AC 2012-3258: GRADUATE STUDENT PEER MENTORING: A MEANS FOR CREATING AN ENGINEERING EDUCATION RESEARCH COMMUNITY

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Graduate Student Peer Mentoring: A Means for Creating an Engineering Education Research Community

Abstract

The purpose of this paper is to describe how the Graduate Engineering Education Consortium for Students (GEECS) peer mentoring works and its contribution to the growth of a community of emerging engineering education scholars. Specifically, we discuss the progress of two peer mentoring groups through autoenthographies, which are based on the authors' experiences in developing, facilitating, and contributing to the peer mentoring groups. GEECS peer mentoring is a space for groups of engineering education graduate students to support one another through such activities as goal setting and monitoring.

Introduction

Engineering education research (EER) is in a pivotal time as a developing field, which have resulted in a in a variety of changes. For example, the *Journal of Engineering Education* transforming into a premier scholarly journal that encourages highly empirically-based research[1,2] and many institutions around the world offering research-based graduate degrees in engineering education. These changes have occurred to improve EER quality and increase the number of faculty trained to conduct rigorous EER. The rapid changes appear to be just the beginning of major transformations to the field.

One area of particular interest is the education of future engineering education researchers. Many future EER faculty members are being educated and trained in dedicated departments of engineering education, but most emerging engineering education researchers are or have been trained in other engineering disciplines or in the social sciences (e.g., education, psychology, or child development). These emerging researchers often learn and conduct research in isolation from other EER graduate students suggesting a need for a student-networking outlet. Peer mentoring allows participants to not only develop a network in a highly distributed and diverse field, but also begin to understand the breadth of experiences of their peers in an assortment of disciplines. In this paper we use an autoethnographic approach to explore the impacts of peer mentoring for graduate students now and in the future.

Peer mentoring is a program hosted by the Graduate Engineering Education Consortium for Students (GEECS).[3] GEECS provides a community for graduate students, especially those dispersed throughout the nation; GEECS mission is:

> *GEECS brings together emerging researchers in engineering education to create a supportive network. Our mission is to enhance each other's scholarly, professional and personal development through collaboration, encouragement, knowledge sharing, and critical and reflective analysis as we contribute to the engineering education discipline.*

About GEECS

The first meeting of what would become GEECS was held in early 2010 through the facilitation of two engineering education faculty members. The goal was to provide a space and opportunity for collaboration among EER graduate students in both engineering education departments and those who were dispersed among contributing disciplines. From 2010 to 2011, the organization formalized, selected a name, and held several events at engineering education conferences (i.e., ASEE and FIE) to expand the GEECS network. The first GEECS symposium was held in March 2012 at the NSF Engineering Education Awardees Conference. The purpose of the symposium was to support the development of engineering education research topics by graduate students. With NSF funding GEECS invited and hosted 33 EER graduate students for a day and a half long workshop. The nature of the symposium and previous events at engineering education conferences limited who GEECS reached and impacted in the overall EER graduate student community. In an effort to address this issue, the GEECS executive board has worked to establish yearlong programming that will reach a greater portion of the community. Through the professional development umbrella, GEECS has hosted webinars related to career development, graduate student life, and peer mentoring to help connect students in the field.

In this paper, we discuss the initial peer mentoring plan and the evolution of two peer mentoring groups. We then present autoethnographies[4] about our experiences participating in the GEECS peer mentoring groups. In concluding, we offer implications for future research, as well as professional development endeavors, such as expanding and connecting peer mentoring to related types of activities.

GEECS Peer Mentoring

To fulfill the GEECS mission, there existed an opportunity for graduate students to personally and professionally support one another through such things as webinars, workshops, and peer mentoring. While webinars and workshops have been promising avenues for GEECS outreach and recruitment of graduate students, these activities have been isolated events. These single events are a strong first step toward the GEECS' mission; however, these endeavors needed to be extended into long-term activities. Peer mentoring was developed in an effort to provide a structured and flexible mechanism for graduate students to support one another throughout the year. The initial thoughts about the program were to provide a space in which graduate students could support one another's goal setting and monitoring, and engage in community building activities. The purpose of the goal setting and monitoring aspect was to hold one another accountable, which can be a critical driving factor in the completion of one's goals.[4,5] Additionally, giving and receiving feedback added the components of professional development and community building. For example, through giving feedback, graduate students could better understand other graduate students' research areas. Finally, this peer mentoring model serves to augment more traditional models of mentoring, such as advisor-advisee.

Methodology
GEECS peer mentoring consists of small (i.e., four to six participants) working groups of EER graduate students who connect monthly via conference calls. These long distance meetings afford students the opportunity to engage in setting goals, monitoring each other's goal progress,

and giving/receiving feedback. Students encourage each other to set both high and specific goals related to a work-life balance (i.e., research, service, teaching, and personal goals). These areas, specifically research, service, and teaching, align with the merit traditions in higher education. The fourth dimension – personal – encourages students to remember a holistic life approach to academia, including such things as living a healthy lifestyle (e.g., exercising, eating healthy), and maintaining important relationships. In addition to goal setting and monitoring, students provide one another with feedback on current work. Each group is led by one graduate student, who is responsible for organizing the group (i.e., identifying meeting times, securing a conference call number, sending out e-mail reminders). This initial overall structure was developed as an emendable starting point. Each groups' structure has slightly changed (see below) as the participants have re-evaluated their needs. In January 2010, GEECS began the process of developing and implementing peer mentoring. In March 2010, the preliminary two peer mentoring groups began meeting.

