A Performance Approach to Designing and Measuring Community-building Interventions for Online Engineering Students

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A Capstone Project

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DEDICATION

This capstone is dedicated to all the men and women who support each other during good times and bad. Their tender hugs, their undying encouragement, their displays of sisterhood, their sympathetic ears, their loud laughter, their comforting shoulders and warm smiles capture the true essence and spirit of what I have learned about community while completing this project.

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"Alone we can do so little, but together we can do so much."

Helen Keller

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Executive Summary

Dr. Stephanie Moore and Dr. Patrice Grimes

The role of community in learning has been examined primarily in the immediate online academic classroom context. However, the communities to which a student belongs extend beyond the immediate online classroom learning context. Learners are part of multiple communities that include peer communities, their academic departments, their university, and, to a larger degree, their professional networks and settings.

This capstone project examined the role and impact of non-academic communities in the online student experience. The purpose of this project was three-fold: (a) to determine which student support services and resources would most likely help connect students to communities outside of the immediate online classroom community, (b) to create a series of interventions that facilitated those connections, and (c) to assess the impact of those interventions within an online community. A needs assessment was conducted to determine what resources and supports learners perceived to be lacking in their student experience and to identify what types of interventions would connect students to the wider community.

Principles of Human Performance Technology Framework and Instructional Design guided the design of the needs assessment and the subsequent interventions. To assess the impact of the interventions, a time series design was employed and multiple data sources were considered. Data sources included site activity on the university's centrally supported online collaboration and learning environment (UVA Collab), post-event surveys, student attendance, observations of event behavior, a post-study survey, and usage reports from the Center for Engineering Career Development.

Findings from the needs assessment indicated that online students wanted to connect to communities outside of their immediate academic classroom communities, especially those that would connect them to career and professional communities. In this study, students' attendance, posting activity, and CECD usage data increased over time, indicating that students will participate in non-academic communities when provided the opportunity. Additionally, in this study, event behavior and post-event survey data decreased over time, which suggests that student involvement in non-academic communities is characteristic of self-directed learning environments.

This study contributes to the field of Instructional Technology by challenging prevailing assumptions and biases about online students' need for community beyond what the academic classroom can provide. Additionally, by examining a problem of practice and implementing interventions, this study illustrates that technology can be used to create expanded experiences of community. Offering these expanded notions of community in online programs such as the one that informs this study can ultimately serve to create a more robust student experience for online learners.

STUDY DESCRIPTION

Introduction

In recent years, researchers have examined the role and development of online learning communities and their impact on the distance education experience (Veseley, Bloom, & Sherlock, 2007; Brown, 2001; Palloff & Pratt, 2006). At one time, however, distance education emphasized information transmission, course content delivery, and the technologies associated with providing learning experiences online. This limited focus created barriers that prevented learning communities from forming in the classroom and from being explored within the literature (Schwier, 2001).

Establishing and developing a sense of community is an important part of the online learning experience. Feelings of community arise when individuals possess shared goals, feel emotionally connected to each other, have a sense of membership or belonging to a group, trust each other, desire to collaborate with other group members, and establish or recognize the boundaries of their given community (Conrad, 2002; Dalton, Elias & Wandesman, 2001; Rovai, 2002; Haythorthwaite, Kazmer, Robins & Shoemaker, 2000; Palloff & Pratt, 2006; Schwier, 2001; Unger & Wandesman, 1985; Sarason, 1974; McMillan & Chavis, 1986). For example, feelings of community can address the problems of high dropout rates by mitigating feelings of isolation among online learners (Vesely, Bloom, & Sherlock, 2007). A developed sense of

community also affects learner satisfaction, social interactions, student performance, and course completion (Bishop, 2007; Charalambos, Michalinos, & Chamberlain, 2004; Littleton & Whitelock, 2005; Liu, Magjuka, Bonk, & Lee, 2007; Rovai, 2002; Russo & Benson, 2005; Schwiebert, 2008). The extent to which students feel connected to a community is a key factor contributing to online course success (Slagter van Tryon & Bishop, 2009).

Designing for community is an increasingly essential component in course content and instructional development for online learning environments (Nicholson, 2005; Palloff & Pratt, 2006). However, a disproportionate number of studies examine the idea of community within the immediate classroom or academic context only (Charlambos, Micalinos, & Chamberlin, 2004; Bishop, 2007; Moller, 1998, Schwieber, 2008; Littleton & Whitelock, 2007; Chapman, Ramondt, & Smiley, 2005; Liu et al., 2007; Rovai, 2000; Russo & Benson, 2005; Vesely, Bloom & Sherlock, 2007).

In truth, learners are part of multiple communities. These could include communities found within an academic course, students' peer groups, departments, the wider university, as well as the larger scale local and global communities in which they live (Nicholson, 2005; LaPadula, 2003). Solely focusing on the idea of classroom community presents a limited perspective and understanding of the role of construct within the larger context of online learning. As Nicholson (2005) writes, "the communities to which a student belongs extend beyond the classroom" (p. 219). Moreover, as work from LaPadula (2003) suggests, the quality of online students' experiences goes beyond merely instructional content of course and degree-granting programs.

Neglecting to go beyond the classroom when considering and designing for community is detrimental at the programmatic, systematic, and strategic levels. Doing so ignores the role and

impact of other types of community on students' interactions as well as their sense of connection and collaboration with faculty, their peers, and educational institutions. In order to create robust online learning experiences and programs, multiple dimensions of community must be considered.

To this end, this capstone project documented how multiple dimensions of community can be created for online learners. This capstone also provided data to illustrate what occurs when online programs offer additional dimensions of community to students. The Providing Undergraduate Connections to Engineering Education Program (commonly known as PRODUCED) was the context through which this problem of practice was explored and addressed.

The current document provides all relevant details and descriptions regarding the capstone project and consists of three main sections. The previous section, "Executive Summary," provided a brief overview of the project's purpose and results. This current section entitled, "Study Description," introduces the problem, presents a discussion of the relevant scholarly literature along with the conceptual framework, and describes the principal Research Questions guiding the project as well as data-collection procedures and tools used for the investigation. The next section entitled, "Position Paper," presents a discussion of the data, the study's findings, and project implications. The final section of this current document, entitled "Action Communications", considers next steps and offers recommendations at the PRODUCED program level and for the wider University of Virginia community.

Problem of Practice

This capstone project explored and examined PRODUCED students' connection to dimensions of community outside of their immediate classroom context. PRODUCED is a

distance learning initiative that offers students an online undergraduate engineering degree from the University of Virgininia's School of Engineering and Applied Science in partnership with the Virginia Community College System (VCCS). Started in 2007, PRODUCED serves as an academic outreach program designed to bring undergraduate engineering education to students, particularly those living in underserved rural Virginia regions (PRODUCED website, http://www.seas.virginia.edu/acad/programs/producedinva/).

The PRODUCED program currently offers online engineering courses to students studying engineering at any of the schools that are a part of the Virginia Community College System (VCCS) who have completed two years of undergraduate engineering studies and earned an associates degree. Upon completing their associates degree, students enroll in the UVA engineering program and complete the online coursework needed to earn a Bachelor of Science degree in Engineering Science from the University of Virginia. Students enrolled in the program may choose among the following technical minors: electrical engineering, materials science and engineering, and mechanical engineering, and they may organize their minors into concentration areas of advanced materials or mechatronics (PRODUCED website,

http://www.seas.virginia.edu/acad/programs/producedinva/).

PRODUCED is an important component of the School of Engineering and Applied Science's (SEAS) academic outreach plan because it provides distance education options to students interested in engineering careers who might not otherwise pursue engineering opportunities due to their location or their personal or professional circumstances. The program also helps nontraditional students who may have families and/or full-time jobs to attend college to obtain a Bachelor of Science degree at an affordable cost close to home. In so doing, PRODUCED aims to meet the ever-increasing demand for well-trained professionals in the

larger field of engineering (PRODUCED website,

http://www.seas.virginia.edu/acad/programs/producedinva/).

Prior to the design and implementation of this project, online engineering students enrolled in PRODUCED had no systematic way to assess student's connection to community. The program also lacked uniquely designed interventions and supports that would help students gain access to or interact with the wider UVA community in a non-academic contexts.

To solve these problem of practice, this capstone inquiry first identified the ways in which PRODUCED students may (or may not) feel connected to levels of community outside of their immediate classroom contexts. The project used the technique of needs assessment to identify students' needs and to determine which support services and resources could best connect them to communities outside of their immediate online classroom environment.

Findings from the needs assessment informed the design of the series of interventions used in this study (Kaufman, Guerra & Platt, 2006; Dick, Carey & Carey, 2009). The principles of Human Performance Technology Framework and instructional design practice guided the design of these interventions (Dessinger, Moseley, & Van Tiem, 2012; Dick, Carey, & Carey, 2009; International Society for Performance Improvement, http://www.ispi.org/; Piskurich, 2006). A survey-based time series design and qualitative observations were employed to assess the impact of the interventions (Creswell, 2008; Kaufman, Guerra, & Platt, 2006).

To this end, the questions that surround these problems of practice and that ultimately guide this capstone inquiry are

Q1 As determined through needs assessment, what current supports and services exist for PRODUCED students beyond the online classroom community?

- Q2 Based on needs assessment data from the PRODUCED program, what kinds of interventions could be implemented to connect students to the wider community?
- What was the impact of such interventions on PRODUCED students' engagement with and involvement in communities outside of the classroom, such as the Center for Engineering Career Development (CECD), as measured by student surveys, researcher's observations, their Collab activity, attendance, and usage of the CECD?
- Q3b Through surveys, attendance, usage, and observations of event behavior, what characteristics of community identified in the literature did students in the PRODUCED program evidence during these interventions?

Rationale

Two forces drove and guided this capstone project. At a basic level, this project aimed to address a problem of practice by increasing online students' access to student support services and exploring how this access contributes to their connection to community and the quality of their learning experiences. At a more complex level, this study was an attempt to advocate for an expanded systems approach to addressing online students' learning and personal development needs at institutions of higher education.

Increasing Access to Forms of Online Support

Creating and supporting shared experiences - with time, money, services, and personnel - are considered essential components of high quality higher education teaching and learning experiences (Beede & Burnett, 1999; Krauth, 1999; Mills & Ross, 1993; Kovel-Jarboe, 1997; Moore & Kearsley, 2005; Scheer, 2001). Distance learners, in particular, are not exempt from needing support services and high quality learning experiences. Major accreditation bodies and

committees, including the Southern Association of Colleges and Schools (SACS) and The Council for the Advancement of Standards in Higher Education (CAS) are beginning to bring more attention to this issue (SACS website, www.sacs.org; CAS website, www.cas.edu). For example, in their policy statement on distance and correspondence education, SACS encourages institutions to ensure that students have access to a range of student support services and to communicate this information accordingly to students (SACS website, www.sacs.org). CAS also advocates that institutions offering distance education options go beyond just academic content delivery and provide online students with "access to information about programs and services, to staff members who can address questions and concerns, and to counseling, advising or other forms of assistance" (CAS website, www.cas.org).

Providing access to support services is of utmost importance (Chute, Thompson, & Handcock, 1999; Nunan, 1992). All learners benefit from the availability of a well developed student services and support program. Such supports are a key factor in determining the quality of a distance learner's educational experience. Due to their geographic and physical separation from host institutions, some would argue that distance learners are more susceptible to feelings of isolation and disconnect, which may contribute to dropout rates, and need these services just as much as, if not more than traditional learners (Scheer, 2001; Mills & Ross, 1993; Krauth, 1999; Moore & Kearsley, 1996).

Unfortunately, student support services for distance learners are often underdeveloped, absent, or lack effective design to foster flexibility and ease of use (Krauth, 1999; Krauth & Carbajal, 1999; Scheer, 2001; Peters, 1998). Sometimes such services are taken for granted and are only extended to students participating in a traditional campus-based experience (Hardy,

1999). Other times, these services are simply not offered or tailored to meet key needs of distance learners, which include flexibility and convenience (Krauth, 1999).

These dynamics present a challenge for both students and practitioners. Students and practitioners can suffer because they may feel isolated or disconnected from the host institution.

At the same time, campus-based peers or faculty may not be receptive to distance learners' needs.

These types of challenges become significant as they are particularly reminiscent of the "chilly climate" environment that has been identified as an issue that should be addressed within the wider field of engineering. For example, women often report experiencing a "chilly climate" in which they feel unwelcomed, ignored, treated differently, or harassed as they progress through engineering programs or other traditionally male-dominated career fields or majors (Morris & Daniel, 2008; Wyer, 2003). This notion of the "chilly climate" could likely extend to other underserved learner populations, especially online students. Given the dynamics and challenges of providing online students access to support services, it is likely that even distance learners might experience a "chilly climate" leading to different negative treatment for online students versus their campus counterparts (e.g. harassment or exclusion). Thus, having an underdeveloped or not having appopriate support structures in place for online programs may cause distance learners to be disenfranchised by the very institutions that intended to serve them (Krauth, 1999).

For practitioners, the dearth of practical examples of designing and implementing student support services in virtual environments can be detrimental. Without examples, practitioners may create programs that only target students' academic needs, which can lead to inefficient and incomplete distance delivery mechanisms and models. Practitioners may also underutilize the vast array of technologies in which universities invest significant time, money, and resources. Of

greater concern is the lack of applied research in this area. Without mechanisms to evaluate and report the success of such efforts, practitioners are left to their own devices. This is not cost effective and may lead to poor knowledge sharing and management, ineffective designs and duplicate delivery systems.

A Systems Approach to Distance Education

A key driver behind this project was advocacy for a system(s) view and approach to creating and implementing distance learning programs. The PRODUCED program, in effect, represents an example of a new paradigm in distance education that parallels, intersects, and affects current models of systems thinking. As seen through the context of this capstone study, systems thinking applies to the traditional educational experiences and also the design of online educational experiences.

Creating a project around the above-mentioned drivers was no simple task. The current climate of online education is not one that encourages such an approach. Few colleges or universities have made genuine adjustments to offer support services in a convenient format to distance learners. On the contrary, colleges and universities tend to apply the regular on-campus local models for student services to distance learners, requiring them to visit campus or to make appointments during working hours. In general, baccalaureate institutions still demonstrate a bias towards the traditional campus-bound college student population. There are still significant gaps between institutions being able to offer distance courses and actually creating and extending support services to learners in a convenient way that meets the distance learners' needs (Krauth, 1999; Jones & Meyer, 2012). Additionally, creating online *classroom* community has such a stronghold within the literature base and practice area of online education that it makes locating studies like the current one a challenge.

Nevertheless, through this capstone study the researcher aspired to 1) create supports that are more inclusive of and welcoming to PRODUCED students, 2) help the program increase the possibility for student retention by reducing isolation, and 3) improve the overall program quality and PRODUCED student experience.

Significance

The current inquiry was significant on many levels. Higher education institutions such as the University of Virginia are expanding online and distance education options. With this expansion, the need to ensure that the virtual student experience is comparable to the on-grounds student learning experience becomes paramount.

The UVA student experience was a particularly intriguing context through which to examine the student experience. According to the 2011 "Understanding the Student Experience: A project for the Board of Visitors" report (Appendix A), UVA is characterized by a number of dynamics that make the student experience especially unique (University of Virginia Student Affairs and Athletics and Educational Policy Committees, 2011). Among those dynamics mentioned in the report are challenging and rigorous academic course work; small class sizes; strong relationships to faculty; access to research and service opportunities; and experiences that foster students' connection to the "real world" and ability to develop "real world" skills like teamwork, time management, and relationship building. In addition, as might be expected, the report found extracurricular involvement to be an expected and important part of the UVA student experience because it encourages levels of autonomy and responsibility that students at other institutions do not typically get. This autonomy and responsibility are defining experiences for UVA students because they help students develop leadership skills, teamwork, social networks, and community. In turn, these skills prepare them for graduate school and are valued

by potential employers (University of Virginia Student Affairs and Athletics and Educational Policy Committees, 2011).

In light of such findings, the question of how a program like PRODUCED might extend similar experiences to its online students is one that begs to be investigated. As institutions such as the University of Virginia expand their offerings to include online and distance education programs, they will need to devote sufficient consideration, investigation, and effort into ensuring that the virtual student experience is equal, or comparable, to the on-grounds student experience. This current study represented an initial step to identify factors that could enhance online learning experiences.

The current study was also significant because it investigated a topic that has been understudied and overlooked within the larger body of research. Much emphasis had been on students' interactions and experiences of community as they relate to teachers, course content, and their peers. As distance education has increased in momentum, many higher education institutions have had to invest their resources in accommodating learners' needs in the classroom as well as outside of the classroom (Wright, 2015). Research efforts, however, have focused on what happens in the classroom. Grounded in traditional research methods and applying these techniques to a a real world context, this capstone study holds tremendous potential for practitioners and program administrators trying to address the issues that arise in their practical professional settings in the absence of a well-developed literature base.

On a programmatic level, the PRODUCED administrators are evaluating ways in which specific supports and interventions could ensure a more robust online student experience than currently exists to connect its students to the wider (UVA) community. The evaluative and

design work undertaken for this current project is significant because it could lay the groundwork for such expansion to occur.

Conceptual Framework

This section reviews the research related to the development of community within online courses. The first portion outlines the conceptual framework guiding this inquiry. Four frameworks are discussed: systems theory, constructivism, self-directed learning (SDL) and Communities of Inquiry (CoI).

Systems Theory

Systems theory shaped the basic conceptual and theoretical foundation for this capstone inquiry. Systems thinking examines how each component of a given system or subsystem functions independently as well as collectively. This type of thinking is a cornerstone of Human Performance Technology and Instructional Design (Foshay, Villachica, & Stephich, 2014). It is useful because it provides a holistic way of examining both tangible and intangible elements within a system as well as the interactions and interdependencies that occur between these elements (Foshay et al., 2014).

Systems are defined as a collection of elements and relationships held together by a common purpose (Foshay, Villachica and Stephich, 2014). Systems exist at various levels of complexity and sophistication (Moore & Kearsley, 2005). Thus, a more complex systems approach considers how these interactions occur, how they impact other parts of the system, and how they are impacted by forces or dynamics in the environment where they operate. These dynamics could include forces that are physical, political, economic, and even those that are social in nature and that ultimately affect the wider system as well as independent sub-systems (Moore & Kearsley, 2005).

Within complex systems thinking is the idea that systems exist within systems. As a result, the systems approach has unlimited capacity to examine how systems can function independently and how they function interdependently to impact other systems (Moore & Kearsley, 2005). As Moore & Kearsley point out, systems thinking operates under the assumption that "anything that happens in one part of the system has an effect on other parts of the system" (2005). Systems thinking ensures that no part of the system or player within in it is excluded or studied in isolation. A quality system approach, therefore, adds value for internal and external partners and helps achieve results for societal impact, not just for a team, department, school, or educational organization (Kaufman, Guerra, & Platt, 2006).

Distance learning is best studied and researched using a systems approach (Moore & Kearsley, 2005). In distance education, basic systems thinking looks at a distance learning program as an isolated and independent learning system. This type of thinking accounts for the interactions that occur between learner groups, their peers, faculty, and course content (Moore & Kearsley, 2005). The range of technical resources and human resources required for these programs to operate successfully creates an array of components and processes that create subsystems that ultimately affect teaching, learning, communication, design, and wider program management (Moore & Kearsley, 2005). The system of distance education affects, and is also influenced by, the broader education system in which it is housed. Thus, all of these systems impact and interact with each other in ways that impact teaching, learning, and, ultimately, community formation.

In this capstone inquiry, systems thinking was applied to challenge a number of assumptions about education. First, it challenged the assumption that the educational experience is a system that is exclusively bound by what happens in the classroom. The idea that the

classroom is the only part of the system that should be studied must be challenged. Classroom interactions shape interactions within the system to a great extent. However, what happens outside of the classroom is an equally important part of the system to consider. For example, interactions that students have with their peers and instructors outside of the classroom can create opportunities for enhanced learning as well as opportunites for professional networking and career advancement. Likewise, the interactions that students have with parts of the system that are not strictly focused on classroom academics (e.g. alumni officies, career service offices, libraries, student health etc.) affect their performance and interactions within the classroom as well as outside of it. Ultimately, for this capstone project, an expanded view of the learning system beyond the classroom highlighted the educational experience as a system, which included academic classes but was not limited to them. This expanded view is important because it provides a deeper understanding of how community is created and fostered and how the student experience evolves.

This project challenged the idea that online programs such as PRODUCED should be treated as isolated sub-systems within the larger UVA academic community. On the contrary, programs like PRODUCED hold tremendous value and potential for educational institutions because they exist as independent and interdependent systems. Online learning environments such as PRODUCED can function on their own; they also can be strategically leveraged as efficient and robust systems used to deliver and enhance high quality educational experiences for a university. Although they can support themselves, they should not be treated as isolated initiatives, but rather should be connected to important parts of the university system.

Constructivism

The constructivist perspective also played a significant role in the conceptual framework that guided this capstone project. Constructivist approaches posit that learners drive the learning process and that learning does not occur in isolation. Rather, learning occurs through interaction and collaboration with other individuals in their learning environment. Knowledge is socially constructed as a result of these interactions. The instructor serves as a guide for learning rather than a director of learning. In this approach, learning should be meaningful, authentic, and applicable to real life or work experiences. (Huang, 2002; Bronack, Riedl, & Tashner, 2006).

This capstone posited that online communities are informal learning spaces where learners continue to interact with others and construct knowledge. The interventions created for this project were meaningful and authentic spaces because they appealed to learners' real life need to connect with the university as well as with potential employers. Thus, the virtual space afforded by these interventions served to help learners construct knowledge outside of traditional learning spaces.

Two increasingly popular distance education frameworks related to learning environments include self-directed learning and communities of inquiry (CoI).

Self-Directed Learning

Self-directed learning encompasses environments such as Massive Open Online Course (MOOCs) or spaces where open content is placed online for the learner. The expectation is that the learner will take initiative and responsibility in planning, pacing, implementing, and even evaluating their efforts. In a self-directed learning environment, learners select what they want to learn and can choose learning activities that help them reach their learning goals at any time and in any place. The learner's ability to take personal responsibility and ownership of their

learning are cornerstones of self-directed learning, and the learner exercises a great deal of autonomy in deciding what is worthwhile to learn and how to approach his/her learning. This autonomy motivates learners to both control and facilitate what they learn and how they process what they have learned. It also spurs learners to identify any additional gaps in their knowledge as well as additional resources that will address these gaps so that he/she can reach their learning goals (Hiemstra, 1994; Garrison, 1997).

Communities of Inquiry

This capstone was situated within the body of work related to communities of inquiry. First articulated by Garrison, Anderson and Archer (2000), the CoI framework is comprised of three elements that define a successful online learning environment. These include social presence, teaching presence, and cognitive presence. Social presence allows students to express their individual and personal identities as well as to establish social relationships through communication and collaboration. An established social presence allows students to project themselves into the community and ultimately to be seen as real people rather than just actors on a virtual stage. Teaching presence is the responsibility of the instructor. It relates to the design and implementation of a learning experience that allows it to realize specific, desired outcomes. Cognitive presence enables students to construct and confirm meaning through sustained reflection and discourse. These three elements are interdependent and work to support students both intellectually and socially. With guidance from a knowledgeable instructor, students will engage in meaningful discourse and develop personal and lasting understanding of the course topics (Rourke & Kanuka, 2009; Farmer, 2004; Akyol, Garrison, & Ozden, 2009; Garrison, Anderson, & Archer, 2010).

CoI is often used to develop effective learning communities because of its emphasis on critical thinking, collaboration, and deep learning. This framework provides a well-structured model and set of guidelines for learning communities in online and blended learning environments (Akyol, Garrison, & Ozden, 2009). As will be illustrated in the Capstone Methodology section of this report, the wider program design of the PRODUCED interventions stresses the CoI framework over the self-directed approach to learning environments. Learning is self-directed and materials are placed for learners to pursue their learning independently and autonmyously. However, the incorporation of features into the design through discussion boards, Q & A boards, virtual office hours, and the live virtual workshops go beyond self-directed approaches to learning and evidence the underlying theories of social and cognitive presence from the CoI framework.

Literature Review

This section provides an overview of distance learning and provides a context for understanding how it has evolved over time. This section describes the various approaches to distance learning delivery and provides a context for understanding how distance education is implemented in educational settings. Subsequent sections in this chapter additionally define community, discuss the impact of this construct in learning environments, describe ways in which community can be built, and detail how community evolves over time.

Overview of Distance Learning

This current study takes place in the context of an online distance learning environment.

Distance learning environments differ from traditional in-person teaching and learning environments. Years worth of research have shown that distance learning can be as effective or more effective than traditional classroom instruction (US Department of Education, 2009;

Freeman, Grimes, & Holiday, 2000; Hislop, 2000; MacGregor, 2001; Neuhauser, 2002; Thomson, 2002; Russell, 1999). As distance education has evolved, so has the ability to build and design for more than just classrooms. To understand the dynamics and factors that inform community formation and development in distance learning contexts, it is necessary to highlight current trends, discuss the need for strategic direction as it relates to community in virtual learning environments, and illustrate how the development of community has influenced distance learning delivery designs.

Current trends. Distance learning is one of the most rapidly growing trends in educational technology (Casey, 2008; U.S. Department of Education, 2009). In 2011, for example, online enrollment accounted for 31% of the total enrollment in higher education. Enrollment in fully online programs is either growing or experiencing steady enrollment (Allen & Seaman, 2011). The growth rate for online enrollments (10%) far exceeds the less than 1% growth of the overall higher education student population (Allen & Seaman, 2011). Moreover, the percentage of online students continues to grow at a significantly faster rate than traditional face-to-face classroom instruction (Allen & Seaman, 2010).

Looking towards the future, the American Federation of Teachers identified four major markets that are significant to distance learning. These markets are expected to play a lead role in the growth of distance learning sector 1) higher education institutions that have or will develop distance education programs 2) corporate-university partnerships, 3) fully virtual universities, and 4) corporate or training institutions (Casey, 2008).

The myriad of distance learning options provides an unprecedented level of access and flexibility with respect to degrees and coursework (Shih, Hung, & Jin, 2007; U.S. Department of Education, 2009). The growth of distance learning presents a number of benefits for learners.

Such benefits are particularly appealing to the "non-traditional" college student population, which is largely composed of working adults who tend to be avid consumers of distance learning offerings (Bocchi, Eastman, & Swift, 2004; Beqiri, Chase, & Bishka, 2009; Tanner, Noser, & Totaro, 2009). For some, disance learning is a cost-effective alternative to traditional educational options. For others, it provides access to learning in situations where face-to-face instruction may not be feasible because of reasons such as geographical distance or spatial constraints (U.S. Department of Education, 2009). Still, for others, distance learning represents a convenient way to access education. Indeed, obtaining a degree, completing a certificate or simply taking a course in a distance-based learning environment is ideal for individuals who work full-time, have families, have other social commitments or responsibilities, and/or who desire flexible course delivery schedules (Dabbagh, 2007; Fiege, 2011; Tanner et al., 2009).

With the growing interest in and popularity of online learning, distance learning has become more of a priority and long-term strategy for many institutions. In a yearly survey of 2,500 colleges and universities, for example, the percentage of chief academic officers who considered online learning critical to their long-term institutional strategies reached its peak (65.5%) in 2011. Despite these promising statistics, there was a gap between those who acknowledged the significance of online learning and those who specifically included and addressed online learning within their institution's strategic plan (Allen & Seaman, 2011). Thus, implementing and incorporating an actual vision and plan with respect to online learning remains a challenge for many institutions.

Distance learning delivery designs. Attempts to build and form community must include discussions about distance learning delivery designs. The design and development of online community is greatly influenced by whether the program makes use of a synchronous,

asynchronous or blended delivery design. Delivery designs affect the technologies that will be used, influence strategies for making interactions authentic and personalized, and define the approaches and best practices for making community a seamless integration and extension of learning activities. Such discussions are paramount to optimizing learning outcomes and to ensuring that learners experience community and reap the benefits of participating in community.

The synchronous approach to distance education enables real-time interactions and collaboration to occur between individuals at the same time. This approach is used when face-to-face contact is required and is ideal for delivering lectures, conducting meetings and holding office hours or study sessions. Building online communities using a synchronous design would include using audio, video and web conferencing, chat or instant messaging capabilities, and application sharing. Meanwhile, the asynchronous approach to distance education allows users to dialogue and collaborate over a period of time at their convenience and/or according to their schedule. Designing community in asynchronous learning environments would primarily occur via technologies such as discussion boards, blogs, e-mail, and newsgroups. (Kaplan, Kaplan, & Ashley, 2003; U.S. Department of Education, 2009).

