, a portfolio of effective strategies, and forums for cross-disciplinary collaboration around undergraduate learning assessment. While only seven in number, partnering universities comprised a diverse set of U.S. institutions. They produced a variety of approaches, resources, and materials for integrating assessment of student learning into existing university structures and programs. Funded institutions created opportunities for interdisciplinary and intradisciplinary dialogues among faculty and graduate students, developed resources for graduate students and faculty, and reformed a host of STEM gateway courses. Graduate schools should find these practices useful as a foundation for similar efforts, and are invited to adapt them as needed to align with their institution's mission and context.

A common thread in this project was the central leadership role of the graduate schools in helping to create a culture of assessment at their institutions. Graduate schools convened key stakeholders, advocated for improved professional development for graduate students aspiring to faculty positions, and engaged faculty in collaboration with graduate students and postdoctoral fellows to ensure that activities were meaningfully integrated into the university's core research and teaching missions.

Despite the diversity of institutions and approaches, participating universities experienced common challenges, especially pertaining to faculty engagement, student recruitment, and gateway course reform. By taking a collaborative approach to overcoming these challenges, these universities developed shared solutions that can work in a variety of institutional contexts. From engaging external partners to developing supplemental online materials flexible to the needs of busy students, the solutions detailed here should help graduate schools strengthen both undergraduate learning assessment and graduate student professional development at their institutions.

U.S. universities are well-positioned to improve the quality of undergraduate teaching and learning through programs that prepare future faculty in the skills of assessment. Graduate schools have the position and tools needed to integrate the assessment of undergraduate learning into faculty and graduate student collaborations, and into existing programs focused on the preparation of graduate students for faculty careers.

This project developed strong and sustainable programs at seven universities and prepared nearly 1,300 graduate students who will take these skills with them into their faculty roles across the higher education system. The next step, however, is bringing these strategies to scale at a national level. This step is required to drive broader culture change on campus, ensure a future of student-centered undergraduate classrooms, and instill assessment values in the next generation of faculty.

WORKS CITED

Adams, W. K., & Wieman, C. E. (2011). Development and validation of instruments to measure learning of expert-like thinking. *International Journal of Science Education,* 33(9): 1289–1312. doi: 10.1080/09500693.2010.512369

Amrein, A. L,. & Berliner, D. C. (2002). High-stakes testing and student learning. *Education Policy Analysis Archives,* 10(18). doi: 10.14507/epaa.v10n18.2002

Arum, R., & Roksa, J. (2011). *Academically adrift: Limited learning on college campuses.* Chicago: University of Chicago Press.

Banta, T. (2007). *Assessing student learning in the disciplines: Assessment update collections.* San Francisco: Jossey-Bass.

Benmayor, R. (2008). Digital storytelling as a signature pedagogy for the new humanities. *Arts and Humanities in Higher Education,* 7(2), 188–204. doi:10.1177/1474022208088648

Berrett, D. (2012, February 19). How 'flipping' the classroom can improve the traditional lecture. *Chronicle of Higher Education.* Retrieved from http://www.chronicle.com/article/How-Flipping-the-Classroom/130857

Boles, W., Goncher, A., & Jayalath, D. (2015, July 15). Uncovering misconceptions through text analysis. Proceedings from *6th Research in Engineering Education Symposium* (REES2015). Dublin, Ireland.

Bresciani Ludvik, M. J. (2016). *The neuroscience of learning and development: enhancing creativity, compassion, critical thinking, and peace in higher education.* Sterling, VA: Stylus Publishing.

Briggs, C., & Keyek-Franssen, D. (2010, December 15). Clickers and CATs: using learner response systems for formative assessments in the classroom. EDUCAUSE Review. Retrieved from http://er.educause.edu/articles/2010/12/clickers-and-cats-using-learner-response-systems-for-formative-assessments-in-the-classroom

Brown, M. K., Hershock, C., Finelli, C. J., & O'Neal, C. (2009). Teaching for retention in science, engineering, and math disciplines: A guide for faculty. *Occasional Paper No. 25, Center for Research on Learning and Teaching.* Ann Arbor, MI: University of Michigan.

