Work-In-Progress: Broadening Participation in Engineering: Exploring the Burdens and Benefits of Student Volunteerism

Ms. Karis Boyd-Sinkler, Virginia Tech

Karis Boyd-Sinkler is a doctoral candidate in Engineering Education at Virginia Tech. She also serves as support staff for the Center for the Enhancement of Engineering Diversity where she is involved in the recruitment, outreach, and retention of engineering students. Her research interests include diversity in engineering and the role of engineering student support centers and institutions in regards to student attrition and persistence rates. Ms. Boyd received her B.S. in Engineering Science from the University of Virginia in 2014.

Cynthia Hampton, Virginia Tech

Cynthia Hampton is a doctoral candidate in the Department of Engineering Education at Virginia Tech. While at Virginia Tech, Cynthia has directed summer bridge programs, led peer support initiatives for underrepresented groups, and served on various commissions, committees, and research groups focused on student support, organizational change, graduate student policy, and culturally responsive evaluation. Her research interests include organizational behavior and change as it pertains to engineering education and broadening participation, faculty change agents, and complex system dynamics. Her research investigates narrative inquiry of faculty who use their agency to engage in broadening participation in engineering activities. Cynthia received her B.S. in Biological Systems Engineering from Kansas State University and will receive her M.S. in Management Systems Engineering from Virginia Tech in 2019.

Taylor Lightner, Virginia Tech Department of Engineering Education

Taylor Lightner is a 2nd year Ph.D. student in Engineering Education at Virginia Tech. She received her B.S. in Industrial Engineering at Clemson University. She currently participates in the Disaster Resilience and Risk Management Program and New Horizon Scholars. Her current research interest includes broadening participation, interdisciplinary interactions, and socio-technical communication boundaries.

Natali Huggins, Virginia Tech

Natali Huggins is a PhD student in the Higher Education program at Virginia Tech. She holds a master's in public administration from the National Experimental University of Táchira in Venezuela. She has several years of experience in higher education administration and internal audit in Venezuela. Her research interests include diversity and inclusion in graduate education, particularly international and Latinx graduate students' persistence and development. She is interested in supporting students in their transition and adaptability to higher education in the United States.

Dr. Cherie D Edwards, Virginia Common Wealth University

Dr. Cherie D. Edwards earned her Ph.D. in Educational Research and Evaluation from Virginia Tech. Her research and scholarship are focused on exploring the implementation of mixed methods, qualitative, and arts-informed research designs in studies examining issues of social justice and educational equity. Most recently, she worked on a research team examining the impacts of an out-of-school STEM summer program for racially underrepresented youth.

Dr. Walter C. Lee, Virginia Polytechnic Institute and State University

Dr. Walter Lee is an assistant professor in the Department of Engineering Education and the assistant director for research in the Center for the Enhancement of Engineering Diversity (CEED), both at Virginia Tech. His research interests include co-curricular support, student success and retention, and diversity. Lee received his Ph.D in engineering education from Virginia Tech, his M.S. in industrial & systems engineering from Virginia Tech, and his B.S. in industrial engineering from Clemson University.

Dr. David B Knight, Virginia Polytechnic Institute and State University

David B. Knight is an Associate Professor and Assistant Department Head of Graduate Programs in the Department of Engineering Education at Virginia Tech. He is also Director of Research of the Academy for Global Engineering at Virginia Tech, and is affiliate faculty with the Higher Education Program. His research tends to be at the macro-scale, focused on a systems-level perspective of how engineering education can become more effective, efficient, and inclusive, tends to be data-driven by leveraging large-scale institutional, state, or national data sets, and considers the intersection between policy and organizational contexts. He has B.S., M.S., and M.U.E.P. degrees from the University of Virginia and a Ph.D. in Higher Education from Pennsylvania State University.

Work-In-Progress: Broadening Participation in Engineering: Exploring the Burdens and Benefits of Student Volunteerism

Abstract

Across the United States, organizations are engaged in ongoing efforts to broaden participation in engineering (BPE). Because of the lack of persistent representation in engineering, these efforts focus across the elementary, secondary, and postsecondary levels of education, primarily targeting women and people of color. Although extensive literature has documented the impacts of BPE efforts on participants themselves, less research examines the experiences of those who engage in efforts to broaden participation. Such an investigation is important because much of the labor that goes into BPE is provided by underrepresented students themselves, at both the undergraduate and graduate levels.

