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Teaching to Increase Diversity and Equity in STEM

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Dr. Kelly Mack is the Vice President for Undergraduate STEM Education and Executive Director of Project Kaleidoscope at the Association of American Colleges and Universities (AAC&U). As such, she leads national efforts to reform STEM higher education that are uniquely focused on empowering STEM faculty to implement evidence based/culturally responsive pedagogies and, ultimately, graduate more students who are competitively trained and liberally educated.

Prior to joining AAC&U, Dr. Mack was the Senior Program Director for the National Science Foundation (NSF) ADVANCE Program while on loan from the University of Maryland Eastern Shore (UMES) where, as a Professor of Biology, she taught courses in Physiology and Endocrinology for 18 years. Dr. Mack earned the BS degree in Biology from UMES and, later, the PhD degree from Howard University in Physiology. She has had extensive training and experience in the area of cancer disparities research, with her more recent research efforts focusing on the genotoxic effects of endocrine disruptors on estrogen receptor positive (ER+) and estrogen receptor negative (ER-) breast tumor cell proliferation.

Dr. Mack has served on numerous boards including: the Board of Governors for the National Council on Undergraduate Research; the National Institutes of Health Review Subcommittee for Training, Workforce Development and Diversity; and the Shimer College Board of Trustees. Currently, Dr. Mack serves as the co-founder and chair of the board of the Society of STEM Women of Color, Inc. Her work has been highlighted in U.S. News and World Report and Diverse Magazine, where she was honored as one of the top 25 women in higher education.

Dr. Kate Winter, Kate Winter Evaluation, LLC

Kate Quinn Winter, PhD, leads the team at Kate Winter Evaluation, LLC (KWE). Dr. Winter has worked with major NSF initiatives (e.g., ADVANCE, HBCU-UP, S STEM) since 2003. KWE is the external evaluator for the AAC&U Project Kaleidoscope (PKAL) initiative, Metacommunity for Broadening Participation; AAC&U PKAL's Undergraduate STEM Education Reform (USER) project; and two five-year long consortia-based projects funded by the U.S. Dept. of Education (a FITW and an HSI-STEM). KWE's areas of evaluation expertise include diversity in STEM, college student access and retention, professional development for faculty, and institutional cultural change.

Dr. Winter is a member of the American Evaluation Association (AEA) and the European Evaluation Society (EES), adheres to AEA professional and ethical principles, and follows the "What Works Clearinghouse (WWC)" standards established by the U.S. Dept. of Education (ED) and the "Common Guidelines for Education Research and Development" of the Institute of Education Sciences and NSF. Dr. Winter has published research findings in the Journal of Diversity in Higher Education, the Journal of the Professoriate, the Journal about Women in Higher Education, the Journal of Women and Minorities in Science and Engineering, the Department Chair, Academe, and Change. She is an editorial board member for the Journal of Diversity in Higher Education and the Journal of the Professoriate and an ad-hoc reviewer for the Journal of College Student Retention: Research, Theory & Practice.

She received her PhD in Educational Leadership and Policy Studies from the University of Washington.

CONFERENCE TITLE: CONECD

PRESENTATION: TEACHING TO INCREASE DIVERSITY AND EQUITY IN STEM

PRESENTERS: KELLY MACK, KATE WINTER

INTRODUCTION

While the US economy is expected to create over 120,000 new jobs requiring at least a bachelor's degree in computer science, only approximately 48,000 computer science baccalaureates are produced each year [1]. This dilemma is further complicated by the systemic marginalization of the "new majority" of undergraduates [2] who represent rich sources of untapped talent and the diverse worldviews that are essential for addressing the most vexing computer/information science problems of our day. Education researchers have identified pedagogical reform as one of the most advanced mechanisms for redressing these trends [3]. However, mastery of the pedagogy – particularly culturally responsive pedagogy – commonly poses a substantial challenge for STEM faculty [4].

In 2014, the Association of American Colleges and Universities (AAC&U) launched the Teaching to Increase Diversity and Equity in STEM (TIDES) initiative – with 19 diverse institutions of higher education – to increase awareness of and self-efficacy with culturally responsive pedagogy among computer/information science faculty. This effort included specific, campus-based projects designed to support the recruitment and/or retention of diverse students in computer science. Additionally, TIDES included a three-year long professional development program for STEM faculty that included structured learning and application opportunities, as well as extensive institutes, continuous communications, and a rigorous assessment strategy. While the TIDES professional development component was consistently applied across STEM faculty participants, the campus-based projects varied depending on the campus climate, culture, and needs.