Bruff, D. (2009). *Teaching with classroom response systems: creating active learning environments.* San Francisco, CA: Jossey-Bass.

Chism, N. V. N., Angelo, T. A., & Cross, K. P. (1995). Classroom assessment techniques: A handbook for college teachers. *The Journal of Higher Education, 66*(1), 108. doi:10.2307/2943957

Contreras-McGavin, M., & Kezar, A. J. (2007). Using qualitative methods to assess student learning in higher education. *New Directions for Institutional Research,* 136. doi: 10.1002/ir.232

Cook, L. (2016, January 28). Can Flipped Classrooms Transform STEM Courses? *Academic Impressions.* Retrieved from https://www.academicimpressions.com/news/can-flipped-classrooms-transform-stem-courses

Correll, S. J., Seymour, E., & Hewitt, N. M. (1997). Talking about leaving: Why undergraduates leave the sciences. *Contemporary Sociology,* 26(5), 644. doi:10.2307/2655673

Council of Graduate Schools. (2011, April). PFF model can help institutions meet assessment and accountability needs. *CGS Communicator, 44*(3), 1–5. Retrieved from http://cgsnet.org/ckfinder/userfiles/files/comm_2011_04.pdf

Crouch, C. H., & Mazur, E. (2001). Peer instruction: Ten years of experience and results. *American Journal of Physics,* 69(9), 970–977. doi:10.1119/1.1374249

Denecke, D., Kent, J., & Wiener, W. (2011). *Preparing future faculty to assess student learning.* Washington, DC: Council of Graduate Schools.

Deslauriers, L., Schelew, E., & Wieman, C. (2011). Improved learning in a large-enrollment physics class. *Science, 332*(6031), 862–864. doi:10.1126/science.1201783

Drew, C. (2011, November 4). Why science majors change their minds (it's just so darn hard). *New York Times, ED16.* Retrieved from http://www.nytimes.com/2011/11/06/education/edlife/why-science-majors-change-their-mind-its-just-so-darn-hard.html

Dunlosky, J., Rawson, K., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest, 14*(1), 4–58.

Eubanks, D. (2006, June 1). The problem with standardized assessment. *University Business, 9*(6). Retrieved from https://www.universitybusiness.com/article/end-note-0

Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Jordt, H., & Wenderoth, M. P. (2014.) Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences of the United States of America, 111*(23), 8410–8415. doi: 10.1073/pnas.1319030111

Gaff, J. G, Pruitt Logan, A., Sims, L., & Denecke, D. (2003). *Preparing Future Faculty in the Humanities and Social Sciences.* Council of Graduate Schools and Association of American Colleges & Universities. Retrieved from http://www.preparing-faculty.org/PFFWeb.PFF4Manual.pdf

Glaser, L. B. (2013, July 16). New project 'flips' the teaching of science. *Cornell Chronicle.* Retrieved from http://news.cornell.edu/stories/2013/07/new-project-flips-teaching-science

Hancock, D. R. (2001). Effects of test anxiety and evaluative threat on students' achievement and motivation. *Journal of Educational Research, 94*(5): 284–290. doi:10.1080/00220670109598764

Handelsman, J., Ebert-May, D., Beichner, R., Bruns, P., Chang, A., DeHaan, R., Gentile, J., Lauffer, S., Stewart, J., Tilghman, S. M., & Wood, W. B. (2004). Scientific teaching. *Science, 304*(5670): 521–522.

Handelsman, J., Miller, S., & Pfund, C. (2007). *Scientific teaching.* London: Macmillan.

Heiland, D., & Rosenthal, L. J. (2011). *Literary study, measurement, and the sublime: disciplinary assessment.* New York, NY: Teagle Foundation.

Ikenberry, S., Ewell, P., & Kuh, G. (2016). Governing Boards and Student Learning Outcomes Assessment. *Trusteeship Magazine.* (January/February). Association of Governing Boards.

Kuh, G. (2008). *High-impact educational practices: What they are, who has access to them, and why they matter.* Washington, DC: Association of American Colleges and Universities.