Accordingly, the purpose of this paper is to explore the impact that broadening participation volunteerism has on engineering students from underserved communities. Volunteerism traditionally refers to the voluntary, sustained, and ongoing helpfulness of one individual to another. We argue that, despite some students being compensated for their contributions, their contribution to BPE efforts should be viewed as volunteerism because: 1) their involvement is non-compulsory, and 2) they are not substantially compensated when compared to what they could be alternatively doing with their engineering training.

This work-in-progress is part of a larger study aimed at understanding the impacts of broadening participation volunteerism at the pre-college, undergraduate, and graduate levels on mentors from underserved communities. To date, we have conducted 9 narrative interviews with underrepresented students who are actively involved in BPE volunteerism at a large, high research, predominantly white university. In this paper, we describe preliminary results concerning the burdens and benefits, both personal and professional, associated with BPE volunteerism. The findings can provide programming administrators with a deeper understanding of the taxation that marginalized students may experience when it comes to BPE.

Motivation

The future success of the United States workforce is highly contingent upon enlisting and maintaining the engagement of racially, ethnically, and gender diverse communities (Saxena, 2014). In addition to addressing the shifting demographic make-up of the United States, broadening participation in the workforce instills fresh perspectives for addressing relevant and complex problems (Saxena, 2014). At the forefront of initiatives to broaden participation, stakeholders in the field of engineering have explored a number of strategies, most of which have focused on both recruiting a diverse population of engineers as well as retaining them to build a sustained culture of engineers with varying backgrounds, perspectives, and skills. One of the prominent strategies employed in engineering is enlisting the aid of mentors to assist in recruiting and acculturating young engineers into the field (Marable, 1999). BPE volunteerism plays a valuable role in engineering education as these students regularly engage other current students (retention) and prospective students (recruitment). This physical, emotional, psychosocial support typically is provided at little to no cost for a university. Nonetheless, students across the country are continually choosing to give back through their volunteerism. Although there is a wealth of knowledge pertaining to the impact these mentors have on their mentees, literature examining the motivation and

implications for mentors is scarce. As major contributors to the future of the field, gaining a better understanding of the mentoring experience from their perspectives can provide vital information regarding how volunteerism contributes to the new cultural norms of engineering.

Project Overview
This paper is situated in a larger project that aims to understand the impacts of broadening participation volunteerism at the pre-college, undergraduate, and graduate levels on those doing the volunteering. The purpose of this work-in-progress is to explore the impacts of broadening participation volunteerism on students from underserved communities at the undergraduate level. We utilized Volunteer Function Inventory (VFI) (Clary et al., 1995) as a theoretical framework to understand the aims, benefits, and consequences of broadening participation in engineering volunteerism. The overarching research question that guides this study is: *How does choosing to dedicate one's time and energy to broadening participation efforts influence engineering student volunteers from underserved communities?* In the subsequent sections, we provide an overview of the VFI followed by the preliminary findings of the current exploratory study.

Volunteer Function Inventory (VFI)
Volunteerism traditionally refers to the voluntary, sustained, and ongoing helpfulness of one individual to another. Today, non-profit organizations rely on the effort and commitment of volunteers, but individuals' motivation varies from one to another even if they are volunteers for the same activity. Sergent and Sedlacek (1990) conducted a study to understand the characteristics and motivations of undergraduate students who volunteer their time and service to aid the efforts of an organization. Their findings revealed that within an organization, there are various motivations for volunteering, and these motivations furthermore vary across organizations. The implications show how people and environments both have characteristic "personalities," and volunteers will seek situations in which they can express their strengths, values and primary characteristics.

