



Dupont Summit 2014

..... Science, Technology, and Environmental Policy Issues

December 5, 2014 ❖ Historic Whittemore House, Washington, DC

The Policy Studies Organization

Panel

"Driving Innovation: STEM Policy and Practice"

"Strategies to Enable Multi-dimensional Mentoring in International Research Collaboration"

Dr. Lisa Frehill – *National Science Foundation*

Katie Seely-Gant – *Energetics Technology Center*

As older cohorts of the STEM workforce are beginning to retire, employers are scrambling for new, fresh talent to fill the void. Colleges, universities, and government agencies use many incentives to encourage students to pursue STEM disciplines including research assistantships. While there is much research about the benefits to be gained by students who take advantage of these incentives as PIs' mentees, there is less research on the mutually beneficial aspects to PIs of including students as mentees on grant funded research projects that goes beyond the labor that they provide. Our paper will answer the question: what are the benefits and pitfalls associated with cross-cultural group mentoring (i.e., the PI, an international collaborator, and each scholars' groups of students, postdocs, and other research personnel)?

In addition, globalization of the science and engineering enterprise has led to an increased need to provide international STEM experiences for students, especially those at minority serving institutions (MSIs). While many students participate in International Study Abroad programs, STEM majors and students from various disadvantaged backgrounds often do not participate. A recent study by the American Council on Education found that HBCUs, for example, often lack the resources or capacity necessary to support robust study abroad programs¹. Further, such programs, if implemented, usually emphasize language and general knowledge rather than STEM, as noted in a working paper by the Institute of International Education².

Our paper presents findings from an assessment of the American Association for the Advancement of Science's (AAAS) Mentoring Women in International Research Collaborations (MWIRC) Program. The program provided funding for 15 PIs at U.S. MSIs to initiate a research collaboration with an international colleague. PIs were required to include in their projects a graduate student or a postdoc as a mentee. Multiple modes of inquiry were used in our formative assessment to understand the outcomes and experiences of the PIs and mentees. Short online surveys were supplemented with documents analysis and brief phone interviews with the PIs.

Consistent with the original intent of the project, we found mentees greatly benefited from working with seasoned PIs on these projects. Notably, 77 percent of mentees surveyed reported that their work on the project resulted in the submission of a research article to a foreign journal with 13 percent reporting that their work resulted in a patent application. We also found that students were critical to these research projects beyond the original design intent. For example, mentees were able to take advantage of other funding sources to support their travel or research, which in turned helped to stretch the PIs' project budgets.

Our research also found that the PIs benefited by forming a reciprocal mentor relationship with their international colleagues. These findings are important as institutions seek to retain and support women and minorities in STEM research. Our paper describes the mutual benefits of multi-dimensional mentoring in the MWRIC projects and suggests ways funders can encourage expanded student involvement in international science collaborations while also encouraging women and minorities to continue STEM research.

¹ "Creating Global Citizens: Challenges and Opportunities for Internationalization at HBCUs". American Council on Education and the Center for Internationalization and Global Engagement, 2014.

² Berdan, Stacie and Wagaye Johannes, "What Will It Take to Double Study Abroad?" Institute of International Education, May 2014.



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Katie Seely-Gant – *Energetics Technology Center*

Dr. Lisa M. Frehill is on assignment to the National Science Foundation, Strategic Human Capital Planning, as an Organizational Evaluation and Assessment Researcher. Her home institution is Energetics Technology Center in St. Charles, MD. She is responsible for science, technology, engineering and mathematics (STEM) workforce analysis and planning as well as program assessment and evaluation efforts in support of Department of Defense clients. She has been a past NSF awardee, with more than \$5 million in grants associated with gender and ethnic diversity in STEM first as an associate professor of sociology at New Mexico State University and later as executive director of the Commission on Professionals in Science and Technology. She is an expert on diversity in STEM, program evaluation, and data analytics in support of STEM human resources policy.

Ms. Katie Seely-Gant is a research assistant at the Energetics Technology Center in St. Charles, MD. She provides research support on a number of science, technology, engineering and mathematics (STEM) education and workforce analysis projects. She is also a graduate student working toward her Master's of Public Policy at the George Washington University, Trachtenberg School of Public Policy and Public Administration where she focuses on Public and Non-Profit Program Evaluation.