The blended learning approach to distance education aims to maximize the benefits of both synchronous and asynchronous delivery designs (Osguthorpe & Graham, 2003). Variations in instructional modalities, delivery media, or instructional methods can all be part of a blended learning design (Graham, 2006; Osguthorpe & Graham, 2003; Rovai & Jordan, 2004). For example, a blended learning environment could take the form of a face to face class that has online components outside of class (e.g. readings, videos, and/or activities). A blended learning approach could also include asynchronous classes with synchronous components such as information social events.

The PRODUCED program, uses a the blended design which takes both a synchronous and asynchronous approach. Community is built with instructors and peers using synchronous technologies such as Blackboard Collaborate or MS Lync as well as asynchronous technologies such as UVA Collab to access their course materials, submit assignments and participate in online discussions.

Summary. Distance learning is a growing field (Allen & Seaman, 2011; Allen & Seaman, 2010; Casey, 2008; U.S. Department of Education, 2009). This educational approach takes many different forms, and delivery options include asynchronous, synchronous, and blended. Over the years, distance learning has proven to be as effective or, in some cases, more effective than classroom instruction (Hislop, 2000; Freeman & et al., 2000; MacGregor, 2001; Neuhauser, 2002; Thomson, 2002; Russell, 1999; Olson & Wisher, 2002; Shachar & Neuman, 2003; U.S. Department of Education, 2009). The ability of this educational approach to be flexible, easily accessible, and cost effective has made it a convenient learning option as well as an alternative to traditional educational approaches (Shih et al, 2007; U.S. Department of Education, 2009; Dabbagh, 2007; Fiege, 2011; Tanner et al., 2009).

As the field continues to expand, many institutions are presented with the challenge of both including and addressing distance learning in their organizational and strategic plans (Allen & Seaman, 2011). Designing with systems level thinking in mind is critical to establishing and implementing a vision and plan for distance learning. Moreover, doing so is important because implementing distance learning programs at the university level requires organizations and the individuals within them to adapt and change policies, practices, and approaches to educating learners. At the same time, as strategic plans account for course delivery in distance education

contexts, they must also account and plan for ways to extend the wider student experience of community to distance students.

Defining Community in Learning Environments

In recent years, there has been an increased level of attention paid to the role and development of the idea of online community as well as its impact on education (Veseley, Bloom, & Sherlock, 2007). Critics argue that distance learning overemphasizes information transmission and argue that the technologies used in such contexts place technological barriers between learners that ultimately prevent community from forming (Schwier, 2001). Proponents view community as an essential component of distance learning that should be considered along with designing course content and instruction (Nichsolson, 2005; Palloff & Pratt, 2006). Indeed, forming and establishing community is thought to be one of the ways to support online learners' psychological and social needs (Bishop, 2007; Del Grosso, 2001). Establishing and developing a sense of community addresses the problems of high dropout rates and mitigates feelings of isolation among online learners (Rovai, 2002; Veseley et al., 2007). To this end, the sections that follow define the construct of community, explain how the concept has been examined within the literature, and discuss the results and impact of community on learning.

Place and relational definitions. A review of the literature revealed that community has been defined and described in multiple ways (Conrad, 2002; Dalton et al., 2001; Rovai, 2002, Haythorthwaite, Kazmer, Robins & Shoemaker, 2000; Palloff & Pratt, 2006; Schwier, 2001; Unger and Wandesman, 1985; Sarason, 1974; McMillan & Chavis, 1986).

The traditional definition of community reflects a locality-based construct that is contingent upon the presence of a common physical location (Conrad, 2002; Schwiebert, 2008). In this respect, community develops as a result of an individual's physical proximity to other

individuals within a given locale (Schwiebert, 2008). For example, students living in the same dorm will get to know each other and tend to develop a strong sense of community by virtue of the associations they make within their shared, common physical space. In distance learning environments, virtual spaces (e.g. websites, discussion forums, virtual classrooms, etc.) become an extension of physical space.

A locality-based definition is not the only way to view or define community, though. Palloff and Pratt (2006), in fact, argue that online learning challenges the notion of community as strictly a place-based concept. While a locality-based definition is helpful in understanding how community can be defined simply as a group of individuals brought together by physical or virtual spaces, viewing community solely from this lens is limiting (Schweibert, 2008; Palloff & Pratt, 2006; Lee, Carter-Wells, Ivers, Street, &2006; Haythorthwaite, Kazmer, Robins, & Shoemaker, 2000). This is particularly true when examining the context of distance education environments because students are often physically located at different sites (Schweibert, 2008).

Geographic and physical spaces are important because they provide a meeting place for community activities to occur. However, communities cannot be defined solely by their geographic and physical boundaries. On the contrary, communities are multifaceted and dynamic in their organization and structure. They must also include relational lenses, which categorize them across social, political, spiritual, intellectual, educational, cultural, and geographic dimensions and boundaries (Conrad, 2002; Schwier, 2001). Schwier (2001) illustrates the dynamic interplay between such factors with respect to community formation and development:

The focus of any particular community may emphasize one of these dimensions, but in most cases, any single community will encompass a combination of several

dimensions...When we talk about virtual learning communities, it is important to realize that they exist as a subset within a dynamic set of dimensions (p. 7).

This current study considers community through a relational as well as a place-based lens. The locality-based lens is an important consideration. Essentially, in order for community to form they must have a physical space to commune. Developments in distance learning technologies enable virtual space to be an extension of physical space. A relational framework is also indispensible to defining community because it broadens the construct to include how individuals organize around their social identities through professional associations, unions, and political parties (Dalton et al., 2001; Schwiebert, 2008). This lens is useful for distance education learning contexts because it allows the construct to be unrestricted to geography or physicality (Schweibert, 2008). More significantly, the relational lens assumes that community can be defined as groups of individuals united by their ideals and purpose. It also highlights the role that social interactions and interpersonal ties play in the process of community formation and maintenance. Thus, where we form community is evidenced through the place-based approach and how and why we form community is addressed through the relational lens.

Characteristics of community. For McMillan and Chavis (1986), membership in a community allows individuals to feel that they belong and creates a shared sense of personal relatedness. Community is also characterized by attributes including recognized boundaries that serve to define who belongs to the community and who does not; emotional safety; sense of belonging and identification; personal investment; and shared values or symbol systems such as language, rituals or, ceremonies (McMillan & Chavis, 1986; Unger & Wandersman, 1985).

Membership in a community is also characterized by influence. Members influence each other and, by doing so, create a sense of mattering. That way group members feel that they

matter to the group and that the group matters to them. Integration and fulfillment of needs is another characteristic of community. This describes the feeling that individual's needs will be met through their commitment and membership in the group. Lastly, membership in a community involves a shared emotional connection, reflecting the community history, common space or place, time and similar experiences that the community members share (McMillan & Chavis, 1986).

At a foundational level, McMillan and Chavis (1986) and Sarason (1974) stressed the belongingness and membership aspect of community. Through these works, it became evident that individuals actively organize themselves around their perceived similarities and common attributes when forming community. These characteristics highlighted how an individual's commitment to the community and the larger dynamic of group interdependence facilitate community formation.

Definitions of community. There are multiple definitions of community. Rovai (2002) provides a larger perspective of community within an educational or classroom context. In acknowledging the multiple ways that community has been defined, Rovai (2002) writes

These various views of community identify or imply the most essential elements of sense of community: mutual interdependence among members, connectedness, trust, interactivity and shared values and goals (p. 321).

For Rovai (2002), community, when examined in an educational context, can be characterized by "feelings of a willingness to share and exchange of ideas as well as reciprocation and support. For Rovai (2002), connectedness ultimately helped create and solidify the bonds and relationships that unite individuals in a given educational community.

In this capstone project, Conrad's (2002) definition is applied instead because it highlighted the interplay between the relational and locality-based perspectives. It also succinctly described the social and emotional factors that affected the formation and maintenance of community. She wrote,

In the term community...three elements are usually present, either singly or in combination: (a) a collection of people with a particular social structure, (b) a sense of belonging or community "spirit," and (c) a self-containment of sorts (Conrad, 2002)

Conrad's ideas about community having a particular social structure and imbuing individuals with a sense of belonging addressed the relational perspective. This perspective is important to include in definitions of community because it addresses how, why, and what happens when individuals form community. Meanwhile, Conrad's idea of self-containment addressed the need to approach community from a locality-based perspective. Indeed, in the absence of a local, albeit virtual or physical locale, individuals would be unable to gather and commune.

Summary. Community is predicated upon relational and place-based factors, such as geography as well as the interactions, connections, and bonds that people make and form. Thus, the relational perspective is helpful in understanding that individual group members must develop interpersonal connections in order to create a sense of community. They must also participate in activities that allow them to exchange ideas, develop shared values, achieve common learning goals, and encourage social interactions that ultimately reinforce their bond to each other (Fiege, 2011; Royai, 2002; McMillan & Chavis, 1986; Lee et al., 2006).

Rapidly emerging research, technologies, and applications require us to consider both the relational and locality-based factors that affect course content, learning objectives, community

norms, program dynamics, and the interactions among students, faculty, and administration. Both the relational and locality-based lens shape how participants experience and build community within online learning contexts such as PRODUCED. Both additionally affect the design of supports and resources used to foster community development and maintenance within the context of PRODUCED.

Types of Online Communities

There are a variety of terms to refer to the types of community that form online. Many of these terms are used interchangeably (Lee et al., 2006). The most common include: online learning communities (Bell, 2005; Chang, 2003; Plant, 2004; Preece & Maloney-Krichmar, 2005; Shea, Li, Swan, & Pickett, 2002) or virtual learning communities (Swan & Shea, 2005) and communities of practice (Correia & Davis, 2008; Henri & Pudelko, 2003; Johnson, 2001; Wenger, 1998; Wenger, McDermott & Snyder, 2002). This section describes features that characterize online communities and provides a context for understanding the types of community that manifest within the PRODUCED program.

Online, or virtual, learning communities are virtual environments where people come together for a particular purpose; are guided by policies, norms, and rules; and are supported by technology and software (Preece & Maloney-Krichmar, 2005; Bell, 2005; Chang, 2003; Plant, 2004). They tend to be named after the activity that takes place, the people they serve, or the technology that is used to support them (Preece & Maloney-Krichmar, 2005). Online/virtual communities can be associated with a formal class but can also be organized by a few individuals with common interests (Bell, 2005). They can exist exclusively online, as seen through asynchronous discussion boards and forums, or as synchronous or asynchronous learning

environments with off-line physical components (Preece & Maloney-Krichmar, 2005; Johnson, 2001).

Typically, learning drives the formation of an online or virtual learning community and is what distinguishes it from other types of communities (Bell, 2005). Thus, the purpose of online/virtual communities is rooted in member's common learning goals, objectives, challenges, and/or interests. Online/virtual, communities allow members to come together formally or informally in order to share information and knowledge. This is accomplished through discussion, interaction, communication, problem solving, and collaboration (Chang, 2003; Bell, 2005).

Although the terms are often used interchangeably, there are differences between communities of practice and virtual or online communities. Online/virtual communities tend to be explicitly designed by course designers or instructors. However, communities of practice tend to emerge within an established organization or community structure. Not all virtual communities are communities of practice. Communities of practice, in fact, form out of necessity to accomplish certain tasks and tend to grow around an online/virtual community. They provide additional opportunities for learning that may be within, between. or outside a defined a specific organizational context (Correia & Davis, 2008; Johnson, 2001). Lastly, learners, rather than course administrators or designers, often assume responsibility for their creation and maintenance and forming them around topics, problems, or knowledge domains that are important to them (Johnson, 2001).

Communities of practice also differ from virtual or online learning communities in the make-up of their membership base. Communities of practice tend to include groups of professionals with similar task responsibilities and may consist of both novices and experts

(Johnson, 2001). Thus, communities of practice tend to arise and develop from existing conditions and/or among individuals who share the same trade or working conditions. The community of practice is, therefore, a way to improve and/or transform a work-related practice (Henri & Pudelko, 2003; Correia & Davis, 2008).

Like online/virtual communities, communities of practice are maintained through informal bonds between members (Wenger, 1998). However, in a community of practice, learning takes place in the actual situation and tends to be more task- and practice-oriented (Johnson, 2001). In a community of practice, professionals come together to work towards a common goal by sharing knowledge on a particular topic. Communication and knowledge sharing between learners is what drives learners. Ultimately, in a community of practice, there is more of an emphasis on learning-by-doing, and on the progression of learners from novices to experts (Johnson, 2001; Wenger, 1998).

In this study, PRODUCED shared elements of both a community of practice as and a traditional virtual community. By virtue of participating in the program and completing the coursework, students were afforded a virtual community which allowed them to fulfill their academic goals. At the same time, however, PRODUCED students participated in communities of practice through the program. For example, many students enrolled were working professionals and often worked together in work settings during the day. They also formed independent study groups according to their professional interests. It was common to observe students discussing and/or looking for practical applications of course content during their interactions. Thus, the program supported the professional knowledge sharing typical of communities of practice. In truth and in practice, the boundaries between where the virtual community ends and community of practice begins are never completely finite. Thus, the

community created for this capstone project exhibited aspects of both virtual communities and communities of practice.

Impact of online community in learning. The presence of a community has an impact on the learning process and on individuals' experiences within the learning environment (Charlambos, Micalinos, and Chamberlin, 2004; Bishop, 2007; Moller, 1998; Schwieber, 2008; Littleton & Whitelock, 2007; Chapman, Ramondt, and Smiley, 2005; Liu et al., 2007; Rovai, 2002; Russo & Benson, 2005; Vesely, Bloom & Sherlock, 2007). Indeed, the extent to which students feel connected to a community is a key factor contributing to online course success. Membership and participation in an online learning community assists students in performing well and learning course material (Slagter van Tryon & Bishop, 2009; Veseley, Bloom & Sherlock, 2007). Online learning environments that are deficient in community can have a negative impact on learning (Childress & Spurgin, 2009).

Social impact of community. Online communities allow for multiple kinds of broad social interactions to occur between community members. Community provides online learners with a useful social network, a venue through which members can get answers and solutions to questions and problems, and psychological support from other community members (Charalambos et al., 2004).

Bishop's (2007) ecological cognition framework of community suggested that online communities provide members with a means to satisfy and take action upon their individual needs to be social and communicate with others, create order or take control of situations, retaliate against others and create authentic content, or engage in problem solving (Bishop, 2007).

Ultimately, community provides an individual with social membership and satisfies the basic human need for self-esteem (Moller, 1998). Satisfying an individual's self-esteem can not

only lead to positive feelings of self-confidence, capability, and adequacy but can also contribute to their overall satisfaction and achievement. Developing a sense of community can also reduce feelings of isolation among online learners and could be a key to lowering the dropout rate for students enrolled in online programs (Moller, 1998; Royai, 2002).

Academic, intellectual and interpersonal impact of community. In examining the role of community in successful asynchronous distance learning contexts, Moller (1998) noted that community offered three different types of support to learners: (a) academic, (b) intellectual, and (c) interpersonal. The academic support that communities provide enables learners to establish connections between the content and the instructor or facilitator. In turn, these connections become the key to encourging dialogue such as questions, forming hypotheses, and constructing arguments. Together with teacher's support, this helps to provide learners with a sense of control that reinforces concepts and may also significantly contribute to learner persistence and course completion (Moller, 1998). Learners also make connections with other learners, thereby increasing their academic support base and increasing the flow of information among students (Rovai, 2002).

Chapman, Ramondt, and Smiley (2005) also suggested that community supports students' academically, intellectually, and interpersonally because it provides learners with an opportunity to collaborate and discuss ideas and course content in ways that can subsequently affect the types of learning that occurs. Using grounded theory to code and analyze discourse from six online asynchronous discussion boards, Chapman et al. (2005) developed a community and learning scale to categorize and describe discourse patterns and learning behaviors. They found a strong association between the types of discourse associated with the presence of a strong community and the degree of learning that occurred. Discourse that focused on the

individual learner, as evidenced through "me" and "my school"-centered statements, was associated with lower level learning environments. This was because these individuals tended to only offer ideas, information, and resources and invite critique to the discussion board.

Conversely, discourse coded as "discussion," "debate," "dialogue," and/or "mentoring" was associated with deeper learning, which was evidenced by behaviors such as use of explanations and examples, challenging ideas, and critiquing discussion and expanding on ideas (Chapman et al., 2005).

Chapman et al.'s (2005) study was important because it provided insight into understanding how community and learning develop together. Chapman et al. (2005) viewed community as a critical investment that should be done earlier, rather than later, in order to ensure quality and deep learning experiences for students. According to them, the formation of online community facilitated self-reliance among group participants and, thus, reduced their reliance on the instructor, facilitator, or tutor. Community also allowed the instructor to focus on promoting deeper learning by asking participants thought-provoking questions, critiquing, and challenging, and also providing further clarification (Chapman et al., 2005).

The intellectual support that community offers can foster active learning and lead to increases in peer interaction and learning effectiveness. Moller (1998) argued that this occurred when the instructional design of the course fostered learner-centered communication. Such designs raise learning expectations; promoted opportunities for meaningful learning where critical thinking and reflection are both encouraged and required; provided emotional support for growth and intellectual risk-taking; and stimulates cognitive development through argument construction, communication, and critical analysis (Moller, 1998).

Littleton and Whitelock (2007) also supported the idea that online communities can impact students' academic, intellectual, and interpersonal development. Through conversation analysis of asynchronous posts and messages in an online community, Littleton and Whitelock (2007) discovered that learners engaged in cumulative and exploratory interactions that allowed them to construct knowledge, engage in ideas, exchange information and resources, and build upon their understanding. Such interactions helped increase students' knowledge base (Littleton & Whitelock, 2007).

Approaches to assessing the impact of community. The impact of community has primarly been evaluated via learner satisfaction and perceptions of learner engagement and performance (Liu et al, 2007; Rovai, 2002).

Liu et al. (2007) used semi-structured interviews and a 65-item survey to examine how feelings of community related to learner engagement, perceived cognitive learning, and satisfaction. Their study revealed a positive correlation between the sense of learning community and perceived learning engagement (r = .62, p < .01), course satisfaction (r = .61, p < .01) and perceived learning outcomes (r = .60, p < .01). Results also indicated that the sense of community was positively related to the instructor's presence and facilitation. There was also a moderate relationship between students' sense of community and social interaction activities. Correlation analyses also revealed that students' intention to drop out of the program was negatively correlated with the perceived helpfulness of the instructor (r = -.51, p < .05), students' sense of community in the class (r = -.47, p < .05), and their engagement in learning (r = -.40, p < .05). In short, the study from Liu et al. (2007) is significant because it suggests that community has an impact on perceived learning and is also important in reducing course attrition rates.

Rovai's (2002) study focused on 314 online learners enrolled in 26 graduate education and leadership courses. Using the Classroom Community Scale, an instrument designed to provide a valid measure of classroom community in online and/or traditional classroom settings, and self-reported surveys of student's perceived learning, Rovai (2002) found that students with a stronger sense of community experienced greater perceived cognitive learning. Thus, students perceived greater levels of learning when they experienced a stronger sense of community.

Russo and Benson (2005) also found that community had a positive impact on students' perceptions of their learning. In this study, students who felt a sense of community also had positive feelings towards the course and satisfaction with their performance in it. Russo and Benson (2005) argued that feelings of connectedness to a community helped students engage with the material and other classmates. In their view, such connections may ultimately lead to increases in student retention and completion of online courses.

Summary. Several researchers have identified the impact that community has on the learning process and individuals' experiences (Charlambos et al., 2004; Bishop, 2007; Moller, 1998; Schwieber, 2008; Littleton & Whitelock, 2007; Chapman, Ramondt, and Smiley, 2005; Liu et al., 2007; Rovai, 2000; Russo & Benson, 2005; Vesely, Bloom and Sherlock, 2007). The areas impacted include learner satisfaction, perceived learning, social interaction, intellectual development, academic performance, engagement, and course completion.

Fostering Community

An investigation into how community is actually built in online contexts revealed that a number of factors and variables were at play. One component that must be in place in order to build and establish a sense of community is social presence (Aragon, 2003; Cui, Lockee, & Meng, 2012). Interactions and collaboration are equally important factors to take into

consideration when building and establishing a sense of community (Moore, 1989; Moore & Kearsley, 2005; Palloff & Pratt, 2007). When students experience social presence, collaboration, and interaction, the formation of community becomes possible, and aspects of the learning experience, such as learner satisfaction and perceived learning, are impacted in positive ways.

Social presence. Social presence is a concept that is rooted in psychological theories of interpersonal communication. It describes the degree to which an individual projects him/herself, or his/her virtual self, in an online learning environment and/or is perceived as "real" in a computer-mediated learning environment (Gunwardena & Zittle, 1997; Cui et al., 2012; McInnerney & Roberts, 2004). Individuals enrolled in distance learning environments tend to be separated by physical space, time, and/or geography location. This separation can create psychological distance between participants and instructors. It can also hinder an individual's ability to establish interpersonal contact with verbal communication as well as non-verbal social cues, such as gesturing and smiling. As a result, students may not only feel a sense of isolation, but may also experience difficulty, dissatisfaction with the course, and/or frustration (Aragon, 2003; Cui et al., 2012; Benbunan-Fich & Hiltz, 2003; Arbaugh, 2005; Richardson & Swan, 2003). Establishing and enhancing an individual's social presence becomes essential to mitigating these challenges, improving a learner's satisfaction, and enhancing instructional effectiveness (Cui et al., 2012).

Recent research indicates that social presence is one important variable that contributes to building a sense of community among distance learners (Aragon, 2003; Cui et al., 2012). Social presence functions as a support for cognitive presence and facilitates the critical thinking of the community of learners (Cui et al., 2012). When students connect with each other and/or the instructor, they create a degree of interpersonal contact that allows them to create social presence

(Aragon, 2003; Gunwardena & Zittle, 1997). This connection facilitates the building of trust, self-disclosure, social interactions; and interpersonal relationships (Aragon, 2003; Oztok & Brett, 2011).

Establishing social presence provides the foundation of community. Although it is possible for online students to interact and collaborate in an online environment without feeling like they belong to a group or community, social presence helps interactions between students to be more engaging, appealing, and rewarding (Oztok & Brett, 2011). Social presence also stimulates learner-learner interactions and contributes to overall sociability in online environments. Oztok & Brett (2001) argued that students with higher degrees of social presence participated more actively and more frequently with their peers. Thus, social presence connects members of a community of learners and provides the foundation for the social interactions that are essential to community formation.

Collaboration and types of interaction. Types of interactions and collaboration also play a key role in building community at the course level. For Palloff and Pratt (2006), collaboration and interaction between community members mediated and facilitated the formation of community, which in turn, drove the learning process at the course level. In their view, the need for students to form social connections and relationships through collaboration was just as important as the course's content-related goals. For online learning to be successful it can never be a passive experience, and students and faculty must actively participate, interact with each other, and collaborate to construct knowledge and make meaning. This is accomplished via interactions and collaborations, which encourage active participation and allow students to construct knowledge and make meaning (Palloff & Pratt, 2006).

Palloff and Pratt (2006) insisted that instructors provide students with opportunities to interact and collaborate in cyberspace as they would in a campus-based setting at the course level. Such opportunities help students not only establish their presence and personality online, but also to form social connections and relationships. Through these connections and relationships, students share thoughts, and ideas, and participate in experiences that become essential to knowledge construction and generation during their progression through a given course or academic program (Palloff & Pratt, 2006). In this manner, collaboration and interaction become essential to community formation.

Types of interaction. Moore (1989) and Moore and Kearsley (2005) provided more specific insight into the types of interactions that facilitate community building in online learning environments at the course level. The types of interactions described in their research include (a) learner-content interactions (b) learner-instructor interactions, and (c) learner-learner interactions. In recent years, they expanded their framework to include learner-interface interactions, which describes the interactions that occur between learners and the technologies used to deliver instruction (Hillman, Willis, & Gunawardena, 1994).

Learner-content interactions are the interactions students have with instructional materials, course content, and/or subject matter at the course level. Moore and Kearsley (2005) considered such interactions a defining hallmark of education because all learners have to interact with content in ways that allow them to construct knowledge. Ultimately, such interactions cause students to experience changes in their own understanding (Moore & Kearsley, 2005).

Learner-instructor interactions occur between learners and instructors. Moore and Kearsley (2005) contended that instructors play a significant role in this type of interaction

because they are the direct link between learners' interactions with content. Learner-instructor interactions have a variety of functions and can stimulate students' interest in that content and motivate them to learn. They can also function to help students apply or demonstrate their knowledge. Lastly, learner-instructor interactions can provide students with support and encouragement (Moore & Kearsley, 2005).

Learner-learner interactions occur between learners and can occur in a variety of settings. These can occur via discussion groups, synchronous chat session, and also via listservs. Such interactions help students share information and ideas. They also facilitate problem solving because students use these interactions to think out and test content that has already been presented by the instructor. Learner-learner interactions are also important because they allow learners to assist one another with understanding and interacting with the subject matter (Moore, 1989; Moore & Kearsley, 2005).

The interaction framework provided by Moore (1989) and Moore and Kearsley (2005) explained how specific types of interactions helped facilitate student collaboration and mediated the connections that allowed them to share ideas, present information, interact with content, and receive feedback from their peers and faculty (Blocher, Montes, Willis & Tucker, 2002).

Ultimately, Moore (1989) and Moore and Kearsley (2005) complemented and enriched the ideas presented through Palloff & Pratt (2006). By giving specificity in describing the specific types of interactions that occur in online learning contexts, Moore (1989) and Moore & Kearsley (2005) deepened the thinking around the types of interactions that are essential to community formation in online learning environments. Knowing the role that these specific types of interactions play in facilitating learning is essential to designing for community. Extending this

framework further to include learner-community, learner-university, and learner-department interactions can also help instructional designers design for community at the system level.

Summary. The research reviewed for this section showd how social presence, collaboration, and interactions contribute to online learning experiences and the formation of community. Missing from the discussion and research presented in this section was the idea that community can be built outside of classroom environments. To rely solely on forming or examining community at the classroom level is limiting and ignores the system-level perspective. Focusing only at the classroom level also negates the roles that interactions, collaboration, and social presence play in spaces outside of the immediate formal academic environment.

Therefore, the current study posited two ideas. First, community formation and connection to community occurs outside of the formal academic environment in informal learning and co-curricular spaces. Learning does not stop upon leaving the physical or virtual classroom. Rather, learning continues and students have opportunities to make meaning, collaborate, participate, and interact with each other in informal and co-curricular spaces. Second, creating ways to facilitate social presence, collaboration and interactions is key to creating community in informal, non-academic and co-curricular spaces.

This study seeks to expand Moore's (1995) and Moore & Kearsley's (2005) work by introducing and examining the idea of learner-community interactions. Community is an integral part of the student experience. However, very little is know regarding the interactions that occur within and between learners and their wider communities.

The Evolution of Community

The creation of community evolves and fluctuates over time. This process occurs in a leveled/staged or cyclic fashion with each stage reflecting a different degree of engagement,

collaboration, and commitment on the part of community members (Iriberri & Leroy, 2008; Brown, 2001; Wenger, 1998; Wenger et al., 2002; Schwier, 2001; Garber, 2004). Ultimately, the involvement, contributions and participation of members can either accelerate, fuel, or slow the growth and evolution of community (Brown, 2001; Conrad, 2005).

This section will explore community from a levels and life-cycle perspective. Examining community from this angle is critical to designing for a program like PRODUCED, whereby designing for the whole student experience represents a new horizon in their program delivery. Examining community this way provides an enhanced understanding of the construct and helps ensure that design efforts target the specific needs and activities of community members as they progress through these stages. Using a life-cycle perspective approach to community helps designers identify the points at which interventions may be needed or removed. It also helps them select the right technologies that will provide optimal support for the community's wider development (Garber, 2004; Iriberri & Leroy, 2009).

Stages of community. Brown (2001) offered the simplest model for understandinf community development. Using a grounded theory approach to investigate community formation in two adult asynchronous distance learning classes, Brown (2001) posited that community developed in three stages, which include making friends, community conferment (acceptance), and camaraderie (Brown, 2001).