Peer Mentoring Group Make-ups
Each of the two pilot peer mentor groups was lead by a doctoral-level student. Group one was lead by a PhD candidate in Engineering Education at Purdue University. The group consisted of five additional members:
1) a 1st year (now 2nd year) Aerospace Engineering PhD student from Georgia Tech
2) a 1st year (now 2nd year) Engineering and Science Education PhD student from Clemson University
3) a recent Electrical and Computer Engineering PhD graduate from the University of Illinois at Urbana-Champaign; now post-doctoral research associate at Purdue University's Engineering Education Department
4) a post-doctoral research associate at Arizona State University (ASU) with a PhD in Education from Tufts University (third author of this paper); now an assistant professor of Engineering at ASU
5) an assistant teaching professor of Business at the University of Missouri who is a recent Industrial Engineering PhD graduate from Iowa State University.

Group two was lead by a PhD candidate in Human Centered Design & Engineering at the University of Washington (first author of this paper). The group consisted of three additional members:
1) a 2nd year (now 3rd year) Engineering Education PhD candidate from Virginia Tech (second author of this paper)
2) a 1st year (now 2nd year) Engineering Education PhD student from Purdue University
3) a 1st year (now 2nd year) Engineering Education PhD student from Virginia Tech

The size and compilation of each group was solely based on the availability of interested participants. All members of the groups identified a focus of their research efforts on engineering education and were invited to participate based on their previous involvement with GEECS. Each peer mentoring session was held once a month for one to two hours focusing on research, teaching, service, and personal goals. Each month the members would review their goals from the previous month (recorded in Google Groups) to discuss which were met and why others were not achieved. New goals were recorded each month to maintain a constant set of goals to work toward. Time was spent encouraging one another to set lofty goals and congratulate those who

reached milestones. When time permitted, an in-depth discussion would occur about a specific research endeavor. When appropriate (and/or when asked), participants would share advice with members of the group. For example, more senior participants might share tips and tricks to other graduate students who are in the midst of tackling various exams. The mix of participants was extremely effective in helping to create a true mentorship experience.

Methods

Autoethnographies were used in this study to provide an initial examination of students' peer mentoring experience. An authoethonographic study is an anaysis of "one's own culture and oneself as part of that culture" (p. 85)[2]. The data collected provides a set of vignettes from each author about our experiences participating in these two GEECS peer mentoring groups. Furthermore, these autoethnographies provide an initial validation of the program providing a foundation for future explorations.

Findings: GEECS Peer Mentoring Positive Outcomes

The following three vignettes, written by the authors, represent the authors' experience participating in GEECS peer mentoring.

Vignette 1: Perspectives from a PhD candidate enrolled in an Engineering Education program. Participating in peer mentoring has been a valuable professional and personal growth experience. Group two has been running for a little under a year and while I knew my peer group mentors before we began, I have learned much more about their interests and goals. Having a greater connection with people in other departments and interested in engineering education provides unique avenues for current and future collaboration. Our monthly calls help me feel connected to the field by hearing about others' projects, papers, and degree progress. As a student in an engineering education department, it is easy to become absorbed in a single view of the field; the peer group assists in maintaining a broad view of engineering education research. Beyond building connections, other valuable aspects of the program are accountability and peer review. Discussing research, teaching, service, and personal goals are often items that do not combine in other spaces. The peer-mentoring group has helped me set clear proximal goals as a developing professional. Our group reminds and motivates me to focus on the goals that can be overlooked and celebrate their achievement. Our group uses peer review to have three additional people to review articles, research reports, and even dissertation sections in a safe place. The perspective that I have gained from my peer mentors on work I have shared has been very helpful. Ideas regarding research approach and their questions about content have assisted in clarifying, focusing, and eventually presenting research. An additional benefit is having a peer mentor at the same degree progress stage. Knowing that someone else is doing the same thing at the same time helps the graduate process feel less isolating and intimidating. It is also rewarding to give advice and perspective to peers who are at earlier stages in their academic careers. The program has provided me with a unique and valuable development experience that likely would not have occurred elsewhere.

Vignette 2. Perspectives from a PhD candidate in a non-engineering education program. Facilitating and participating in peer mentor group two has been a significant part of my graduate

education. As a scholar, I live in non-engineering education department, which is often quite isolating. Initiating and continuing peer mentoring has been important to me as an emerging scholar in engineering education. Peer mentoring has provided me with a true sense of community. For example, I am more aware of traditional engineering education degree paths (i.e., Virginia Tech and Purdue) and other emerging engineering education researchers' interests. Most importantly, these three other scholars have become my "virtual engineering education family." As a peer mentoring member who is further along in my degree path, I have had the opportunity to share my knowledge with others, which has been an important validating aspect of my graduate program (i.e., seeing myself as a capable and knowledgeable scholar). Peer mentoring provides me with a safe space to share and evaluate personal and professional goals. Through this goal setting and monitoring, I am supported through my graduate program, which if highly characterized as personally self-motivating time in one's life. My peer mentors have encouraged and challenged my development as a scholar and as an individual. As I continue through my degree program, I anticipate that peer mentoring will continue to be such a significant part of my growth into an engineering education academic.