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"Revitalizing ethics training of STEM graduates via immersive engagements with grassroots organizations: The Tonawanda, NY experience"

Siddhartha Roy - *Virginia Tech*

At least partial responsibility for inventing the future lies on the shoulders of STEM graduates who are trusted to enhance the quality of life of the 7+ billion people on this planet. They are battling challenges as formidable as any from millennia past¹ but on a grander scale (think climate change, worldwide access to clean water/quality food, scalable renewable energy, etc.) impacting our civilization in its entirety. University training for these scientists and engineers is technically robust and intellectually stimulating; but it falls woefully short of teaching students that their ultimate client is the often invisible and defenseless public, and instilling in them appreciation for the societal impacts of their work. In other words, the techno-centric nature of STEM education leaves trainees with limited, if any, awareness about the power they will have in the workforce. This is a cause for concern, whether graduates find themselves working as consultants, researchers, or politicians. In this presentation, I argue that an overhaul of STEM education is warranted to produce STEM professionals who are competent, accountable, ethical, and, if need be, even whistleblowers.

Drawing from my graduate level class at Virginia Tech, "Engineering Ethics and the Public," I will highlight an unconventional approach to learning ethics. In this class, my STEM classmates and I researched together an ongoing case of environmental contamination in the town of Tonawanda, NY. We supplemented our background research with one-on-one ethnographic interviews of diverse stakeholders, to better understand the ethical, legal, and social aspects of the case from different perspectives. Eventually, some of us also had the opportunity to visit Tonawanda in person and meet a group of citizen activists as well as residents directly affected by the contamination. Listening to people's stories and seeing them in their daily routines challenged our stereotypes about "the public." It also gave us a better appreciation for the profound impact that narrow or erroneous engineering decisions can have and the importance of non-expert experiences and knowledge.² Perhaps more importantly, it helped us put real faces to what otherwise would seem to us like mere "numbers." Expert statements like, "x affects 1% of the exposed population," that our education conditions us to accept as meaningful suddenly seemed incomplete without citizen voices like, "Look at this picture of my daughter dying of cancer."³

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“Revitalizing ethics training of STEM graduates via immersive engagements with grassroots organizations: The Tonawanda, NY experience” (continued)

If the National Academy of Engineering’s ideal ‘Engineer of 2020’4 ought to have characteristics of Gordon Moore, Albert Einstein, Pablo Picasso, the Wright Brothers, and Bill Gates, he/she should also possess ‘the conscience of Eleanor Roosevelt and the vision of Martin Luther King.’ This cannot happen unless ethical training is stimulating and made an integral part of curricula. The talk will outline specifics of what this training might look like and how it can be incorporated across schools and even the workplace. Finally, STEM students can benefit immensely by engaging with local communities and grassroots organizations/NGOs in being shown the mirror and not end up as orthodox experts with blinders of technical knowledge and an underdeveloped moral compass.

References

National Academy of Engineering (2008). Introduction to the Grand Challenges for Engineering. From the NAE website: <http://www.engineeringchallenges.org/cms/8996/9221.aspx> (Accessed 9/21/14 14:01)

Lambrinidou, Y., Rhoads, W., Roy, S., Heaney, S., Ratajczak, G., and Ratajczak, J. (2014). Ethnography in Engineering Ethics Education: A Pedagogy for Transformational Listening. 121st American Society for Engineering Education (ASEE) Annual Conference & Exposition, June 15-18, Indianapolis, IN.

Rhoads, W. and Roy, S. (2013). The Tonawanda Story. Presentation to the ‘CEE5804 Engineering Ethics and the Public’ class of Fall 2013 at Virginia Tech, Blacksburg VA. Sept. 25, 2013.

National Academy of Engineering (2004). The Engineer of 2020: Visions of Engineering in the New Century. The National Academies Press: Washington, DC. pp. 57.



