2018 CoNECD - The Collaborative Network for Engineering and Computing
Diversity Conference: Crystal City, Virginia Apr 29

Exploring the incorporation of diversity and inclusion curriculum in engineering living and learning community programs: A work in progress

Dr. Elizabeth R. Kurban, Women in Engineering, University of Maryland College Park

Elizabeth Kurban serves as the Assistant Director of Retention for the Women in Engineering Program at the University of Maryland Clark School of Engineering. Elizabeth's professional and research interests broadly surround STEM-field access and persistence for women and underrepresented minoritized student populations. She is passionate about equity, diversity, and inclusion in higher education, particularly in the context of engineering. Elizabeth recently earned her Ph.D. in Higher Education from the University of Maryland College of Education. Prior to her journey at UMD, Elizabeth worked in higher education policy research in Washington, DC and earned an M.S.Ed in Higher Education Administration from the University of Pennsylvania and an M.A. in Cognitive Science from the University of Delaware.

Dr. Paige E Smith, University of Maryland, College Park

Paige Smith, Ph.D. is the director of the Women in Engineering Program in the A. James Clark School of Engineering at the University of Maryland. Paige has over 20 years of experience with recruiting and retaining diverse populations in engineering. Under her leadership, the Women in Engineering Program received the 2008 National Engineers Week Introduce a Girl to Engineering Day Award. She is the principal investigator for a National Science Foundation's Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP) grant called the Successful Engineering Education and Development Support (SEEDS) Program. SEEDS extends successful women in engineering retention programs to all first-year and new external transfer students in the Clark School. Paige is the co-lead for the Mid-Atlantic Girls Collaborative (MAGiC), a regional collaborative within the NSF-funded National Girls Collaborative Project which brings together girl-serving organizations across Delaware, Maryland, Virginia, and Washington, D.C. that are committed to increasing the number of young women pursuing science, technology, engineering, and math (STEM) careers. Currently, Paige is serving as the Immediate Past President for the Women in Engineering ProActive Network (WEPAN). Paige earned her Ph.D. and M.S. in industrial and systems engineering and B.S. in engineering science and mechanics from Virginia Tech.

Title:

Exploring the incorporation of diversity and inclusion curriculum in engineering living and learning community programs: A work in progress

Abstract:

Aligned with the mission and vision of the Women in Engineering Program at the University of Maryland College Park, the engineering Living and Learning Community (LLC) programs seek to cultivate inclusive and diverse communities of support and success. Over the past year, we have revised, piloted, and implemented intentionally-crafted diversity and inclusion curriculum into the LLC programs seminars. This content includes understanding diversity and inclusion concepts and terminology, social identities, the importance of diversity and inclusion in the engineering context, socialization, unconscious bias, and tools for interrupting implicit bias. In addition, the curriculum incorporates ethics in engineering and engineering social responsibility. The paper will describe our experiences, strategies, and challenges in developing and implementing diversity and inclusion curriculum within the engineering living and learning programs, and discuss ways to consider incorporating diversity and inclusion programs and practices in various engineering contexts.

The mission and vision of the Women in Engineering Program at the University of Maryland College Park (UMD) is to cultivate inclusive and diverse communities of support and success. One of the ways in which we seek to realize our mission and vision is through our Living and Learning Community (LLC) programs. Over the past year, we have revised, piloted, are in the process of implementing intentionally-crafted diversity and inclusion curriculum into our LLC programs seminars. As we are currently on the ground navigating this ongoing process of curriculum development, we believe it is important to share with others our experiences thus far in developing and implementing diversity and inclusion curriculum within our engineering LLCs. This paper will provide an overview of our LLC programs and the goals of our curriculum development before describing the strategies and challenges faced. Furthermore, we seek to encourage discussion on the ways in which to consider the incorporation of diversity and inclusion pedagogy and practices in various engineering contexts.