Vignette 3: Perspectives from a postdoctoral researcher.
Becoming involved in an engineering education focused peer mentor group was an extremely valuable experience for me. I joined peer mentor group one right as I was transitioning from being a graduate student to a postdoctoral research assistant. The timing was perfect as I was exploring possible next steps for my career. The mentoring program helped me both as a mentee and a mentor. As a mentee, the setup of the mentoring allowed me to practice setting goals that aligned with faculty responsibilities. The mentoring group checked my ability to balance work (teaching, research, and service) and non-work related activities. I found my peers to be a great sounding board for ideas that I was planning to implement as a faculty member. I benefited greatly from the feedback and positive encouragement my group gave me regarding my ideas and my activities. The excitement and support I received from the other group members became a driving force for me to accomplish all of my monthly goals. As one of the elder statesmen in the group, I also found the experience to offer many opportunities to be a mentor. The group dynamic of graduate students and recent graduates encouraged me to often share my experiences with the newer students. I discovered that some of my interests and research activities matched the interests of my peers, which made our shared mentoring experience even more constructive. This experience was invaluable in my education as a new professor and I wish I had such an experience earlier in my graduate education.

Findings: Themes Across Three Peer Mentoring Participants

There are two major outcomes of peer mentoring from the perspective of the authors: 1) goal setting and accountability, and 2) community building. Goal setting in a group environment helped individuals define, monitor, and achieve their goals. As graduate students, we tend to know our end goal, but lack the experience to know what prerequisites will help us ultimately accomplish that goal. The peer mentor environment provided guidance in defining these goals. Peer mentoring ensured that each member achieved their goals through scheduled updates and established deadlines. Deadlines and consistent meetings encouraged each participant to be cognizant about persistently working toward achieving their goals. The activity also helped

participants create new and related goals with peers, especially in terms of individual research activities.

Peer mentoring offered students an opportunity to join an extended community, which enabled participants to feel as if they were connected beyond brief interactions at conferences or other professional activities. Extended interactions during peer mentoring were used by each participant to foster immediate and future research collaborations, crucial in the early stages of our careers. Peer mentoring can be seen as a method to accelerate career development for these emerging scholars through development. Creating a sense of community is a valuable contribution for the field, particularly as these researchers emerge professionally and join the larger community of engineering education scholars.

Conclusions & Implications

As GEECS has grown, so too has the need for participatory activities that build a strong supportive community of engineering education researchers. The peer mentoring activities presented in this paper are intended to be a seed for future peer mentor support of EER students and graduates. The positive stories from the first two GEECS mentor groups have set the stage for widespread participation of current and future GEECS members.

The initial mentorship activities have established a protocol to build from. The program would benefit from continued refinement including further grounding in scholarship on goal setting, monitoring rigorously to ensure a standard implementation, and identifying future participants. We envision the possibility of the mentorship activities becoming integrated into curriculum at universities with sustainable engineering education graduate programs, which would provide an opportunity to encourage students outside their comfort zone. For institutions that cannot support such interventions, the program may benefit from partnership with societies, like the American Society for Engineering Education (ASEE), to reach more students.

The inevitable future growth of the program will require expanded research on effectiveness, and plans to address what occurs when students move on to become professionals. Systematic data collection will likely occur as part of the GEECS mission to increase collaborative graduate student lead research projects (Note: This current study began as one such project). The GEECS activities would be well served by partnering with additional outside mentorship groups like the PEER Collaborative Network, designed to foster mentorship among new tenure-track engineering education faculty, or the ASEE New Engineering Educators Division. These and many other steps will help guide the future success of the GEECS peer mentoring activities.

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Bibliography

1. Lohmann, J. R. (2005). Building a community of scholars. The role of the *Journal of Engineering Education* as a research journal. *Journal of Engineering Education,* 94(1), 1-6.

2. Lohmann, J. R. (2011). JEE and its Second Century. *Journal of Engineering Education,* 100(1), 1-5.

3. Thomas, L. D., Sattler, B., & Carberry, A. R. (2010). Work in Progress – Developing a Graduate Consortium in Engineering Education. Proceedings from FIE '10: *41st ASEE/IEEE Frontiers in Education Conference.* Rapid City, SD.

4. Patton, M. Q. (2002). *Qualitative Research & Evaluation Methods.* Thousand Oaks, CA: Sage Publications, Inc.

5. Locke, E. A., Shaw, K. N., Saari, L. M., & Latham, G. P. (1981). Goal Setting and Task Performance: 1969 - 1980. *Psychological Bulletin*, 90(1), 125-152.

6. Locke, E. A. & Latham, G.P. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice Hall.