

Promoting Institutional Change to Strengthen Science Teacher Preparation

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BACKGROUND

The Association of Public and Land-grant Universities (APLU)—the nation’s public research universities—launched the Science and Mathematics Teacher Imperative (SMTI), to transform middle and high school science, technology, engineering and mathematics (STEM) education by preparing a new generation of world-class science and mathematics teachers. Currently, 125 APLU institutions and 12 university systems are members of the SMTI initiative.

As a subset of SMTI, The Leadership Collaborative (TLC) is a network of 26 institutions focusing on institutional change efforts that support the strengthening of teacher preparation programs in the sciences. As a participant in the TLC, each institution has prepared an **Implementation and Assessment Plan** to foster change for science and mathematics teacher preparation, and report annually on how they are progressing to meet their goals and objectives. The TLC is supported by a grant from the National Science Foundation to APLU (0831950) for a Mathematics & Science Partnership project.

In order to encourage cross-institutional learning and collaboration, APLU held a retreat for members of The Leadership Collaborative in Coral Gables, Florida in January, 2010. The purpose of the retreat was to provide a forum for TLC leaders to identify common challenges around STEM teacher preparation and to share successful strategies, with a particular focus on institutional leadership and change. **The retreat was attended by 24 team leaders and 15 provosts.**

Jennifer Frank, P-20 Project Director in the Office of Academic Affairs at the University System of Maryland, and Nancy Shapiro, Associate Vice Chancellor for Academic Affairs at the University System of Maryland wrote the report and executive summary for this retreat. You can download the report, the executive summary, and presentations from this retreat at www.aplu.org/NetCommunity/Leadership_Retreat.

During the TLC Retreat, participants discussed strategies for implementing institutional change. The key recommendations and strategies follow.

RECOMMENDATIONS FOR INSTITUTIONAL CHANGE

Faculty Roles and Rewards

Ann Austin, Michigan State University, outlined six strategies for implementing appropriate faculty rewards:

- ❖ Conduct a thorough review of the institution’s tenure and promotion guidelines.
- ❖ Ensure senior academic leaders clearly and consistently articulate faculty roles and priorities.
- ❖ Create ample opportunities for faculty networking and cross-disciplinary work (e.g., fellowships, joint appointments, and informal opportunities to make scholarly connections).
- ❖ Provide recognition and prestige to faculty engaged in this work.
- ❖ Explicitly support faculty who are already committed to the institution’s teaching and learning agenda (recognizing that faculty have different pressure points at different stages in their careers).
- ❖ Connect interested faculty with interested graduate students.

Participants at the retreat suggested additional strategies:

- ❖ Confront the conflicting message about pressure for research productivity and increased emphasis on undergraduate education and public outreach.
- ❖ Expand professional opportunities for non-tenure track faculty and try to achieve a “critical mass” of these types of faculty positions in disciplinary departments.
- ❖ Expand appointments and roles for discipline based education researchers to introduce culture change in disciplinary departments.

Transforming STEM Undergraduate Teaching and Learning

Introductory STEM courses can have a strong influence on student major and career choices. Focused institutional efforts to improve these courses could increase the recruitment and retention of STEM majors and teacher candidates.

- ❖ Improve the environment for undergraduate teaching and learning in STEM disciplines to attract more STEM majors and increase the pool of potential K-12 teachers.
- ❖ Combat the negative attitudes that often steer interested students away from K-12 teaching.
- ❖ Actively cultivate student interest in teaching through co-curricular opportunities such as early field experiences in education, volunteer activities in K-12 classrooms, peer tutoring at either the college or K-12 level, and involvement in undergraduate teaching assistant programs.

Promising Teacher Preparation Practices and Program Strategies

- ❖ Find effective ways to incentivize STEM majors to consider teaching.
- ❖ Increase internal and external marketing efforts by forging ties with university press offices, using social media outlets, and student testimonials.
- ❖ Create formal links to community colleges for recruitment.
- ❖ Provide STEM majors with early teaching experiences for recruitment and preparation.
- ❖ Partner with K-12, and get information directly into the hands of teachers and principals.
- ❖ Connect new teachers with scientists.
- ❖ Bring STEM teachers (especially novice teachers) together as part of a larger community.
- ❖ Provide more flexible delivery formats for professional development.