Overview of LLC Programs

The Flexus and Virtus LLC Programs are two-year residential living and learning community programs for first- and second-year female and male engineering students. The Flexus Program, which was originally developed through a grant from a former Associate Dean of the Clark School of Engineering, is specifically designed for women engineering students (see Samuelson, Litzler, Staples, & Smith, 2014 for a comprehensive overview of Flexus). Following the implementation of Flexus, the Virtus Program was developed to provide a LLC program for male engineering students, serving as the male counterpart to Flexus.

Overall, the goals of the Flexus and Virtus Programs are to promote gender diversity, while cultivating a community of support among first-year and second-year engineering students. Flexus and Virtus students begin the program in their first-year in the Clark School of

Engineering. All students are housed together in the same residence hall and are enrolled in a one-credit seminar course, which is taken each semester of their first two-years as a student. The purpose of these seminars in the students' first year is to facilitate their transition into college and into their introductory engineering courses. Much of the curriculum is focused on personal and professional development, as well as foundational development of technical engineering skills. In the second year, the seminars focus on leadership strengths development and understanding diversity in engineering. Throughout every seminar, there is a strong emphasis on community-building, community-service, and personal, professional, and career development. Though the Flexus and Virtus seminars are typically held separately, there are several co-curricular classes that combine the Flexus and Virtus students in a larger group seminar.

Goals of Curriculum Re-Development

While the core purpose of the Women in Engineering (WIE) Program at the Clark School has remained steadfast in promoting gender diversity in engineering, over the past several years the mission and vision of the program has been more intentionally geared toward promoting all forms of diversity and has placed greater emphasis on inclusion. We believe that cultivating diverse and inclusive environments in our school of engineering can contribute to changing the culture of engineering for the better (Pless & Maak, 2004; Stevens, Plaut, & Sanchez-Burks, 2008). Our purpose is to produce engineers who value every voice and mobilize the power of community to thrive as global citizens and fearless agents of positive change.

We continuously seek to align our mission and vision with our programs, events, and activities. As such, one of the main goals of our curriculum re-development was to align the curriculum of the LLC seminars with the mission and vision of the WIE Program. This required us to redesign much of the "diversity and multiculturalism in engineering" content to focus more

intentionally on meaningful, relevant, and innovative content in diversity and inclusion, particularly within Virtus. In addition, we sought to include content related to ethics in engineering and engineering responsibility, which is content that was previously absent in the LLC seminars. Furthermore, in an effort to cultivate a community of allyship and support from the Virtus community, we sought to align the Flexus and Virtus curriculum, so that both communities would be exposed to and engaged in the same curricular content.

Piloting Diversity and Inclusion Content

The curriculum re-development process began through revising the second-year Flexus/Virtus seminars. The original third semester seminar focused on entrepreneurship, leadership development, and networking. The original fourth and final semester focused on multiculturalism and diversity, negotiations, and women in leadership. In spring 2017, we took the opportunity to pilot new content in the fourth seminar, specifically focusing on the importance of diversity and inclusion in engineering, while incorporating ethics in engineering.

As a starting point, we consulted with expert knowledge in the field, through partnering with resources on campus and further developing our foundation of literature and resources from experts in the field. We partnered with the Office of Diversity and Inclusion (ODI) at UMD to pilot workshop seminars geared toward engaging our students in dialogues around diversity, inclusion, identity, prejudice, discrimination, and biases. We also partnered with the LGBTQ Equity Center to feature a Speakers Bureau of students to share their stories and experiences in the LGBT+ community. In addition, we consulted with a faculty member at UMD who specializes in teaching engineering ethics, in our effort to incorporate this content into our seminars. Though it was a relatively new practice for Virtus students in the seminars, we sought

to focus on facilitating class discussion and dialogue around each topic, encouraging students to engage in reflection and critical thinking.