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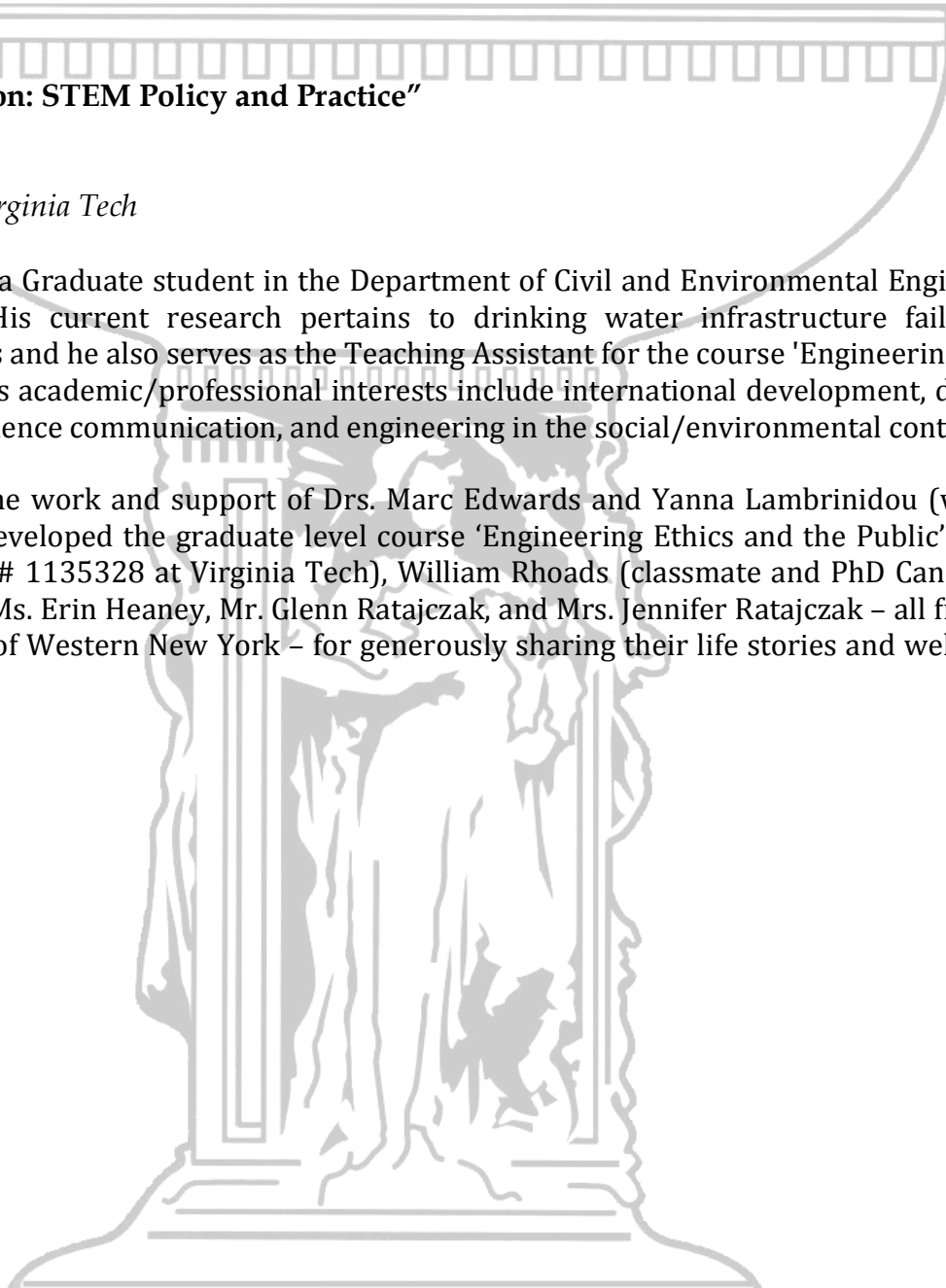
"Driving Innovation: STEM Policy and Practice"

Biography

Siddharth Roy – *Virginia Tech*

Siddhartha Roy is a Graduate student in the Department of Civil and Environmental Engineering at Virginia Tech. His current research pertains to drinking water infrastructure failures in developed countries and he also serves as the Teaching Assistant for the course 'Engineering Ethics and the Public'. Sid's academic/professional interests include international development, drinking water, corrosion, science communication, and engineering in the social/environmental context.

He acknowledges the work and support of Drs. Marc Edwards and Yanna Lambrinidou (who co-conceived and co-developed the graduate level course 'Engineering Ethics and the Public' funded through NSF Grant # 1135328 at Virginia Tech), William Rhoads (classmate and PhD Candidate - Virginia Tech) and Ms. Erin Heaney, Mr. Glenn Ratajczak, and Mrs. Jennifer Ratajczak – all from the Clean Air Coalition of Western New York – for generously sharing their life stories and welcoming us into their homes.