Engaging Institutional Leaders

- ❖ Increase the level of involvement in and ownership for STEM teacher preparation on the part of presidents, provosts, and other senior leaders.
- ❖ Provide opportunities for senior leaders to convene with their peers.

WORKING GROUPS

As a follow-up to the retreat, TLC team leaders met in Cincinnati to plan subsequent work. Three working groups were created to foster cross-institutional collaboration and produce useful products for the 125 institutions of the Science and Mathematics Teacher Imperative.

Working Group 1: This working group will create a concept paper and executive summary of successful practices outlining how to build robust university teacher preparation program communities that prepare candidates for successful induction into the teaching profession. The paper will highlight how to build expertise in teaching math and science, create a positive, professional teaching environment for teaching candidates, and improve the preparation of math and science teachers. Such communities can include teachers, faculty (spanning colleges and disciplines), mentors, and teacher candidates. These communities are developed to enhance the support and reflective practice of teacher candidates and practicing teachers with a focus on developing habits of mind of scientists including inquiry-based learning and developing math and science reasoning skills.

Members

Simon Bott (Co-Chair), University of Houston, Professor and Undergrad Chair, Chemistry
Laird Kramer (Co-Chair), Florida International University, Associate Professor, Physics
Larry Browning, South Dakota State University, Professor, Physics
Cynthia Gautreau, California State University, Fullerton, Assistant Professor, Elementary and Bilingual Education
Susan Johnson, University of California, Santa Barbara, Director of CalTeach
Mike Klymkowsky, University of Colorado, Boulder, Professor, Molecular, Cellular, Developmental Biology
Robert Mercer, Portland State University, Assistant Dean for Student Affairs, College of Liberal Arts & Sciences
Louis Nadelson, Boise State University, Assistant Professor, Education
Kate Popejoy, University of North Carolina at Charlotte, Assistant Professor, Education
Gail Richmond, Michigan State University, Associate Professor, Teacher Education (leader of Woodrow Wilson effort)

Working Group 2: This working group will address how undergraduate STEM education can be improved for all students while attending to the realities faced by STEM faculty. The following deliverables will be produced:

- A field tested interview protocol for institutions with innovative approaches to promote STEM reform. After pilot-testing the protocol at each other’s institutions, two group members will conduct site visits to five other group members’ institutions during February, 2011.
- Publishable vignettes of promising or proven innovations that offer sufficient depth to allow others to emulate. These vignettes will be based on the site visits.
- Emergent ideas for a survey to assess the institutional “friendliness” to STEM faculty engagement in STEM reform.

Members

Marvin Kaiser (Co-Chair), Portland State University, Professor and Dean, College of Liberal Arts & Sciences
Cherilynn Morrow (Co-Chair), Georgia State University, Professor and STEM Director, Physics & Astronomy (and co-researcher)
Jana Bouwma-Gearhart, University of Kentucky, Assistant Professor, Curriculum and Instruction (lead researcher)
Ken Furton, Florida International University, Professor and Dean, College of Arts & Sciences
Soonhye Park, University of Iowa, Assistant Professor, Teaching and Learning - Science Education
Patricia Pyke, Boise State University, Director, STEM Central STATION
Steven Pollock, University of Colorado at Boulder, Professor, Physics
Petra Van Koppen, University of California, Santa Barbara, Chemistry STEM Outreach and CalTeach

Working Group 3: The common core standards represent an unprecedented, unified effort to make a promise to U.S. children to focus their mathematical and scientific education on core topics across all states. The efforts of multiple stakeholders are required to make good on this promise. This working group will write a brief laying out an action agenda for the role of higher education institutions in this collective work.

Members

W. Gary Martin (Co-Chair), Auburn University, Professor, Curriculum and Teaching
Suzanne Wilson (Co-Chair), Michigan State University, Chair, Teacher Education
Brian Hand, University of Iowa, Professor, Teaching and Learning - Science Education
Lisa Martin-Hansen, Georgia State University, Associate Professor, Middle, Secondary Education & Instructional Technology (MSIT)
Matt Miller, South Dakota State University, Associate Professor, Chemistry
David Pugalee, University of North Carolina at Charlotte, Director, Center for STEM Education
David Webb, University of Colorado, Boulder, Assistant Professor, Mathematics Education
Jennifer Wilhelm, University of Kentucky, Associate Professor, Curriculum and Instruction