Kuh, G. D., Ikenberry, S. O., Jankowski, N. A., Cain, T. R., Ewell, P. T., Hutchings, P., & Kinzie, J. (2015). *Using evidence of student learning to improve higher education.* Champaign, IL: National Institute for Learning Outcomes Assessment, University of Illinois at Urbana-Champaign.

Love, B., Hodge, A., Grandgenett, N., & Swift, A.W. (2014). Student learning and perceptions in a flipped linear algebra course. *International Journal of Mathematical Education in Science and Technology, 45*(3), 317–324.

Mazur, E. (2009). Farewell, lecture? *Science, 323*(5910), 50–51. doi:10.1126/science.1168927

Moravec, M, Williams, A., Aguilar-Roca, N., & O'Dowd, D. K. (2010). Learn before lecture: A strategy that improves learning outcomes in a large introductory biology class. *CBE—Life Sciences Education 9,* 473–481.

Pascarella, E. T. & Blaich, C. (2013). Lessons from the Wabash National Study. *Change: The Magazine of Higher Learning 45*(2), 6–15.

Pastor, V. M. L. (2011). Best practices in academic assessment in higher education. *Journal of Technology and Science Education, 1*(2), 25–39. doi:10.3926/jotse.2011.20.

Preszler, R. W., Dawe, A., Shuster, C. B., & Shuster, M. (2007). Assessment of the effects of student response systems on student learning and attitudes over a broad range of biology courses. *Cell Biology Education, 6*(1), 29–41. doi:10.1187/cbe.06-09-0190

Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education, 93*(3), 223–231. doi:10.1002/j.2168-9830.2004.tb00809.x

Potter, M. K., & Kustra, E. D. H. (2011). The relationship between scholarly teaching and SoTL: Models, distinctions, and clarifications. *International Journal for the Scholarship of Teaching and Learning, 5*(1). Retrieved from https://doi.org/10.20429/ijsotl.2011.050123

Provezis, S. (2010). Regional accreditation and student learning outcomes: Mapping the territory. *Occasional Paper No. 6, National Institute for Learning Outcomes Assessment.* Champaign, IL: University of Illinois at Urbana-Champaign.

Pruitt-Logan, A., Gaff, J. G, & Jentoft, J. E. (2002). *Preparing future faculty in the sciences and mathematics.* Council of Graduate Schools and Association of American Colleges & Universities. Retrieved from http://www.preparing-faculty.org/PFFWeb.PFF3Manual.pdf

Pusecker, K. L., Torres, M. R., Crawford, I., Levia, D., Lehman, D., & Copic, G. (2011). Increasing the validity of outcomes assessment. *Peer Review, 13*(4/1), 27.

Reddy, Y. M., & Andrade, H. (2010). A review of rubric use in higher education. *Assessment & Evaluation in Higher Education, 35*(4), 435–448. doi:10.1080/02602930902862859

Savinainen, A., & Scott, P. (2002). Using the Force Concept Inventory to monitor student learning and to plan teaching. *Physics Education, 37*(1), 53-58.

Simpson-Beck, V. (2011). Assessing classroom assessment techniques. *Active Learning in Higher Education, 12*(2), 125–132. doi:10.1177/1469787411402482

Smith, J. I., & Tanner, K. (2010). The problem of revealing how students think: concept inventories and beyond. *Cell Biology Education, 9*(1), 1–5. doi:10.1187/cbe.09-12-0094

Stevens, D. D., & Levi, A. (2005). *Introduction to rubrics: An assessment tool to save grading time, convey effective feedback, and promote student learning.* Sterling, VA: Stylus Publishing.

