

## **Board 54: Revolutionizing an Engineering Department Through Diversity and Inclusion**

### **Mr. Tiago R Forin, Rowan University**

Tiago Forin is a PhD candidate in Engineering Education and researcher at Purdue University affiliated with XRoads Research Group, the Global Engineering Program and the Office of Institutional Research, Assessment, and Effectiveness. He received a Bachelor's degree in civil engineering from Florida State University and a Master's degree in environmental engineering from Purdue University.

### **Dr. Stephanie Farrell, Rowan University**

Dr. Stephanie Farrell is Professor and Founding Chair of Experiential Engineering Education at Rowan University (USA). Prior to 2016 she was a faculty member in Chemical Engineering at Rowan for eighteen years. Dr. Farrell has contributed to engineering education through her work in inductive pedagogy, spatial skills, and inclusion and diversity. She has been honored by the American Society of Engineering Education with several teaching awards such as the 2004 National Outstanding Teaching Medal and the 2005 Quinn Award for experiential learning, and she was 2014-15 Fulbright Scholar in Engineering Education at Dublin Institute of Technology (Ireland). Stephanie Farrell is Professor and Founding Chair of Experiential Engineering Education at Rowan University (USA) and was 2014-15 Fulbright Scholar in Engineering Education at Dublin Institute of Technology (Ireland).

### **Dr. Kauser Jahan P.E., Rowan University**

Kauser Jahan, is a Professor of Civil and Environmental Engineering at Rowan University. She received her B.S.C.E. from the Bangladesh University of Engineering and Technology, an MSCE from the University of Arkansas, Fayetteville and a Ph.D. from the University of Minnesota, Minneapolis. Her passion as an educator and mentor has been recognized by many professional organizations over the years. She is the recipient of the Gloucester County Women of Achievement Award, Lindback Foundation Teaching Award, the NJ ASCE Educator of the Year award, the Gary J. Hunter Excellence in Mentoring Award, the ASEE Environmental Engineering Division Meritorious Service Award, the ASEE Women in Engineering Division Sharon A. Keillor Award and the WEPAN Women in Engineering Initiative Award. She has been instrumental in establishing the Attracting Women into Engineering, the Engineers on Wheels and Engineering Clinics for Teachers programs at Rowan University. She has served as the Institutional Representative and Advisory Board Chair for the Women's Professional Network at Rowan University for six years and currently is an advisory board member of the New Jersey Chapter of the American Council on Education (ACE) Office of Women in Higher Education (OWHE). She received a Fulbright award in 2015.

### **Prof. Harriet Hartman, Rowan University**

Professor of Sociology, Chair of Sociology and Anthropology Department and IRB Chair, Rowan University. Co-p.i. of RED NSF RevED project at Rowan University. Editor-in-chief, Contemporary Jewry.

### **Dr. Beena Sukumaran, Rowan University**

Beena Sukumaran has been on the faculty at Rowan University since 1998 and is currently Vice President for Research and Professor of Civil and Environmental Engineering. She served as Department Head for 7 years. Under her leadership, the Civil and Environmental Engineering Program saw considerable growth in student and faculty numbers. Her area of expertise is in micro-geomechanics and has published over 100 peer reviewed conference and journal papers including several papers on engineering education and the unique undergraduate curriculum at Rowan University, especially the Engineering Clinics. She has been involved in various outreach activities to recruit more women and minorities into engineering and is Program Chair Elect of the Women in Engineering Division of ASEE. She is the recipient of the 2011 New Jersey Section of ASCE Educator of the Year award as well as the 2013 Distinguished Engineering Award from the New Jersey Alliance for Action.

**Dr. Ralph Alan Dusseau P.E., Rowan University**

Dr. Ralph Dusseau is a Professor of Civil and Environmental Engineering at Rowan University in Glassboro, New Jersey. Dr. Dusseau is also serving as the Associate Chair of the Department of Civil and Environmental Engineering and is Coordinator of the Engineering Management Programs at Rowan University. Dr. Dusseau was an Assistant and Associate Professor at Wayne State University in Detroit, Michigan from 1985 to 1995. Dr. Dusseau was the Founding Chair of the Department of Civil and Environmental Engineering at Rowan University from 1995 to 2008.

**Dr. Sarah K. Bauer, Rowan University**

Dr. Sarah Bauer is an Assistant Professor in the Department of Civil and Environmental Engineering at Rowan University. Dr. Bauer holds a doctoral degree in Civil and Environmental Engineering from the University of Virginia, Charlottesville. Dr. Bauer is the recipient of numerous awards and scholarships as a graduate student and young professional. Her primary research interests are: water and wastewater treatment, renewable energy technologies, pollution prevention, and engineering education. Dr. Bauer is an active member of ASEE and the Society of Women Engineers (SWE) and currently serves as the Faculty Advisor for Rowan's Student Chapter of SWE.