To better understand the psychological functions that motivate volunteer actions, Clary et al. (1995) proposed a framework named the Volunteer Function Inventory (VFI) with six motivational functions: Values, Social, Career, Protective, Enchantment, and Understanding. Each of these functions has a five-scale measure allowing to complete the inventory and a profile for each volunteer's motivation (Clary et al., 1998). Table 1 below explains each of the six motivational functions.

Table 1. Volunteer Function Inventory extracted from Clary et al. 1995

Volunteer Function Inventory Construct	Definition
Career Function	Gain experiences and explore a career field
Enhancement Function	Improving themselves by personal and self- esteem growth
Protective Function	Coping with anxiety, conflicts, guilt and ego

Social Function	Personal involvement with a group that is important for the volunteer
Understanding Function	Gain knowledge and skills that otherwise will be unknown
Values Function	Personal convictions about their own values

By using VFI, Finklestein (2008) revealed that volunteers reported greater satisfaction the more their experiences matched their reasons for helping (for all motives but the career function). However, the time spent volunteering was only related to the fulfillment of value and understanding function. Finklestein (2018) found that over time volunteers develop a volunteer identity in which the role of volunteering is incorporated into their self-concept. According to role identity theory, this identity drives future activity. In Finklestein (2008)'s study, motive becomes unimportant in sustaining volunteerism once a volunteer role identity forms. It is also important to note that motivations can change, and it may not always reflect their initial motive and reasons for staying. Therefore, organizations should focus on recruitment and retaining volunteers that attract a diverse pool of individuals.

Organizations will be able to recruit from a larger pool of individuals by ensuring that the task satisfies the diverse functions of the volunteers' needs. Researchers reveal that if volunteer recruits can find tasks with benefits that match their personal motives, their volunteering efforts will result in higher satisfaction and commitment to their volunteer experience (Houle et al., 2005). Francis (2011) examines the functions and norms that drive undergraduate students to volunteer and concludes that researchers need to move from the VFI framework to social norms as volunteering for primary reference group members, shifting the recruitment and advertisement procedure to recruit university students. We hope to further examine the VFI theory by understanding how this lens is applicable when discussing the motives and needs of broadening participation volunteers.

Research Design
We conducted narrative interviews with volunteers at the undergraduate and graduate levels. Interview questions were created that focused on emphasizing critical incidents as a means to understand volunteerism through each of the six VFI constructs. Interview responses were analyzed using a priori coding of the six constructs of VFI. For the purposes of this paper, we present the results that were focused on mentors at the collegiate level. Our methods are further discussed in the following sections.

Context and Participants
The research site was a large, predominantly white research-intensive university in the Mid-Atlantic United States. An introductory email was sent to past and current participants who were actively involved in the research site's Engineering Diversity Mentoring Program. This email allowed the researchers to specifically target the select participants who identify with a racial and/or gender minority. We conducted interviews with nine engineering students, four at the undergraduate level and five at the graduate level. This paper focuses on the four undergraduate student interviews. The undergraduate participants consisted of three females and one male participant who were in their junior or senior year at the

institution. Of the four undergraduate participants, three identified as African American and one identified as mixed race.

Data Collection
Data were collected via narrative interviews with the four students and lasted approximately 30-70 minutes. All interviews were transcribed verbatim by a professional transcription service and any identifying information was removed prior to analysis. All interview protocols were approved by the university's Institutional Review Board.

Data Analysis
Participant interviews underwent a priori coding using each of the six volunteerism constructs. After the researchers familiarized themselves with the interview transcripts, two of the researchers conducted a priori coding using the VFI constructs. The two researchers independently coded one of the interviews and discussed the coding results before moving forward and coding the remaining interviews. Table 2 below highlights the codebook that was formed from a priori coding.