Through this piloting process we were able to strengthen our partnerships across campus and our exposure and access to relevant resources. This contributed to our building foundational resources in the content area of diversity and inclusion in engineering and beginning to implement this content into our class seminars. Throughout the semester, the instructors of the Flexus and Virtus seminars worked closely with one another to debrief on the implementation of the content in the classroom and the feedback from the students. Overall, this piloting of content allowed us to move forward in further aligning our curriculum with the WIE mission and vision and address our goals of curriculum re-development.

Implementing Diversity and Inclusion Content

In fall of 2017, we fully implemented the new diversity and inclusion curriculum as the third seminar for Flexus/Virtus second-year students. The seminar curriculum began with a presentation and discussion on ethics in engineering. This content focused on the role of ethics in engineering practices, engineering responsibility, and conflicts of interest in engineering settings. We transitioned from discussion on ethical behaviors to a series on the importance of diversity and inclusion in engineering.

Introducing Diversity and Inclusion

The diversity and inclusion series began with an introduction to diversity and inclusion. During this class session, we opened with a candid discussion inquiring about how students felt about engaging in conversations about identity, diversity, and inclusion. This provided an opportunity for students to begin reflecting on themselves and how they were feeling about the upcoming class topics, as well as provided us, as instructors, with a better understanding of how

the class was feeling as a whole. We followed this with a conversation about what students hope to gain from learning about diversity and inclusion. During this time we encouraged students to focus on their own identities and the identities of others in the room and develop a better awareness of difference. We also encouraged the students to develop their sense of community and support within the Flexus/Virtus communities and within the larger campus community. Furthermore, we encouraged students to open their minds and expand on their understanding of themselves and the world around them.

One of the first activities in this series was to develop a "group agreement." A group agreement is a set of guidelines, rules, and expectations that the students and instructors set as a class, in an effort to create a safe, inclusive, and respectful environment. While the instructor facilitates the conversation in developing this agreement and providing suggestions, the students take an active role in offering rules or expectations by which the class may agree to abide. Some of these agreements include respecting one another's ideas and comments, listening when others are speaking and refraining from interrupting, keeping an open mind, maintaining confidentiality, encouraging everyone to engage in discussion, etc. This group agreement is revisited throughout the semester, not only as a reminder to the class of their ground rules agreement but to allow for the opportunity to continue adding or revising the agreement as necessary.

In the introduction to diversity and inclusion, it was important to begin to lay a foundation for engaging in discussion around these topics through developing an understanding of key terminology and concepts. We began with a presentation of terms and concepts with definitions, and revisited this content throughout the semester as needed. Some of the key terms included diversity, inclusion, equality, equity, social justice, social identity, and intersectionality.

Exploring Identities

To facilitate student reflections on the diversity of identities within their communities, we provided activities for students to explore their own social identities. One such activity is the "Social Identity Wheel" which is a worksheet encouraging students to reflect and identify the various ways in which they identify socially (Program on Intergroup Relations and the Spectrum Center, no date). The worksheet features a wheel that prompts students to list various social identities in which they may categorize, such as race, gender, sex, ability, religion, sexual orientation, and primary language. Following their completion of the "Social Identity Wheel," students are asked to pair with a partner and discuss the following exploration questions: Which of your identities do you think about most often? Which of your identities do you think about least often? Which of your identities are areas of privilege? Which of your identities are areas of oppression? Which of your identities would you like to know more about? Which of your identities have the strongest effect on how you see yourself as a person? Which of your identities do you think are misunderstood?

Overall, activities such as the "Social Identity Wheel" encourages students to self-reflect on the social identities they hold and better understand the diversity of identities in the community. We also encourage critical thinking and discussion around how identities may evolve in various contexts, and how privilege and power may operate in normalizing some identities over others (Program on Intergroup Relations and the Spectrum Center, no date; Torres, Jones, & Renn, 2009).