Stowell, J. R., & Nelson, J. M. (2007). Benefits of electronic audience response systems on student participation, learning, and emotion. *Teaching of Psychology, 34*(4), 253–258. doi:10.1080/00986280701700391

Taylor, V. J., & Walton, G. M. (2011). Stereotype threat undermines academic learning. *Personality and Social Psychology Bulletin, 37*(8), 1055–1067. doi:10.1177/0146167211406506

Tilghman, S. (2010, January 5). *The future of science education in the liberal arts college.* Presented at the Presidents Institute, Council of Independent Colleges. Retrieved from http://www.princeton.edu/president/tilghman/speeches/20100105/

Van Horne, S., Murniati, C., Gaffney J. D. H., & Jesse, M. (2012). Promoting active learning in technology-infused TILE classrooms at the University of Iowa. *Journal of Learning Spaces, 1*(2). Retrieved from http://libjournal.uncg.edu/jls/article/view/344/280

Wieman, C. (2007). Why not try a scientific approach to science education? *Change: The Magazine of Higher Learning, 39*(5), 9–15. doi:10.3200/chng.39.5.9-15

Wiggins, G., & McTighe, J. (2005). Backward design. In *Understanding by design* (2nd ed). Alexandria, VA: Association for Supervision & Curriculum Development.

Zhu, E. (2007). Teaching with clickers. *Occasional Paper 22, Center for Research on Learning and Teaching.* Ann Arbor, MI: University of Michigan.

Resources

Project Resources

The Preparing Future Faculty to Assess Student Learning project landing page

The project landing page, housed in the Best Practices section of the CGS website, briefly describes the rationale for strengthened assessment of undergraduate learning, outlines the project goals and background, and includes a link to the CGS publication Preparing Future Faculty to Assess Student Learning (2010). The web page also links to project summaries for each of the seven research partner institutions. The 19 affiliate partners are also highlighted here, as well as the press release on award announcements.

Resource Type: Web Page

Preparing Future Faculty to Assess Student Learning (2011)

In 2010, the Council of Graduate Schools was awarded a grant from the Teagle Foundation to explore the preparation of future faculty to assess student learning. The project examined how professional development programs such as Preparing Future Faculty and other, similar programs might best train graduate students in the assessment of undergraduate student learning and the use of outcomes measures to improve teaching and course design. The project also sought to learn how such programs might catalyze broader cultural change within institutions and disciplines by supporting a generation of future faculty who perceive assessment of student learning to be integral to their roles as faculty and scholars.

Resource Type: Report

Preparing Future Faculty Resource Library

CGS has compiled helpful resources and tools for institutions, deans, and program directors seeking to enhance the preparation of graduate students to assess student learning and to prepare them for faculty careers. Searchable categories include Learning Assessment Strategies; Institutional Strategies; Using Student Learning Outcomes; Teaching and Pedagogy; Mentoring and Advising; Research on Student Learning; Using Technology; and Web Resources. All visitors are welcome to submit resource recommendations for inclusion in the library.

Resource Type: Online Knowledge Base

Sample University Resources

Cornell University

Cornell University's Center for Teaching Excellence has compiled an online knowledge base on how to use assessment rubrics, including guidelines for developing rubrics, links to examples, and templates.

Resource Type: Templates

Harvard University

Harvard University's Derek Bok Center for Teaching and Learning has provided an online repository of tip sheets for faculty and teaching assistants, covering topics such as active learning, course design, creating assessments, and managing large courses in the humanities.

Resource Type: Tip Sheets

Indiana University

Lesson.ly is a modern learning software program that Indiana University used to host its activities related to curriculum design and peer microteaching. The platform provides versatile, real-time assessment tools and can accommodate educators focused on STEM and arts and applied degree programs.

Resource Type: Software Platform

Michigan State University

Instruct 2020 is an online community of practice (CoP) for faculty to co-create and share visual communication resources. By using images that have been developed by the community and uploaded in an editable format, instructors save time and can prepare more accurate material for their courses. The CoP includes tools and guidelines for creating images, instructional strategies for using visual aids in the classroom, and a repository of free, editable image files created by other members.

Resource Type: Community of Practice

University of North Carolina, Greensboro (UNCG) and North Carolina A&T State University (NC A&T)

Focusing on Assessment of Student Learning is a series of four online learning modules on designing, implementing, and analyzing assessment in the classroom. These modules support the Preparing Future Faculty track in UNCG's and NC A&T's Preparing Future Leaders program and include Principles and Purposes of Assessment, Designing Effective Assessment, Applying Tools in Different Contexts, and Using Assessment Data for Continuous Improvement.

