Work-in-Progress – Constructing a Diverse and Interdisciplinary Community of Learning and Mentoring: Developing Leadership and Emotional Intelligence through Here-and-Now projects

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Abstract – **An interdisciplinary team of two engineers and a humanist aimed to create a community where a diverse group of students could learn to become active members of the engineering school and future leaders of society. This work-in-progress paper explores the challenges and rewards of student empowerment and experiential learning in an introductory engineering/STS course at the University of Virginia. After reviewing the teamwork, leadership, and diversity learning outcomes at the conclusion of the first semester, the authors lay out remaining tasks and future goals, which include the potential redesigning of the overall first-year engineering curriculum, a longitudinal study of student-faculty relationships by annual semi-structured interviews, and empowering former students to become peer mentors for new students.**

Index Terms – Interdisciplinary Learning, Teamwork and Leadership, Diversity, Emotional Intelligence, Mentoring

INTRODUCTION

The Class of 2018 at the School of Engineering and Applied Science (SEAS) at the University of Virginia (UVA) have gone through a particularly tough first year of their academic life. In September 2014, Hannah Graham, a second-year student in the College of Arts and Sciences, went missing and was later found dead. In fall 2014, three students took their lives and many students sought counseling support at Counseling and Psychological Services. UVA has been investigated for Title IX violations, as have many universities, and *Rolling Stones* published a story of sexual assault in November 2014 that divided the university faculty, staff, students, and alumni more than ever before. Despite the subsequent retraction of the article and the publication of an independent investigation, UVA is still at the center of the nation-wide discussion about the role of the university administration, faculty, and students in preventing and responding to gender-based violence and in honoring the UVA tradition of shared governance [1]-[2]. In March 2015, two white state Alcoholic Beverage Control (ABC) agents pinned Martese Johnson, an African-American honor student, to the ground. The encounter occurred after Johnson showed his driver's license at a bar near the school but could not recall the zip code on the license. The ABC agents' physical confrontation with Johnson was captured as a video, which drew more national attention toward UVA and central Virginia on its racial climate [3]. Engineering faculty, staff, and students became increasingly concerned about power-based violence, physical safety, mental health, and university governance.

Engineering education has been recognized as an area of national interest and priority. Although nationally over 55% of college graduates are women, less than 25% of engineering graduates are women. At the University of Virginia, women make up 55% of the student body overall, but only 31% of engineering students are women [4]. Similarly, for other underrepresented demographic groups in engineering, the percentage of undergraduate degrees earned is significantly less than the population as a whole. African Americans, Latinos, Native Americans, students from less privileged socioeconomic backgrounds, and students with traumatic childhood experiences are not given sufficient opportunity to become engineers [5].

Engineering education research and practice have been partially successful in addressing the lack of diversity in the last fifty years. Using the old-fashioned pipeline model, educators and policy-makers identified that there have been leaks in the system, and the leaks are particularly severe for minorities and underrepresented groups. At the same time, there has been increasing attention on the role of K-12 education, life-long mentoring, and support for diverse groups of students as they make the transition from college graduates to engineers. Increasing focus has been given to the area of liberal studies in engineering and engineering studies [6]-[7]. Wisnioski [8] argued that the history of engineering education research and practice can provide guidelines for researchers and practitioners alike.

In order to address the lack of diversity in the engineering community, we propose to incorporate emotional intelligence into engineering education at the beginning of the student's training. We believe that helping our students become better team members and leaders is essential in making engineering education more inclusive, engaging, and socially relevant. In the remainder of our paper, we will first lay out the motivations, expectations,

and accomplishments of the new interdisciplinary course that we taught in spring 2016. After discussing remaining tasks, we will conclude with reflective thoughts about our own journey toward teamwork, leadership, and diversity.