During one class, we invited the LGBTQ Equity Center Speaker's Bureau to engage in a workshop with our students. The Speaker's Bureau features students from the LGBT+ community at the University of Maryland. During this session, students share their stories and

experiences in the LGBT+ community with the class. This provided an opportunity for students to discuss with their peers various aspects of identities and how these identities impact students' lived experiences.

Understanding Importance of Diversity & Inclusion

Through the use of articles, videos, films, and other forms of media we engage students in discussion around the importance of diversity and inclusion in various contexts. In particular, we focus on the context of engineering, considering how and why the field of engineering faces some of the greatest disparities by gender, race, and ethnicity among all STEM fields. Students are asked to consider the demographics within their own school of engineering and within their classes and discuss why these disparities exist and how we may all benefit from a more diverse and inclusive environment.

The message we emphasize during these discussions is the value of diversity and inclusion in the field of engineering. Diversity contributes to the diversity of thought, innovation, and creative ideas. It is integrally connected to academic and workplace excellence and helps us to be present in our globally diverse world (Hewlett, Marshall, & Sherbin, 2013; Phillips, 2014). Throughout the semester, we have students consider the benefits of diversity and inclusion in engineering environments, not only in engineering educational settings but also in industry and professional contexts.

Understanding Unconscious Bias and Its Impact

Before engaging in content around implicit bias, prejudice, and discrimination, we focus our discussion on the topic of socialization and the cycle of socialization. Through readings and informative video clips, we discuss what socialization is and its purpose in society. Once students gain a deeper understanding of the concept, we discuss the cycle of socialization and ask

students to provide their own examples in various stages of this cycle. This discussion helps students to consider the impact of socialization on identities, experiences, behaviors, values, thoughts, and goals. This conversation progresses to discussion on gender stereotypes and racial hierarchy in the U.S., prompting rich dialogue on the outcomes of the socialization process.

After an understanding of the cycle of socialization, we begin discussing unconscious biases. One of the most engaging homework assignments that sets up for valuable class discussion is for students to complete a minimum of two implicit bias tests (Project Implicit, no date). During class, we discuss students' thoughts on the implicit bias test and how their results made them feel. Many students describe feeling surprised by the results, insisting that they did not believe they held biased beliefs. This discussion provides an opportunity for students to consider the relationship between socialization and unconscious/implicit biases, and to consider the impact of unconscious biases. We ask students to break into small groups to discuss the implications and consequences of unconscious bias in day-to-day activities, in class contexts, in engineering, in the workforce, in hiring or promotion processes, and other areas of life. Furthermore, we engage in dialogue about prejudice and discrimination and the role that the cycle of socialization and unconscious biases plays in prejudice and discrimination.

Addressing Bias

Through readings and activities, we explore content with our students on systems of power and privilege. Through discussion on privilege and the work of Peggy McIntosh (2004) on "Unpacking the Invisible Knapsack," students are asked to consider their own privileges. Toward the end of our discussion on privilege, we ask students to consider how one can leverage their privileges for good, to help others or to challenge systems of power.

The discussion on leveraging privilege opens the opportunity for students to consider ways to address biases when they face them, especially in the engineering context. Guided by the work of Stephanie Goodwin (2016), we provide students with strategies for interrupting bias. Through the use of several case studies we describe common instances of bias in regards to various social identities (especially gender bias) that often occurs in engineering educational settings. Students break into small groups to discuss a case study and pose questions to one another about the scenario. Goodwin (2017) offers seven strategies for responding to bias, which provides tools for the students to consider when determining how they may respond to the scenario in their case study.

Final Project: Universal Design

While students have several smaller assignments and projects throughout the semester, there is one main culminating project that is delivered by students at the end of the semester called the "Universal Design Project" (Burgstahler, 2009). The purpose of this project is for students to apply what they have learned throughout the semester to critically evaluate the impact that engineering has one society. In particular, students identify a product, system, or structure that was developed by engineers and conduct research on the item they select. They are asked to research the history of the product, system, or structure, the individuals involved in creating it, and the purpose in which it was intended to serve. Students then identify the limitations of the product, system, or structure as well as its unintended consequences (either positive and/or negative). Finally, students are asked to consider how they may address the limitations or unintended consequences of the item they selected. Overall, the final project encourages students to think critically about engineering design and to apply their understanding of diversity and inclusion into engineering practices.