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"Driving Innovation: STEM Policy and Practice"

"Women in STEM: A Gender Gap to Innovation"

David Beede – *US Department of Commerce*

Our science, technology, engineering and math (STEM) workforce is crucial to America's innovative capacity and global competitiveness. Yet women are vastly underrepresented in STEM jobs and among STEM degree holders despite making up about half of the U.S. workforce and half of the college-educated workforce. That leaves an untapped opportunity to expand STEM employment in the United States, even as there is wide agreement that the nation must do more to improve its competitiveness.

- Although women fill close to half of all jobs in the U.S. economy, they hold a much lower share of STEM jobs. This has been the case throughout the past decade, even as college educated women have increased their share of the overall workforce.
- Women with STEM jobs earned much more than comparable women in non-STEM jobs – considerably higher than the STEM premium for men. As a result, the gender wage gap is smaller in STEM jobs than in non-STEM jobs.
- Women hold a disproportionately low share of STEM undergraduate degrees, particularly in engineering.
- Women with a STEM degree are less likely than their male counterparts to work in a STEM occupation; they are more likely to work in education or healthcare.
- There are many possible factors contributing to the discrepancy of women and men in STEM jobs, including: a lack of female role models, gender stereotyping, and less family-friendly flexibility in the STEM fields. Regardless of the causes, the findings of this report provide evidence of a need to encourage and support women in STEM.



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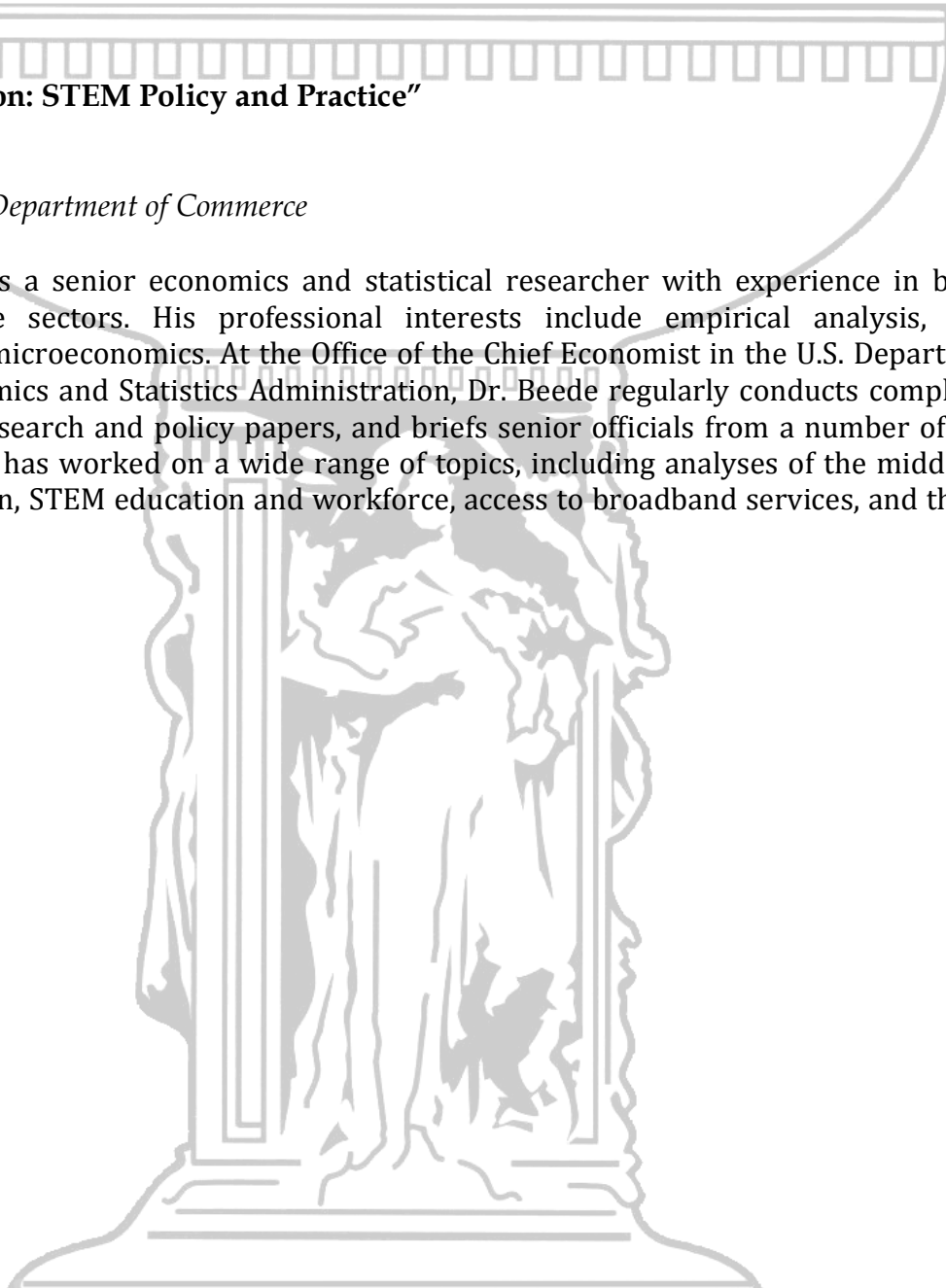
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David Beede – *US Department of Commerce*