**Theresa FS Bruckerhoff, Curriculum Research & Evaluation, Inc.**

Theresa Bruckerhoff is the Principal Research Associate and Operations Manager at CRE., with nearly twenty-five years of evaluation experience, ten years as the principal evaluator. She studies and evaluates training, professional development and other education change programs funded by state, federal and private sources and is a member of the American Evaluation Association, ASEE, and other content and education focused professional organizations.

**Mr. Danilo Zeppilli, Rowan University**

**Stephanie Lezotte, Rowan University**

Stephanie is a Ph.D. candidate studying postsecondary and higher education. Using organizational theories, she examines systems and structures that contribute to the oppression and symbolic violence of minoritized, underrepresented, and underserved students.

**Danielle Macey**

# Revolutionizing an Engineering Department Through Diversity and Inclusion

## Abstract

The National Science Foundation's Revolutionizing Engineering and computer science Departments (RED) grant was awarded to the Civil and Environmental Engineering (CEE) Department at Rowan University in 2016. This RED grant enables the institution to improve the inclusion of underrepresented and underserved minorities over the course of five years. The grant is focused on diversity and inclusion as a means to improve the intellectual and social development of all students in our engineering program. The CEE Department established a research group called Revolutionizing Engineering Diversity (RevED) to address the initiatives behind the RED grant that include (but are not limited to) recruitment, inclusive pedagogy, student perception of campus climate, and faculty development. The RevED team is currently in the third year of the grant, where it is trying to capitalize on understanding the impacts the grant is having on the faculty and students. This poster intends to show a variety of the developments made in enabling faculty to be trained in issues in diversity and inclusion. The poster will also show how the grant has impacted the students through data garnered from surveys and focus groups. The poster will also show how the CEE student body has changed between the years prior to the grant and how they are progressing now with respect to demographics and how they perceive the development of diversity and inclusion on campus. We will also showcase our engagement with partners within the university which have helped us initiate grander changes across the institution. As the RevED team expands its offerings to the institution, we will also show how we are developing materials for dissemination to influence the university and any other institution who wishes to develop their own ability to be inclusive.

## Introduction

In 1992 a multimillion dollar gift was given to the College of Engineering at Rowan University establishing the modern version of the program [1]. In 2016, the Civil and Environmental Engineering (CEE) department was awarded a grant through the National Science Foundation known as the Revolutionizing Engineering and computer science Departments (RED) grant. The CEE Department is using the RED grant in order to change its ability to serve underrepresented minorities (URMs) and underserved groups. The grant funds all CEE department endeavors over the course of five years which include but are not limited to curriculum changes, faculty development, mentoring, recruitment, and retention. The RED personnel comprises of multiple faculty and staff members within the CEE Department, the College of Education, the Sociology and Anthropology Department, and the Experiential Engineering Education (ExEEd) Department. Currently the RED grant is in the third year of its five year term. Within this time, the grant has taken some added focus into establishing institutional change along with its curricular change. This change is based on critical education theory. This framework establishes policies and practices in education that can lead to social transformation in students rather than maintain present levels of privilege and power in education. The goal of critical education is to develop equity for all students [2].

Since the initiation of the RED grant, the CEE Department provided faculty an opportunity to initiate policies that promote and develop a more inclusive climate for students. Prior to the start of the RED grant, the amount of women enrolled in the CEE Department was slightly below 20%. This is significant since the National Academy of Engineering reported that 20% was the national average [3]. URM students in the CEE Department were less than 10% of the student population. When compared to the averages reported by the National Academy of Engineering, the CEE department realized that improvements could be made [3]. The CEE department is also striving to engage the non-visible elements of diversity. While sex, race, and ethnicity are the visible aspects, socioeconomic status, ability, sexual orientation, and gender expression are considered non-visible. These non-visible elements that students could have are usually overlooked in educational policies and methods [4]. These non-visible elements also make it difficult to keep track of these particular student groups within the whole student body. Another confounding element in making a department for inclusive is taking into account underserved groups such as transfer students. The RED grant enabled the CEE department to take all these elements into account when developing improvements for the department. These insights have also guided the RED research team to begin making initial strides for wider institutional changes with regards to diversity and inclusion.

#### First and Second Year Summary

The first action taken by the RED research team in 2016 was the initiation of survey to assess the climate of diversity and inclusion for the entire College of Engineering. This survey was based on the work of Ferdman and Jost. Their work focused on how diversity was expressed in curriculum, policy, and practice [5,6]. This survey was given to both students and faculty. This survey was used to see what the baseline is for the College of Engineering. While women, non-Christians, and people with some form of disability voiced their concerns about diversity and inclusion within the College of Engineering, the survey also enabled students to voice their own opinions that were counter to the ideas of promoting diversity and inclusion. For faculty, there were concerns about how to adequately engage diverse students. These results led to the RED research team to justify their next steps. To help with faculty engagement, the RED research team ran a workshop for CEE faculty to give them an opportunity to understand what diversity and inclusive practices means to students [7].

The RevED research team also compared SAT scores from various school districts within the state. Seeing that certain inconsistencies in SAT scores acceptance could prevent students from enrolling, the RED research team engaged with the Office of Admissions and were given the authority to expand the criteria of acceptance to include a wider focus on the students' high school GPA and transcripts. In order to help these newer students, the CEE department also established a peer mentoring program to give incoming and transfer students more support. Mentoring has been known to help with retention and that has been given greater focus in the coming years in the CEE department [8].