In the first stage, students make friends with online and peers who share similar interests, locations, or academic backgrounds. Bonding is important because it prompts participants to initiate regular and ongoing interactions. The second stage of community formation is marked by community conferment, which is the result of long, thoughtful, and sustained discussion on subjects that are important to participants. Through such exchanges, participants derive a sense

of personal satisfaction in their own knowledge and their ability to communicate with others. This stage serves to widen a participant's circle, and participants begin to have feelings of membership and belonging to the larger learning community (Brown, 2001).

The highest level of community can be found in the third stage, and it is achieved only after prolonged and intense personal communication (Brown, 2001). This level of community is found among students who have taken multiple classes together, who have communicated outside of the virtual course delivery platform and, in some cases, who have met each other in face-to-face contexts. Students interacting at this level of community experienced higher levels of engagement in class and dialogue as well as feelings of belonging to a community (Brown, 2001).

Malhotra, Gosain, & Hars (1997) offered a more complex model illustrating the stage-like nature of community development. They identified four stages of community development, which include inception, beginning of user involvement, interactivity, growth, and experimentation. During inception, the community has a very small membership base and there is no interaction between participants. The purpose of this stage is to allow the creators of the community to gather content and explore appropriate technologies. The next phase marks the beginning of the user involvement stage. At this stage, there are more interactions between the founders of the community and the growing membership base. During the interactivity stage, members of the community regularly interact with each other and with community leaders in ways that influence the content available to them. Such exchanges not only help the community grow but also reinforce member's bonds. At this stage, there are also visible structures and organizational substructures that define the community as well as shared goals, values and understandings among participants. Members' contributions and interactions peak at the final

growth and experimentation stage. At this stage, the community reaches a level of stability that allows members and founders to experiment with additional features and more flexible designs (Malhotra et al., 1997).

Lifecycle of community. Research from Brown (2001) and Malhotra et al. (1997) is particularly useful for developing a basic understanding the stage-like process of community formation. Further research from other scholars (Wenger, 1998; Iriberri & Leroy, 2008; Garber, 2004) describes the specific types of interactions that occur among groups as community forms as well as the impact that those interactions have on the wider formation of community. Such work not only supports the idea that community evolves in stages but also extends the discussion from focusing exclusively on broad understandings to providing an explanation of how community actually develops and functions at the systems level.

Wenger (1998) and Wenger et al. (2002) identified five stages of community development: potential, coalescing, active, dispersed, and memorable. During the potential stage, individuals begin to find each other and discover their commonalities. During coalescing, members recognize their potential by exploring areas of connection and begin to come together and negotiate and define community. The active stage represents the peak of community. Members participate in shared activities and create artifacts that are representative of their experience. Here, members renew their interest and commitment to the relationships that served as the original foundation of their community. When the community reaches the dispersed stage, the level of engagement is no longer as intense. However, during this stage the community still exists. In fact, individuals engage in activities that allow them to stay in touch, reunite, or get advice. The final stage is the memorable stage. In this stage, community is no longer a central focus, but members still remember and self-identify with it. During the memorable stage,

individuals tell stories as well as preserve and collect items or memorabilia that represent their connection to the community.

Wenger's stages of community development (Wenger 1998; Wenger et al., (2002) extended the lifecycle model of community in ways that Brown (2001) and Malhotra et al. (1997) did not. Like Brown (2001), they posited that reaching a level of community was a gradual process that eventually reached a specific peak. Wenger (1998) and Wenger et al., (2002) demonstrated how the peaks of community are marked not just through an individual's participation or engagement in activities. Indeed, at the active stage, individuals create artifacts symbolic of the community and also commit to maintaining relationships with other members of the community. The active creation of such symbols is what makes community a real and ongoing experience for members.

While work from Brown (2001) suggested that students were no longer connected to or experiencing community as they progress through a program, Wenger's (1998) and Wenger et al., (2002) suggested otherwise. Thus, the final stages of community development (Wenger, 1998; Wenger's et al. 2002) supports the idea that individuals preserve and feel a sense of community even when interactions may not be at their peak.

Iriberri and Leroy (2009) argued that online communities evolve following five distinctive lifecycle stages, inception, creation, growth, maturity, and death. The idea and vision for online community emerges at the inception stage, which is tied directly to members' needs for information, support, recreation, and/or relationships. During this stage, the community develops its focus as well as establishes rules of behavior and communication that will help it maintain its focus. Once the vision for the community is clear, the required technological components such as chats, discussion boards, and software applications are selected and

gradually incorporated in response to the needs and preferences of the members. According to Iriberri and Leroy (2009), the creation stage commences once the appropriate technologies are in place and members begin to interact and invite other members to join.

During the growth stage, group culture and identity begin to form. At this stage, members use a common vocabulary and define the roles they will play in the community. Some members become leaders and active contributors to discussion boards while others become followers or lurkers by not actively contributing to the community and only reading messages instead. It is common for rules for communication, etiquette, and behavior to begin to surface at this stage (Iriberri & Leroy, 2009).

During the maturation stage, the community develops a more explicit and formal organizational structure by establishing regulations and rewards. At this stage, members will create subgroups, and trust and lasting relationships begin to emerge. This is the longest phase of the lifecycle of community development and is marked by new members joining the community and previous members leaving the community. During this time, communities may go through multiple stages of iteration whereby the focus may shift, roles may change, and/or new features may get added according to users' interests and preferences (Iriberri & Leroy, 2009).

The final stage, death, is characterized by a lack of participation. Members may lose interest in the community and tend to decrease their contributions to it. As a result of lower activity levels, the quality of content may suffer and contributions may appear disjointed and unorganized. Membership in the community may also become more transient and will eventually wane (Iriberri & Leroy, 2009).

Research from Iriberri and Leroy (2009) adds to the discussion of how the social, psychological, and technological needs of a community change as members proceed through the life-cycle. Like many earlier researchers, their research also underscored the types of variations in behaviors and interaction patterns throughout these different stages. The value of Iriberri and Leroy's (2009) research lies in its ability to demonstrate that individuals within a community actively take on roles and responsibilities that contribute to the growth or decline of that particular community. Thus, community is not formed simply through interactions between members and the creation of artifacts representing their identity as earlier works might have suggested. Rather, individuals actively assume roles and establish norms for behavior that shape the formation and development of a particular community.

Iriberri and Leroy's (2009) work around the growth and maturity stage of community showed how community develops over several iterations. This, in turn, allows members to change roles and responsibilities, introduces new features to that community, and reshapes the larger focus of that community. This aspect of their work suggests that the growth and maturity phases might be the most difficult areas to support but are the most important areas to offer supports and resources to.

Garber (2004) also described the community lifecycle as a five-stage process. Garber (2004) highlighted the ability of communities to function independently without guidance or input from a facilitator. For Garber (2004), this occurs at the third stage, or the maturity stage. At this stage, the community functions independently, and the purpose, shape, and larger operations have been established. Garber's description of the fourth stage of community is also significant because the community starts to expand beyond its initial focus and becomes

something that it was originally not. For Garber (2004), this stage was characterized by member's resistance to change and through their efforts to block or prevent it.

Garber's (2004) work around the third and fourth stages of community brings up important design considerations to keep in mind when designing for community. Indeed, as illustrated in the third stage, designs should allow communities to function and develop independent of outside or administrative influence, direction, or guidance. Garber's (2004) fourth stage revealed that community continuously evolves through the active efforts and actions of participants and demonstrated the conflict that can occur as the community shifts its focus and/or expands beyond its original purpose. Ultimately design efforts must also account for such dynamics, and proposed solutions must target changes in member's practices, attitudes, or beliefs.

Time and community. The time an individual spends in a given community also affects the development of community. Brown (2001) posited the concept of Time Triangles, which described the time that students need to become acclimated to technology, pedagogy, and content within a given community. The idea of Time Triangles is significant because it suggested there is an inverse relationship between the amount of time that new students and veteran students dedicate to community-building activities (Brown, 2001).

New students often spend the bulk of their first few weeks getting acclimated and comfortable with the technology, familiarizing themselves with course content, and understanding the teaching methods associated with the course. They tend to require more support and encouragement from instructors as well as assignments and activities that focus on the first stage of Brown's (2001) model on community development. Thus, they request assignments that help them to become acquainted with each other, discuss professor's

expectations, allow them to determine their individual goals, and promote the sharing of life experiences and professional experiences (Brown, 2001).

In contrast to new students, veteran students take on community-building responsibilities earlier in the process rather than later. Veteran students tend to be more familiar and experienced with the technology. As a result, they spend more time focusing on course content and community-building. They are also able to model community behavior, offer support and encouragement, and continue discussions as well as the friendships that had developed in previous classes (Brown, 2001).

Brown (2001) found that the activities of veteran students were a key determinant in community formation. Veteran students helped develop community during the initial interactions of a course. However, as the course progressed, they had a tendency to mingle and communicate more with their friends from previous classes. Such behaviors hindered the overall formation of community and served to isolate new students. Brown (2001) found that the more community-minded veterans were essential to overall community formation. They helped widen the circle of friends and acquaintances which ultimately helped participants achieve higher levels of community (Brown, 2001).

Like Brown (2001), Haythorthwaite, Kazmer, Robins & Shoemaker (2000) also found students' sense of community to be affected by an individual's time in the program. Using interviews and a grounded theory methodology, Haythornthwaite et al. (2000) found that the connection to and need for community shifted as students progressed through the program. Essentially, students initially entering the program felt more of a need to be supported by a community. Rates of attachment to and membership in the community were much higher among those who had just entered the program or who were progressing through it than those preparing

to depart from it. Interestingly, students who were preparing to exit the program also redefined and expanded their notion of community. Exiting students had less of a connection to the immediate academic community and more of a connection to the broader community found in the outside world (Haythorthwaite et al., 2000). These findings reveal the need for designers to consider how the participation and activities of veteran students may differ from newer students. Such findings also reveal the need for designers to consider how to leverage veteran students to draw participants into the community as well as to promote ongoing interactions.

Summary. Research on the life cycle of community development clearly demonstrates that community does not develop overnight (Brown, 2001; Conrad, 2005; Garber, 2004; Haythorthwaite et al., 2000; Iriberri & Leroy, 2009; Malhotra et al., 1997; Wenger, 1998; Wenger et al., 2002; Schwier, 2001). In addition, as this section demonstrated, community does not develop simply because the appropriate and relevant technologies are in place or are provided to members (Garber, 2004). Community happens because participants want it to happen and because they actively create it through their interactions, participation, contributions, and collaboration (Brown, 2001; Lee et al., 2006). Ultimately, the development of community is a gradual process that could take days, months, and even years to form and reach its peak.

In addition, consistent within the various models of the community development life cycle presented in this section was the idea that participation levels fluctuate depending on the amount of time an individual remains in the community. Missing from this discussion in the literature was an exploration of the types of scaffolds and supports needed to move an individual from one level to the next stage in the community life cycle. However, it was very clear that each level of community presented different requirements and challenges for participants as well as different patterns of interactions and participation (Iriberri & Leroy, 2009).

The Role of the University in Developing Online Communities

Many studies on community only examined the impact and effects of community at the course level – within the context of the classroom or immediate learning environment. However, research from LaPadula (2003) revealed that the quality of online students' experiences goes beyond the instructional content of courses and degree-granting programs. For LaPadula (2003), university services also played a role in creating a community. Thus, the assistance and guidance that a university offers beyond the learning and instructional materials is important, even though it is an area that is often overlooked in distance education systems as well as in empirical research (LaPadula, 2003)

LaPadula (2003) noted that traditional students had a learning advantage because support services such as tutoring, career counseling, academic advising, and personal counseling were readily accessible and available to them. She asserted that online students also need access to these types of services and contended that it is unfeasible and unrealistic to expect them to travel to campus to access these services. As many distance education programs are lacking in this area, this can cause students to feel isolated and/or less of sense of connection to the community at the university level (LaPadula, 2003). LaPadula (2003) contended that access to such resources could help decrease attrition rates, enhance enrollment, help students adjust, aid their intellectual and personal growth, help universities be more competitive, and provide online learners with a learning experience that was more equivalent to the experiences of face-to-face students.

Childress and Spurgin (2009) further underscored the importance of examining the construct from a broader perspective. Their work examined the total learning community experience by students in an online academic program. Key to their argument was the idea that online students are members of multiple communities – classroom communities, academic

departmental communities, and university communities. For Childress and Spurgin (2009), the academic departmental community and the university community exist independently of a single class. They argued that there was a tremendous potential for online learners to miss out on these aspects of community because so much attention was given to building classroom community.

Using survey methodology, Childress and Spurgin (2009) first measured online learner's perceptions of departmental and university community. Then they compared how departmental and university community differed for exclusively online learners and for students who had taken some face-to-face courses. Results from the study revealed that online learners reported low levels of connection to their department but a medium sense of contentment with this level of community. Online learners also reported feeling a notably lesser sense of connection to the university than what they imagined face-to-face learners felt. In comparing the two groups, the face-to-face group reported feeling more connected to both the departmental and university communities than the online learner group (Childress & Spurgin, 2009).

Childress and Spurgin (2009) attributed part of the difference in perceptions of community to the online learning delivery modality and concluded that face-to-face interactions associated with departmental and university community do not occur automatically when learners interact exclusively online. Childress and Spurgin (2009) recommended that explicit community structures be put in place so that online learners would feel a sense of community and connection to their departments and universities. They also advocated for departments and universities to share online community-building responsibilities. Doing so, in their view, would permit teaching staff to cover more content as well as enable online learners to interact both inside and outside of the classroom learning environment (Childress & Spurgin, 2009).

Work from LaPadula (2003) and Childress and Spurgin (2009) demonstrated that research on an expanded model of community for online learners is worthy of further consideration and exploration. Although the classroom is one of the key places where community forms and develops (Palloff & Pratt, 2006), it is not the only place where community forms or becomes important to students. This is particularly true when examining the construct of community from a systems perspective. Inasmuch, the focus of this current study is to (a) to determine which student support services, programming and/or resources would most likely help connect students to communities outside of the immediate online classroom community, (b) to create a series of interventions that provide these resources, and (c) to assess the impact of these interventions.

Summary. The first section of this chapter outlined how systems thinking served as the conceptual framework guiding this capstone inquiry. The remaining sections of this chapter examined the research related to the development of community within online courses. The first part of this chapter provided an overview of distance learning and described the various approaches to distance learning delivery to provide a context for understanding how distance education is implemented in educational settings. Subsequent sections in this chapter focused on defining community, discussing its impact in learning environments, describing ways in which community can be built, explaining the cyclic nature of the construct, and advocating for the university to expand its role in developing community for online programs.

Explanation of Research Methods

The brief sections that follows describe the two frameworks that informed the wider research design and implementation of this capstone project as well as the value that they add to this inquiry.

Human Performance Technology

Principles from Human Performance Technology (HPT) served as the primary framework for the research design and implementation of this capstone project. HPT is a "process of selection, analysis, design, development, implementation, and evaluation of programs to most cost-effectively influence human behavior and accomplishment." (www.ispi.org). HPT shares commonalities with the discipline of Instructional Design. However, it does not presume an instructional solution is the answer to a given problem or opportunity (Foshay, Villachica, & Stepich, 2014; Aziz, 2013). Unlike ID, HPT forces a designer to expand its view of the system as being comprised of strictly learners, objectives, methods, and evaluation. In the HPT framework, the system view is comprised of multiple players who operate and interact at multiple levels, including the individual, team, organization, enterprise and societal levels (Foshay et al., 2014; Aziz, 2013; Alarifi & Alamri, 2014). HPT requires a rigorous analysis of the present and desired levels of performance, identification of the causes for performance gaps, and consideration of a wide range of interventions. It is a framework that guides the change management and implementation process as well as evaluation of the results (ISPI website, 2013; Aziz, 2013; Dessinger, Moseley, & Van Tiem, 2012).

HPT was ideal for this project because it takes a systems view; focuses on delivering outcomes and results for stakeholders, adding value to an organization; and stresses collaboration and establishing partnerships (ISPI website, 2013; Aziz, 2013; Foshay et al., 2014). HPT also focuses on ensuring that designers systematically analyze, design, develop, implement, and evaluate a given solution and the process by which the solution was derived (ISPI website, www.ispi.org; Dessinger et al., 2012). Using the HPT framework ensured that a rigorous analysis process was used throughout the course of this project so that both instructional and

non-instructional solutions could be considered. It also ensured that the project provided an added value to key stakeholders, such as PRODUCED students and the program administrators, and optimized and leveraged existing resources in an efficient manner.

Organizational analysis. Organizational analysis is a key part of the HPT model because it examines the vision, mission, values, goals, and strategies of an organization. The purpose of this type of analysis is to determine the desired performance state from an organizational perspective rather than at the individual level (Dessinger et al., 2012).

Gap Analysis. Identifying and closing performance gaps is a key focus of the analysis phase of the Human Performance Technology Model. The technique of gap analysis is used along with organizational analysis and environmental analysis to help clarify the opportunity or problem. Gap analysis is valuable because it identifies the current state and desired states. The difference between the two is defined as the "gap," which can be expressed quantitatively or qualitatively (Dessinger et al., 2012).

Instructional Design

Instructional Design (ID) principles influenced the research design in that the technique and framework for needs assessment was used as a front-end analysis technique to answer the first two Research Questions. ID principles were also used to guide the creation of the intervention and associated user-facing materials. ID is an intellectual process that engages a designer to systematically design and plan learning and performance environments that bring about desired learning outcomes. The advantage of using ID is that it provides a process through which a designer can design around learners' needs, and the steps involved in the process take multiple perspectives and factors into account (Piskurich, 2006; Dick, Carey, & Carey, 1996).

The approach taken in this study is one posited by Dick and Carey (1996). Their model is ideal because it presents designers with a thorough and detailed description of the steps involved in ID. It also takes a systems approach to designing, developing, implementing, and evaluating instruction. Dick and Carey's (1996) model is useful in ensuring that materials or interventions developed for learners are responsive and sensitive to their needs and also effectively achieve desired learning objectives and outcomes.

Needs assessment. The process of needs assessment is indispensible in the total design process (Dick & Carey, 2009). Needs assessment has its roots in performance analysis, which is a front-end analysis technique employed to identify the most pressing issues related to a project, to determine what should be happening in a given situation, to determine why individuals are not performing as desired, and to anticipate potential barriers to project implementation (Rossett, 2009; Dick et al., 2009).

Needs are defined as the gap between the desired status and the actual status (Dick et al., 2009). Needs are also defined as measurable gaps between what should be and what currently is (Kaufman et al., 2006). Most importantly, needs are not seen as gaps in resources or methods, but rather they are defined as gaps in results and consequences. They are prioritized by determining the cost of meeting the need versus the cost of ignoring them (Kaufman et al., 2006). Defining needs from this perspective does not limit or confine a designer to a finite range of solution sets based on preconceived methods or already limited and constrained resources. Rather, it allows a designer to fully examine the widest possible range of solutions to meet specifically stated needs and gaps (Kauffman et al., 2006). This approach is ideal because it is results-oriented and focuses on addressing and designing for true needs as opposed to prioritizing convenient solutions or biased preferences in a given project.

The process of needs assessment helps a practitioner uncover and pinpoint a problem or set of problems within a given system. Once those problems are identified, the findings from the needs assessment are used to select or develop an appropriate intervention to resolve those issues (Rossett, 2009; Dick et al., 2009). Conducting thorough and proper needs assessments helps ensure that dollars and resources are channeled towards interventions, resources and instruction that address participants' needs (Dick et al., 2009). Needs assessment also provides a framework to set educational goals and to ensure that proposed solution sets provide the maximum benefit to recipients (Kaufman et al., 2006). In this capstone inquiry, the use of needs assessment ensures that materials or interventions developed for learners are responsive and sensitive to their needs and also effectively achieve desired objectives and outcomes.

Survey instruments have typically been the major means of conducting front-end needs analyses. Nowadays, however, it is more common for surveys to be supplemented with interviews and, in some cases, direct observations (Dick et al., 2009). In keeping with current practices as highlighted by Dick, Carey, and Carey (2009) and as described in the timeline section of this project, the needs assessment for this project was broken into three phases and made use of both surveys and interviews.

Needs assessment was critical to the design of this project for two reasons. First, it ensured that the interventions developed for this project addressed specific needs within the context of the PRODUCED program (Piskurich, 2006). Second, conducting needs assessment ensured that the proposed solutions and interventions were appropriate and in accord with the stated needs (Piskurich, 2006). Essentially, in order to produce successful outcomes and to be of benefit to the target audience and the wider PRODUCED program, the design of the

interventions used in this project had to be tied to specific needs as articulated by PRODUCED students and program staff.

Capstone Methodology

The primary objective of this study was to determine which student support services, programming, and resources would most likely connect students to communities outside of their immediate online classroom community. The second objective was to design and implement a series of interventions that could provide students with access to these communities. The final project objective was to assess the impact of these interventions on students' satisfaction and their sense of community. To this end, three Research Questions guided this capstone project:

- Q1 As determined through needs assessment, what current supports and services exist for PRODUCED students beyond the online classroom community?
- Q2 Based on needs assessment data from the PRODUCED program, what kinds of interventions could be implemented to connect students to the wider community?
- What was the impact of such interventions on PRODUCED students' engagement with and involvement in communities outside of the classroom, such as the Center for Engineering Career Development (CECD), as measured by student surveys, researcher's observations, their Collab activity, attendance, and usage of the CECD?
- Q3b Through surveys, attendance, usage, and observations of event behavior, what characteristics of community identified in the literature did students in the PRODUCED program evidence during these interventions?

This section describes the methodology that was used to meet the stated project objectives and to answer above-mentioned Research Questions. This section discusses the

design and implementation of the needs assessment as well as the resulting performance interventions used to connect students to the wider community. In addition, this section outlines the data collection and analysis procedures which were used to assess the intervention's impact on students. Lastly, this section describes perceived threats to validity, project limitiations, and benefits.

Although only Research Question 3a and 3b are being submitted to fulfill the requirements of the capstone degree, the section that follows details the design for all three Research Questions. For purposes of providing a complete understanding of this project, however, the researcher has included a description of the design and methodology behind Research Question 1 & 2. Doing so provides a context behind how the interventions were determined. Including this information also ensures thoroughness of reporting and aids with documentation of the project should the PRODUCED program and/or other researchers seek to replicate or build upon the study. Table 1 links each research question to the methods and instruments used to collect data.

Table 1

Capstone Research Questions and Methodology

RQ1: As determined through needs assessment, what current supports and services exist for PRODUCED students beyond the online classroom community?

Research Question

RO2: Based on needs assessment data from the PRODUCED program, what kinds of interventions can be implemented to connect students to the wider community?

RQ3a: What is the impact of such interventions on PRODUCED students' engagement with and involvement in communities outside of the classroom such as the Center for Engineering Career Development (CECD) as measured by student surveys, researcher's observations, their Collab activity, attendance and usage of the CECD?

RQ3b: What characteristics of community identified in the literature do students in the PRODUCED program evidence through surveys, attendance, usage and observations of event behavior during these interventions?

Methodology

- **Human Performance Technology**
- Instructional Design
- Needs Assessment that was broken into three phases:
 - Phase 1 Interviews with recent graduates
 - Phase 2 Inteviews with current and transfer students
 - Phase 2 Organizational analysis (Interview with PRODUCED program director)
 - Phase 3 Online needs assessment survey with gap analysis component
- Time Series Analysis on: Attendance data **CECD Forum Posting Activity CECD Usage Reports** Event behavior (Observational Checklist) Post-event survey data End-of-study usage survey
- Coded time series data according to the major themes in the literature review: Attendance data CECD forum posting activity CECD usage reports Event behavior (observational checklist) Post-event survey data End-of-study usage survey

Timeline

The preparation, design, and implementation of this project took a little over a year and a half. The first two Research Questions were answered through a needs assessment process that

occurred in three phases, as part of the researcher's doctoral assistantship. Phase 1 of the needs assessment occurred between June and August 2012, when the researcher conducted one-on-one interviews with six recent graduates of the PRODUCED program. Phase 2 of the needs assessment occurred between November 2012 and December 2012 when the researcher used maximum variation sampling to select current PRODUCED students for interviews and purposeful sampling to interview two former PRODUCED students who transferred to the ongrounds UVA option. During this phase, the researcher also interviewed the PRODUCED program director. Phase 3 occurred between November 2012 and August 2013, when the researcher designed, administered, and analyzed the results of the PRODUCED Student Community Survey, which was administered to PRODUCED students during the spring 2013 school term.

The third research question was answered through the actual design and implementation of the interventions that had been identified through Phase 1 and 2 of the needs assessment.

Design of the interventions occurred between December 2012 and March 2013. Meanwhile, actual implementation of the interventions occur between March 2013 and July 2013. Analysis of the data collected on the impact of the project occurred between July 2013 and May 2014.

Participants

Six graduates of the PRODUCED program participated in Phase 1 of the needs assessment. Six current PRODUCED students and two former PRODUCED students participated in Phase 2 of the needs assessment. During Phase 2 of the needs assessment, the PRODUCED program director participated in the interview process. At the time of this study's implementation, 19 students were enrolled in the PRODUCED program, and the interventions described in this project were made available to all of them. These students ranged in age from

22 to 57 years old. Slightly over half (52%) of the students were between the ages of 20 and 29. Students between the ages of 40 and 49 constituted 27% of the PRODUCED student population. Of the 19 students enrolled in PRODUCED, 14 identified as Caucasian, 1 was African-American, 1 identified as Asian, 1 identified as both Asian and Caucasian, 1 identified as Latino or Hispanic, and 1 did not specify an ethnic identity. There were 15 male students and 4 female students enrolled in PRODUCED (PRODUCED program data, 2013).

PRODUCED students share characteristics of non-traditional students and the typical online learners, which tend to be working adults (Dabbagh, 2007). Like most online learners, PRODUCED students also described having significant life responsibilities that most college-age students typically do not have. This included responsibilities such as having families, being homeowners, and providing care for family members. The majority of PRODUCED students (64%) held full-time or part-time jobs or took part in full-time or part-time internships while completing their degree through the program. Approximately 16 were enrolled in PRODUCED as full-time students, and 4 were enrolled as part-time students (PRODUCED program data, 2013).

Study Design Overview

A thorough needs assessment process was essential to answering Research Questions 1 and 2 and had to be undertaken before the interventions could be developed and piloted. Thus, the design of Research Questions 3a and 3b in this capstone study was highly dependent on information and data gathered to answer Research Questions 1 and 2.

In this project, gap analysis was employed in the survey instrument used to answer Research Question 1. The goal of implementing an intervention using an HPT framework is to close the gap between those two performance states, so gap analysis was necessary because it helped ensure that the interventions selected for implementation in Research Question 3 were appropriately aligned to true needs and gaps. Additionally, organizational analysis was employed during Phase 2 of the needs assessment when the researcher interviewed the PRODUCED program director. Employing this technique also ensured that a thorough needs assessment was employed for Research Question 1 and 2. It also ensured that the interventions ultimately selected to answer Research Questions 3a and 3b were aligned with the wider organizational values and mission of the PRODUCED program. Findings from the needs assessment informed the design and implementation of the interventions that were selected to answer Research Questions 3a and 3b.

Research Questions 1 and 2 Treatment

Needs assessment was employed to answer Research Questions 1 and 2. The needs assessment was broken into three phases. This approach helped capture perspectives from the entire PRODUCED student experience – including alumni, current students and former students.

Phase 1 (RQ1 and RQ2). During Phase 1 for Research Questions 1 and 2, the researcher interviewed recent graduates of the PRODUCED program. Because these students were the first group of PRODUCED students to graduate from the program, the purpose of this phase was more exploratory in nature. Prior to this phase, the experience of students enrolled in PRODUCED had not been formally documented or studied. Thus, in many respects, this portion of the needs assessment functioned as an initial baseline to compare and interpret future findings about the PRODUCED student experience. Data collected informed the design of Phase 2 and Phase 3 of the needs assessment process. Phase 1 also served to identify a list of graduates that could assist with future community- building initiatives and activities. Ultimately, however, this phase a) determined the behaviors, attitudes and practices that characterized students enrolled in

the program, b) provided insight into how PRODUCED students experience a sense of community, c) identified potential gaps in PRODUCED students' connection to community, and d) helped the researcher understand the role that technology plays in fostering a sense of community within the context of the PRODUCED program.

In Phase 1 of the needs assessment, a total of six graduates were interviewed using a semi-structured interview protocol, which included both close and open-ended questions.

Appendix B contains the interview protocol used during Phase 1. Interviews were chosen because they are an effective way for gathering detailed descriptions and insight into a situation or individual's experience (Kaufman et al., 2006; Creswell, 2008).