Dr. David Beede is a senior economics and statistical researcher with experience in both the public and private sectors. His professional interests include empirical analysis, applied econometrics, and microeconomics. At the Office of the Chief Economist in the U.S. Department of Commerce's Economics and Statistics Administration, Dr. Beede regularly conducts complex data analysis, authors research and policy papers, and briefs senior officials from a number of federal agencies. Dr. Beede has worked on a wide range of topics, including analyses of the middle class, well-being of women, STEM education and workforce, access to broadband services, and the value of government data.





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"Exploring Successful STEM Practices at McKinley Technology Education Campus"

Louise Jones – *McKinley Technology Education Campus*

McKinley Technology High School was built in the late 1920s and has seen major changes in demographics and curriculum over the years. The ability to adapt to student needs has made the school an important fixture in the metro area. Today, as an application school, it is the STEM flagship school for DCPS, offering four STEM focus areas: Information Technology, Engineering, Bio-Technology and Mass Media.

In 2012 McKinley Tech High School was named by the U.S. Department of Education as a National Blue Ribbon School. In 2013 a neighborhood middle school program was added to the campus, grades 6-8. In 2014 two new National Academy Foundation (NAF) Academies were implemented for Engineering and Information Technology. Using the NAF Academy Model, we hope to propel McKinley Tech even further forward in college and career readiness.

The presentation will center on why our STEM curriculum is so important to our students, our local and our global community. It will focus on the success of a Title One school that is primarily composed of African American students. Our students choose more rigorous diploma requirements than their counterparts and their graduation requirements include a CTE pathway completion and an internship.



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Dr. Louise Jones is a veteran educator with over 30 years of teaching and administrative experience in Virginia, North Carolina and now the District of Columbia. She has been the principal of three middle schools, two high schools and the interim principal of one PK-8 school. Previously she taught social studies and coached track and basketball. Currently she is the principal of McKinley Technology Education Campus (grades 6-12) in Washington, D.C.

She grew up on a farm in southwest Virginia where everyone was poor so it wasn't really an issue until she went away to college. She has three college degrees, one from Virginia Tech and two from the University of Virginia. This creates a great deal of drama and conflict when watching sporting events with family and friends.

As a former farm girl she has a skill set that is missing with many principals. She can grade tobacco, drive a tractor, milk a cow and blow up cow pies with 4 of July fireworks.

She was the youngest principal in Virginia when leading her first school in Buckingham County. She had the highest academically performing middle school in North Carolina for several years. This school, Davidson IB, won the National Intel and Scholastic Award for all secondary schools the year before she left to become the principal of the second largest high school in North Carolina. A state assistance team met with her during her first week at Hopewell High School to plan for their presence the next school year. They did not come because the End of Course scores rose sufficiently to negate this step. Hopewell High became a respected and academically successful school. Hopewell High met enough indicators to be named as the top NC high school by US News and World Report for 2010. Dr. Jones has presented at various conferences over the years, her favorite locale was in The Bahamas. She was the NC Good Samaritan in 1999 and was honored with other state winners with an all-expense paid trip to Washington, DC where she met with various politicians, who later embarrassed themselves with their congressional votes or with extra-marital affairs or both.

She is celebrating her 6th year of federally recognized marriage on November 25th and her 20th year of the "informal" union on December 20th. She and Jackie have two daughters, two sons-in-law, four grandchildren, two dogs and twelve fish.