To date, TIDES has positively impacted nearly 300,000 STEM students – over 50% of whom are from diverse populations. More importantly, TIDES has illuminated how STEM faculty came to know what needed to be done to positively impact the success of these diverse STEM students.

PRESENTATION CONTENT

This presentation will showcase the entire implementation arc of the AAC&U TIDES initiative, beginning with its conception. Particular attention will be paid to the design, execution, evaluation and assessment strategies, and the overall impacts of TIDES. Additionally, because of the potential for this presentation to contribute to a significant paradigm shift in our approaches to STEM faculty professional development, effort has been made to carefully organize it into several broad modules that fully capture both the theoretical and practical underpinnings of TIDES. Details of each presentation module are described below.

MODULE I – Background Information

The presentation authors have been involved with TIDES since its early conception and throughout its implementation. Collaboratively and collectively, they have worked to ensure that the outcomes of TIDES are both meaningful and well-documented. As such, they are ideally suited to lead an introduction of the presentation that will provide deep insight into the underlying premise upon which the AAC&U TIDES initiative was built.

Specifically, the Background Information Module will include an analysis of the national landscape of US STEM higher education and the shifting demographics that now call for more robust approaches to competitively training STEM graduates. Emphasis will be placed on the culture of the computer science disciplines. Additionally, the role of faculty will be stressed and highlighted as quintessential to any institution's broadening participation efforts.

MODULE II – Framework

The Framework Module of this presentation will deeply explore self-efficacy [5] and its relevance to the theoretical underpinnings of the TIDES approach to STEM faculty professional development. As a known determinant of behavior change, self-efficacy represents the capacity of STEM faculty to not only make important changes in undergraduate teaching behavior, but to also sustain those changes even in the face of institutional barriers.

This Module will also provide a step-by-step analysis of the goals of TIDES, the integration of its professional development process toward achieving those goals, and the logic that supports both. As time allows, information about specific experiential exercises that are exclusive to the TIDES approach will be provided along with opportunities for presentation attendees to actively participate in modified renditions of those exercises. It is envisaged that the interactive nature of this Module will not only demystify the TIDES approach to STEM faculty professional development, but also catapult attendees toward deeper exploration of their own capacities for cultural responsiveness.

MODULE III – Results

As noted, 19 institutions participated in the AAC&U initiative. These institutions represented the full range of institution types and classifications, including: tribal colleges and universities, historically black colleges and universities, Hispanic serving institutions, community colleges, women's colleges, research intensive universities, and predominantly undergraduate institutions. An overall summary of TIDES institutions will contribute to the Results Module. Specific details of how their approaches to culturally responsive undergraduate STEM teaching both complemented each other and addressed unique institutional contexts will be stressed.

Overall, as a result of our TIDES professional development intervention, the self-efficacy of STEM faculty to implement culturally responsive pedagogies was significantly increased. The Results Module will summarize our quantitative and qualitative findings in detail. Results related to STEM student self-efficacy will also be explored during this Module.

Module IV – Conclusion

To conclude this presentation, a summary of the three most significant lessons learned from the AAC&U TIDES initiative will be reviewed. Of particular importance is the inclusion of insights into which elements of TIDES can and should be adapted within other institutions' settings. Additionally, in keeping with its interactive approach, this presentation will invite attendees to not only ask questions, but to also share their individual experiences, successes, and challenges related to implementing culturally responsive undergraduate teaching strategies.

A direct outcome of the Conclusion Module will be an agreed-upon plan for achieving the kind of national impact that will empower all STEM faculty, regardless of institutional context, to create culturally responsive undergraduate STEM learning environments. This plan may also include specific strategies that can be used to more adroitly promulgate the need for cultural responsiveness throughout the entire STEM reform community.

SUMMARY

Oftentimes, efforts to reform STEM higher education focus on “fixing” students, particularly those from underrepresented backgrounds, and overlook the importance of faculty professional development in addressing the academic and psychosocial needs of *all* STEM students. The AAC&U TIDES initiative represents an important departure from this tradition, providing the STEM reform community with: 1) a more contemporary perspective of STEM reform; 2) an alternative strategy that does not rely on “fixing” the student; and, 3) a proven mechanism for increasing the capacity of STEM faculty to meet our nation’s imperative for a diverse and competitively trained STEM workforce.

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