Graduates were initially contacted via email to solicit their participation and, upon confirming, to schedule the interview. Appendix C contains the email sent to PRODUCED alumni to request an interview. At an agreed upon date and time, graduates were interviewed via telephone and/or Skype. During each interview, the researcher took detailed notes on the participants' responses. Following each interview, the researcher sent each participant an email and thanked them for their participation.

Phase 2 (RQ1 and RQ2). For Phase 2 of the needs assessment undertaken for RQs 1 and 2, the researcher interviewed six current PRODUCED students and two students who transferred from PRODUCED to the on-grounds UVA option. Maximum variation sampling was used to select current PRODUCED students for interviews, and purposeful sampling was employed to interview two former PRODUCED students who transferred to the on-grounds UVA option.

Students were initially contacted via email to solicit their participation and to schedule the interviews. At an agreed upon date and time, all but one of the students, who preferred an in-

person interview, were interviewed via telephone or Microsoft Lync (MS Lync). Appendix D contains the email that was sent to students in order to request an interview.

The purpose of interviewing current PRODUCED students was three-fold. First, they helped identify how PRODUCED students experienced and connected to the individuals, services, and resources within the wider UVA community. Second, they provided insight into how students articulated their desired experience of community as PRODUCED students. This also allowed the researcher to identify students' needs and assess the gap between their current and desired experience of community. Lastly, these interviews were conducted with the purpose of understanding how to best design for and solicit PRODUCED student's involvement and participation in community-building activities. Interviews with current students also served to triangulate and expand on the findings uncovered in the PRODUCED alumni interviews conducted during Phase 1 of the needs assessment. Appendix E lists the questions used during the interviews with current PRODUCED students.

The purpose of interviewing the students who transferred from PRODUCED to the ongrounds UVA option was to gain insight into how the on-grounds option compared to the PRODUCED online option. These students were selected over students who had only completed the on-grounds option because they could provide insight from the PRODUCED student perspective and could also relate to the on-grounds experience. Appendix E also lists the questions used during the interviews with former PRODUCED students.

The researcher also interviewed Dr. James Groves, the PRODUCED program director at the time, during Phase 2 of the needs assessment. The interview with Dr. Groves functioned as an organizational analysis and was employed in accord with the Human Performance

Technology Model that guided the wider research design for this capstone project. Through this

interview, the researcher examined the organization's values, mission, and long-term goals. This interview also helped the researcher identify critical issues related to the PRODUCED-specific organizational context as well as resources and strategies for overcoming impediments and challenges to community building (Dessinger et al., 2012). The interview conducted with Dr. Groves was a semi-structured interview and served a number of purposes. Appendix F lists the questions used during the interview with Dr. Groves.

Phase 3 (RQs 1 and 2). Phase 3 of the needs assessment for RQs 1 and 2 took the form of an online survey that PRODUCED students were asked to complete during the Spring 2013 school semester. A survey research design was chosen for this part of the needs assessment because surveys are a useful methodology for learning about a population and for describing trends. Survey research also provides useful information about individuals' behaviors and is commonly employed in program evaluation (Creswell, 2008). Surveys can be used to collect soft data, such as perceptions and attitudes, as well as hard data that quantifies relevant information such as test scores, employment status, and income levels (Kauffman et al., 2006). Electronic surveys, like the one used during Phase 3, are an ideal alternative to traditional paper and pencil based surveys because they provide an easy and quick way for a researcher to collect data. They also allow respondents to answer questions at their own convenience and at their own pace (Creswell, 2008; Kaufman et al., 2006).

The survey used in Phase 3 served two purposes. First, the survey provided baseline data on students' current level of connection to each other, to on-grounds students as well as to the resources and services within the UVA community. Secondly, the survey helped the researcher identify gaps between the current level of connection and the ideal level of connection that students would like to have with each other, with on-grounds students as well as with the wider

UVA community. Findings from the survey provided a quantitative lens to examine Research Question 1 and were used to guide and prioritize design work through this project that are explored in RQs 2, 3a and 3b.

For purposes of this capstone study, an electronic survey was developed using PHP and placed on a server with the capability of capturing data electronically and anonymously. It was made available to all PRODUCED students from March 11, 2013, until April 5, 2013. This survey took about 30 to 45 minutes for students to complete and had a 100% response rate. Due to the length of the survey and the time required to complete it, any student who completed the survey received a \$10 gift certificate to Amazon.com in appreciation for their time and feedback. Additionally, a summary of the final survey results and report were made available to students upon request. At the writing of this report, none of the PRODUCED students have requested a copy of the report or survey findings. The survey can be found at the following link: http://inspirationaldraperies.com/Timur/ProducedSurvey_demo/login.html. The login information is provided on the screen (Appendix G).

The survey included a mix of questions. The survey mostly employed gap analysis techniques and closed-ended questions, primarily composed of category scale and rank order questions. However, a few open-ended questions were included to capture qualitative data.

Gap analysis questions were used to compare the actual and potential/desired performance states for community. Closed-ended questions were chosen because they require less time and work to complete on the part of participants. Including these closed-ended questions increased the likelihood of getting a response. The category scale questions included on this survey focused on frequencies, and a 6-point Likert scale was used to force participants to identify with one side of the range of options over the other side of the range (Kaufman et al.,

2006). Rank order questions were included in this survey to provide information about respondent's preferences about proposed interventions. The survey also contained open-ended questions for students to provide additional qualitative data beyond what the closed-ended responses could reveal about respondents (Creswell, 2008; Kauffman et al., 2006).

Many of the questions and much of the content found in this survey were a result of initial piloting during Phase 1 and Phase 2 of the needs assessment. These two initial phases allowed the researcher to pilot the initial versions of the survey questions and also to refine them based on participants' feedback, responses, and reactions. As Creswell (2008) notes, this piloting was important because it helped determine whether individuals were capable of understanding the questions and could ultimately complete the survey. Final survey questions were revised according to Creswell's (2008) survey item construction guidelines.

The suggestions, strategies, and ideas that students were asked to rank order in some of the sections of the survey came from two sources. Data taken from the interviews conducted during Phases 1 and 2 of the needs assessment helped populate the ideas, strategies, and suggestions used in the rank order questions found on the survey. Additional ideas, strategies, and suggestions were drawn from a conference workshop that the researcher attended in Fall 2012. The workshop entitled, "We Are...Penn Staters Too: Building a Co-curricular Student Experience for Penn State Online Distance Learners" was part of the University Professional and Continuing Education Association's 2012 Seminar on the Management of Online Programs held in early November 2012. The workshop addressed the misconception that online distance learners do not want to engage with the activities and offerings available through physical university campuses. During the workshop, presenters shared strategies for the co-curricular

engagement of online students, and many of those strategies have been included in the final version of the rank order sections of the survey.

This survey did not give participants the option to opt out of questions in any of the sections. Additionally, participants could not move on to subsequent sections until they answered all of the questions in a particular section. Given the N for this study was so low (N = 19), it was crucial to collect as much data as possible. Indeed, in a study such as the present one, omitting key data points in subsequent sections could jeopardize the larger generalizability of the findings. Restricting student's ability to opt out of questions was also justifiable because the questions are not controversial or invasive in ways that would cause psychological or emotional discomfort or distress on the part of students.

Informed consent. The researcher first emailed students inviting them to participate, explaining the purpose of the survey, and outlining the timeline for completion and their rights. This was a first measure used to obtain informed consent (Appendix H). Individuals who did not wish to participate could reply directly to the email to opt out so that the researcher could avoid contacting them in subsequent email attempts. A second attempt to obtain informed consent was built into the survey itself. Participants gave their consent once they selected the "Begin" button on the electronic version of the survey.

Response rates. Response return rates are a frequent challenge to survey research design, and most studies published in leading journals report a response rate of 50% or higher (Creswell, 2008). The following three measures were implemented to encourage a high response rate. First, after the initial invitation, the researcher asked Dr. Groves to send out a follow-up email encouraging students to participate. This was done because initial Phase 2 needs assessment data revealed that emails were more likely to be read and, more importantly, acted upon by

PRODUCED students when messages came from program staff or faculty. Secondly, two additional reminder emails were sent to individuals who had yet to complete the survey or who had not already opted out.

Confidentiality. Data was not linked to individual participants in any way. Participants received a participant number when they began the survey, and any identifying information was coded only as a number. The researcher could only access a list of non-respondents who had not yet completed the survey. This was done so that reminder emails could be sent directly to non-respondents.

Data Sources

For Phase 1 and 2 of the needs assessment, data was drawn from participant interviews. For Phase 3 of the needs assessment, data was drawn from the PRODUCED Student Community Survey. As will be detailed in this section, data collected during each of these phases was from a different set of students.

Phase 1 data sources. In Phase 1, all interviewees were males and had majored in Engineering Science through the PRODUCED program at the University of Virginia. The range of minors represented within the sample included Materials Science, Mechanical Engineering, and Electrical Engineering. The average time to complete each interview was 52 minutes.

Phase 2 data sources. For Phase 2 of the needs assessment, students were a mix of male and female. In all, there were 5 male interviewees and 3 female interviewees. Each offered a unique perspective, specifically with regards to time spent in the program. While some had just begun the PRODUCED program, others were about half way through, had just transferred to the on-grounds option, or were about to graduate. The average interview completion time was 56 minutes, with the shortest interview lasting 33 minutes and the longest one lasting 90 minutes.

The interview with Dr. Groves also served as a data source during Phase 2 of the needs assessment. Data was collected through a semi-structured interview with Dr. Groves. This interview lasted 1 hour.

Phase 3 data sources. For Phase 3 of the needs assessment, students were a mix of male and female. In all, 15 males and 4 females completed the survey. The survey was available online to students for a month. It took 30 to 45 minutes for students to complete the survey. In the end, the survey had a 100% response rate.

Analysis Framework

Phase 1 analysis framework. Interview data from Phase 1 of the needs assessment was analyzed using the qualitative method of coding. Coding is a process that allows researchers to make sense out of data, such as interviews, observations, and/or focus groups. In doing so, the researcher examines textual data for key themes, ideas and categories using open coding. The process of coding is done by dividing the text into smaller segments, using open coding to label these segments with codes that are based on initial categories of information tied to the body of data, examining the codes for overlap and redundancy, and then collapsing the list of codes into larger, broader themes (Creswell, 2008).

In this project, data reduction was conducted on each participant interview for each question using *in vivo* coding. *In vivo* coding is the practice of assigning a label to each section of data and assigning a code that is derived directly from the informant's responses (Creswell, 2008). Broader themes are then determined by examining the codes that arose most frequently within the question sets, were unique or surprising, had the most evidence to support them and/or were supported by evidence from the larger literature base on community (Creswell, 2008).

Appendix J illustrates the coding categories used to analyze the interview data obtained from the PRODUCED program's recent graduates.

Phase 2 analysis framework. Interview data for Phase 2 was analyzed twice. At the writing of the initial capstone proposal, the researcher completed an initial pass at extracting and summarizing the big ideas from the interview data collected during Phase 2 of the needs assessment. To do this, the researcher examined each informant's response to each interview question for main ideas and key issues. In addition, a preliminary set of needs were determined by reviewing the data for any explicitly stated needs originating from the participant's responses as well as taking the remaining list of key issues and main ideas and rephrasing them as needs to ensure that any implicit needs were addressed. This preliminary pass at the data was done in the interest of time and in response to the need to begin sketching out a preliminary design of the proposed interventions piloted in Researcher Question 3 of this project.

In the final analysis and write-up, the researcher analyzed each student interview using a qualitative method of coding by which emergent themes were identified. Data reduction was conducted on each student participant interview for each question using the coding scheme developed in Phase 1. Because the new data set produced new information, the original coding scheme served as just a starting point. The researcher added to the initial coding scheme by creating additional *in vivo* codes derived directly from the informant's responses in Phase 2 (Appendix I). In the interest of time and managing project scope, the researcher reviewed interview data from the organizational analysis with Dr. Groves for any explicitly stated needs. His insights were summarized to ensure that any implicit needs were addressed in the design of the project's interventions.

Phase 3 analysis framework. Data analysis for the survey followed Creswell's (2008) checklist and guidelines for analyzing survey data. Analysis consisted of calculating the response rate, checking for response bias, and conducting descriptive statistics (mean, variance, and range) for each question on the instrument. Where applicable, data was analyzed qualitatively to answer the descriptive questions found on the survey. Additionally, the reliability of the scores on the Likert scale items was analyzed using Chronbach's alpha as a coefficient of internal consistency. The Chronbach alpha for all 87 Likert scale items found on the survey was 0.937 (Appendix W). The specific analysis framework for each section of the survey is discussed below.

Section 1: Demographics. There were four questions within the demographic section — gender, age, employment status, and enrollment status. These questions were included on the survey for descriptive reporting purposes only so as to accurately capture the characteristics that make up the participant sample. Gender was coded as 1 and 2 (1 = male; 2 = female). Age was listed in four-year range increments. The ranges were coded 1 to 8 for each possible choice, with the "19 and under" option being coded as a 1 and the final "50 or over" option coded as an 8. Employment status was coded 1 to 5 for each possible option, with full-time employment being coded as 1 and the currently not employed option being coded as 5. Should this survey be readministered, these items should be re-coded with full-time employment = 4 and the notemployed option being coded as 0. Enrollment status was coded 1 to 2, with "10 credits or more" being coded as 1 and "less than 10 credits" as 2. Future analyses should re-code these items with "10 credits or more" being coded as 1 and "less than 10 credits" as 0.

Section 2: General questions about community. The purpose of this section was to determine students' current general sense of community as well as their sense of connection to

various aspects of the UVA community. This section also measured student's satisfaction and the importance they attributed to feeling connected to each of these aspects of community. The questions found in this section were crucial to identifying needs and gaps in the PRODUCED student experience and rested on the approach to needs assessment done by Dick et al. (2009). Dick et al. (2009) suggest that a need can be identified when an individual is given an opportunity to survey a situation and rate it satisfactory or unsatisfactory. If the individual indicates that the situation is satisfactory then there is no need for change (Dick, Carey & Carey, 2009). This section pushed this idea further by asking students to rate importance. Students' answers provided the PRODUCED program with an idea of which needs were most important to be creating students' sense of community.

Items in this section were arranged by topic in a three-question sequence that measures connection, satisfaction, and importance. Section 2 (Appendix W) contains category scale closed-ended questions based on a 6-point Likert scale ranging from 1to 6 (Strongly Disagree = 1, Disagree = 2, Somewhat Disagree = 3, Somewhat Agree = 4, Agree = 5, Strongly Agree = 6). Data was coded in direct correspondence to the numbers found on the survey instrument (e.g. 1 will be coded as 1, 2 as 2, and so on.) The Chronbach alpha for this section of the survey was 0.868.

Section 3: Using communication and collaboration tools with PRODUCED Students. These questions were included to gauge the frequency with which PRODUCED students used tools such as Blackboard Collaborate, Lync, Facebook, Twitter, G-chat, Google Hangout, and email to communicate with each other (Appendix W). This section contained closed-ended questions that solicited information about respondents' behavior using a frequency-based scale.

Responses were coded from 1 to 5 (Several times a day = 1; Once a day = 2; Several times a week = 3; Once a week = 4; Never = 5).

Should this survey be re-administered, these frequency-based questions should be re-coded with Never = 0; Once a day = 1; Several times a day = 2; Once a week = 3; Several times a week = 4. A final open-ended question at the end of this section asked students to list any additional online communication and collaboration that they use. Data collected for this final question was coded qualitatively.

Section 4: Current & desired level of community among PRODUCED students. This section measured the current and desired levels of community between PRODUCED students using the gap analysis technique (Appendix W). Students were asked to rate the PRODUCED program based on how it was doing (left column), and how they thought things should be (right column), with regard to their sense of community or connection with other PRODUCED students. The survey examined the sense of connection afforded through opportunities and resources that connected them to other PRODUCED students.

The design of this section of the survey was adapted from Kaufman's et al. approach to needs assessment (2006), which recommended that evaluators uncover needs by identifying gaps in results as opposed to wants. To identify the gaps, Kaufman et al. (2006) suggested using "What Is" and "What Should Be" objectives to guide the needs assessment. On the left side, respondents indicate "What Is" to describe the current state or practices related to a particular situation or context. On the right side, respondents indicate "What Should Be" to describe the ideal state or practices related to a particular situation or context. The difference between the current and ideal states reflects the extent of the gaps (Kaufman et al., 2006).

This section contains category scale closed-ended questions based on a 6 point Likert scale ranging from 1to 6 (Strongly Disagree = 1, Disagree = 2, Somewhat Disagree = 3, Somewhat Agree = 4, Agree = 5, Strongly Agree = 6). Data was coded in direct correspondence to the numbers found on the survey instrument (e.g. 1 was coded as 1, 2 as 2, and so on).

Chronbach's alpha was used as the reliability coefficient to measure the internal consistency of the items and to ensure that questions measured the intended construct found in this section of the survey instrument. Table 2 lists Chronbach's alpha for this portion of the survey.

Table 2
Chronbach's Alpha for Section 4 of the PRODUCED Student Survey

	What is?	What Should Be?
Opportunities	0.940	0.882
Resources	0.830	0.868

Section 5: Increasing Opportunities for Community among PRODUCED students.

The first question in this section asked students to consider a list of strategies, ideas, and suggestions that could potentially help PRODUCED students interact, communicate, collaborate, bond, and connect more with each other (Appendix W). They were then asked to rank the importance of each, from 1 being the most important item to 10 being the least important item that would help them form community amongst themselves.

The data collected in this section was analyzed using the nominal group technique outlined in Kaufman et al. (2006). Each item was assigned a letter A to J (Facebook page = A; Peer mentoring program = B,;Student blogs = C; Student town halls = D; Student council or student government = E; Regional dinners or meetups = F; Online teambuilding activities = G; PRODUCED newsletter = H; Activities at the UVA campus = I; Virtual Information hub = J).

Then, a corresponding numeric point value was assigned to each rank, and the points were added for each idea to determine a total point value. Given the wording of the question, the idea with the highest point total was the one of least importance and, thus, the lowest priority item.

There was also an open-ended question that allowed students to record any additional ideas or suggestions that they felt would help them create more of a community with other PRODUCED students. Responses to this question were coded qualitatively.

Section 6: Using Communication and Collaboration Tools with On-grounds Students. These questions were included to gauge the frequency with which PRODUCED students used tools such as Blackboard Collaborate, Lync, Facebook, Twitter, G-chat, Google Hangout, and email to communicate with on-grounds students. This section contained closed-ended questions that solicited information about respondents' behavior using a frequency-based scale. Responses were coded from 1 to 5 (Several times a day = 1; Once a day = 2; Several times a week = 3; Once a week = 4; Never = 5). Should this survey be re-administered, these frequency-based questions should be re-coded with Never = 0; Once a day = 1; Several times a day = 2; Once a week = 3; Several times a week = 4. A final, open-ended question at the end of this section asked students to list any additional online communication and collaboration that they used.

Section 7: Current and Desired Levels of Community with On-grounds Students. This portion of the survey followed the same rationale as Section 4 of the survey instrument, which was described earlier in this section. Inasmuch, this section also used gap analysis to measure the current and desired levels of community between PRODUCED students and on-grounds students. It contained category scale closed-ended questions based on a 6-point Likert scale ranging from 1 to 6 (Strongly Disagree = 1; Disagree = 2; Somewhat Disagree = 3; Somewhat

Agree = 4; Agree = 5; Strongly Agree = 6). Data was coded in direct correspondence to the numbers found on the survey instrument (e.g. 1 will be coded as 1, 2 as 2, and so on.)

Chronbach's alpha was used as the reliability coefficient to measure the internal consistency of the items found in this section of the survey instrument. Table 3 lists the Chronbach's alpha for this section of the survey.

Table 3
Chronbach's Alpha for Section 7 of the PRODUCED Student Survey

	What is?	What Should Be?
Opportunities	0.541	0.787
Resources	0.879	0.879

Section 8: Increasing opportunities for community among on-ground students. Ongrounds students make up an important part of the PRODUCED student's experience of community. They are in classes with PRODUCED students and are often required to collaborate on assignments together. Thus, the first question in this section asked students to consider a list of strategies, ideas, and suggestions that could potentially help PRODUCED students interact, communicate, collaborate, bond, and connect more with on-grounds students. They were then asked to rank order the importance of each, from 1 being the most important item to #5 being the least important item that would help them form community with on-grounds students (Appendix W).

The data collected in this section was analyzed using a process similar to the nominal group technique outlined in Kaufman et al. (2006). As described in Section 5, each respective item was assigned a letter A to H and each rank was assigned a numeric point value. Then the researcher tallied the number of points for each item appearing within a given rank. There is also

an open-ended question that allowed students to record any additional ideas or suggestions that they felt would help them create more of a community with on-grounds students. Responses to that question were coded qualitatively.

Section 9: Connecting to SEAS. SEAS represented the wider administrative aspect of community because programs such as the PRODUCED program fall under this school's jurisdiction. This section contained two types of questions (Appendix W). The first question type was a closed-ended question that solicited information about respondents' participation in events and workshops offered through SEAS. Responses were coded using a frequency-based scale from 1 to 3 (Never = 1; 1-3 times per semester = 2; 4 or more times per semester = 3). Should this survey be re-administered, this frequency-based scale should be re-coded with Never = 0; 1-3 times = 1; and 4 or more times per semester = 3. The second question type was a rank order item that asked respondents to rank, with 1 being the most important and 6 being the least important, the types of events that would help them feel connected to SEAS.

Like the rank order questions described earlier in Section 8 and Section 5, the data collected in this section was analyzed using the nominal group technique outlined in Kaufman et al. (2006). Each respective item was assigned a letter A to G. Then, the researcher tallied the number of counts for each item appearing within a given rank to determine a point value. Responses to the final open-ended question which asked students to record any additional ideas or suggestions that they feel would help them connect to SEAS was coded qualitatively

Section 10: Connecting to the library. The library is an important component of the student experience of community at UVA because it assists students with their research and academic needs. This section contained three types of questions (Appendix W). The first question type was a closed-ended question that solicited information about respondent's use of

the resources available through the library. Responses were coded using a frequency-based scale from 1 to 3 (Never = 1; 1-3 times per semester = 2; 4 or more times per semester = 3). In the future, this frequency-based scale should be re-coded with Never = 0; 1-3 times = 1; and 4 or more times per semester = 3. The second question type required participants to indicate whether they could perform certain types of library-related tasks. Responses were coded from 1 to 3 (Yes = 1; No = 2; Somewhat = 3). Should this survey be re-administered, these responses should be coded as No = 0; Somewhat = 1; and Yes = 2.

The third question type was a rank order item that asked respondents to rank, with 1 being the most important and 5 being the least important, the types of tasks that would help them feel connected to the library. Like the rank order questions described earlier, the data collected in this section were analyzed using the nominal group technique outlined in Kaufman et al. (2006). Each respective item was assigned a letter A to E. Then, the researcher tallied the number of points for each item appearing within a given rank. There was also one open-ended question at the end of this section. Responses to this question allowed students to record any additional ideas or suggestions that they felt would help them connect to the library. These responses were coded qualitatively.

Section 11: Connecting to the Center for Engineering Career Development. The

Center for Engineering Career Development (CECD) represents a piece of the UVA community
where students can gain access to career development resources. It also prepares them for life
outside of the UVA academic community. This section contained two types of questions
(Appendix W). The first question type was a closed-ended question that solicited information
about respondent's use of the resources and services available through the CECD. Responses
were coded using a frequency-based scale from 1 to 3 (Never = 1; 1-3 times per semester = 2; 4

or more times per semester = 3). In the future, these responses should be re-coded with Never = 0; 1-3 times = 1; and 4 or more times per semester = 3.

The second question type was a rank order item that asked respondents to rank, with 1 being the most important and 8 being the least important, the types of events that would help them feel connected to the CECD. Like the rank order questions described earlier, the data collected in this section were analyzed using the nominal group technique outlined in Kaufman et al. (2006). Each respective item was assigned a letter A to M. Then the researcher tallied the number of counts for each item appearing within a given rank. Responses to a final open-ended question that allowed students to record any additional ideas or suggestions that they felt would help them connect to the CECD was coded qualitatively.

Sections 12: Connecting to the engineering profession through student organizations, honor societies and national or statewide organizations. Student organizations, honor societies, and national or statewide organizations represent a portion of community that is often overlooked for distance learners like PRODUCED students. Membership in these organizations is important because it creates a sense of community that connects students to each other while they are still students at UVA and to students and or professionals at other institutions upon graduation.

This section asked students to consider the connection they have to the wider field of engineering, as evidenced through their connection to engineering student organizations, non-engineering student organizations, honor societies, and national or statewide engineering professional organizations (Appendix W). Like Section 2, this section incorporated Dick, Carey, and Carey's (2009) approach to needs assessment. It contained items that measured connection, satisfaction, and importance using closed-ended questions based on a 6-point Likert scale

ranging from 1 to 6 (Strongly disagree = 1; Disagree = 2; Somewhat disagree = 3; Somewhat agree = 4; Agree = 5, Strongly agree = 6). Data were coded in direct correspondence to the numbers found on the survey instrument (e.g., 1 was coded as 1, 2 as 2, and so on.). Chronbach's alpha for this section of the survey was 0.768.

Section 13: Involvement in engineering profession through student organizations, honor societies and national or statewide organizations.

Student involvement in the wider engineering community is important because it connects students to the wider engineering community of practice. This section of the survey allowed the researcher to capture whether students were currently affiliated or involved with student organizations, honor societies, and national or statewide organizations. The online format of this section enabled branching to occur. In cases where students were not involved with such organizations, the branching capability enabled the researcher to capture whether students would like to be affiliated with such organizations and also which specific ones students would like to be a part of (Appendix W).

Section 13 first asked whether students were a part of any engineering student organizations and answers were coded either as a 1 or 2 (Yes = 1; No = 2). Branching began after students indicated either "Yes" or "No" to this first question. If students indicated "yes," they were asked to supply the name of the organization they were affiliated with. If they indicated "no," students were asked whether they would like to be included in any engineering student organization. If they answered "yes" to this second question, then they were provided with a list student organizations and societies available through SEAS. The coding scheme was as follows: Yes = 1; No = 2. Should this survey be re-administered, these responses should be coded as Yes = 2; No = 0; and Somewhat = 1. The list of student organizations and societies

available through SEAS was coded 1 to 11 (e.g., Alpha Omega Epsilon = 1; Society of Women Engineers = 2; and so on.). As these are not rank order questions, the researcher reported basic frequency counts for each item.

The next portion of this section asked whether students were a part of any honor societies and was coded either 1 or 2 (Yes = 1; No = 2). Should this survey be re-administered, these responses should be coded as Yes = 2; No = 0; and Somewhat = 1.

Branching began after students indicated either "Yes" or "No" to this question. If students indicated "yes," they were asked to supply the name of the honor society they were affiliated with. If they indicated "no," students were asked whether they would like to be a part of any honor societies. If they answered "yes" to this question, then they were asked to provide the name of any honor societies they would like to connect with. Again, frequency counts were used to report final totals.

The final part of this section asked whether students were a part of any national or statewide professional engineering organizations and was be coded either 1 or 2 (Yes = 1; No = 2). Should this survey be re-administered, these responses should be coded as Yes = 2; No = 0; and Somewhat = 1. Branching begun after students indicated either "Yes" or "No" to this question. If students indicated "yes," they were asked to supply the name of the organization they were affiliated with. If they indicated "no," students were asked whether they would like to be a part of any national or statewide professional organizations. If they answered "yes" to this question, then they were asked to provide the name of any national or statewide professional engineering organizations they would like to connect with. Frequency counts were used to report this data.

Research Question 3a & 3b Treatment

Conducting a literature review and a front-end analysis using needs assessment helped answer the first two questions associated with this study. However, in order to answer Research Questions 3a and 3b, which are the focus of this capstone inquiry, the researcher had to use the preliminary findings and data from Research Questions 1 and 2 along with the literature review to design and implement the series of interventions associated with this study. The remainder of this section will provide a brief rationale behind the interventions used in this portion of the study, describe them, explain the implementation process, and provide an overview of the tools that were used.