MOTIVATIONS AND EXPECTATIONS

Between summer and winter 2015, a duo of engineering and humanities faculty developed a new, interdisciplinary course on teamwork, leadership, and diversity. William (Bill) Johnson is a professor and chair at the Department of Materials Science and Engineering who became increasingly interested in incorporating project-based and experiential learning into the classroom through collaboration with engineering education researchers. Bill has a total of 34 years of teaching, research, and administration experience, of which 23 were at UVA. Jongmin Lee is a Science and Technology Studies (STS) faculty with degrees in engineering, history of science, and STS who wanted to instill an activist mindset into young engineering students. Jongmin has been at UVA since fall 2013. As a response to the Hannah Graham, *Rolling Stones*, and Martese Johnson issues, Jongmin invited an engineering education scholar, Donna Riley of Virginia Tech, to give a presentation and hold a roundtable discussion on gender-based violence in STEM in spring 2015. Donna Riley's talk functioned as a stepping stone for Jongmin and Bill to begin SEAS-level discussion about the need for diversity education and raising institutional awareness [9].

In summer 2015, Bill proposed a meeting to discuss a new course focused on teamwork, leadership, and diversity. Between July and November 2015, Bill and Jongmin developed their ideas into a course. They found a need to infuse teamwork and leadership thoughts into first- and second-year students. Bill employed his past experience in course design and faculty and student mentoring. Bill was passionate about making students own this course and engage them as class liaisons, volunteers, and potential collaborators for change. Jongmin brought historical and current humanities and social science scholarship and education practices into the discussion. Bill and Jongmin invited guest speakers into the classroom to create a common ground where diversity and leadership could meet in a STEM context. Leslie Hubbard and Jason Jones from the Contemplative Sciences Center at the UVA became the consultants for Bill and Jongmin by setting up reflective elements of the course and came to the course as guest speakers twice during the semester [10]. Right before the spring semester started, Marybeth Parker, Ph.D. candidate, joined the instruction team as the teaching assistant. Marybeth brought in a new and complementary perspective into the team, drawing from her educational and corporate experiences. Bill, Jongmin, and Marybeth spent the next four months teaching, working, and learning together.

STS courses at UVA SEAS have a long history that goes back to the graduating thesis requirement established by the first Dean William M. Thornton (1905-1925) [11]. Thornton's emphasis on communication skills met with a series of emerging disciplines including the history of science, philosophy of science, sociology of science, and science and technology studies, the latter of which is now often regarded as inclusive of the formers [12].

Prospective students were asked to apply for this new course by writing a half-page essay explaining their interest in the class as well as how they would contribute to the diversity of the class. All SEAS students need to take at least one 3 credit 2XXX/3XXX level STS course, and our course was listed as one choice. Bill and Jongmin received 46 applications and chose 30 based on year, gender, race, and other factors. Here is the breakdown of the student body. (14 women, 16 men; 1 African American, 7 Asian, 22 White; 15 first-year, 12 second-year, 3 third-year),

There were three learning objectives that the instructors wanted to achieve from this new course. The first goal was to help students recognize their leadership and teamwork skills and to teach them to use these tools effectively to "make a difference" in the UVA engineering community. The second goal was to help everyone develop the tools necessary for the life-long quest toward wisdom and personal wellness, qualities that we believe are prerequisite to becoming an effective leader and achieving personal fulfillment. The third goal was for the class to gain confidence in social competence, to find positive inspirations from complicated situations, and to provide positive influences to the people in their lives.

In order to achieve three goals of "making a difference," "personal competence," and "social competence," the instruction team applied four major elements (self-awareness, self-management, social awareness, and relationship management) based on the book *Primal Leadership* written by Daniel Goleman, Richard Boyatzis, and Annie McKee [13]. Student-led discussion of the book provided guidelines for combining various elements of this course into the themes of teamwork, leadership, diversity, and emotional intelligence. The course combined critical reading that covered both the scientific and humanistic understanding of leadership and diversity with reflection of personal life trajectories. Psychological learning, GreenDot, Survivor Support Network, and innate bias training were also incorporated in order to nurture compassion and increase social awareness. Exemplary elements of the course are laid out with four major elements of the course and three learning objectives in Table I.

TABLE I
FOUR ELEMENTS AND THREE COURSE OBJECTIVES

Modules	Four major elements	Three learning objectives
Myers Briggs Personality Test	Self-awareness	Personal competence
Implicit bias training	Self-awareness	Social competence
Green Dot training & Survivor Support Network training	Self-management Social-awareness	Personal competence Social competence Make a difference

Group projects	Self-management	Personal competence
	Social-awareness	Social competence
	Relationship-management	Make a difference

HERE-AND-NOW PROJECTS

In spring 2016, 29 students participated in six Here-and-Now group projects (the smallest group being 3 members and the biggest one begin 7 members) to tackle concrete problems that they recognized in SEAS. Six teams identified issues of concern, crafted a vision and mission, interviewed faculty, staff, and students, and proposed tangible recommendations to "make a difference" at UVA.