Resource Type: Online Course Modules

University of California, Merced (UC Merced)

The Undergraduate Learning Outcomes Assessment Pedagogy and Program Planning Resources page contains links to readings related to relevant pedagogy that were discussed during UC Merced's Learning Community meetings. In addition to readings and publications, the resource page includes example survey questions, graduate student teaching essays, and other classroom assessment materials.

Resource Type: Reading List

Other Resources

Teaching and Learning Resource Centers

The following resource centers are comprehensive repositories for information on the scholarship of teaching and learning, assessment metrics and rubrics, strategies for preparing future faculty, and pedagogical approaches for improving undergraduate student outcomes.

- The Science Education Resource Center at Carleton College
- Center for the Integration of Research, Teaching and Learning
- Vanderbilt University Center for Teaching

Assessment Strategies

- This report synthesizes the insights from nine institutional case studies conducted by the National Institute for Learning Outcomes Assessment. These brief, instructive examples are intended to highlight promising practices in using assessment data to inform and improve undergraduate student learning. The report includes lessons learned and reflective questions to help institutions advance their own assessment efforts within their specific institutional contexts.

  Resource Type: Case Studies

- Ways to Assess Student Learning During Class provides step-by-step instructions for student engagement activities in the classroom that will generate evidence of student learning.

  Resource Type: How-to Guide

Assessment Metrics and Rubrics

- The VALUE Rubrics, offered by the Association of American Colleges & Universities, are a set of 16 free, downloadable rubrics for assessing student learning outcomes across disciplines. They are organized into three categories: Intellectual and Practical Skills (e.g., creative thinking, written communication, and quantitative literacy), Personal and Social Responsibility (e.g., intercultural knowledge, ethical reasoning), and Integrative and Applied Learning.

  Resource Type: Templates

Backward Design

- Michigan State University's Graduate School has posted a set of brief videos on backward design, with an example of how to apply the technique in a cell biology course.
- Understanding by Design Wiggins & McTighe: A Brief Introduction provides an overview of backward design theory and the stages of the design process.

Resource Type: Presentations

Communities of Practice

- If you are thinking of launching an online community of practice (CoP), the array of technology platforms and features can be overwhelming. Connected Educators has created a concise guide for developing an online CoP strategy and selecting the appropriate technology to meet the community's goals.
- EDUCAUSE Review: Community of Practice Design Guide: A Step-by-Step Guide for Designing and Cultivating Communities of Practice in Higher Education

Resource Type: How-to Guides

Course Design

- The University of Michigan Center for Research on Teaching and Learning has a free, online guidebook for redesigning courses in a wide variety of disciplines. The guidebook contains sample syllabi and lesson plans, tips for incorporating active learning, and strategies for creating an inclusive classroom.
  Resource Type: Tip Sheets

Flipped Classrooms

- The Flipped Learning Global Initiative (FLGI) is a worldwide coalition of educators, researchers, technologists, professional development providers, and education leaders who are committed to flipped learning. FLGI aims to fill the growing global need for collaboration across borders in three domains: research curation and distribution, evolving best practices in flipped learning, and technology selection and implementation. The FLGI leadership team collaborates to identify and develop partnerships, initiatives, projects, best-in-class vendors, products, and services to introduce and support flipped learning around the globe.
  Resource Type: Online Community of Practice

Learning Communities

- The Center for the Integration of Research, Teaching and Learning (CIRTL) Network, funded by NSF and the Alfred P. Sloan Foundation, is a learning community of 45 institutions across North America. Members participate in courses, workshops, and summer institutes, and have access to CIRTLCast presentations from STEM education experts.
  Resource Type: Online Community of Practice

- McDonald, J., & Cater-Steel, A., Eds. (2016). Making an Impact: Utilising Faculty Learning Communities to Enhance Teaching and Learning. In *Communities of Practice:* 423–435. Singapore: Springer.
  Resource Type: Book Chapter

- Richlin, L. & Essington, A. (2004). Faculty learning communities for preparing future faculty. *New Directions for Teaching and Learning*: 149–157. doi:10.1002/tl.141
  Resource Type: Peer-reviewed Journal Article