Our Strategies

Throughout the curriculum re-development process, we have relied on and continue to build upon several strategies geared toward the success of this curricular change. We would like to offer the strategies we employed, including building a strong knowledge base, including discussion-based classes, incorporating various forms of media, and valuing the student experience.

Building Strong Knowledge Base

One of the most important strategies we adopted in preparation for curriculum re-development was to build a strong knowledge base of content. This required our staff to gather a wealth of resources on the topics of diversity and inclusion, especially in the engineering education context. We found it most helpful to reach out to and partner with experts and resources on campus. For example, we consulted with the Office of Diversity and Inclusion on our campus to discuss our goals for the curriculum re-development and the ways in which we could effectively reach these goals for the course. Strengthening our partnerships across campus, while consulting with experts and the work of scholars in the field, allows us to develop a strong foundation of knowledge and resources with which to work as we built our curriculum and class content.

Emphasizing Discussion-Based Classes

Through building a strong knowledge base, we realized the critical importance of having our Virtus students, in addition to our Flexus students, engage in discussion and dialogue throughout class time. Class discussion within both Virtus and Flexus seminars allows students in our LLC communities to consider and share their thoughts and feelings on a topic and hear the thoughts and feelings of others within a structured and facilitation space. As instructors, we

provided a variety of interactive activities to encourage students to interact with one another and engage in the class content more deeply. We often posed questions for students to contemplate before we facilitated discussion on the topics at hand. We found that these discussion-based components of the course were some of the most enriching and engaging aspects of the class. Furthermore, class discussions provided an opportunity for us, as instructors, to gauge students' understanding of and interaction with the course material.

Incorporating Various Forms of Media

In addition to facilitating class discussion and interactive activities, we also employed another strategy to encourage students to be engaged with the class content: Incorporating various forms of media. While we opted to include some traditional reading assignments that students were asked to complete prior to class, we also sought to expand upon the various forms of media included both in and outside of the classroom. For example, we included YouTube videos, films, interactive tests, and podcast episodes. We found that the variety of forms of content kept each class and homework assignment interesting to our students, and contributed to the extent to which they were engaged in the course material. Many of the in-class videos, for instance, prompted engaging class discussion and provided helpful examples for our class when referencing certain concepts or ideas.

Valuing the Student Experience

While piloting and implementing the new curriculum content, it was important for us to be transparent with our students regarding the curriculum development process. Through this process, we explained our goals of revising the curriculum and maintained honesty and transparency in our approach to incorporating the new material. We have continually invited students to provide feedback and input on their experiences in the classroom with their

engagement in the new content. For example, at the end of each class we pass around notecards for students to provide instant anonymous feedback on the class that day, as well as their thoughts and feelings about their experience. We seek to emphasize the ways in which we value the students' experiences in our classes when engaging with the diversity and inclusion content, and when appropriate, we seek to incorporate their feedback and suggestions into the curriculum revision process.

Challenges

As to be expected, it has been a challenging process to revise and implement new diversity and inclusion curriculum. While we expect that many of the challenges we have faced thus far may be mitigated as we gain experience through time, we continue to engage with one another and consult resources and experts to further develop strategies to address these challenges and prepare for challenges in the future. In this section we share some of the main challenges we faced.

Determining Breadth and Depth of Content

One of the biggest challenges has been determining the breadth and depth of the content. This requires us to gauge what will be developmentally appropriate for our students based on the diversity of knowledge and lived experiences of the students in our classrooms. Though most of the time students have not been previously formally exposed to or engaged with the diversity and inclusion content included in our curriculum, we must acknowledge that students are coming to class with varying levels of knowledge, development, experience, and exposure to such content. While this might be typical in any college course, it is a challenge that we face in determining the extent to which we dive into each class topic.