I. Here-and-now projects

All groups created initiatives for "making certain groups feel more included at UVA/SEAS" [14]. The first three groups (1-3) focused on creating supporting mechanisms for traditionally marginalized groups. The other three groups (4-6) explored the need for curriculum reform in the first-year engineering experience. Here we lay out major achievements of six groups:

- **Group 1_Talking Trauma: Promoting Awareness and Support in SEAS:** Animated video created and shared to promote awareness, and biweekly discussion group planned in fall 2016.
- **Group 2_Promoting Socio-economic Diversity in SEAS:** Met with interested faculty, administrators including Deans of admissions and undergraduate education. Plan to be involved in the Experiential Leadership program (See next section).
- **Group 3_Bridging the Gap: International Awareness in SEAS and Beyond:** Created a video based on domestic and international student pairs discussing what have in common.
- **Group 4_Expanding Multidisciplinary Learning at UVA:** Created a full syllabus after meetings with faculty and staff in engineering, created connections with the humanities and commerce faculty.
- **Group 5_Redesigning the SEAS First-year Experience:** Met with faculty and students to argue for a balance between long-term planning and revolutionizing the engineering curriculum. Plan to be involved in the Experiential Leadership program (See next section).
- **Group 6_Reinventing ENGR 1620 and ENGR 1621:** Conducted a field survey of 341 students to measure the students' satisfaction and series of interviews with faculty teaching introduction to engineering courses.

II. Creating a diverse community of learning

The instruction team found it rewarding to allow students to form project teams naturally following the member's interest. Based on the course objectives of self-awareness and social awareness, the students were given ample opportunity to express their interests and discuss topics before choosing their group. However, according to the group survey and course evaluation, some project teams worked more efficiently than others.

We found out that some students felt marginalized because others did not come together around their ideas. These students eventually joined other groups that were not their first choice. Some groups were bigger than others, and we found a split between first-years and second-years. We want to try to use the Myers-Briggs personality type indicator to create groups of similar size and more diverse mix-up in fall 2016.

Rather unexpectedly, communication among group members went well with minimal intervention by the instruction team. Since most groups used GroupMe and GoogleDocs, the instruction team's efforts to create online community at the course management's WordPress site was unsuccessful. To create stronger continuity between the former and current students and instructors, we still aim to create online repository accessible for all the parties interested at the university's course management site.

III. Creating and sharing leadership experience together

We anticipated that most of our self-selected participants already had a strong interest in teamwork and leadership and would be open to the training offered in this course. Psychological trainings and a reflection essay were designed to make self-awareness and social awareness important elements of leadership based on emotional intelligence. Most students found this process helped them to identify their own leadership and teamwork styles.

The instructors purposefully disclosed our evolving relationship and decision-making process to students. We demonstrated to our students different lecturing and mentoring styles. Students learned how to address faculty by first names while still honoring their expertise and experience. Instructors found this type of transparent leadership to contribute to the overall dynamics of the class. Unavoidable delays and confusion happened at times, but ironically this served to empower students to claim ownership of the course.

While many students reported a positive experience in deciding the pace and direction of the new course, we want to report a few areas that we plan to change in the following semester. The role of mentors was not as clearly defined as we would have liked. One outside mentor who helped two project groups reported that she could have helped them better if she were told of expectations and final outcomes. Jongmin responded by meeting with the groups together with this mentor to answer potential questions and decide on specific expectations as needed. Marybeth and Bill found out that selecting a person of contact in each group helped the instructors to contact groups more effectively.

FUTURE PLANS

We are teaching this course again in fall 2016. We are interested in sharing our experience with a broader

audience, and expanding the initiatives into the first-year curriculum.

- **Longitudinal study of faculty-student relationship:** Using semi-structured individual interviews, the researchers, including instructors and outside observers, aim to find out if and how former students use the three learning objectives (making a difference, personal competence, and social competence) to grow into successful leaders and team members. Faculty members in SEAS and the School of Education can be recruited to become interviewers for this multi-year research endeavor [15]- [16].