Learning Principles

- This list, compiled by Carnegie Mellon University's Eberly Center for Teaching Excellence and Educational Innovation, presents the basic principles that underlie effective learning. These principles are distilled from research from a variety of disciplines.
  Resource Type: Summary of Evidence

Response Systems

- The Vanderbilt University Center for Teaching (CFT) has compiled an extensive bibliography on classroom response systems. The 295-item bibliography includes articles, books, and literature reviews for both general and discipline-specific audiences. In addition, the CFT has created an online knowledge base of resources for teaching with clickers, including videos, sample questions, suggested activities for using clickers, and vendor information.
  Resource Type: Online Knowledge Base

- The University of Colorado Science Education Initiative and the University of British Columbia Carl Wieman Science Education Initiative have produced a set of videos about using clickers in the classroom.
  Resource Type: Video

Student Learning Outcomes

- The University of California, Los Angeles has created a Framework for Assessing Educational Effectiveness, which offers a common structure for engaging faculty in meaningful dialogue about assessing student learning outcomes. The framework contains three distinct but complementary focal points: student learning, course-based instruction, and program effectiveness.
  Resource Type: Online Knowledge Base

- The University of Nebraska, Lincoln's Office of Undergraduate Studies has posted a comprehensive guidebook for programmatic assessment of student learning outcomes.
  Resource Type: How-to Guide

Teaching-as-Research

- Teaching-as-Research (TAR) involves the deliberate, systematic, and reflective use of research methods to develop and implement teaching practices that advance the learning experiences and outcomes of students and teachers. The Center for the Integration of Research, Teaching and Learning (CIRTL) has provided a set of introductory online modules on TAR; learning outcomes include outlining the steps of a TAR project, developing a rubric for a TAR assessment, and analyzing a completed TAR project in the viewer's discipline.
  Resource Type: Online Modules

- Cornell University's First Year Writing Seminar fellows page has examples of TAR projects. This page includes links to TAR posters that were presented at the campus-wide Classroom Research and Teaching Symposia in May 2013 and 2014.
  Resource Type: Posters

APPENDIX A:

Project Request for Proposals

Council of Graduate Schools

Request for Proposals

Preparing Future Faculty to Assess Student Learning

PROPOSAL DEADLINE: September 10, 2012, 5 pm EDT

The Council of Graduate Schools (CGS) invites proposals from CGS member institutions to integrate learning assessment into existing programs that prepare graduate students for faculty careers. Five "accelerator grants" will be awarded to institutions at the forefront of learning assessment to develop model approaches to enhancing graduate student skills and understanding in the assessment of undergraduate learning. The project is supported through grants to CGS from the Alfred P. Sloan Foundation and the Teagle Foundation.

Awards of $50,000 will support five, two-year institutional projects. In these projects, U.S. graduate schools will collaborate with experts in general learning and field-specific learning assessment, directors of graduate student training programs, and faculty in science, technology, engineering and mathematics (STEM) fields and in the humanities and qualitative social sciences. Under the leadership of graduate schools, project teams will: 1) identify promising learning assessment strategies, 2) develop model approaches to enhancing programs to prepare graduate students for faculty careers, and 3) foster intra-campus disciplinary and multi-disciplinary dialogues about effective response interventions. Awardees will contribute to a national clearinghouse of resources and materials on learning assessment, hosted by CGS, and to biannual meetings to exchange best practices with U.S. universities. The immediate goal of the project is to provide graduate students who aspire to faculty positions with strategies to identify needs and opportunities in their classrooms and in their programs, to respond to those needs through enhanced teaching and learning techniques, and to engage with other graduate students and faculty in evidence-based conversations within and across the arts and sciences. A longer term goal is the enhanced integration of skills and understanding in student learning assessment into the majority of existing professional development programs to prepare graduate students for faculty careers.

I. Project Rationale and Background

The assessment of undergraduate learning, and the use of assessment evidence to improve teaching, is one of the most important skills for advancing the quality of U.S. higher education. Yet learning assessment is typically a topic to which faculty have little or no exposure until they begin their faculty careers. This project seeks to enhance faculty involvement by preparing graduate students in the assessment of student learning before they begin their careers.