Rationale. The project interventions connected PRODUCED students to the resources available through the CECD. Preliminary data from the needs assessment suggested that expanding and building student's access to community beyond the academic classroom needed to start with the CECD. The largest gaps were found in students' connection to CECD resources and services (gap = 1.06) and moderate gaps were found in students' connection to CECD staff (gap = 0.84). The CECD was an ideal starting place because it addressed the organizational and program mission of creating pathways for students to become engineers and prepared them to do so. In keeping with the tenets and principles of HPT and ensuring that projects add value to stakeholders and leverage existing resources, these interventions were strategic. They helped the program satisfy its mission as an academic outreach initiative to bring undergraduate engineering education to communities throughout Virginia and to connect enrolled students to professional networking and employment opportunities in the wider field of engineering. Additionally, as identified in each of the phases of the needs assessment, connecting to the CECD was an aspect of community that PRODUCED students repeatedly expressed interest in and enthusiastically

showed support for (Appendix U, V, and W). Thus, in many respects, connecting with and having access to the CECD was the most clear and explicit need expressed by students interviewed during the Phase 1 and Phase 2 needs assessment.

Intervention description. To meet the needs unearthed through answers to Research Questions 2 and 3, the researcher created three types of interventions to use in the times series design. The first intervention was a Collab site dedicated to providing CECD resources to all PRODUCED students. The site was called the CECD Connections Collab site. Here students could find key CECD resources related to interviews, resumes, jobs/interviews/career fairs, and networking. These were the most popular topics mentioned during the needs assessment.

Resources took the form of handouts, relevant CECD links, relevant University Career Services (UCS) links, and, in some cases, relevant links from the UVA Alumni Association's Career Services page. Appendix K is a schematic that depicts how this site was organized and Appendix L contains screenshots from the site. The CECD Connections Collab site also offered students discussion forums to ask questions about these documents and to interact with each other as well as CECD staff during the capstone study period.

For the second and third interventions, the researcher worked in conjunction with CECD staff to plan and offer two virtual events for PRODUCED students. The events were live virtual sessions targeted towards helping students with resumes and interviews. These events were delivered using Microsoft Lync. For students who were unable to attend the events, which needs assessment data indicated would be highly probable, a link to the event recordings was made available to students in the CECD Connections section of the PRODUCED Collab site.

Additionally, within the CECD Connections Collab site, students were able to ask questions before and after each of these events. The researcher made sure that questions were answered by

appropriate CECD or PRODUCED program staff. Students could also access a calendar on the Collab site to learn more about these events and to RSVP.

Having an integrated approach between the events and the Collab site through features such as the Q&A, calendar, and RSVP was very important. Indeed, seamless integration between systems was identified as a need during the needs assessment process and also helped ensure that PRODUCED students had an equal opportunity to ask questions like their ongrounds student counterparts. Specific details about each virtual event and the technology used to deliver them are discussed in brief in the next three sub-sections.

Developing a resume workshop and resume drop-off: Resumes are an important way that PRODUCED students represent themselves to prospective employers. Well-crafted resumes highlight a student's qualifications and experiences along with demonstrating their professional capabilities and skills (CECD website, n.d.). The CECD offered a virtual resume workshop to help PRODUCED students understand how to create a well-crafted resume. In the week following the workshop, CECD advertised special online virtual "walk-in" hours for PRODUCED students to meet with CECD staff and have their resume reviewed. At any point in the semester, students could have their resume reviewed by CECD staff.

Mock & behavioral interviews workshop and interview sessions. Mock interviews provide students with a way to practice and prepare for interviews (CECD website, n.d.). Behavioral interviews differ from traditional interviews in that they probe more into the candidates' behaviors (CECD Behavioral Interview Fact sheet, n.d.). They are commonly employed in electrical, mechanical; and materials engineering. For this capstone project, the CECD offered a mock behavioral interview virtual workshop for students to learn about the skills and techniques that can help them succeed during these types of interviews. In the week

following the workshop, the CECD office offered 45 minute virtual mock interview sessions to PRODUCED students. The purpose of this was to give them hands-on practice with interviewing as well as to help them gain confidence in their interviewing skills. A career counselor conducted the interviews and provided students with feedback and critiques on their interviews. During any point in the study, students were able to schedule a mock interview session with a career counselor at the CECD.

Microsoft Lync. Microsoft Lync was used to deliver the mock interview, behavior interview, and resume drop-off & critique sessions to PRODUCED students. Microsoft Lync is an enterprise-level communications suite that connects people via instant messaging, desktop sharing, and audio and video conferencing (Microsoft Lync website, www.microsoft.com). This tool was selected because it was currently used by PRODUCED students and was a popular means for them to connect and reach out to each other. The researcher provided training, documentation, and support to CECD staff so they were able to maximize use of this resource both before and during the event.

Methodology. This portion of the study made use of an equivalent time series design. A graphical illustration and timeline of how this design was used in this study is provided in Appendix J. Time series designs allow researchers to implement an intervention and then measure whether the frequency and/or quality of a behavior improves after a particular treatment. This methodology supports replications across time, different subjects, reversals, and different baselines, which limits threats to the study's external and internal validity (Kaufman et al., 2006; Creswell, 2008). According to Kaufman et al. (2006), time series designs are the most powerful research designs that exist. They are ideal for investigating whether treatments and interventions, like the ones described in this study, work in a given context or setting (Kaufman et al., 2006).

They are also ideal when a researcher has access to only one group and can study them over a period of time (Creswell, 2008).

Implementation process. Between March and June 2013, the researcher introduced the treatment intervention conditions described above and then measured and observed their effects on community formation in the PRODUCED student population. The Collab site was made available to students beginning March 25, 2013. Students had access to the Collab site until the end of June 2013. Meanwhile, the resume workshop was held on March 27, 2013, and the interview workshop was held on April 10, 2013. Both workshops were held in the early evening at 5 p.m. to accommodate students' schedules.

Prior to the workshop events, students could RSVP via the Collab site. On the day of each event, students were sent an event reminder email from the researcher's personal email and also a reminder from the Collab site. All workshops were recorded via MS Lync. Within 24 hours of the workshop's end, the researcher posted a link to the recording on the Collab site so that students could watch it at their convenience. Once this link was uploaded, the Collab site alerted students that it was available.

Recruitment and consent process. Upon receiving Institutional Review Board approval, all current PRODUCED students were emailed about the study. The PRODUCED program director also sent email to students informing them that the researcher would contact them about the upcoming study. Needs assessment data suggested that students would be more likely to read an email if it came from the PRODUCED program director. A few days after this email was sent, the researcher sent the recruitment email to all PRODUCED students. Appendix M contains a copy of the email notification. Appendix N contains the consent forms that were sent to students. Appendix O is the email that Dr. Groves sent students to raise students' awareness about the

study. This email was sent in response to findings from Phase 2 of the needs assessment. Indeed, many PRODUCED students were more likely to open an email coming from Dr. Groves rather than from the researcher. Students electronically signed the forms and emailed them back to the researcher. Participants were given the option not to participate or to withdraw at any point in the study.

At the program's request, the CECD Connections Collab site was made available to all PRODUCED students. However, the researcher did not collect data from any students who did not return the consent forms by April 30, 2013; or who elected to withdraw from the study. Follow-up invitations for PRODUCED students to participate in the study and reminders to return their consent forms were sent three times via email. Three reminders were appropriate because it raised awareness of the opportunity without being overly intrusive or burdensome for students and the researcher.

Data sources. The data collected for this study included CECD forum posting activity, attendance data, event behavior as observed through a researcher-created observational checklist instrument (Appendix P), post-event student survey (Appendix Q), CECD usage reports (Appendix R), and an end-of-study usage survey (Appendix S).

CECD virtual events – attendance data. Attendance was collected at every live event. Whenever a student clicked on the link to the recording on the CECD forum, this also provided evidence of usage and connection.

CECD forum posting activity. Between March and June 2013, the researcher tracked and observed posting activity on the CECD Collab forum on a weekly basis. The researcher also observed CECD usage and posting activity following virtual resume review and interview sessions in order to provide evidence of the level of connection that students formed with the

CECD as a result of these interventions. To do this, the researcher recorded the frequency of links and resources that students authored and read on a weekly basis after an event. As Collab was not equipped with capabilities to indicate whether students actually downloaded resources attached to posts, the researcher needed to assume that any attachments, such as links to recordings included with forum messages, had been read or viewed. It is also important to note that due to UVA's strict interpretation of FERPA law, which protects student data and privacy, this was the only way to monitor and track community activity within a Collab site.

CECD usage data. For interventions where students met with CECD staff individually (e.g., mock interview and resume virtual review sessions), the researcher checked in with the CECD on a weekly basis to find out how many PRODUCED students reached out to the office to make or keep an appointment. The CECD reported the names of the participants. The researcher tracked whether any of those students were using the resource for a second or third time. Appendix R is the form that was given to the CECD staff.

Event behavior. Observations are a way of gathering data and provide the researcher with firsthand knowledge of what is going on (Kaufman et al., 2006). Therefore, during synchronous virtual events, the researcher used an observational checklist (Appendix P) to qualitatively capture and describe the behaviors and activities associated with community. This observational checklist operationalized the construct of community and allowed the researcher to code and describe community-like behaviors that participants exhibited.

Post-event survey. Students were asked to complete a brief post-event online survey via Survey Monkey after each event to gauge their connection. The researcher also posted a link to the survey for PRODUCED students who watched the event via the recordings made available to them and sent out an email reminder to PRODUCED students via the Collab site.

End-of-study student survey data. Posting activity in the CECD forum was initially supposed to provide information regarding the site's overall usage and student's connection and interaction with the Collab resource. However, due to a redundancy and limitation in the setup and design of the forum tool found on Collab, the researcher was not able to collect the detailed usage data that she had originally planned to collect. As a result, the researcher had to administer a brief end-of-study survey to students to take inventory of the resources that students may or may not have used during the study period.

Analysis Framework

The impact of the interventions on PRODUCED students' engagement and involvement in communities outside of the classroom was measured quantitatively and qualitatively.

Attendance data

Attendance data were collected at every live event and whenever a student clicked on the link to the recording in the CECD Forum. This provided evidence of usage, connection, and engagement with the community outside the classroom. The researcher counted the total number of participants attending each event and also tracked virtually with regards to the recordings housed within the CECD forum on a weekly basis. The researcher hypothesized that she would see increases in attendance over time. To the researcher's knowledge, no PRODUCED students had attended CECD events previously. Indeed, prior to this study, CECD events were offered on-grounds and had never been delivered virtually so that they could attend. Thus, baseline attendance data for PRODUCED students attending CECD events was zero.

CECD Forum posting activity

Posting activity in the CECD forum provided information regarding the site's overall usage and students' connection and interaction with that resource. The researcher observed

posting activity on the CECD forum on a weekly basis and analyzed the frequency of students' authored/read/unread posts and the total percentage of posts read per student over time. The researcher also analyzed the number of students posting over time. The researcher hypothesized that she would see increases in the number of authored and read posts as well as the number of students participating in the site over time. Baseline data was not collected for this data point because, prior to this study, the CECD Collab site did not exist nor, was there a comparable resource available.

CECD Usage Reports

CECD usage reports on the number of students using the follow-up virtual resume review and mock or behavioral interview practice sessions provided evidence of the level of connection that students form with the CECD as a result of these interventions. Each week the CECD liaison sent the researcher a report (Appendix R) listing the names of students who had utilized the services. The researcher counted the total number of participants attending each interview or resume review session. The researcher hypothesized that she would see increases in the number of students using the CECD over time. Baseline data indicated that 5 students had used the CECD during the previous year.

Event Behavior

During live events, the researcher used an observational checklist to qualitatively capture and describe behaviors and activities that occurred (Appendix P). Each session was given a holistic level of community score on a scale of 0 to 4. According to this scale, 0 represented a session that did not occur due to technical difficulties or because none of the behaviors on the checklist were observed. A score of 4 indicated that all of the behaviors were observed. The researcher then quantified the qualitative behavior descriptions on the checklist using frequency

counts. The researcher's observational notes were also analyzed using a qualitative coding scheme to supplement the qualitative data. The researcher hypothesized that she would see increases in the event behaviors, indicating that the level of community was improving over time. No baseline data was collected for this data point because PRODUCED students had not attended CECD events nor had an instrument been developed to observe such behaviors.

Post-Event Student Survey Data

Students were asked to complete a brief online survey via Survey Monkey after each event to gauge their connection. In total, there were 4 questions on these surveys and the survey instrument employed a 6 point Likert scale. Responses were analyzed using basic descriptive statistics (mean, median, mode, std. dev, variance, range, frequency distribution). Appendix Q lists the questions found on this survey. The researcher hypothesized that she would see increases in mean values, indicating that student's connection to the CECD was improving over time. Mean data from Phase 3 of the needs assessment served to baseline student's connection to CECD events (M = 3.21, SD = 1.62), resources and services at the CECD (M = 3.68, SD = 1.45) and CECD staff (M = 3.04; SD = 1.31).

End-of-Study Usage Survey

Due to a glitch in data collection, students were instructed to complete a short survey (Appendix S), which asked them to identify the resources they viewed on the CECD Connections Collab site at the end of the study. This measure examined usage for one instance. If they did not view any resources on the CECD Connections Collab site, they were asked to select a reason that prevented them from using the resource. This data was analyzed using a frequency count for each respective item. Data was reported as an aggregate number (i.e., % of students viewing a particular item).

Characteristics of Community

To analyze what characteristics of community the students demonstrated, as identified in the literature, the researcher used the themes identified in the literature review as a priori codes to provide a qualitative interpretation of the quantitative data collected for this capstone study. The research examined the frequency counts for data sources such as attendance, CECD usage, post-event surveys, post-study survey and event behavior particularly by relating them to the major themes within the literature review (Creswell, 2008). For purposes of this capstone project, the researcher examined the data for the following themes: self-directed learning and communities of inquiry; community involvement; and time in the program; levels of community; life-cycle of community; and the taxonomy and definition of community.

Ethical Protection of Participants

This study followed standard ethical practices and guidelines associated with research practice. This included informing participants of the nature of the study, refraining from deceptive practices, sharing information with participants, being respectful of the research site, reciprocity, using ethical interview practices and maintaining confidentiality (Creswell, 2008). Participants were fully informed about the purpose and nature of the study along with any anticipated risks. Sensitive or "off the record information" was omitted from final analysis as Creswell (2008) suggests. In addition, the researcher clearly defined her role as a researcher and a PRODUCED digital support assistant. She did not share her experiences with participants during any interactions. Student names were kept confidential and were not included in the final write-up of the study results. Pseudonyms were used in the place of real names to protect participant's identity. In handling the survey data related to the project's interventions, individual student names were not linked to responses. Students also received an ID number.

Threats to Validity

Content Validity

Content validity is described as the extent to which the questions on a given instrument and the scores derived from that instrument are representative of the possible questions that could be asked about the particular content area, skill, or domain that the instrument intends to measure. To ensure there are no threats to content validity, researchers typically examine the objectives of the instrument, the content area(s) represented on the measure, and the level of difficulty of the questions. Once the measure has been assembled, the researcher goes to a panel of judges or experts and has them identify whether the content domain is accurately reflected in the questions posed on the survey (Creswell, 2008). Several steps were taken in this project to limit threats to this type of validity.

The first measure to limit threats to content validity occurred prior to designing the survey instrument. The researcher consulted with experts from the CECD and the Charles L. Brown Science and Engineering Library. Ms. Frances Hersey served as the representative from the CECD. She has over 17 years of experience working in career services and higher education and is currently the Associate Director for the center (Center for Engineering Career Development, http://www.seas.virginia.edu/admin/careerdev/). Mr. Fred O'Bryant was chosen to represent the Brown Science and Engineering Library and has over 30 years of experience working in the field of library sciences. As an applied sciences librarian, he oversees many of the engineering subject research guides for the library (Brown Sciences Library, https://www.library.virginia.edu/). The purpose of these consultations was to map out the skills developed and supported through their departments and to identify key resources offered through

their offices. This ensured that the questions reflected on the survey instrument were developed in consultation with subject matter experts such as Ms. Hersey and Mr. O'Bryant.

The second measure taken to limiting threats to content validity occurred once a draft of the survey questions had been finalized. The researcher emailed Ms. Hersey and Mr. O'Bryant with a request to serve as a content review expert by reviewing the survey items related to their respective domains for final review (Appendix T). Both agreed and provided the necessary feedback and edits to ensure that the questions found on the current survey were accurately reflective of their domain and practice areas.

The final step taken to limit threats to content validity occurred after Ms. Hersey and Mr. O'Bryant's review. Once changes to the survey instrument had been made based on their recommendations and feedback, the researcher then forwarded a link to the final survey to Dr. James Groves and Dr. Stephanie Moore. Dr. Groves was asked to review the instrument using his knowledge and expertise as an assistant dean at SEAS, his role as program director, and his understanding of the wider engineering field. Dr. Moore previously served as director of Engineering Instructional Design and was asked to review the instrument using her expertise in systems and instructional design. This step was taken to ensure that the questions found on the current survey reflected the wider domains of engineering and systems theory and that they followed principles of sound instructional design.

Construct Validity

Construct validity is described as the degree to which a test measures a stated construct.

Establishing this type of validity usually involves hypothesis testing and correlational research designs. Typically, independent studies are used to establish construct validity and to determine

whether scores are significant, meaningful, and useful and serve their intended purpose (Kaufman et al., 2006; Creswell, 2008).

The survey used in Phase 3 of the needs assessment does not statistically establish construct validity. The researcher recommends that such steps should be taken if the instrument will continue to be used or if it will be used for large-scale policy decisions that will affect the PRODUCED program or its students. Due diligence efforts have been made to ensure that the survey items measured the variables related to community. This was done mainly through item generation of the questions as suggested by Rattray and Jones (2005). The research constantly referenced both the relevant Research Questions guiding this study and the definition of community as outlined in the literature review to ensure that items accurately represented the construct.

Face Validity

Face validity is another form of validity that determines whether an item measures the construct it is supposed to measure and is intended for practical use. An instrument with high face validity contains questions that relate to the purported construct and should look valid or apparent to potential respondents. In short, participants are less likely to complete a survey instrument if the questions appear to be unrelated to the topic that the survey is supposed to be about. Face validity is typically established by initial piloting of the instrument or by having the actual participants rate the validity of the instrument as it appears to them. When establishing face validity for an instrument, experts in a particular content domain should be avoided because they tend to possess too much knowledge or expertise in a topic area. As an alternative, nonprofessional users and/or the general public can review an instrument in instances when the actual participants are unavailable (Nevo, 1985; Gall, Gall, & Borg, 2003; Kaufman et al., 2006).

Given the small N for this study (N=19), it was not feasible to pilot the instrument with current PRODUCED students. Indeed, with such a small N, there was concern that piloting of the entire survey with select students beforehand would expose them to the instrument and would ultimately lower the number of students available to take the survey. In the case of this project, efforts to limit threats to face validity were taken during the fall 2012 in the researcher's seminar in Instructional Technology. The researcher had the first draft of the survey instrument reviewed by an Instructional Technology professor, who specializes in Instructional Design, along with three senior doctoral students in Instructional Technology. These individuals were familiar enough with the general topics of community and online learning, yet removed enough from the topic to provide objective input. Their background in Instructional Technology and Instructional Design also helped to ensure that the survey questions and format were optimally designed for the target audience.

Internal Validity

Phase 2 of the needs assessment may have exposed students who were interviewed to aspects of some of the items found on the current survey. Such exposure could be considered a threat to the internal validity of the study design (Creswell, 2008). However, given that this survey is part of a needs assessment rather than a major component of a truly experimental project design, this threat is not expected to have a significant impact on the larger study at hand. The researcher also concluded that the exposure was considered relatively minimal and not enough to be considered a piloting of the full instrument because either (a) questions were reworded and revised since their initial administration via features such as the Likert frequency and behavior scales, and/or (b) a significant amount of time had passed between the Phase 2 interview and administration of the survey.

While time series designs, such as the one used in this study, limit the number of threats to internal validity, this approach does have its limitations. The effects of history and confounding variables pose a threat to studies such as the one contained in this capstone study. Indeed, during the time between the beginning of the experiment and the end of it, various events may have occurred that can influence the project's outcomes. Confounding variables are attributes or characteristics that the researcher cannot directly measure but may have an effect on a study. They are often difficult to measure because their effects and influence cannot be easily observed or separated from the impact of other variables (Creswell, 2008).

For example, over the course of the semester, additional events and variables were introduced that could have caused PRODUCED students to draw together or distance themselves from the community. These may have included open office meetings held for PRODUCED students by Dr. Groves, other CECD events made available virtually to students, or events that students themselves may have organized that the researcher is unaware of. Even the introduction and use of the PRODUCED Collab site as a resource, email announcements, follow-up reminders about the interventions, along with face-to-face or Lync conversations that the researcher or PRODUCED program staff may have hwith students enrolled in the program may have had an impact on the final outcomes of the study. This said, it is impossible to have a tightly controlled experiment and monitor all events (Creswell, 2008). At the same time, however, it is necessary to be aware of the impact that such events do have and to acknowledge the limitations they may impose on the study findings.

Additionally, recent graduates of the program and current students have reported forming study groups, having pre-existing bonds because they attended the same high school or community college, and/or getting together informally in their local towns. The frequency and

impact that such gatherings and bonds have had on students' sense of community and connection has not been formally measured. Thus, it may be difficult to gauge and separate how interconnected these experiences are and/or how much they influence their current experiences and attitudes towards community as PRODUCED students.

Maturation of participants posed another limitation to the study. Individuals develop and change throughout the course of a given experiment. Such changes may have affected scores between interventions. In this study, it was not feasible to control for maturation by carefully selecting participants who mature or develop in the same way (Creswell, 2008). Indeed, as highlighted in the literature review, participants may have been at different levels with respect to their need for community during the spring 2013 semester. Based on their time in the PRODUCED program, participants may have also varied with respect to their need to connect to CECD resources. Thus, it is possible that students just entering the program may have had less of a need to connect to CECD resources and may have more of a need to connect to other resources available through the UVA community. Meanwhile, students preparing to graduate may have had more of a need to connect to such resources. Unfortunately, given time and resource constraints, it was necessary to limit the scope of this project to a series of interventions based around CECD resources.

Triangulation

In qualitative research, triangulation is the process of corroborating evidence from different data sources to ensure the credibility of a study and to enhance its accuracy.

Triangulation is achieved by corroborating evidence from using different types of data sources (e.g., observations and interviews), drawing upon different individuals for information (e.g.,

students and administrators), employing different types of data collection methods (e.g., document review and interviews) (Creswell, 2008).

In this project, the researcher attempted to ensure a basic level of triangulation by using both interview and survey data during the needs assessment. The researcher also triangulated data by drawing upon three distinct types of informants: PRODUCED administrative leadership, recent PRODUCED graduates, and current PRODUCED students. With regards to the interventions implemented in this capstone, the researcher triangulated data by drawing upon survey data and usage activity as well as by combining both qualitative and quantitative methods to answer the researcher questions.

Researcher-as-Instrument

To avoid mention of the researcher's position as a student and role with the PRODUCED program would downplay the ways in which her own identity influenced her interactions with PRODUCED students as well as the subsequent interpretation of the data. To fail to do so would additionally compromise the trustworthiness and reliability of the qualitative data gathered for this project.

At the time of this study, the researcher worked for the PRODUCED program and was a member of the digital support team. Her key responsibilities included providing technical support and assisting faculty with the online delivery of the PRODUCED engineering courses and creating technical documentation related to the software and hardware used in the program. She also worked to spearhead and coordinate initiatives related to fostering a stronger sense of community among PRODUCED students.

Through her work with the PRODUCED program, the researcher was routinely exposed to the types of interactions PRODUCED students have with each other, their professors and on-

grounds students within the academic portion of the program. Because much of her work was customer-oriented, she may have been pre-disposed to observing and interpreting data in ways that privileged the PRODUCED student perspective. Furthermore, as a UVA student herself and a digital support assistant, her own perceived deficits in the formal or academic part of the system may have influenced or skewed her interpretation as she examined other parts of the system such as the informal or co-curricular systems.

In addition, through her work with the PRODUCED digital support team, the researcher may have been provided access to information that she would not otherwise have had access to had she been an external evaluator or designer with no prior relationship to the program. For example, working for the PRODUCED program greatly facilitated the connections that the researcher was able to make with contacts at Career Services and the library. Additionally, venues such as staff meetings, conversations with the PRODUCED administrative team, and/or PRODUCED student-centered events such as graduation celebrations and student group meetings with Dr. Groves may have also provided the researcher with insight about the program's needs and challenges beyond what the interview data alone would have provided.

Lastly, the researcher's status as a student and part-time worker is worthy of discussion. These aspects of her identity informed her own personal lens and introduced potential biases to the study. At the time of this study, the researcher was enrolled as a doctoral student in the Instructional Technology Ed.D. program at the Curry School of Education. This experience deepened her knowledge of technology as well as of the issues that shape technology-mediated learning environments such as the one used in the PRODUCED program. Coupled with her hands-on work for PRODUCED, the researcher was well primed to point out the tensions between theory and practice, and has, over the years, shown a tendency toward applied research.

As a result, she may have been more inclined to privilege practical and applied solutions over a rigorous traditional or theoretical approach to aspects of the project such as the needs assessment and the interventions described in this capstone study write-up. Lastly, her role as a student and part-time employee made her more likely to be sensitive to the needs and experiences of professional working students like the ones enrolled in the PRODUCED program.

Benefits

Connecting students to the wider UVA community's student support resources available through the CECD may have helped improve the overall program quality. This presented a huge benefit for PRODUCED program staff in their efforts to create a robust online experience for students. By connecting PRODUCED students to the wider UVA community this project benefited the School of Engineering and Applied Sciences by enabling them to be in a better position to offer two distinct yet equally enriching types of quality learning environments – an online option and an on-grounds option.

This capstone project may have also helped lessen feelings of isolation amongst PRODUCED students and created supports and performance interventions that are more inclusive and welcoming of PRODUCED students. Essentially, this project provided intellectual growth opportunities outside of the immediate academic classroom context that allowed students to exchange ideas and talk with each other and access other parts of the university. It could have also improved the PRODUCED student experience and benefited students by helping them acquire the knowledge and skills they needed to enter the workforce as professional engineers.

Lastly, the research activities undertaken for this study have allowed PRODUCED students to tell the story of the student experience from an online student perspective. This may have, in effect, helped to allay some of the concerns raised by PRODUCED students, who have

often reported feeling neglected, slighted or ignored in their interactions with the wider UVA community. Therefore, this study may have also helped to create more equitable access for online students and helped to begin to ease the tensions around their interactions with the university. Finally, this study provided data and a framework that may also serve as a foundation for future studies and initiatives implemented within the PRODUCED program or in the larger field of online education.

Limitations

As with all research and applied endeavors, the present study is not without limitations. Indeed, this study is limited to the context of one undergraduate online engineering program at one institution. Inasmuch, it is important to note that the findings and the needs uncovered in this work are specific to this project's particular context and may differ in other types of academic settings. Other online and distance learning engineering initiatives offered through SEAS, such as the Commonwealth Graduate Engineering Program (CGEP) or other UVA departments are advised to use this project as a guide, keeping in mind that they will need to customize according their respective program contexts and dynamics.

Due to factors such as time and resources, the interventions used for this project are limited to addressing only one aspect of the system that influence students' experience and connection to the UVA community. Thus, this study does not attempt to address PRODUCED students' needs with respect to other parts of the system that influence the student experience in to areas such as health and wellness, learning needs and supports, and interactions with faculty, etc. To add these aspects would have a tremendous effect on project scope and exceed the researcher's current capacity. Nevertheless, one significant limitation is that the current data do not draw upon or include the perspectives of professors teaching within the PRODUCED

program or on-grounds students. As a result, the current data may be overly biased with the PRODUCED student perspective and under representative of other perspectives such as those held by other key players that make up the wider UVA system.

POSITION PAPER

The overarching purpose of this study was to identify student support services and resources that could strengthen PRODUCED students' connection to communities outside of the immediate classroom context and to examine the impact of offering such resources to students. Needs assessment was used during the initial stages of this study to first identify the most pressing issues or needs. Findings from the needs assessment were used to ensure that the interventions developed for this project addressed specific needs within the context of PRODUCED. A time series research design was used to measure the impact of these interventions on students' engagement and community formation.