- **Experiential Leadership for first-year experience:** The instruction team and selected students are working together to scale up Here-and-Now project experience to a cohort-based first-year curriculum in the next academic year. Bill wants to create a cohort of underrepresented and disadvantaged students who study science, social science, engineering, and humanities courses together throughout their first year at UVA [17].

To realize the above research and action plans, the instruction team is looking forward to working with interested former students to engage with current students in the fall semester course. This will provide leadership opportunities for former students. Together we want to create and expand a community of learning and mentoring.

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REFERENCES

[1] Ellison, S., "After a Rape Story, a Murder, and Lawsuits: What's Next ", *Vanity Fair,* October 2015.

[2] Erdely, S., "A Rape on Campus: A Brutal Assault and Struggle for Justice at UVA", *Rolling Stone,* November 19 2014. http://web.archive.org/web/20150404090041/http://www.rollingstone.com/culture/features/a-rape-on-campus-20141119

[3] Payne, G. G., *Administrative Investigation/Review: Department of Alcohol Beverage Control, Arrest Incident, Martese Rashaad Johnson,* July 17, 2015.

[4] University of Virginia, "On-Grounds Headcount Enrollment, Degree/Certificate Seeking Students by Major/Certificate Program, Fall 2015." http://avillage.web.virginia.edu/iaas/instreports/studat/hist/enroll/major_by_gender_2015.shtm

[5] Smith, J. M. and Lucena, J. C. Invisible Innovators: How Low-income, First-generation Students Use their Funds of Knowledge to Belong in Engineering, Engineering Studies Vol 8, No. 1, 2016, pp. 1-26.

[6] Bucciarelli, L. L. and Drew, D. E., "Liberal Studies in Engineering-A Design Plan", *Engineering Studies,* Vol 7, No 2-3, October 2015, pp. 103-122.

[7] ASEE and Teagle Foundation, *Engineering-Enhanced Liberal Education Project.* https://www.asee.org/engineering-enhanced-liberal-education-project/introduction

[8] Wisnioski, M. "What's the Use?: History and Engineering Education Research," *Journal of Engineering Education* Vol 104, No. 3, 2015, pp. 244-251.

[9] Mezzacappa, H. "Virginia Tech Engineering Professor Discusses Gender-based Violence in STEM Fields: Riley Highlights Culture of Silence, Ties to Larger Issue of Sexual Assault," *Cavalier Daily*, April 6 2015.

[10] Contemplative Sciences Center, "Education and Learning", *University of Virginia, Contemplative Sciences Center,* 2015. http://www.uvacontemplation.org/content/education-learning

[11] Pfaffenberger, B., "The History of the SEAS Undergraduate Thesis", *Undergraduate Thesis Manual 2012-2013,* 2012, pp. 10-14. Also available at http://guides.lib.virginia.edu/content.php?pid=607723&sid=5088610#history

[12] Department of Engineering and Society, "STS for the 21st Century Engineer", *University of Virginia, School of Engineering and Applied Science, Engineering and Society.* http://www.eands.virginia.edu/STS/

[13] Goleman, D., Boyatzis, R., and McKee, A., *Primal Leadership: Unleashing the Power of Emotional Intelligence,* 2002/2013.

[14] Wylie, C., Catlin Wylie's Observations on STS 2500 Seize the Moment Final Presentations, 5/9/2016, pp. 1-5.

[15] Foor, C. E., Walden, S. E., and Trytten, D. A., ""I wish that I belonged More in this Whole Engineering Group:" Achieving Individual Diversity," *Journal of Engineering Education* Vol 96, No 2, April 2007, 103-115.

[16] Institutional Assessment and Studies, "Listening to Student Voices: Oral Interviews and Written Statements," *Undergraduate Education at the University of Virginia: Final Report of a Longitudinal Study, 1988-1992,* Charlottesville, VA, pp. 43-52.

[17] Johnson, W. C. "The Experiential Leadership Program: Increasing Academic Success in Undergraduate Engineering for Students from Disadvantaged Backgrounds", pp. 1-2.

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