Table 2. Codebook

Volunteer Function Inventory Construct	Representative Quotation
Career Function	"...we have to work with our cultures and individuals and you have to understand that all individuals don't get the same experiences that you do and that pushing for [that] idea is really what made me successful inside my workplace while working at companies over the summer, internships, co-ops.."- A.1A
Enhancement Function	"...I think it's really gotten me more comfortable with speaking about my experiences...I used to hate speaking in front of people...I could not do it. I would get sick every time, but now, like, I have to give presentations...it also taught me like study habits and like organizing my time better" - E.1A
Protective Function	"...we kind of grow this culture of Hey, you can talk about stuff like it's okay to have problems and it's okay to talk about those problems and that group of people that you can always talk about your problems with."- A.1A
Social Function	"...I feel like I've kind of made a family...I see my mentees and it's like my kids are like, sometimes they texted me, they're like, mom, why don't we do?...I really enjoy that..I like having that sense of like I'm helping somebody…"- E.1A
Understanding Function	"...not only do you have to mentor someone, but you also have to think about the mental aspects and then the social economic aspects and also how they think about life and their experience with life so far. And that like thinking about all these different variables together and looking at it as a thing that's everything's really connected." - A.1A

Values Function	"...when I talk about my mistakes that I made with them [mentees], I like sit there and analyze to myself, am I still doing that or am I just telling them that like, I don't want to be hypocritical. So it kind of allows me to check myself and to make sure that I'm still doing what I need to do. Because at the end of the day, when you're in these leadership positions, they're [mentees] looking up to you to be doing these things. So it kind of just holds you accountable." - J.1.A.

Preliminary Results

We present the initial results of our narrative interviews with undergraduate engineering students. As exhibited in the codebook, undergraduate students in the study described perspectives and experiences that categorically align with the various VFI constructs. Along with the alignment of constructs, students discussed salient instances that potentially allude to nuances in volunteerism experiences. These nuances still fall within the VFI constructs, but provide an additional layer of potential complexity. These nuances should be explored further in order to support those who are supporting others through their volunteerism. Several of these nuances are described below in further detail.

Effort Investment

Universities, and in particular programs designed to provide student support, are extremely reliant on the volunteerism of undergraduate students. These individuals provide needed guidance to their peers that enhances and drives recruitment and retention efforts. As stated by a participant, "*... it's not really the faculty who actually run the organization here. It's more of the students.*" Therefore, the temporal, emotional, and physical contribution that students experience as a result of their involvement in BPE volunteerism should not be taken lightly. These aspects, seen by the researchers as potential detriments, were sometimes described by participants sometime as "negatives" or as "considerations" rather than outright burdens. One participant described the amount of effort involved, saying:

> *I learned really how hard it is to be a mentor on how much time it takes to actually be able to make sure people understand, 'Hey, you have someone here, you have someone that's actually willing to put time towards you.'*

The participant highlighted that there is a substantial amount of time required to build trust for a student to "understand" that there is a volunteer who is invested and willing to help. However, this described experience did not occur until the participant had become involved in the BPE volunteerism, indicating although stated responsibilities and tasks may have been communicated for the participant's role, the reality of the BPE volunteerism time commitment did not become apparent until later. Although there is a protective factor present, this took time to realize.

Competing Agenda

Similar to the effort involved, one participant described the balance required for their current volunteerism role versus other professional development:

> *Um, there are sometimes 'Im not, like, I'm not saying that I'm like mad about it, but there's sometimes like there's clubs or like professional development events or just like networking or*

> *like just some events that happen during our meeting times.... But I, I still would, I want to be here... sometimes its just like hard to like balance between the two.*

The participant describes professional development and club meetings that they wanted to attend but were unable because those meetings were held on the same days and times as their BPE volunteerism events. The career or enhancement factors of professional development is in competition with the BPE volunteerism.

Awareness of Self and Relation to Others
The concept of the seriousness of their BPE volunteerism as well as the issues that they face were communicated by several participants. For example, the severity of issues that one participant had to address in their BPE volunteerism is described as:

> *My second year I literally was mentoring a group of individuals who were going through all sorts of stuff from depression and dealing with anxiety for their first years to just how to eat well enough where you don't die, which is surprisingly hard for certain individuals. And then also just how to go about doing well in school, which is hard even to me nowadays.*

Nevertheless, there still must be a consideration of the types of issues that BPE volunteers must encounter to assist students, with the above participant acknowledging their own challenges. The understanding function that is present here exhibits the multi-layered and complex level of student support needed that this participant had to navigate. The above reflection of the participant and their role also extends to the broader picture of their own marginalization in certain areas of BPE volunteerism. One participant says:

> *...they do push a lot more of the ones they have in their grasp because the ones that are here are passionate about that and they at times it seems like overextend us. Um, and one, uh, which I, I don't blame if like you only have two people, you're going to use them as much as you can.*

This valuation and utilization that this participant describes is a result of having BPE volunteers. This participant acknowledges this overall taxation and the reality of being passionate (value inventory) and subsequently utilized.