The questions that guided this inquiry included

- RQ1 As determined through needs assessment, what current supports and services exist for PRODUCED students beyond the online classroom community?
- RQ2 Based on needs assessment data from the PRODUCED program, what kinds of interventions can be implemented to connect students to the wider community?
- RQ3a What is the impact of such interventions on PRODUCED students' engagement with and involvement in communities outside of the classroom, such as the Center for Engineering Career Development (CECD), as measured by student surveys, researcher's observations, students' Collab activity, attendance, and usage of the CECD?
- RQ3b What characteristics of community identified in the literature do students in the PRODUCED program evidence through surveys, attendance, usage and observations of event behavior during these intervention

This chapter revisits each research question and then presents the results from this study as determined by data from student surveys, the researcher's observations, students' Collab activity, attendance, and students' usage of the CECD. Elements include data interpretation, key findings, recommendations, and solutions for next steps, as well as implications of these proposed recommendations.

Research Questions 1 and 2

The research questions that guided the initial portion of the capstone inquiry included RQ1 As determined through needs assessment, what current supports and services exist for PRODUCED students beyond the online classroom community?

RQ2 Based on needs assessment data from the PRODUCED program, what kinds of interventions can be implemented to connect students to the wider community?

Questions 1 and 2 Findings

Full reports of the findings related to these two questions can be found in Appendices U through W. In general, the needs assessment uncovered that very few supports and services existed for students beyond the online classroom community. The types of interventions that could connect students to the wider community have been summarized as needs in this section.

Pre-enrollment. Community formation occurs prior to students enrolling in the PRODUCED program. There is a need for incoming PRODUCED students to feel supported and to interact with each other at the community college level so that they can form the bonds and relationships that will continue to develop and strenghten as they progress through the PRODUCED program.

Student-teacher interactions. There are tensions and gaps between faculty and PRODUCED students during their interactions. There is a need for faculty to understand how to use the tools and technologies that will connect them to PRODUCED students. There is also a need for them to understand PRODUCED students' needs and perspectives as online learners so that they can better understand why consistent and accessible office hours and detailed email responses enhance their experience in the program. There is also a need for faculty to make better use of the technical, practical, and professional knowledge that PRODUCED students bring to the classroom, to their peers, and to the wider university.

Student-student interactions. There are tensions and gaps between on-ground students' and PRODUCED students' interactions. PRODUCED students felt that they often do not have the level of access that their on-ground counterparts have. Thus, there is a need to reduce this disparity. Students also felt that on-grounds students did not understand their experience as online learners. There is also a need for on-ground students to recognize the value and benefits that PRODUCED students bring to the classroom. There is a need for both groups to develop better strategies for communicating expectations, collaborating together as virtual teams, and working on assignments using the technologies available to them.

PRODUCED student-specific needs: Time management. PRODUCED students reported many major life events such as marrying, having families, and purchasing new homes. Many wished that they had more time to complete all that they needed to accomplish. The tensions inherent in having to schedule and structure activites in advance or not being available in the evenings when on-grounds students were available produced constraints and kept them from being able to work on projects at the spur of the moment. There is a need to

equip PRODUCED students with skills and strategies for managing their time so that they can successfully balance their academic, family, and professional obligations and identities.

PRODUCED student-specific needs: Bonding. PRODUCED students also play a major role in supporting each other by forming study groups and bonding outside of class. While orientation and courses provide an opportunity for students to meet and solidify their bonds, many students reported not having the chance to meet new students in the program or bond outside of specific class contexts. The longer students stayed in the program, the harder it was for them to connect with other PRODUCED students. As online learners, they felt they lacked a way to "tap" other students on the shoulder and ask questions the way they would in a classroom. Thus, there is a need for PRODUCED students to be able to continuously form or strengthen their bonds with students in the program. Creating such space is important because PRODUCED students are often each other's greatest source of support while in the program and upon graduation. Such spaces would also allow for informal types of interactions to occur, such as students being able to ask each other questions about the content and to gain access to informal knowledge bases.

PRODUCED student-specific needs: Reaching in. Email is not completely effective in communicating with students. Most PRODUCED students were motivated to pursue opportunities when communication came from someone with whom they had a personal connection (e.g. Dr. Groves or a professor), when they were related to professional or personal interests, or when they were tied to an award or incentive. Many students requested more personalized and sustained individualized contact and would have liked to see the program do more "reaching in" rather than requiring them to have to "reach out" for support. Students also requested a centralized resource or repository where they could ask

questions related to their needs and interests. Thus, there is a need to improve communication channels so that they 1) target student's specific needs, 2) encourage students to become involved in the wider community, and 3) enable them to find out what is going on and ask questions at any point in time.

Connecting to the university. While students were either satisfied with their connection to the library or had not used it much, the need to connect and access career development resources came through very strongly in interviews and survey data. Thus, there is a strong need for PRODUCED students to connect with aspects of the university community that could connect them to potential employers, networking, and job/internship opportunities as well as career fairs. There is also a need to equip them with key skills such as interviewing, resume writing, and even professional branding so they can represent themselves as online students that are as qualified as on-grounds students.

Connecting to SEAS. Students were not very aware of the activities at SEAS. With regards to the broader university, many students were unaware of what was available to them or overwhelmed by the number of systems and channels they were required to go through to access resources and events. Not having this equal awareness or access to SEAS reinforced the disparity between on-grounds and online learners such as PRODUCED. There is a need to provide students with a mechanism for staying informed about these activities as well as vehicles that allow them to participate in these offerings.

Findings from the organizational analysis. The interview with Dr. Groves,
PRODUCED program director, also helped answers Research Questions 1 and 2. This
interview provided insight into the types of interventions that could be implemented to help
provide students access to the affordances of the wider community. For Dr. Groves, creating

a PRODUCED community satisfies students' basic need for human and social interaction and benefits students in a number of ways. First, community provides intellectual growth opportunities outside of the immediate academic classroom context that allow students to exchange ideas and talk with each other. Community is perceived to be a way to lessen isolation and will help students build long-term professional skills such as teamwork, cooperation, and working virtually.

For Dr. Groves, creating a sense of community also provides students with a reference point to gauge their progress, gives them a sense of direction, and serves as a supportive guide as they complete the program. Lastly, creating community enables SEAS, as illustrated through the context of PRODUCED, to be in a position to offer two different types of quality learning environments – an online option and an on-grounds option. For Dr. Groves, the ideal community strikes a balance between providing support to students and encouraging them to be self-reliant advocates for themselves.

Dr. Groves' interview also brought up a number of concerns that alumni and current students had raised during their interviews. For example, the stability and reliability of the technology platform and infrastructure used to broadcast PRODUCED classes was seen as a pressing concern at the organizational level. Moreover, as illustrated in the student interviews, Dr. Groves' interview highlighted challenges with regards to faculty training and adaptation of the technologies used in PRODUCED. Dr. Groves was also aware of the concerns around office hours and noted that ensuring that faculty consistently held online office hours for PRODUCED students was part of his ideal vision for the program.

Dr. Groves thought that the program was not fully using the technology infrastructure to reach distance learners with respect to co-curricular offerings. Although technology

presented a challenge, space constraints were also seen to be challenges to distributing the technologies and encouraging the use of the technology infrastructure. Indeed, there are only so many available lab or classroom spaces to conduct educational activities in. The ideal PRODUCED community would provide online students with a similar level of access to the wider UVA community and the resources offered to on-grounds students. Inasmuch, the larger programmatic vision would be to increase students' access by making events available to students in real time and via recordings in ways that allowed them to see, hear and participate in the same way that on-grounds students can. Also included in this vision is the desire for PRODUCED students to participate in extra-curricular projects, such as the mini baja car and the eco mod house, engineering clubs, and team competitions.

Dr. Groves was aware of the differences between on-grounds students' and PRODUCED students' experiences as well as the apparent divide between the two groups. One of his primary goals was to ensure that PRODUCED students connect with each other, older PRODUCED students, and with on-grounds students. One strategy he thought would help accomplish this goal was a wide-scale adaptation of Lync-like communication tools which would enable PRODUCED students to connect with each other as well as with faculty and on-grounds students more effectively and efficiently.

Ultimately, Dr. Groves' vision for the PRODUCED community extended much further than ensuring a level playing field and equal access for PRODUCED students. His wider vision was for on-grounds students, faculty, and the wider institution to see the value of technology-enabled learning environments such as the PRODUCED program. The long-term vision was, thus, not just a one-sided integration of PRODUCED into the UVA culture

but a larger organizational shift that would make two distinct yet equitable learning environments possible.

A final finding from this interview included Dr. Groves' long-term vision and goals for community colleges. During the interview, he expressed a desire for community colleges to shift their current thinking and approach to higher education. For Dr. Groves, the current model of engineering education at the community college level does not offer enough engineering tracks that students are interested in and unnecessarily pulls students out of their home communities to attend college. His vision for community colleges included developing a stronger educational pipeline at the community college level. This could be accomplished if community colleges saw themselves as the first two years of a four-year degree and also if they worked as extensions of on-grounds experiences such as those found at UVA. For him, appropriate strategies to do this included expanding the types of courses and tracks offered by community colleges, hiring additional faculty, encouraging co-curricular activities, increasing, and, in some cases, creating accessible and functional lab space, as well as coordinating and collaborating with other community colleges. Dr. Groves also felt that state entities such as secretaries of education, commerce and technology along with the statewide engineering peer group, which is composed of faculty and deans, could be instrumental in making this happen.

This final finding is significant because it is reminiscent of the larger outreach mission and values that initially sparked the creation of the PRODUCED program. It also reveals the ways in which community colleges and state entities can support the mission, goals, and values PRODUCED program. In many respects, this is important because the program cannot achieve these goals in isolation or in a vacuum. Indeed, to achieve optimal

success, even a program such as PRODUCED must reach out to and be supported by the communities that make up the wider system in which it is contained. Finally, as illustrated through the alumni interviews, strengthening the pre-PRODUCED program experience for students at the community college level in the ways described above could potentially have a benefit for future PRODUCED students.

A full report and analysis of the survey data from Phase 3 of the needs assessment is provided in Appendix W. This quantitative data provides final clarification as to what kinds of interventions could be implemented to connect students to the wider community. As illustrated in Table 3 of that report (Appendix U), gap analysis results indicated that the smallest gaps in means existed with respect to students' connection to UVA engineering alumni (gap = 0.21), on-grounds students (gap = 0.21) and PRODUCED alumni (gap = 0.31). Moderate performance gaps existed in library resources (gap = 0.63), PRODUCED students (gap = 0.68), faculty (gap = 0.79), CECD staff (gap = .84), and CECD events (gap = 0.95). The largest gaps were found in students' connection to SEAS events (gap = 1.05), CECD resources and services (gap = 1.06), SEAS resources (gap = 1.16), local businesses (gap = 1.69), and local engineering job opportunities (gap = 1.79). For purposes of this capstone study, connecting students to the CECD's resources and services was selected as the most viable way to begin connecting students to the wider UVA community. Designing interventions around the CECD was an optimal way to address the issues and themes important to fulfilling the program's organizational mission and vision, as illustrated in Dr. Groves' interview and the interviews with alumni and current and former students. It also was ideal because the CECD was willing to partner on this project, as they too had wanted to increase their connection with online students. Having a willing partner and central point of

contact was indispensable to the design and build out of these interventions. More strategically and in line with goals of needs assessment, connecting students to the CECD was a pre-requisite for students to successfully connect with some of the groups that had higher gaps on the survey (e.g., local businesses and local engineering job opportunities) and to fulfill the program's mission. Thus, the cost of meeting students' need to obtain employment through local job opportunities and to be adequately primed for obtaining those opportunities through the CECD's offerings outweighed the cost of ignoring those needs.

Research Question 3

This portion of the capstone inquiry was guided by the following questions:

- RQ3a What is the impact of such interventions on PRODUCED students' engagement with and involvement in communities outside of the classroom, such as the Center for Engineering Career Development (CECD), as measured by student surveys, researcher's observations, students' Collab activity, attendance, and usage of the CECD?
- RQ3b What characteristics of community identified in the literature do students in the PRODUCED program evidence through surveys, attendance, usage, and observations of event behavior during these interventions?

Question 3a and 3b Findings

A time series research design was used to measure the impact of these interventions on students' engagement and community formation. Data from student surveys, the researcher's observations of event behavior, students' Collab activity, attendance, and students' usage of the CECD was used to measure the impact. This data is presented below.

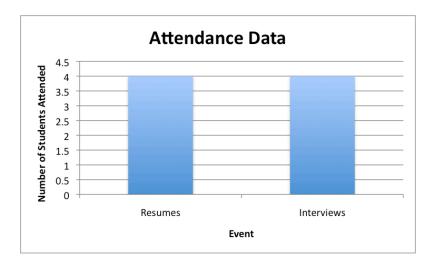
Attendance. Three students attended the resumes workshop on the actual day that it was held for students virtually. One student clicked on the resume workshop link on the CECD Collab site and used the "on-demand" feature. Thus, the total attendance for the resumes workshop was 4 students. This represents 21% of the PRODUCED student population.

Two students attended the interviews workshop on the actual day that it was held for students virtually. Two students clicked on the interviews workshop link on the CECD Collab site and used the "on-demand" feature. Thus, the total attendance for the interviews workshop was 4. This also represents 21% of the PRODUCED student population.

The total number of students that attended both of these workshops was 8, which represents 42% of the PRODUCED student population. Interestingly, 3 of these students were repeat attendees. The majority of students who attended the resumes workshop (75%) were preparing to graduate during the spring of the study period. Students attending the interviews workshop came from an equal mix of those preparing to graduate during the spring of 2013 and those preparing to graduate the following year.

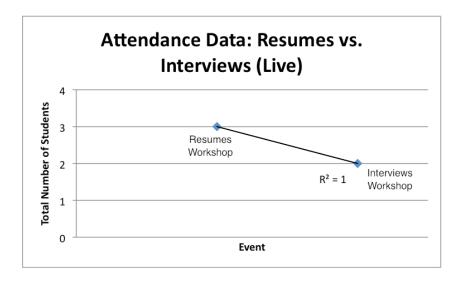
As illustrated in Figure 1, there was no change in the total workshop attendance over time.

Figure 1. Event Attendance Data



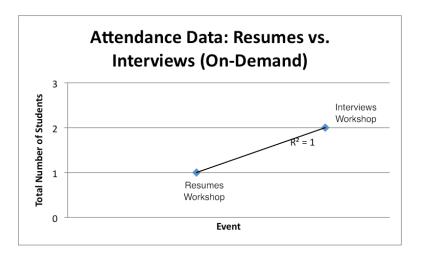
As illustrated in Figure 2 and Figure 3, there were changes in attendance over time with respect to whether PRODUCED students attended live or via the on-demand option. As illustrated in Figure 2, the trend was that less students attended the live workshops over time.

Figure 2. Comparison of Workshop Attendance Data (Live)



Meanwhile, as illustrated in Figure 3, more students attended the on-demand workshops over time.

Figure 3. Comparison of Workshop Attendance Data (On-Demand)



CECD Collab site activity. During the eighth week of the study, the researcher noticed a redundancy in the setup and design of the forums tool that had been used to collect data. The issue was that even though students accessed the forum thread that contained a resource (e.g., video link or PDF), they still had to open the actual message. Basically, the thread would automatically display and preview the message. At the same time, however, in order to capture the appropriate usage statistic, students had to double click on the message or select "mark as read", even though the content they needed was already displayed. Most students would not think to double click or mark "as read" on a message they had already seen. This meant that there could have been usage data that wasn't fully captured during the study (e.g., students could have watched a video or accessed a PDF, but because they didn't double click on the message or select "mark as read" the usage statistic wasn't captured). While this suggested a wider usability issue with the Collab forums tool, it substantially affected data collection efforts. As a result, the researcher had to create a separate survey to distribute to students at the end of the study. The data reported in this section were what the system captured during the study period. The post-study student survey provided a more

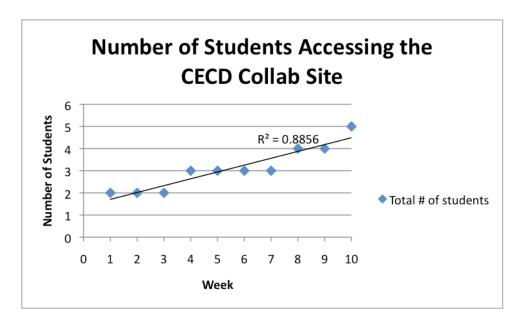
accurate assessment of students' usage and activity on the Collab site, but it only captured at one point in time (e.g., at the end of the study).

In general, usage according to the CECD site's metrics appeared low. During Week 1 of the study, two students used the site. One student accessed the instructions on how to use the site and also the resources related to cover letters and thank you letters. The data for the other student was unusually high. This student contacted the researcher with a problem and explained that he could not open the PDF files. In an attempt to troubleshoot on his own, he experimented with opening up numerous ones with the hopes of getting one to work. Upon further inquiry with the Collab technical support group, it was discovered that there was a known issue with Collab running PDFs on a Firefox browser. This caused the researcher to have to re-upload all the files. It cannot be assumed that this student successfully accessed those files. Instead, the statistics associated with his usage were probably due to his troubleshooting.

No additional students accessed the CECD Collab site during Week 2 and Week 3 of the study. During Week 4, however, one additional student accessed the site. Records show that this student accessed the interviews workshop via the on-demand recording function. No additional students accessed the site between Weeks 5 through 7. During Week 8, an additional student accessed a resource on the CECD connections site. This resource was the resumes workshop via the on-demand recording function. During Week 9 of the study, no additional students accessed the CECD connections Collab site. However, during the final week of the study (Week 10), one student who had not accessed any of the resources on the Collab site up until that point accessed every last resource available.

Figure 4 presents the total number of PRODUCED students who accessed the CECD connections Collab site over time. While the total usage was low with regard to the total number of students using the site, the trend does show an increase over the course of the study period.





In total, the data showed that 5 students accessed the CECD connections Collab site. This represents 26% of the PRODUCED student population. Of the 5 students who used the site, only 2 of them were graduating in the spring of the study period. Interestingly, data indicated that once a student accessed the Collab site, their usage of other resources did not increase. Thus, if a student accessed a resource during Week 1 of the study, their usage of the site's resources did not increase as the study progressed. Instead, the data showed a tendency for new students to access the site rather than for previous users to deepen or expand their usage or exploration of the site. Additionally, there were no spikes in student usage before or after the virtual workshop interventions. Thus, this part of the study data did

not suggest that these workshops influenced or prompted students' use of the CECD Connections Collab site.

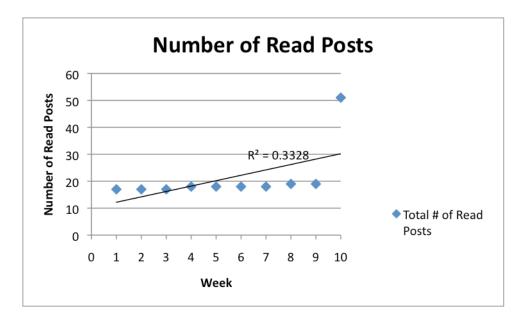
Table 4 presents a frequency count of each students' total authored, read and unread posts on the CECD connections Collab site along with the total percentage of read posts per student. This data reflects the final totals at the end of the study.

Table 4
Student usage of the CECD Connections Collab Site

Student	Authored	Read	Unread	Percentage Read
DA2	0	0	32	0%
G93	0	0	32	0%
DK8	0	1	31	3%
8ZP	0	0	32	0%
6T5	0	0	32	0%
WZG	0	0	32	0%
862	0	0	32	0%
FDT	0	0	32	0%
8PT	0	15	17	47%
QV0	0	0	32	0%
BQR	0	0	32	0%
X40	0	2	30	6%
X81	0	32	0	100%
LW9	0	0	32	0%
M0H	0	0	32	0%
PAH	0	0	32	0%
HGJ	0	1	31	3%
EGI	0	0	32	0%
CU4	0	0	32	0%

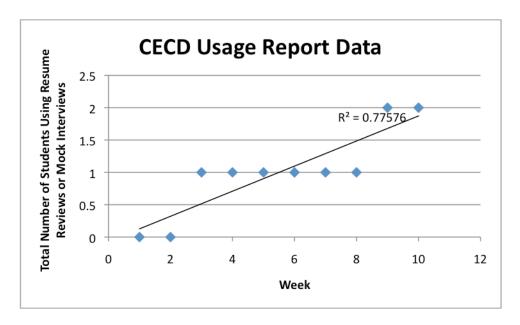
As reflected in Table 4, none of the PRODUCED students authored any posts during the study period. A few students did, however, read the posts. Figure 5 presents the total number of read posts over time. Unfortunately, the R-squared value for this analysis was very low and the resulting data should not be used to make predictions.

Figure 5. Number of Read Posts



CECD usage. Only two students took advantage of having their resume reviewed by CECD staff. None of the students in the study reached out to the CECD to participate in mock or behavioral interviewing. One student made arrangements to reach out for a resume review during the resume workshop during Week 3 of the study. Then during Week 9 of the study, another PRODUCED student reached out for a resume review. As illustrated in Figure 6, the trend showed an increase in student engagement within this part of the CECD community over time.

Figure 6. CECD Usage Report Data



No pattern of use could be determined between when the workshops were offered and when students reached out. However, the students who reached out to use these services were upcoming graduates of the program.

Event behavior. During the resumes and interviews virtual workshops, the researcher used an observational checklist to qualitatively capture and describe behaviors and activities that occurred (Appendix P). The purpose of this checklist was to describe the ways and depth to which community developed during these workshops. The sections that follow describe data and observations collected with this checklist.

Resumes Workshop. This workshop lasted 41 minutes and 31 seconds. It received a holistic score of 1 because only 13 of the possible 28 behaviors were exhibited during the session. With approximately 46% of the behaviors observed in this workshop, the level of community for this workshop would technically be considered as "underdeveloped." However, it was very close to being characterized as "emerging" based on the scoring guide found on the observational checklist (Appendix P).

Before the workshop, many of the foundational, technical, and logistical features of community were observed. For example, the event was publicized via email and on the CECD Collab site before the workshop. Details about the event were also posted on the CECD Collab site calendar along with a link to RSVP.

During the workshop, the speaker was heard and seen, and their presentation was successfully shared with the group. At one point during the workshop, a portion of the presentation could not be seen clearly so the speaker and the researcher had to work together to make the necessary adjustments to the view. During the workshop, the speaker interacted with PRODUCED students by acknowledging their presence and inviting them to ask questions. Many of the questions were technical or generic in nature. Thus, questions such as, "Can you see this?", "Do you have any questions about this topic?", or "Does this make sense?" were quite frequently observed. Questions that focused more on specific content or on the topical nature of the workshop were less frequently observed (e.g., "Have you written a cover letter before?" or "Would that work for your resume?"). The speaker tended to invite students to submit their resumes for one-on-one review or to review the materials that had been posted to the CECD site.

Students also posed questions to the speaker and even added to the discussion by expanding on points by using and incorporating their personal experiences. Questions such as "How do you handle breaks in work history?" and "How do you balance your most relevant work history with chronological info?" allowed the speaker to provide specific targeted responses to students' questions. Sometimes the questions and personal experiences were intertwined. Towards the end of the workshop, for example, a student inquired about including full performance reports and potentially outdated references in their resume to a

potential employer. The speaker suggested that the student use university or community college references because they were more current. Another student who had previous work experience in human resources was able to further add to the discussion by offering their personal experience. This student clarified that performance reports were not necessary and that typically employers can only legally verify whether a person worked at a particular location and the dates of service during a reference check. After the event, the presentation and relevant presentation materials were housed on the CECD Connections Collab site.

As displayed in Table 5, what was not observed in this workshop were sustained interactions that promote deeper levels of community interaction and formation. Although behaviors such as the speaker inviting PRODUCED students to share their experience or to model or demonstrate a skill were observed, many of these invitations did not advance very far. Most of these invitations were invitations for students to test out the audio, submit their resume for review, schedule one-on-one help with a resume, or to check out the resources on the CECD Collab site.

Friendly or informal chats between the speaker and the student as well as between students were not observed. Opportunities for small break out group activities or sessions and evidence of students making use of the CECD connections forum to continue the conversations in the online space were also not observed.

Table 5

Features and Behaviors Exhibited During the Resume Workshop

	Did it	
Event Features	Occur?	
Before the Event		
Event is publicized: email / CECD Announcements page / CECD	yes	
calendar.		
Presentation, speaker contact information, and/or relevant handouts are	yes	
housed on the CECD Connections Forum.		
During the Event		
Speaker is heard.	yes	
Speaker is seen.	yes	
Speaker's presentation is shared.	yes	
After the Event		
Speaker hangs around for a few minutes so that PRODUCED students can	no	
ask any lingering questions.		
A link to the survey is posted on the CECD site.	yes	
Speaker or PRODUCED staff participate in the Q&A forum on the CECD		
Connections Forum.		

Event Behaviors	Frequencies
Speaker Interactions with PRODUCED Students	
Speaker acknowledges PRODUCED students' presence.	4
Speaker poses questions to students.	19
Speaker invites PRODUCED students to share their experiences, thoughts or opinions.	1
Speaker invites PRODUCED students to model, role play, or to demonstrate a skill or idea.	12
Speaker responds to student questions or remarks in chat window or out loud.	9
Speaker engages in friendly chat or informal conversations.	0
Opportunities for Group Interactions	
Speaker provides opportunities for small break-out group activities or sessions.	0
Speaker provides feedback and guidance to students in these groups.	0
Speaker observes these groups.	0
PRODUCED Students Initiate Interactions with the Speaker	
PRODUCED students ask questions via chat or using audio capabilities.	9
PRODUCED students ask for clarification.	0
PRODUCED students add to the discussion by expanding on a point using their experience.	10
PRODUCED students submit questions before or after the workshop on	0
the CECD Connections Forum.	0
PRODUCED students engage in friendly chat or informal conversations. PRODUCED Students' Interactions With Each Other	0
PRODUCED students interactions with Each Other PRODUCED students share ideas or resources.	0
PRODUCED students share ideas of resources. PRODUCED students engage in friendly chat or informal conversations.	0
PRODUCED students engage in mentry that of informal conversations. PRODUCED students ask each other about speaker comments.	0
PRODUCED students ask about missed speaker comments (e.g., What	0
did he/she say? Do you think he/she means?).	U
PRODUCED students make personal remarks or shares insights about the	0
speaker's comments.	J

Interviews workshop. This workshop lasted 52 minutes and 34 seconds. It received a holistic score of 1 because only 13 of the possible 28 behaviors were exhibited during the session. With approximately 46% of the behaviors observed, the level of community observed in this workshop would also be considered "underdeveloped." However, like the resumes workshop, this event showed promise towards being characterized as "emerging" based on the criteria outlined in the observational checklist.

Basic foundational features needed to foster community, such as publicizing the site and posting the event details and RSVP information on the CECD Collab site, were in place before the beginning of the workshop. During the workshop, both the audio and video capabilities, which allowed the speaker to be seen and heard, functioned properly. The speakers' presentation was also successfully shared with participants using the desktop sharing functionality. This ensured that the technical and basic logistical components that are needed to create virtual community were in place.

During the workshop, the speaker posed questions and invited PRODUCED students to share their experiences, thoughts, or opinions. As observed in the resume workshop, many of these questions, were simple questions such as "Do you have any questions?" However, twice during the interviews workshop, the speaker asked more probing questions that engaged students to share their personal experiences, thoughts, or opinions. Questions that focused more on helping students connect the content of the workshop with their personal experiences included, "Have either of you had a Skype interview?" or, when responding to a student's comment about having once had to take an unexpected test at the end of an interview, the speaker asked "What did you do in that situation?"

During the workshop, students posed questions to the speaker that drew on their personal experiences. For example, one student had a question about how they should handle uncomfortable or potentially illegal questions during an interview. Another student asked how they could present what others sometimes have perceived as weaknesses in their personality as a strength during an interview. A few other questions posed during the event also showed students drawing from their personal experiences. These included questions and comments such as: "I've seen them fly kids down for big interviews, so how do you handle

group interviews like that?" and "What if you finish the interview and they tell you have to take a test at the end?"

Interestingly, students did not offer comments or add to the discussion during the presentation by expanding on a point using their personal experiences with the same detail and depth that they did as in the resumes workshop. However, during the workshop, there was one instance where a participant engaged in what was considered friendly chat or informal conversation. In this occurrence, the student sent an instant message to the group because he/she had to sign off a little early and wanted to thank the speaker.

As displayed in Table 6, evidence of higher levels of community engagement were not observed. For example, friendly or informal chats with the speaker or among students did not occur. Additionally, opportunities for small break-out group activities did not occur during the workshop. After the workshop, the recording link was posted and distributed to students. However, evidence of students building and extending community into the online CECD connections virtual space via conversations and posting was not observed.