The project builds upon the results of a prior, one-year partnership with the Teagle Foundation, documented in the CGS report, Preparing Future Faculty to Assess Student Learning (2011). The report examines the place of outcomes assessment in the U.S. national context of higher education accountability and quality improvement, the role of the graduate school in the preparation of graduate students for faculty careers, and opportunities for enhancing future faculty preparation programs to address national needs in enhancing undergraduate learning. Proposers may wish to consult Chapter 5 of this publication which discusses: institutional strategies for creating a culture that values learning assessment, the broad parameters of an enhanced graduate student program, potential curricular content, and key considerations in assessing success in program integration.

II. Program Content

This project supports the identification and diffusion of general undergraduate assessment approaches that are applicable across a range of fields. Approaches that build on work from different fields (e.g., cognitive psychology, neuroscience, education) are welcome and should be grounded in evidence of effectiveness. This project also requires institutions to identify a subset of fields in which faculty support for the goals of the project exists and where promising practices can be scaled up and/or are most needed. Targeted fields and disciplines include: 1) STEM (esp., physical sciences, engineering, and mathematics) and economics, and 2) the humanities and qualitative social sciences.

- In STEM fields and in economics, applicants should address how graduate students will be prepared to assess the impact of teaching behaviors, pedagogies, and classroom strategies in introductory and gateway courses. Evidence suggests that many undergraduates encounter obstacles in these early stages of baccalaureate study. Applicants are therefore encouraged to identify how graduate students will be exposed to strategies for assessing student learning and using learning outcomes and data to improve their teaching in the context of introductory STEM and economics courses.
- In the humanities and social sciences, applicants should describe how evidence-based approaches target field-specific issues and will reflect faculty input on the adequacy of assessment to the forms of knowledge specific to their disciplines.

During the project, CGS will foster a range of activities at the five participating campuses, and host best practice discussions nationally, to enhance skills and understanding of future faculty in the assessment of student learning and the effective use of student learning outcomes. CGS has supported the development of graduate students aspiring to faculty careers since its involvement in promoting the diffusion of Preparing Future Faculty (PFF) programs (1993-2003), and will also leverage this network of PFF institutions throughout this project to foster broader adoption of best practices that emerge from the five funded pilot projects.

III. Institutional Eligibility

All U.S. CGS member institutions with existing programs (**either** "Preparing Future Faculty" programs **or** other programs to prepare graduate students for faculty careers) are eligible to apply.

Priority will be given to proposals from institutions that can demonstrate: a) expertise in general- and field-specific learning assessment and b) the potential of their project to have an impact on the preparation of the next generation of faculty in learning assessment.

IV. Minimum Requirements and Commitments

A. Collaboration

- Demonstrate how grant will leverage existing programs and resources to advance student learning assessment (including activities specific to STEM fields and to humanities and qualitative social sciences). Examples may include: Centers for Teaching and Learning; department-based PFF or similar programs; CIRTL participation; successful pilot programs (e.g., ROLE, REESE, TUES/CCLI, etc.).
- Identify how teaching and learning assessment experts and faculty with field-expertise will be involved in the project; and identify at least 2 "gateway" courses from targeted STEM fields and explain how graduate students will be prepared to address issues specific to the disciplines.
- Define skills in learning assessment and teaching methods that programs will use to prepare graduate students, and describe how these skills are grounded in literature on how undergraduates learn. Skills may include, but are not limited to use of: active and collaborative learning, STEM learning studios, immediate feedback, peer facilitators, interest groups, etc.

B. Impact and Infrastructure

- Demonstrate how grant will facilitate scale-up of promising practices; and, where possible, provide evidence of successful prior, related graduate reform efforts (e.g., AGEP, PFF, STEM-based teaching and learning initiatives such as ROLE, REESE, TUES/CCLI programs).

- Estimate number of participants and explain how targets will be met; describe how needs assessment data will be used; and commit to track student participation and participant employment during the grant and 3 years subsequent to grant period.
- Commit to sharing project results via a CGS web-based clearinghouse of resources and materials, at CGS meetings, and in appropriate meetings in the disciplines.