Adapting and Adjusting Class Content

While we can do our best to predict what content may be developmentally appropriate for our students, we continue to face the challenge each class of *meeting students where they are*. In other words, though we carefully prepare our agenda of content for each class session, we often face the challenge of quickly adapting the content prepared based on gauging the ways in which it is received by the class. For example, if we find that students are having a hard time grasping a particular concept, we will adjust our agenda to focus that class time on discussing and working through that concept in order to ensure that students have a better understanding of the material before moving forward. This is inherently challenging, as it requires us to keep a keen pulse on the class's receptivity to the material and remain flexible in our delivery of the course material.

Engaging in Difficult Conversations

The course material on diversity and inclusion can often open opportunities for engaging in difficult, but crucial, conversations. For example, discussions on social identities of gender, race, and sexual orientation, can prompt varying levels of discomfort, especially in relation to students' personal identities, opinions, beliefs, values, etc. As instructors, we face the challenge of facilitating these difficult conversations, while encouraging students to participate in this enriching learning opportunity. We recognize that stepping into the discomfort of difficult dialogues can provide opportunities for students to reflect on their thoughts, feelings, and opinions, while considering the thoughts, feelings, and opinions of others. Ultimately, we believe this encourages open-mindedness and exposure to the perspectives and lived experiences of others.

Conclusion

Throughout this paper we have shared our experiences implementing diversity and inclusion curriculum into our LLC program seminars. During this process of revising, piloting, and implementing new course content, we have been able to identify the strategies employed and the challenges we have faced. As we continue to navigate this ongoing process, we are considering the lessons we have learned and continue building upon our strategies for improvement. It is our hope that we can encourage further discussion regarding strategies for incorporating diversity and inclusion into curriculum, as well as programs and practices, in various engineering contexts.

References

Burgstahler, S. (2009). *Universal design of instruction (UDI): Definition, principles, guidelines, and examples.* Disabilities, Opportunities, Internetworking, and Technology (DO-IT), University of Washington College of Engineering, Seattle, WA.

Hewlett, S. A., Marshall, M., & Sherbin, L. (2013). How diversity can drive innovation. *Harvard Business Review*, *91*(12), 30-30.

McIntosh, P. (2004). White privilege: Unpacking the invisible knapsack. Race, class, and gender in the United States, 6, 188-192.

Phillips, K. W. (2014). How diversity makes us smarter: Being around people who are different from us makes us more creative, more diligent, and harder-working. *Scientific American.* Retrieved from http://www. scientificamerican. com/article/how-diversity-makes-us-smarter.

Pless, N., & Maak, T. (2004). Building an inclusive diversity culture: Principles, processes and practice. *Journal of Business Ethics*, *54*(2), 129-147.

Program on Intergroup Relations and the Spectrum Center (no date). University of Michigan. Retrieved from: https://sites.lsa.umich.edu/inclusive-teaching/

Project Implicit (no date). Retrieved from: https://implicit.harvard.edu/implicit/aboutus.html

Samuelson, C., Litzler, E., Staples, C., & Smith, P. (2014). Living, learning, and staying: The impact of a women in engineering living and learning community. American Society for Engineering Education. 121st ASEE Annual Conference & Exposition (June 15-18, 2014): Indianapolis, IN.

Stevens, F. G., Plaut, V. C., & Sanchez-Burks, J. (2008). Unlocking the benefits of diversity:

All-inclusive multiculturalism and positive organizational change. *The Journal of Applied Behavioral Science, 44*(1), 116-133.

Torres, V., Jones, S. R., & Renn, K. A. (2009). Identity development theories in student affairs: Origins, current status, and new approaches. *Journal of College Student Development, 50*(6), 577-596.