In 2017, the RevED research team began its second year. This time, the team initiated a survey for only CEE students to see if the CEE students would be different from the larger engineering student body. These surveys would then justify the RED research team's approach to gaining

richer knowledge by using qualitative interviews. These interviews would be a focus for the third year to come. After the first year, the CEE faculty was ready to begin making small changes to their courses. The RevED research team determined that using global examples would be an easy way to introduce diversity and inclusivity in courses. The RevED research team based this off of work done by Donna Riley who mentions that non-western examples are a part of inclusive practice [9]. Along with Donna Riley's framework, the Accreditation Board for Engineering and Technology addresses the development global competency in students and looks for this quality in evaluating criteria [10]. The faculty were given the opportunity to merge social and technical issues to enrich their courses and they developed several assignments across the subdisciplinary courses in the CEE department. These pilot assignments also led the way towards refinement and enabled the RevED research team to seek out more opportunities to develop inclusive pedagogy. The RevED research team also enabled a mentoring program for students and alumni which helped students hone their professional skills and make connections into the local engineering workforce and multiple graduate school programs. It was noted that peer mentoring for students required more attention. Students were also able to attend speaker panels where professionals would share their experiences in the workforce and explain how they sought inclusion in their careers. The RED research team also developed a web presence through a dynamic website and social media. This has led the researchers to gain greater connectivity with others who engage in inclusivity and diversity in education and engineering.

### The Third Year

The third year of the RED grant began in 2018. This year there was considerable focus in establishing more influence across the College of Engineering and the entire institution. The leadership of the RED grant changed in order to enable its change agency for all engineers. While the focus of much of the work will still be in the CEE department, the ExEEd department will now take more RED initiatives. The ExEEd department at Rowan University focuses on the general education of the first two years of all engineering students. This enables the RevED research team to establish a greater influence on the student body as well as give an entrance to other engineering departments. The ExEEd department will look take a deeper look at the students entering the program and determine potential issues across the four year timeline that would discourage a student from finishing their engineering degree. Another climate survey was initiated for the entire College of Engineering to see if any changes have taken place been the 2016 and now. As with the baseline survey, both students and faculty were given an opportunity to respond. These responses will be analyzed in the Spring semester of 2019. Another way the RevED research team is collecting data is through the use of one-on-one qualitative interviews with students. Students have been recruited to share their experiences with researchers. These qualitative interviews will be analyzed during the summer of 2019 and compared to the surveys to see if any new concerns can be addressed.

A current development for the RevED research team was the initiation of conversations with the Rowan Faculty Center on campus. The Faculty Center engages the faculty in a variety of ways including the creation of faculty learning communities, webinars for faculty, and other programs for professional development. This year, the RED research team wanted to establish a

certification process for faculty who engage in diversity and inclusion. A certificate on diversity and inclusion would focus on allowing faculty to attend events on campus that have a focus on diversity and inclusion and enable them to develop a small portfolio of curricular additions for their courses. The hope for this certificate would be to allow faculty to actively create materials that help service their diverse students as well as provide faculty with a way to document their development for promotion and tenure. The RevED research team believes that having wider support from department heads would help give faculty more incentive to seek out developments in inclusive curriculum. The RevED research team envisions a connection of a variety of campus wide events with on-campus organizations that already focus on diversity and inclusivity. This will help faculty become more visible allies to their students. Since the RevED research team is accustomed to giving workshops on inclusive pedagogy, events can be planned that give faculty more tools to develop their own inclusive coursework. More conversations with the Faculty Center, department heads, and the RevED research team will be ongoing in the 2019 Spring semester. The RevED research team is also using students to help develop another aspect of inclusive coursework. This year students are asked to create assignments for CEE courses that focus on visual learning styles and using examples that are developed from personal experiences that students may have come across. Donna Riley also identified that making coursework that stems from a student's lived experience is inclusive and helps ground the concepts that the student is learning [9]. As these new assignments develop, the RED research team will also be working with CEE faculty to develop assessments that help measure the growth students receive from doing these inclusive activities.

## Conclusions

This paper offers a summary of all the current initiatives taking place with the RevED research team for the 2018-2019 academic year. While the RevED research team is more focused on wider institutional initiatives, the CEE focus will remain. Students are being offered to give their insights to the climate of diversity on campus through surveys and interviews. The CEE faculty are continuing with course development with inclusive activities and assessment that take into account multiple learning styles and the students' lived experience. A major development being undertaken in the project's third year will be the faculty certification process that will be distributed using the Rowan Faculty Center. This certification process aims to establish a deeper institutional change that will all faculty to take credit for their inclusive endeavors for tenure and promotion. This will be the first attempt to bring significant change to the institution outside of the CEE department and to develop a network of eager allies from across the campus. The new initiatives will be the building block for a renewed focus on wider institutional change and will guide the research team for the remaining two years.

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