Table 6
Features and Behaviors Exhibited during the Interviews Workshop

	Dian
Event Features	Occur?
Before the Event	
Event is publicized: email / CECD Announcements page / CECD calendar.	yes
Presentation, speaker contact information and/or relevant handouts are	yes
housed on the CECD Connections Forum.	
During the Event	
Speaker is heard.	yes
Speaker is seen.	yes
Speaker's presentation is shared.	yes
After the Event	
Speaker hangs around for a few minutes so that PRODUCED students can	no
ask any lingering questions.	
A link to the survey is posted on the CECD site.	no
Speaker or PRODUCED staff participate in the Q&A forum on the CECD	no

Did it

Behaviors	Frequency
Speaker Interactions with PRODUCED Students	
Speaker acknowledges PRODUCED students' presence.	1
Speaker poses questions to students.	10
Speaker invites PRODUCED students to share their experiences,	2
thoughts, or opinions.	
Speaker invites PRODUCED students to model, role play, or to	7
demonstrate a skill or idea.	
Speaker responds to student questions or remarks in chat window or out	5
loud.	
Speaker engages in friendly chat or informal conversations.	0
Opportunities for Crown Interactions	
Opportunities for Group Interactions Speaker provides opportunities for small break out group activities or	0
Speaker provides opportunities for small break-out group activities or sessions.	U
	0
Speaker provides feedback and guidance to students in these groups. Speaker observes these groups.	0
PRODUCED Students Initiate Interactions with the Speaker	Ü
PRODUCED students intrace interactions with the speaker PRODUCED students ask questions via chat or using audio capabilities.	5
PRODUCED students ask for clarification.	0
PRODUCED students add to the discussion by expanding on a point using	0
their experience.	O
PRODUCED students submit questions before or after the workshop on	0
the CECD Connections Forum.	O
PRODUCED students engage in friendly chat or informal conversations.	1
PRODUCED Students' Interactions with Each Other	1
PRODUCED students share ideas or resources.	0
PRODUCED students engage in friendly chat or informal conversations.	0
PRODUCED students ask each other about speaker comments.	0
PRODUCED students ask about missed speaker comments (i.e. What did	0
he/she say? Do you think he/she means?).	J
PRODUCED students make personal remarks or share insights about the	0
speaker's comments.	-

Table 7 examines how the frequency of these behaviors changed with time and also categorizes them according to whether such behaviors would be seen in self-directed learning (SDL) environments, in communities of inquiry (CoI) or in both types of environments.

Over the course of the study, there was a decrease in the frequency of many of the event behaviors. Only two behaviors showed a positive change in frequency. These were "Speaker invites PRODUCED students to share their experiences, thoughts, or opinions,"

which had a +1 change, and "Students engage in friendly conversation with each other," which also had a +1 change. The remaining behaviors experienced negative changes in frequency ranging from -10 to -3.

Table 7
Change in Workshop Behaviors Over Time

Event Behaviors and Category	Frequency	Frequency	Change		
	Count -	Count -			
	Resumes	Interviews			
Speaker acknowledges PRODUCED	4	1	-3		
students' presence (SDL and CoI).					
Speaker poses questions to students (SDL and CoI).	19	10	-9		
Speaker invites PRODUCED students to	1	2	+1		
share their experiences, thoughts, or opinions	-	_			
(SDL and CoI).					
Speaker invites PRODUCED students to	12	7	-5		
model, role play, or to demonstrate a skill or					
idea (CoI).					
Speaker responds to student questions or	9	5	-4		
remarks in chat window or out loud (CoI)					
Speaker engages in friendly chat or informal	0	0	0		
conversations (CoI)					
Opportunities for Group Interactions					
Speaker provides opportunities for small	0	0	0		
break out group activities or sessions (CoI).					
Speaker provides feedback and guidance to	0	0	0		
students in these groups (CoI).					
Speaker observes these groups (CoI).	0	0	0		

	Frequency Count -	Frequency Count -	Change
Event Behaviors and Category	Resumes	Interviews	
PRODUCED Students Initiate 1		ith the Speaker	
PRODUCED students ask questions via chat or using audio capabilities (CoI).	9	5	-4
PRODUCED students ask for clarification (SDL / CoI).	0	0	0
PRODUCED students add to the discussion by expanding on a point using their experience (CoI).	10	0	-10
PRODUCED students submit questions before or after the workshop on the CECD Connections Forum (SDL or CoI).	0	0	0
PRODUCED students' Inter	actions With	Each Other	
Share ideas or resources (SDL or CoI).	0	0	0
Engage in friendly chat or informal conversations (CoI).	0	0	0
Ask each other about speaker comments (CoI).	0	0	0
Ask about missed speaker comments (e.g., What did he/she say? Do you think he/she means?) (CoI).	0	0	0
Make personal remarks or shares insights about the speaker's comments (CoI).	0	0	0

Post-event survey. After each CECD workshop, students were asked to complete a brief online survey via Survey Monkey to gauge their connection to the CECD. The survey contained four questions. This request was made of students who either attended virtually or who accessed the event using the on demand link available through the CECD connections Collab site. Although 8 students attended the events, only 3 students completed both surveys. The survey response rate for the resumes workshop was 50%. Meanwhile the survey response rate for the interviews workshop was 25%.

Table 8 presents the findings from the post-event survey for the resume workshop. In general, respondents agreed that they felt a stronger connection to the CECD. Thus, for Question 1, one respondent somewhat agreed while the other indicated a solid agreement.

Both agreed they would recommend the event to other PRODUCED students (Question 2). Generally, both would also be more likely to attend an event like this again in the future. Thus, for Question 3, one respondent indicated they somewhat agreed while the other indicated a solid agreement. On the whole, both respondents had a better understanding of the services offered through the CECD. Thus, for Question 4, one respondent indicated that they somewhat agreed while the other indicated a solid full agreement.

Table 8

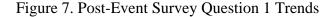
Post-Event Survey Results for the Resume Workshop

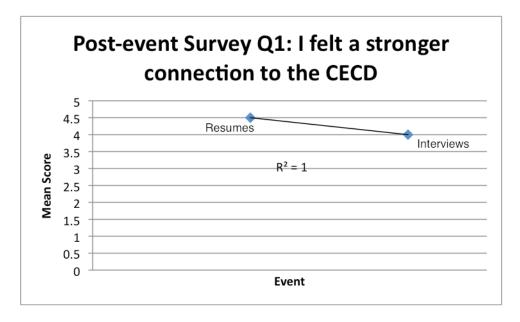
	Mean	Median	Range	Std. Dev.	Variance
Question 1: I felt a stronger connection to the Center for Engineering Career Development	4.5	4.5	1	.71	.5
Question 2: I would recommend this event to other PRODUCED students.	5	5	0	0	0
Question 3: I would be more likely to attend an event like this again.	4.5	4.5	1	.71	.5
Question 4: I have a better understanding of the services offered through the Center for Engineering Career Development.	4.5	4.5	1	.71	.5

There was not enough data to run descriptive statistics on post-event survey data from the interviews workshop because only one student completed that survey. This student somewhat agreed that they felt a stronger connection to the CECD. They agreed that they would recommend this event to other PRODUCED students. This student somewhat agreed

that they would be more likely to attend an event like this again. Lastly, they somewhat agreed that they had a better understanding of the services offered through the CECD.

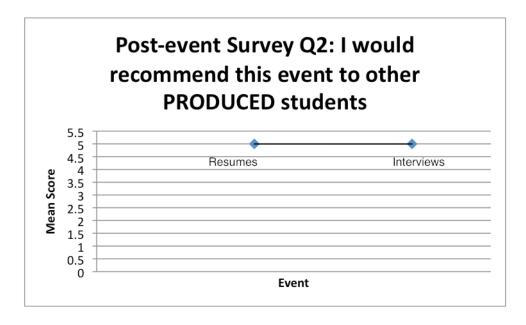
Figures 7 through 10 examine how students' responses to each of these questions changed over time. The trend decreased over time for all of the questions except Questions 2, which had no change. Thus, as illustrated below in Figure 7, over time, the trend showed that students' feelings of connection to the CECD were beginning to decrease. This said, responses still indicated agreement with this question rather than disagreement. Additionally, the sample size for the interviews workshop was only based on 1 participant.





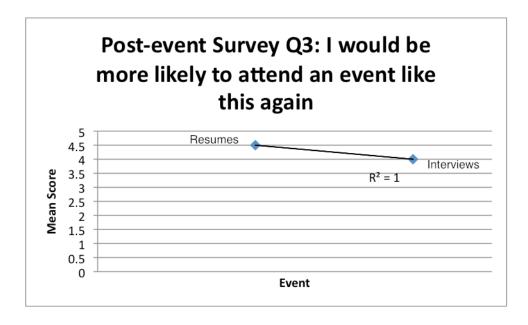
As illustrated in Figure 8, there was no change in students' decision to recommend these events to other students. They all agreed that they would recommend the event to other students.

Figure 8. Post-Event Survey Question 2 Trends



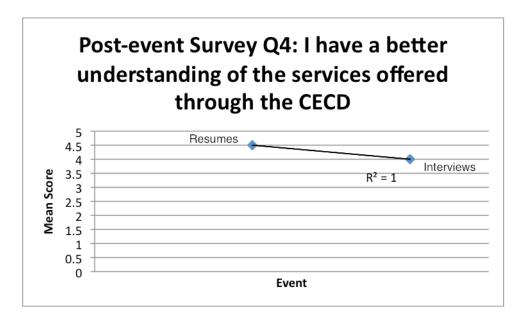
As illustrated in Figure 9, the number of students agreeing that they would attend an event like the ones offered through the study began to show a decrease. However, responses were still on the agreement part of the scale as opposed to disagreement. Additionally, the sample size for the interviews workshop was only based on one respondent.

Figure 9. Post-Event Survey Question 3 Trends



As illustrated in Figure 10, student responses showed a slight decrease with regards to whether they had a better understanding of the services through the CECD. However, responses were still on the agreement part of the scale as opposed to disagreement and the sample size for the Interviews workshop was only based on one respondent.

Figure 10. Post-Event Survey Question 4 Trends



End-of-study survey. As described earlier, due to limitations in the Collab data collection capabilities, students were instructed to complete a short survey at the end of the study period. This survey asked them to identify the resources that they viewed on the CECD Connections Collab site. In total, 17 students completed this survey. Only one student started the survey and did not complete it. Of those 17 completed surveys, 8 students reported that they viewed resources on the CECD Collab site. Only 1 student did not complete the survey. Meanwhile, 9 students reported not having viewed the resources on the CECD Collab site. Table 9 summarizes this information.

Table 9
Student Usage of the CECD Connections Resources Site

Viewed	Percentage	Did Not View	Percentage	
8	47.1%	9	52.9%	

Students who did not view any resources on the CECD connections Collab site were asked to select a reason that prevented them from using the resource. Most (77.8%) respondents indicated that they were too busy and simply did not have time in their schedule to go on the site. Only a small number of students did not access the site because they just were not looking for a job or an internship at that time. Table 10 presents these findings as both a frequency count and a percentage.

Table 10

Reasons for Not Viewing CECD Connections Resources Site

Reason	Number of Students	Percentage	
Busy schedule – just	7	77.78%	
didn't have time			
Study was completed	0	0%	
Couldn't figure out how	0	0%	
to use the site			
Not looking for a job or	2	22.22%	
internship			
The topics were not of	0	0%	
interest			

Of the 8 students who viewed resources on the CECD Collab site, most (75%) accessed the recording link to the resume workshop. Only 3 students (35.7%) reported having accessed the recording link to the interview workshop. Overall, resources related to resumes, finding a job, and networking were the types of resources that were most accessed by students. Table 11 presents these findings as both a frequency count and a percentage.

Table 11

Types of CECD Connections Resources Viewed

Type	Number of students	Percentage
Who's Who on CECD	1	12.5%
Connections?		
What's What on CECD	1	12.5%
Connections?		
March 27 th Resume Workshop	6	75%
Recording Link		
CECD Resume Prep Packet	2	25%
CECD Cover Letter Prep Packet	1	12.5%
UCS Writing Resumes	2	25%
UCS Writing Cover Letters and	2	25%
Resumes		
UCS Career Development	1	12.5%
Model: Resumes		
March 10 th Interview Workshop	3	35.7%
CECD Traditional Interviews	0	0%
CECD Behavioral Interviews	0	0%
CECD Case Interviews	0	0%
CECD Questions to Ask an	1	12.5%
Interviewer		
UCS Career Development	0	0%
Model: Interviewing		
UCS Informational	0	0%
Interviewing		
CECD Informational	0	0%
Interviewing		
UCS Interview Stream	0	0%
Career Advice Videos – Career	0	0%
Spots		
Organize your Job Search-	0	0%
Career Shift		
Find Jobs & Internships –	2	25%
CavLink		
CECD Handouts	1	12.5%
Job Search Step-by-Step	0	0%
Alumni and Networking	2	25%
General Career Development	1	12.5%
Resources at UVA		

Question 3a Discussion and Interpretation

The impact of the study's interventions on PRODUCED students' engagement with and involvement in communities outside of the classroom such as the CECD was measured by attendance data, CECD posting activity, CECD usage reports, event observations, postevent student survey data, and the end-of-study usage survey.

Attendance data from the virtual workshop events suggested that the interventions impacted student engagement and involvement with the CECD community. In total, 8 students attended the workshops either in person or by using the Collab "on demand" feature. Overall, 40% of the PRODUCED student population engaged with the CECD community by attending both of the events. While not all PRODUCED students engaged or became involved in the community, almost half of them did. Although there was no increase or decrease in total student attendance between the resumes and interview workshops (Figure 1), the trend suggested that over time students were more engaged in the self-directed ondemand workshop offerings rather than the live offerings (Figures 2 and 3).

Attendance data from the virtual workshops also showed 3 of these students to be repeat attendees. Many of the students who attended were preparing to graduate during the spring of 2013. This initial data suggested that students were willing to re-engage with the community when given the opportunity. In general, those who were more likely to become involved and engaged in the CECD community were students who were about to graduate and most likely had an immediate need to use and apply the skills and knowledge presented through the workshops. Additional studies would be needed to determine student reengagement patterns and to gauge whether the impact of these interventions and student engagement is affected by students' standing in the PRODUCED program.

Despite the platform limitations discussed earlier, initial CECD Collab activity data suggested that this intervention impacted students' engagement with the community. This was evidenced to a large extent by student usage of the site, which showed a trend of the number of students using the site increasing over time. Had the data on authored and read posts been more reliable, the researcher would have been able to observe to what degree students were engaged and involved in the community. Authored posts would have indicated whether students were more active participants and contributors to the community. Meanwhile, read posts would have provided data on whether students were passively involved.

CECD usage report data suggested that students were engaged with the services and resources afforded by the CECD community. However, engagement was lower compared to some of the other data points. As shown in Figure 6 the number of students who engaged in the resume reviews with CECD staff increased over time. However, during the study period, none of the students in the study reached out to the CECD to participate in mock or behavioral interviewing. This could be due to the study's timing. Indeed, during that time of the year, students may have been more focused on submitting or refining their resumes than preparing for interviews. Students may have additionally felt that they needed to have an actual position to interview for before engaging in the mock or behavioral interviews with CECD staff. Nevertheless, initial data trends suggested that students might be more likely to engage with resources that are self-directed and that allow them to access materials at their leisure or build their social presence in group settings during structured appointed times, like those offered through the online workshops, rather than building their social presence independently through one-on-one reviews with CECD.

Observational data from the virtual workshops also provided insight into the impact that the interventions had on students' connection and involvement with the CECD.

Observational data suggests that an underdeveloped level of engagement was present in both of the virtual workshops. Both workshops received a score of 1 on the observational checklist (Appendix P). While the level of engagement for both workshops was very close to becoming emerging for both, the changes in each of the behaviors from Table 7 suggested a downward trend in engagement. Thus, key behaviors that would indicate collaboration and meaningful discourse between students, their peers, and the CECD, and, ultimately increased social presence within a community of inquiry framework, all experienced negative changes. At the very least, offering these workshops created a pathway for PRODUCED students to engage more with the CECD in a self-directed way, raised their awareness that this resource was even available to them as online students, and created importance around them becoming more involved in this type of community outside of their normal academic activities.

As illustrated through the post-event survey data, initial data indicated positive levels of engagement. Students' responses all fell within the agreement category as opposed to the disagreement side of the scale. However, the trend analysis suggested that data was moving toward a possible decrease for all four post-event questions except Question 2. With such a low respondent pool on the surveys, however, more responses would be needed to replicate results and to identify stronger patterns within the data.

When examining the impact of the interventions on student engagement and involvement using post-study survey data (Appendix S), the interventions impacted students' engagement with the CECD community. For example, 8 out of 17 survey respondents (47%) engaged in communities outside of the classroom by viewing the resources that were made

available to them via the CECD connections site. Only 9 students did not engage with the CECD community. Thus, while not all PRODUCED students engaged or became involved in the community, almost half of them did.

Ancillary qualitative data. Interestingly, ancillary PRODUCED student usage data of the CECD services provided to the researcher by the associate director of the CECD, suggests that this study prompted one student to return to the CECD for help and one new student to seek assistance. Ancillary qualitative data that the researcher received via email from PRODUCED students also suggested that the interventions began to impact student's engagement with the CECD. For example, during the months of the study, 3 PRODUCED students sent the researcher LinkedIn requests. This suggests that students were becoming more aware of how creating professional personas could connect them to the wider UVA engineering community.

These occurrences could be coincidences or they could be due to resources they viewed on the CECD connections site. It is also be plausible that the increased attention from a study like the current one might have prompted students to dedicate some time to developing their professional identities. Network analysis of their connections on social networking sites such as LinkedIn would provide further insight.

One student also sent an email response to the researcher's invitation to fill out the post-study survey. The response read, "I'm glad you sent this out. I didn't have time during the semester to explore the resources available and I forgot about it. I just took a look at a few items (and completed the survey) and I plan to look at most of it over the summer." Such data suggested that the interventions and communications about the study prompted students to have more of a prolonged engagement with the CECD resources. Finally, another student

provided the following response to the email reminder about the resumes workshop, "Erika, you are doing a great job addressing the topics discussed during the interviews you held last semester. Thank you so much and keep up the great work." This comment suggested that students felt their needs were being addressed and that they appreciated the efforts to connect them to the CECD.

Question 3b Discussion and Interpretation

The characteristics of community evidenced through surveys, attendance, usage, and observations of event behavior during the interventions implemented for this study show evidence many of the key themes and ideas associated with community identified in the literature review. These themes include self-directed learning and communities of inquiry (Akyol, Garrison, & Ozden, 2009; Farmer, 2004; Garrison, 1997; Hiemstra, 1994; Garrison, Anderson, & Archer, 2000; Rourke and Kanuka, 2009), the relationship between community involvement and students' time in the program (Brown, 2001; Haythornthwaite et al., 2000), the life-cycle of community (Iriberri & Leroy, 2009; Garber, 2004; Wenger, 1998; Wenger et al., 2002) as well as how the overall taxonomy and definition of community becomes operationalized in real world settings such as the one found in this study.

Self-directed learning and communities of inquiry. The interventions used in this capstone study emphasized the communities of inquiry framework over the self-directed approach to learning environments. Features such as discussion boards, Q & A boards, recordings, and the live virtual workshops were incorporated into the design to demonstrate evidence the community of inquiry framework and served to encourage and promote student's social presence between themselves as well as with CECD staff.

In examining study data, students took more of a self-directed learning approach to their experience of community. For example, with regards to the CECD Collab site activity and post-study data, while the number of students increased over time, those participating took a self-directed approach towards interacting with the community. Indeed, they focused on reading posts rather than authoring them. Had they authored posts and participated in the discussion forums, they would have most likely increased their social presence amongst each other and the CECD in the online community. Additionally, the trend towards students using the on-demand resources rather than attending the live workshops over time also suggested they took a self-directed learning approach, which allowed them more control over their learning.

Data from the observational checklist also suggested a self-directed learning approach. As presented in Table 7, the behaviors indicative of a communities of inquiry framework did not increase over time. In fact, many of these behaviors decreased in their frequency over time. Ultimately, the increased usage of the CECD over time – as evidenced through the CECD usage reports – and attendance data represent first steps in PRODUCED students building social presence between themselves and CECD staff. Additional studies could examine how, when, and if students' involvement shifts from a self-directed patterns, of engagement to a communities of inquiry framework.

Community involvement and time in the program. Brown (2001) found an inverse relationship between the amount of time that new students and veteran students dedicate to community-building activities. Essentially, veteran students spent more time participating and dedicating themselves to community building than new students (Brown, 2001). Haythorthwaite et al. (2000) found a relationship between student's time in a program

and their involvement with communities as well. Their work suggested that new students had more of a connection to and involvement with the academic community than veteran students. Veteran students connected more with the broader community found in the outside world.

In this capstone study, attendance data and student CECD usage behavior also supported the idea that there may be a relationship between students' time in the program and their involvement in the community. Indeed, the majority of the students accessing the community created by this study's interventions were slated to graduate in the spring of 2013 or in the following year. Students who were completely new to the program or who were completing the coursework part-time, and thus would take a longer time to graduate, were not observed making use of the online community created in this study or many of the resources that would strengthen their connection to the CECD.

As Brown's (2001) research suggested, this was plausible because newer PRODUCED students may have preferred to invest their time getting acclimated with technology and coursework. Additionally, as Haythornthwaite et al.'s (2001) research might suggest, veteran PRODUCED students had less of a connection to the immediate academic community and were more involved in connecting to the broader communities found in the outside world. In the context of this study, many PRODUCED students might have also been already connected to engineering employers through co-ops and, therefore, did not have an immediate need or reason to connect with a community focused around career and professional development. Those students who did partake in the interventions were most likely motivated to gain greater access to the broader professional engineering community

because they were preparing to enter it upon graduation. Therefore, their involvement and attachment to this type of community was stronger than those of new students.

Levels of community / life-cycle of community. Wenger (1998); Wenger et al. (2002); Iriberri & Leroy (2009); and Garber (2004) each described how community develops and forms from a theoretical and systems perspective. Coupled with the final post-study student survey, attendance data and the CECD student usage data additionally support the level of community/life cycle community themes found in the literature. Due to the flaws in data collection, student activity on the CECD connections site was not fully considered in this portion of the analysis, and only discussion forum activity served as the best indicator of their level of community.

In this study, the level of community exhibited could be characterized according to Wenger (1998) and Wenger et al. (2002) as the "potential" stage. The fact that students even attended the events and/or used these resources at all provided baseline evidence that members of the community used the venue to begin to find each other and to discover their commonalities in the online community space that had been created for them. To be characterized as the "coalescing" stage (Wenger, 1998; Wenger et al., 2002), whereby members start to recognize their potential by exploring areas of connection-in this case, their job search-participants would have had to interact more on the UVA Collab site by taking advantage of the discussion forums.

Using Iriberri and Leroy, (2009) life-cycle of community framework, the level of community evidenced through this study would be best characterized as the "creation". Indeed, with the appropriate technologies, rules for behavior, and community already in place at the onset, the level of community went beyond "inception," the first stage in their 5

stage framework, so that community members could start to interact. Attendance data, usage data, and post-study student surveys illustrated that members took advantage of these technologies and interacted with the resources that CECD staff made available to them by virtue of the creation of this online community. That said, data does not support the idea that the level of community exhibited in this study had reached the growth stage- whereby members start to define roles and form a group culture or identity. Again, to see such a level of community, the researcher would have expected to have observed a) more interactions and rich discussion on the Collab boards, b) more students attending the events, c) more students using the CECD one-on-one resume and interview prep sessions, d) students responding that the topics were not of interest to them when probed as to why they had not used the site, or e) a combination of any of these reasons.

Examining the data through Garber's (2004) lens, the level of community exhibited in this study could be characterized as the beginning of the "formative" stage. Indeed, with policies and technologies already in place at the beginning of this study, the level of community that emerged was one that allowed members to opt into and join the community so that they could begin to communicate on a regular basis with each other, make new acquaintances, and begin to identify their commonalities. Usage, survey, and attendance data did not suggest that the level of community had fully progressed deep into the "formative stage" because the usage numbers and types of unique individual community users were low.

This data also did not suggest that the level of community had even progressed to the maturity stage, where members no longer need direct support or guidance from an outside facilitator because they are able to function independently. To see this level of community, the researcher would have expected to see more students creating individual discussion

threads and/or taking the lead on either arranging for or requesting specific resources to be channeled to the community. Arguably, however, had the study been longer or repeated, such behaviors may have been observed.

Taxonomy and definition of community. Evidence of how the overall taxonomy and definition of community becomes operationalized in real world settings such as the one found in this study was best illustrated through the interview and resume virtual events. Having both relational and locality-based qualities, community was best described by Conrad's (2002) definition, which outlined community as having three key components. These components include "(a) a collection of people with a particular social structure, (b) a sense of belonging or community "spirit", and (c) a self-containment of sorts" (Conrad, 2002, p. 4). Conrad (2002) argued that these three elements were implict in the notion of community and present either singly or in combination.

For this capstone study, the behaviors exhibited during the interview and resume workshops were described using an observational checklist. The behaviors were then mapped using Conrad's (2002) framework (see Table 12). Although this checklist would need further validation and testing, its initial piloting through this study served as a template for gauging the degree of community and for understanding the extent to which it is exhibited during real world events (e.g., the two live event study interventions).

Table 12

Mapping of Event Behaviors to Conrad's Definition of Community

Conrad (2002)	Behaviors	Total Frequency (Resumes)	Total Frequency (Interviews)
A collection of people with a particular social	• Speaker is heard.	1	1
structure	• Speaker is seen.	1	1
	 Speaker's presentation is shared. 	1	1
Sense of belonging or community of spirit	 Speaker interactions with PRODUCED students. 	45	25
community of spirit	 Opportunities available for group interactions. PRODUCED students' 	0	0
	interact with the speaker.PRODUCED students' interact with each other.	19	6
	 Speaker hangs around for a few minutes for lingering 	0	0
	 questions. Speaker or PRODUCED staff participate on the Q&A forum on the CECD Connections Forum. 	0	0
Self-containment	• Event is publicized.	3	3
	 Presentation, speaker contact information and/or relevant handouts are housed on the CECD Connections Forum. 	1	1
	 Link to the survey is posted on the CECD site. 	1	1

The mapping provided in Table 12 illustrated that the community that emerged during this capstone study exhibited all three of the key components and characteristics of community. In the case of self-containment, this community was bound by virtual locations such as MS Lync and UVA Collab. Frequency counts correspond to the number of times an action of self-containment was taken during the study. Ultimately, publicizing the event and housing materials on the CECD Collab site provided participants with a sense of place, location, and geographical boundary that created a self-containment even in a virtual context. Such space served as a point of reference for students to locate materials and will ideally encourage them to create and form similar spaces for community in the future.

With regard to the social structure formed during the resume and interview workshop events, the community heavily centered on the speaker. In this regard, the ability of the speaker to be heard and seen as well as to have their presentation shared with the wider audience were the key focal points that guided, directed, shaped, and ultimately set the tone for the types of content and behaviors that students used to organize and interact in this community. Frequency counts indicated that these capabilities functioned and were in place during the event so that these interactions could occur. Interestingly, for this capstone study, this social structure worked in conjunction with the self-containment afforded through the CECD connections Collab site. Together, they provided students with content and topics to respond, react to, and interact around.

A sense of belonging or community of spirit in learning was the final characteristic of community that was observed in this study. As reflected in the data shown in Table 12, a sense of belonging, or community spirit occurred between PRODUCED students and the speaker. In both workshops, interactions initiated by the speaker were the dominant behavior

that served to foster and encourage a sense of belonging or community spirit for participants. For the resumes workshop, the frequency of interactions intiated by the speaker was 45.

Meanwhile, for the interviews workshop, the frequency was 25. Instances where

PRODUCED students intiatiated interactions that created a sense of belonging or community spirit with the speaker were much less frequent. During the resumes workshop, the frequency count for interactions initiated by students was 19 and only 6 for the interviews workshop.

The notion that the speaker precipated most of the sense of belonging or community spirit, rather than the students, could be attributed to the principal role they played during in event. In essence, the speaker had the responsibility of providing content for the workshop. Thus, they were in a better position to facilitate and drive the discussion in a way that fostered feelings of belonging and community spirit during the workshop.