Acknowledgement of Efforts
It should be noted that for several of the participants, there were times that were described as being salient or representative of their volunteerism that involves reflecting on an interaction with a student who they had assisted in some way. This reflection involved two points in time: one when the participant initially assisted the student with something technical or personal and what that experience was like, and the second after reconnecting with the student at a later date (sometimes years) after the first interaction. The participants in this study appear to go through a combination of remembering the original event in the past, an evaluation on the impact the student communicated to them, followed by a realization of their presence in the student's academic life, and lastly what that experience of being recognized as having an impact on someone's academic experience meant to them personally. The following is an example of this reflection by a student remembering when they reconnected with a previous mentee after several years:

...serving as an example and showing them like there's people at this university that care and exposing them to more... cause a few of them have come back and like, 'Hey, I want to be a part of [organization] and I want to keep, you know, giving back and being a part of this [organization]'... I run into them and they're like, 'Hey, thank you by the way'... and it gets me every single time when I run into [them]. Cause like, I was unaware, I was just trying to make sure you had everything you needed. So that's a big one for me.

This particular type of phenomenon is important to note because although participants may be motivated by various factors such as values or the other five constructs, the fruition that satisfies these needs may not be fully felt until much later than when the act of volunteerism occurred. This sense of valuing, or appreciation, seems to have a salient effect on the participants of this exploratory study. Additionally, the several "appreciation" interactions described by participants happened by chance, with participants randomly interacting with students in settings outside of the volunteerism scenarios.

Future Work
Given that this work is situated in a larger study, future work consists of analyzing the obtained interviews from students at the graduate level. Once the interviews have been coded using the VFI, we plan to look at the results within and between academic levels. In addition to looking at the results within and between levels, the researchers plan to analyze the results based on the racial and/or gender identities of the volunteers. Furthermore, we will highlight challenges and ways to enhance the volunteering experience for volunteers as a means to identify concrete practices for BPE programs.

Acknowledgments

References

Clary, E. G., & Snyder, M. (1995). Motivations for volunteering and giving: A functional approach. *New directions for philanthropic fundraising*, *1995*(8), 111-123.

Clary, E. G., Snyder, M., Ridge, R. D., Copeland, J., Stukas, A. A., Haugen, J., & Miene, P. (1998). Understanding and assessing the motivations of volunteers: a functional approach. *Journal of personality and social psychology*, *74*(6), 1516.

Finkelstein, M. A. (2008). Volunteer satisfaction and volunteer action: A functional approach. *Social Behavior and Personality: an International Journal*, *36*(1), 9-18.

Francis, J. E. (2011). The functions and norms that drive university student volunteering. *International Journal of Nonprofit and Voluntary Sector Marketing*, *16*(1), 1-12.

Houle, B. J., Sagarin, B. J., & Kaplan, M. F. (2005). A functional approach to volunteerism: Do volunteer motives predict task preference?. *Basic and applied social psychology*, *27*(4), 337-344.

Marable, T.D. (1999). The role of student mentors in a precollege engineering program. *Peabody Journal of Education*, 74(2), 44-54.

Saxena, A. (2014). Workforce diversity: A key to improve productivity. *Procedia Economics and Finance*, 11, 76-85.

Sergent, M. & Sedlacek, W. (1990). Volunteer motivations across student organizations: A test of person-environment fit theory. *Journal of College Student Development*, *31*(3), 255-261

Snyder, M., Clary, E. G., & Stukas, A. A. (2000). The functional approach to volunteerism. In G. Maio & J. Olson (Eds.) *Why we evaluate: Functions of attitudes*, 365-393. Hillsdale, NJ: Lawrence Erlbaum Associates.