C. Institutional Commitment and Sustainability

- Key leadership of the project by the senior academic officer for graduate education (graduate dean or equivalent) who will serve as principal investigator (PI).
- Provide evidence of senior institutional support for enhanced teaching and learning; letters of support from faculty in target disciplines detailing agreement to collaborate with graduate school.

V. Selection Criteria

Institutional proposals will be competitively evaluated and selected by an external proposal review committee on the basis of the quality of their plan to integrate, or enhance integration, of learning assessment into PFF or similar programs to prepare graduate students for faculty careers. Graduate schools will foster intra-campus disciplinary and multi-disciplinary dialogues among faculty and students about effective response interventions.

Priority considerations

- Institutional capacity to bring significant expertise and graduate school leadership to develop model programs with the potential to advance the national dialogue around graduate student preparation in learning assessment.
- Demonstrated national expertise in college learning assessment, including learning methods, practices, theories, assessment relevant to STEM fields (esp. Engineering, Mathematics, Physical Sciences) and Economics and to humanities and qualitative social sciences.
- Discussion of how experience in STEM classrooms and arts and science classrooms will be used to improve the preparation of graduate students for arts and science careers in academia.
- Plan for sharing promising practices with others on campus.
- Discussion of how discipline-specific learning assessment activities will enrich centralized PFF programming and/or institutional undergraduate learning assessment plans.
- Willingness and capacity of the graduate school to sustain successful project activities as evident by the strength of plans for scale up and sustainability beyond the duration of the grant.

- Discussion of how differences in cultural, including international, background of participating graduate students and/or undergraduates will be addressed.

VI. Application Materials

A proposal (no more than 10 pages, single spaced) outlining proposed activities and demonstrating the applicant institution's ability to meet or exceed minimum criteria, including a budget specifying the uses for requested funds of $50,000. Indirect costs are not allowable on CGS sub-awards. (A sample financial reporting form is available upon request if you would like to use this form to structure your budget).

VII. Instructions for Submitting Proposals

Applications must be **received no later than 5 pm EDT, Monday, September 10, 2012.** Awards will be announced by October 15 for projects that will begin November 1, 2012 and conclude October 31, 2014.

Send completed proposals via e-mail (preferred) to: ddenecke@cgs.nche.edu.

Proposals sent via U.S. mail will also be accepted (must be accompanied by an e-mail notice that a proposal is being shipped): Attn: Daniel Denecke, Council of Graduate Schools, One Dupont Circle, NW, Suite 230, Washington, DC 20036.

VIII. Reporting Requirements

Annual narrative and financial report due November 30, 2013. Final narrative and financial report due October 15, 2014.

For more information, contact:

Daniel Denecke, ddenecke@cgs.nche.edu, phone (202) 461-3868

Online version of RFP: http://www.cgsnet.org/ckfinder/userfiles/files/CGS_PFFASL_RFP.pdf

APPENDIX B:

Affiliate Program Links

Below are links to active programs at our affiliate institutions:

The Chicago School of Professional Psychology: Preparing Future Professional Faculty (PF^2) Program

Clemson University: Clemson Thinks2

Emory University: Center for Faculty Development and Excellence

Florida State University: Preparing Future Faculty (PFF)

Fordham University: Preparing Future Faculty Program

Johns Hopkins University: Teaching Academy

Marquette University: Preparing Future Faculty and Professionals (PFFP)

Purdue University: The Teaching Academy at Purdue University

The University of Missouri: Teaching, Mentoring, and Future Faculty Programs

The University of Missouri-Kansas City: Graduate Certificate in College Teaching and Career Preparation

The University of Oklahoma Health Sciences Center: Preparing Future Faculty (PFF) Program

The University of South Florida: Preparing for College Teaching

Virginia Tech: Preparing the Future Professoriate Graduate Certificate

One Dupont Circle NW, Suite 230
Washington, DC 20036

Office: 202.223.3791
Fax: 202.331.7157

www.cgsnet.org

ISBN-10: 1-933042-50-8
ISBN-13: 9781933042503