Interestingly, opportunities for group interactions, evidence of PRODUCED students interacting with each other, lingering behavior, or continued discussion on the CECD connections forum were not observed during this study. Had such behaviors been observed, the researcher speculates that there would have been more attachment and involvement in the community. As a result, the sense of belonging or community of spirit would have been more pronounced and captured through the frequency count data as well as potentially through other behaviors (e.g., student requests for content) not captured on the checklist.

Key Capstone Study Findings and Implications

This section presents the key capstone findings and implications that could be drawn from the data collected and analyzed for this inquiry. This capstone was implemented within the specific context of the PRODUCED program. Thus, the findings and implications are

limited to this inquiry. They are not meant to be generalizable across the University of Virginia organization but are meant to be a starting point for program improvement and discussion.

Locating Community

Within the literature and even within the practical day-to-day operations of the field, there tends to be a strong bias towards examining or improving community specifically as it relates to students' academic classroom contexts. However, attendance data, observations of event behavior, and survey responses from this study indicated that it is possible for community to form in virtual spaces that are outside of PRODUCED students' immediate academic classroom environments. Thus, a key finding of this study is that feelings of community are not strictly limited to the physical or geographical boundaries defined by the classroom and/or relational causes and interests such as students' academic pursuits. On the contrary, community can form in virtual spaces that are designed to meet students' non-academic and/or professional needs and interests.

This finding is significant because it expanded ideas of community, as seen through place-based definitions, and also reinforced ideas of community as viewed through the relational lens. In essence, virtual spaces such as the CECD connections Collab site and the virtual events implemented in this study challenged conceptions of place and location, particularly in distance learning environments. Thus, although virtual in nature, these spaces still had finite entry and exit points as well as beginnings and endings, which allowed individuals to experience the type of self-containment and spatial limits inherent in place-based definitions of community based in geography and physicality.

This finding is significant for distance learning practitioners because it reinforced the importance of also taking a relational approach to defining community. Feelings of community occurred when groups of PRODUCED students interacted around a common purpose, topic, interest, concern, theme, or goal (Conrad, 2002; Dalton et al., 2001; Schwier, 2001). This creates a sense of belonging and shared investment amongst community members, which is essential to community formation and survival (McMillan & Chavis, 1986; Unger & Wandersman, 1985; Sarason, 1974).

In this capstone study, the community was organized around non-academic causes and interests. Often, practitioners devote a significant portion of their time, energy, and efforts to creating ways for students to connect to the academic community. However, as needs assessment data indicated, PRODUCED students also had an interest in connecting outside of academic contexts. Indeed, according to the needs assessment data, the largest gaps in community were observed in students' connection to aspects of community that would help them as professional engineers (Appendix W). Moreover, when given the opportunity, as discovered during the implementation phase of this capstone, PRODUCED students were willing to connect to the CECD Connections community because it was a resource that addressed and united their professional needs and interests.

The finding that community forms around student's non-academic relational pursuits and interests has even further significance. At a basic level, it challenged popular assumptions that students simply want access to online education so that they can get a degree. As evidenced in this study, students wanted more than just a degree and could potentially benefit from what the non-academic online communities could offer them. More importantly, this finding also expanded how practitioners (e.g., designers, administrators, and

even professors) conceived of the system within distance learning environments. Thus, the system must account for the more apparent parts (e.g., what happens in the classroom) as well as what happens beyond and outside the classroom. Both influence each other and are vital to students' success, satisfaction and experience of community in distance learning environments.

Technology as a Bridge to Community

Technologies such as UVA Collab and MS Lync can be used as tools to bridge, create, and foster a sense of community for PRODUCED students. This is important because community is traditionally believed to be bound by geographic or physical location, and there is an assumption that it cannot be created or be effective with technology. However, as demonstrated through this capstone study, it was quite possible to re-create a basic level of community in a virtual space simply by using tools that house content (e.g., UVA Collab) and that enable participants to connect, share content, interact and collaborate (e.g., MS Lync).

In order to optimize the capacity for creating community, purposeful use of technology, deliberate actions, and intentional designs must also be implemented alongside the use of these tools. Implementing tools by themselves sets groundwork for community to unfold. However, tools alone do little to ensure that community thrives or grows around a focused purpose that enhances the student experience. On the contrary, intentional structures and scaffolds, must be put in place so that a purposeful and beneficial community can emerge. As demonstrated through this capstone study, both Human Performance Technology and Instructional Design can guide the selection and design of such structures, tools, scaffolds

and technologies, both in formal learning spaces and also informal social spaces to support the learning community.

Lastly, when considering where to start and how best to invest funds and resources so that students can experience a more robust online student experience through their connection to community, program administrators should invest in those types of community-building tools, technologies, and activities that will help them achieve their program mission. Doing that allows students to reap the full benefits and potential of community. It also helps program administrators create a more robust online student experience that fulfills the PRODUCED program objectives, vision, and mission.

Multiple Approaches to Creating and Measuring Community Across Time and Space

Connecting to a learning community can enhance the online PRODUCED student experience. For example, post-event survey data indicated that students felt more connected to the aspects of community that were offered to them through the CECD interventions.

Since they indicated that they were also more likely to attend similar events and recommend the event to others, it is highly plausible that this connection was beneficial and enhanced their experience at the most basic level. Survey data also supported the idea that students would continue to engage in the aspects of the community made available for prolonged periods of time and would recruit others to participate. Ancillary qualitative data from one student, who was able to make the connection between the needs assessment and resulting interventions, also reinforced the idea that community can enhance the student experience. In the case of this particular student, recognizing that his/her voice was heard and had created changes in the program experience and structure was likely very empowering and reassuring. Continuing to listen to and incorporate students'

recommendations and suggestions into the program structure and offerings will likely give students greater investment and connection to the communities that are made available to them and, ultimately with time, would serve to produce an enhanced PRODUCED student experience. Ultimately, such findings serve as preliminary evidence of the benefits, value, and impact that community has on enhancing the PRODUCED student experience.

The finding that community can enhance the PRODUCED student experience has significant implications on future design efforts. In order to foster students' connection to community across time and space, multiple outlets and approaches must be employed. As observed in the interventions designed for this study, PRODUCED students needed access to community in ways that accommodated their own personal and time constraints. In this capstone study, for example, students had the option of attending events live or watching them at a later time. They also could email questions to the CECD before, during, and after events. The resources were also available to them by way of the CECD connections Collab site 24/7. Thus, students had multiple ways to participate in and connect with community. They did so according to their own preferences and constraints. Had the study only offered one approach, this would have impeded student's connection to the community. This suggests that designs for community should incorporate both synchronous and asynchronous approaches to fostering online community.

Community takes time to develop and arises as a result of interactions that individuals have over time. To gauge the construct, it is necessary to use multiple measures that examine not only the depth of connection, as seen in the observations of event behavior, post-event surveys, and post-study surveys, but also how community develops over time, which would have been observed through the Collab usage activity had that measure been successful.

Community is also a complex construct to measure and should be measured using multiple methods. Indeed, measuring community using self-perceptions found on measures such as the surveys used in this capstone study is important. In essence, an individual's sense of community is heavily dependent on how strong or weak they perceive their connection to a particular community to be. At the same time, however, community can and should also be measured using empirical data such as attendance, behavior frequencies, and usage statistics. Using multiple measures to gauge community triangulates data and helps capture the richness of what happens when community is formed and fostered over time.

Recommendations

This section discusses specific recommendations for action that would help the PRODUCED program meet its current challenge of creating a more robust online student experience that connects its learners to broader aspects of community at UVA and beyond. This section also discusses the challenges that may impede implementation of these recommended actions. The recommendations are summarized in Table 13.

Table 13

Summary of Recommendations

Recommendation 1: Dedicate a student or professional resource to coordinating and building out student connections to the UVA community and beyond.

Recommendation 2: Invest in technologies that integrate with existing systems, are easy to use, and seamlessly capture data.

Recommendation 3: Use the methods, tools, outcomes, and lessons learned from this capstone study to develop more programming that connects PRODUCED students to the UVA community and to continue researching how to expand the student experience for online learners within PRODUCED and at UVA.

Challenges

The biggest challenge to implementing these recommendations lies within the culture and fabric of UVA. This university is a traditional brick and mortar school, which prides itself on providing a campus-based college experience. Professors and even students often question why

students choose to take an online course of study. Perceptions of online students vary across departments and the wider institution.

Comments made by students and faculty in informal learning spaces and meetings during the study period indicated that online students, such as PRODUCED students, are not always viewed favorably. After a PRODUCED class, for example, two grounds-based students questioned whether the online students were even real or if the professor had just invented them so he could trick them into doing their work. Additionally, an underlying tension among PRODUCED faculty is that they often struggled to see the value of offering virtual office hours or holding virtual labs for PRODUCED students. Such comments and actions reflected how the PRODUCED student experience was often deemed somehow inferior or second-rate compared to the traditional campus experience.

Another major challenge that arose when implementing these recommendations originated within the PRODUCED student community itself. In looking at the PRODUCED student demographic, the majority of these students have multiple responsibilities and are constantly trying to balance both personal and academic obligations. Often, their main focus became to complete the courses required to obtain their academic degree. They did not always realize the value of participating in extracurricular activities and/or were so consumed with personal responsibilities that they could not make time for community. Such challenges reflect how gaps in students' cultural capital may cause them to miss out on resources and knowledge that would ultimately put them at an advantage as they develop professionally.

To this end, changing and shifting culture can be difficult, slow, and can often produce a lot of resistance within a given population. At the writing of this report, the PRODUCED program director was strategically positioned to advocate for students enrolled in the program as

well as to shift the biases and unfavorable perceptions of online learners. While such work can be complex, exhausting, and frustrating at times, targeted efforts that focus on creating change at the organizational level and efforts to create alliances with other online programs or online learning proponents at the university will pave the way for the tactical suggestions found in recommendations 1 through 3.

Recommendation 1

Recommendation 1: Dedicate a full-time student or professional resource to coordinate and build out student connections to the UVA community and beyond.

Research from the literature review supported the growing need to design for community in online learning environments (Charlambos et al., 2005; Moller, 1998; Nicholson, 2005; Palloff & Pratt, 2006; Veseley, Bloom & Sherlock, 2007; Russo & Benson, 2005; Rovai, 2002). Findings from this capstone inquiry indicated that students would engage and participate in community even when it went beyond the traditional academic and classroom-based approach to community. As seen in both the literature and in this capstone inquiry, community does not happen overnight or because the right technologies are in place (Garber, 2004). It develops out of students' need for connection and interaction and/or because specific pathways and channels have been included within the design of the student experience that help foster such collaboration and interaction (Brown, 2001; Lee et al., 2006).

Together, the research and the findings from this study suggested that explicitly designing for community enriched and strengthened the online student experience by connecting online students to aspects of community that were traditionally not available to them. By creating such access students experienced immediate gains such as feeling more connected to resources, such as the CECD, and to each other. However, the long-term gains afforded by these

types of connections included students being better positioned and prepared to obtain gainful employment upon graduation in engineering careers as well as increased professional networking opportunities for both current and graduating students.

For this reason, it is advisable that the PRODUCED program dedicate a student or professional resource whose primary responsibility is to build out more pathways for students to connect to the wider UVA community and beyond. As the researcher learned through her own experience during this capstone inquiry, such a position required anywhere from 20 to 40 hours of time per week. This time was dedicated to making the appropriate contacts at UVA, building the infrastructure to house content on platforms such as UVA Collab, and using technologies such as MS Lync to broadcast and record content so that students could still engage and connect with the community at a time that was convenient for them. Thus, a primary responsibility for the person in this position would be to assume and manage the logistical and operational tasks associated with designing events and interventions along with the simple mechanics needed to create an infrastructure for community to occur.

Additionally, as observed in the needs assessment phases of this capstone project, students appreciate having program staff "reach in" to them. Due to their busy schedules trying to balance work with family and school they often neglect to reach out to the university and seek out opportunities that might benefit them. For many students, their main focus is completing the courses they need to graduate. Early on in the program they learn to hunker down and do not often seek out support until they near graduation. Additionally, because most events at the university do not even offer broadcast options or consider online learners such as those in the PRODUCED program as their target audience, students are often left out or assume that such events are not available to them. This causes them to miss out and prevents them from seeing

the full value of community or benefiting from the experiences of non-academic community. Thus, another aspect of this person's responsibility should be reaching out to students to publicize the events, connecting them to just-in-time resources based on their specific professional interests, and helping them see the value of participating and interacting with the UVA community and beyond.

Recommendation 2

Recommendation 2: Invest in technologies that integrate with existing systems, are easy to use, and seamlessly capture data.

One of the key findings from this study was that technology can be a bridge to creating community. However, one of the biggest challenges encountered during this study was selecting a technology that did not add to a student's growing list of tools, but rather integrated with or complimented their existing set of tools and resources. As observed during the needs assessment, students were reluctant to have yet another platform to log into. Moreover, in order to measure the impact of the interventions chosen for this study, the technology needed to be able to collect data in a seamless and easy fashion. MS Lync and UVA Collab were the ideal choices because they met these criteria.

In this study, MS Lync proved to be an ideal tool for broadcasting and recording content. The researcher found that it was really easy to use, had lots of functionality, and students were already versed in working with it. However, UVA Collab, while very easy to set up and familiar to students, was severely limited in its ability to capture student data. Part of the problem experienced with UVA Collab stemmed from how the system is set up to register students' views of materials. The redundancy in items being marked as read is impractical and ineffective from a usability and design standpoint.

At the system level, collecting data via UVA Collab has created a lot of controversy at the university. Current university regulations prevent researchers from collecting any type of data beyond what the system currently offers in the way of data and how it collects that data. However, as seen in the capstone study, this presents a Catch 22 because the data that the system collects is inaccurate. This makes UVA Collab a flawed tool to use in a study on online community. It is the university's tool of choice, but not being able to collect accurate data while using UVA Collab creates a missed opportunity for studying how students interact in an online environment.

For these reasons, it is advisable that the PRODUCED program invest in technologies that integrate with existing systems, are easy to use, and seamlessly capture data. This could occur in a number of ways. For instance, should the program continue to use M.S. Lync for events, it should also consider how it can take advantage of possible polling capabilities at the close of a session to get immediate student feedback and data. In this study, response rates for the email-based post-event surveys were extremely low. Asking students to complete an email-based survey after an event is less effective than requiring them to complete a quick survey at the end of an event before they log out of the system.

Should PRODUCED continue to use UVA Collab, it would be advisable for program administrators to work with the university to ensure that student activity data can be collected more effectively and efficiently. University policy may present a significant challenge. Indeed, much of the university's argument to date for not allowing data collection has stemmed from protecting the university from legal repercussions and ensuring student privacy as mandated through laws such as FERPA. To mitigate this challenge, PRODUCED program administrators may consider working with similar online programs at the University of Virginia. They could

consider how other programs work around this issue when approaching data collection. They could also consider forming a coalition of programs across the university dedicated to building a solid business case that demonstrates how allowing access to such data would enable the university to get more out of the technology investments and research as well as ensuring that student privacy is protected university-wide in these types of online settings.

Recommendation 3

Recommendation 3: Use the methods, tools, outcomes, and lessons learned from this capstone study to a) develop more programming that connects PRODUCED students to the UVA community and b) continue researching how to build community and explore what happens when a program expands the student experience for online learners within PRODUCED and at the University of Virginia.

As observed in this study, multiple methods should be used to connect students to community, and multiple ways should be used to gauge its impact beyond students' self-perception. As seen in the literature review, current research on community lacks longitudinal studies and detailed case studies that document designs for community and illustrate impact that community has on student engagement and performance. Moreover, one of the biggest gaps in the literature remains exploring the scaffolds and supports that move individuals from one stage of community to another.

Time is an important variable that affects students' need for and involvement in this particular community. For example, another recommended future study would be to investigate whether student's interactions and behaviors change over time based on the length of time in the program. Indeed, if students engage in the community (e.g. over the course of a year as opposed to a few weeks) or had they known it to be one of the program features or perks all along, data

would have yielded deeper and richer perspectives on how interactions and behaviors change over time in virtual communities.

The literature base on online community would also greatly benefit from such studies.

As a Tier 1 research institution, the University of Virginia is well suited and positioned to add to the literature base through the efforts such as those undertaken for the PRODUCED program for this capstone as well as for other online programs at the university.

This capstone helped pave the way for such inquiries and holds significance for both the PRODUCED program as well as the wider university. It represents one of the first attempts to make resources available to online learners that had not been previously offered. This study also deepens and challenges how programs and universities define and create a student community for non-traditional learner populations in online contexts.

From a business standpoint, as the University of Virginia continues to explore online learning as an option or as an alternative to the traditional UVA experience, they will need to find ways to distinguish their brand from other online programs and to attract students.

Designing for the whole student experience by providing access to multiple types of community in an online context is one way they can accomplish this. Indeed, making students aware that they will have access to the institutional legacy of UVA in a way that is tailored to meet their needs as online learners would be a huge selling point. For the PRODUCED program, which has already started to think about meeting the challenge of expanding its offerings, this capstone inquiry helped program administrators begin to create a more robust online student experience for their learners and to create a competitive advantage.

Ultimately, this study provided methodology, tools, resources, infrastructure, and lessons learned that can serve as a baseline, framework, and/or case example from which to further

expand design and development efforts. As a result of this initial capstone inquiry, both UVA and the PRODUCED program are better positioned to design interventions and studies that meet this research need and that position the university competitively within the marketplace as online learning providers.

For the PRODUCED program, students now know an expanded notion of community and that the program is capable of helping them take advantage of its offerings. A recommended future study therefore would be to see whether the interventions implemented in this study closed the original gaps identified in the needs assessment. Additionally, when faced with the challenge of naysayers and skeptics, PRODUCED program administrators also have a template to use should they seek to make other aspects of community available to students. For these reasons, it is advisable that the program build off of the work done through this capstone to continue with design efforts as well as to research their impact on students in the PRODUCED program.

ACTION COMMUNICATIONS

To: PRODUCED Program Director Rice Hall 015 P.O. Box 400235 Charlottesville, VA 22904

From: Erika Powell, B.A., M.S.Ed Doctoral candidate 1012 S. 20th St. Apt. 2 Arlington, VA 22202

Dear PRODUCED Program Director,

The purpose of this letter is to report the key findings and recommendations from my recent capstone inquiry, which focused on the PRODUCED program. This capstone inquiry arose as a response to address the PRODUCED program's desire to expand programmatic supports and interventions to students that would help create a more robust online student experience.

Between March and April 2013, I partnered with the UVA Center for Engineering Career Development and implemented three interventions that would connect students to both the UVA community and the wider engineering community. These interventions were informed by needs assessment data that I collected from students enrolled in the program between the early spring 2013 and summer 2013.

The first intervention was the creation of a UVA CECD Connections site that housed hosts of resources related to students' career development. These included materials regarding topics such as interviews, resumes, networking, cover letters, etc. This site also contained instructions on how to use the site, links to event recordings, a calendar and event R.S.V.P. system. It also contained discussion forums for students to ask questions and interact with each other and a CECD staff liaison.

The second and third interventions were virtual workshops on the topics of resumes and interviews. These events were recorded and housed on the CECD connections site so that students who could not attend would be able to watch them at their convenience.

The key findings from the study are

• **<u>Key Finding 1:</u>** Community is not strictly limited to the physical or geographical boundaries defined by the classroom and/or relational causes and interests such as

- student's academic pursuits. On the contrary, community can form in virtual spaces
 that are designed to meet students' non-academic and/or professional needs and
 interests.
- **Key Finding 2:** Connecting to community can enhance the online PRODUCED student experience. Individuals need to connect to community using both synchronous and asynchronous methods. Measurement approaches to gauging community and its impact must triangulate data in ways that include students' self-perceptions of community as well as empirical evidence such as attendance, behavioral frequencies, and usage statistics.
- <u>Key Finding 3:</u> Technologies such as UVA Collab and MS Lync can be used as tools to bridge, create, and foster a sense of community for PRODUCED students.

Based on these findings, I recommend the following actions for the PRODUCED program to consider as it continues to build out its offerings:

- Recommendation 1: Dedicate a student or professional resource to coordinating and building out student connections to the UVA community and beyond.
- Recommendation 2: Invest in technologies that integrate with existing systems, are easy to use, and seamlessly capture data.
- Recommendation 3: Use the methods, tools, outcomes, and lessons learned from this capstone study to develop more programming that connects PRODUCED students to the UVA community and to continue researching how to expand the student experience for online learners within PRODUCED and at the University of Virginia, and what happens when these programs are expanded.

The enclosed final capstone report expands upon the capstone inquiry and explains the findings and recommendations in more detail.

To further support the PRODUCED program, I have also included a list of references and appendices that will help with both the strategic and tactical implementation of these recommendations. These documents also provide a solid literature and theoretical base to inform understandings of community. Should future initiatives be implemented, the content of these documents will also provide a methodological framework to follow or to improve upon as it relates to needs assessment or intervention design.

A designated staff member can easily adapt or revise for any future community-building efforts. In particular, the observational checklist (Appendix P) and the CECD Facilitator Quick Sheet (Appendix X) will be valuable tools to guide event speakers and facilitators in employing behaviors and strategies that lend themselves to creating and fostering community for students. The entire CECD connections Collab site will also be available for your program to use again in the future.

I hope these findings, recommendations, and resources will be of use and helpful to the PRODUCED program as it continues serving underrepresented populations in rural Virginia. The data contained in this report can also serve as a baseline from which to compare future results or data.

It was truly a pleasure working with PRODUCED students, faculty, administrators, and program staff during my time as a graduate student at the University of Virginia.

Thank you again for allowing me to use the context of your program to fulfill the requirements of my doctoral degree and for your continued support during this process.

Most sincerely,

Erika Powell

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Appendix A

2011 Report to the Board of Visitors on the UVA Student Experience

UNDERSTANDING THE STUDENT EXPERIENCE A PROJECT FOR THE BOARD OF VISITORS STUDENT AFFAIRS AND ATHLETICS AND EDUCATIONAL POLICY COMMITTEES

<u>Goal:</u> The purpose of this project was to provide critical information to the Board of Visitors about what makes the UVA. student experience unique, as the Board plans for potential enrollment growth.

Approach

<u>Format:</u> Five 90-minute focus groups of 9-15 students were held on a Friday afternoon (1/28/2011) on the Grounds. Focus groups were facilitated by staff members and note-takers recorded general themes and comments in the conversation. The groups were also audio-recorded.

<u>Population:</u> Students were identified through involvement and academic recognition, with effort made to gather students whose experiences represented excellence across those dimensions representing the core values of the Division of Student Affairs: academic rigor, student self-governance, honor, diversity and multiculturalism, and public service.

Fifty-six students participated. All four undergraduate years were represented, with 3rd and 4th year students making up the majority of participants. Two graduate students participated. Eight schools were represented: ARCH, BATT, CLAS, COMM, Curry, Law, SEAS, and the SON. Slightly more women than men participated. The racial/ethnic profile of the group roughly reflected that of the University, with African-American students slightly over-represented.

Results are provided only in aggregate, meaning no personally identifiable information is included. Students were instructed that we were interested in their perceptions of their experiences and were encouraged to be candid and honest about what has worked for them, as well as what challenges they may have experienced as a student.

Questions: The following questions were asked in each group:

- 1. How would you describe your academic experience at UVA? (note: if needed, ask specifically about interactions with faculty or advisors).
- 2. What are you involved with in or out of the classroom that matters to you or that has been particularly meaningful? Who, if anyone, has helped you in this experience?
- 3. In what ways, if any, has public service been part of your time as a student? What have you specifically pursued?
- 4. In what ways, if any, do you feel like you've been exposed to perspectives different from your own? In what settings did that exposure occur? What is your opinion of the University's diversity efforts? What, specifically, informs that opinion?
- 5. Tell me about your experience with the value of honor at UVA. and here I mean "little h" honor as it relates to ethical decision making, ethical conduct and integrity.
- 6. You have all had leadership experiences while you've been here. What do you consider to be essential characteristics or traits of good leadership? How has the University helped or hindered your development as a leader?

- 7. What have been the most critical resources that have supported your student experience?
- 8. We know that you have competing priorities and limited time as a student. How do you prioritize?
- 9. What has made your experience as a student especially positive or not so positive so far?
- 10. Any final thoughts?

Results

Summary

Overall, students agree that the UVA. experience is unique. Challenging, rigorous academic work is central and is of the highest quality when characterized by small class size, strong relationships with faculty, access to research and service opportunities, and connections to "real world" issues. Students must make the effort to reach out to faculty, but when they do so faculty are responsive.

Extracurricular involvement is expected and important in the experience, and provides significant levels of autonomy and responsibility that students elsewhere do not get. The University environment is seen as competitive, which has positive and negative components. Peer support is unusually high here and is seen as important to navigating the University environment. Exposure to different perspectives comes largely in the first year through the residence halls and then is subject to individual effort. Honor is an important part of the

UVA. experience and sets us apart, but perceptions vary with regard to its definition and effect across the University. Public service is experienced largely as community service, but some go beyond that definition through programs such as Jefferson Public Citizens.

Students worry quite a lot that the excellence and unique character of their experience is threatened by potential enrollment growth.

Academics & Faculty Interaction

Students see their academics as central to the student experience. Academic work here is perceived as challenging, engaging and rigorous. There was strong consensus that smaller classes are key to having positive student experience, that it makes students feel as though they have a place at the University and can navigate the larger environment. They worry that this component of the experience is at risk with enrollment growth. Big classes were a major concern, particularly in the sciences. A few defended large lectures if delivered well.

Feeling connected to faculty is particularly important, as students perceive those connections as creating community, providing access to research opportunities, and making the experience intimate rather than anonymous. They phrased it as making the difference between "feeling lost" and feeling connected. Several noted the "take a professor to lunch" program provided some of their most memorable experiences. Interaction with faculty outside of the classroom through events, seminars, etc., was important, and provided opportunities to learn different things, to make connections outside "the UVA bubble."

Small group work and research provided opportunities to deepen learning but also to develop "real world" skills like teamwork, time management, and relationship building. The Echols Scholar program was noted as creating "a community of scholars."

There was a strong perception that students need to make the effort when it comes to academics – to learn about majors, research and other opportunities, to build relationships with faculty, to make connections. Faculty will not seek students out in this way, but they are receptive and generous with their time when a student reaches out.

Peer-to-peer support was reported to be very important. Several students commented that older students were critical to their academic success – in the classroom to help those struggling but also to navigate the system and opportunities.

Interdisciplinary majors seem to facilitate good faculty interaction, more engagement with the community, strong peer relationships, and opportunities for research.

There was consensus that advising in the early years was not very strong and was dependent on the advisor. Students reported regular reliance on peers in this area.

Some see gaps in the curriculum – faculty stretched too thin, not enough connection between topics and issues.

Overall, the academic experience is defined by interaction with faculty members and creating a small-community feel. The small community feel, in turn, strengthens the student experience.

Involvement & Leadership

Students agreed that UVA. provides leadership opportunities that are unique and that make the student experience special. Those opportunities are meaningful and appreciated – Hullabahoos or Honor & UJC, class councils, being an RA – these are defining experiences for students. They feel trusted with money and decisions, and they feel this sets us apart. Many students find themselves in leadership positions after coming up through the ranks of being a general member. "Growing through an organization" as a leadership ladder was cited as valuable in developing strong leaders. Relationships – particularly "friends" – are important to successful leadership, and mentorship was noted as a strong component of the quality of these experiences.

Students recognize they are given an extraordinary level of independence, autonomy, decision-making, and control as part of their involvement. These experiences have proven valuable in interviews for graduate school and jobs. Specific skill sets developed include managing a budget, selecting and training a staff, and holding members accountable. They also report that this involvement provides preparation for the work world, develops teamwork, social networks and community. This involvement helps students "learn by doing," build meaningful relationships with peers, faculty and administrators, and engage in things about which they are passionate.

"UVA does a great job of letting you choose your level of engagement."
"Students hold students accountable. It's not an administrator saying I can't believe you didn't show up. It's your friend holding you accountable. It helps make folks want to participate more—being held accountable by their peers (talking about Madison House)."

Students recognize that our model allows them to make mistakes, which can be challenging but allows them to learn. One student describes it as "Autonomy with a safety net."

Although not directly stated, self-governance was a theme throughout all the responses. Students indicated that they were engaged in experiences that professionals at other institutions would normally perform, that they were empowered to make decisions, to learn from mistakes, and to manage budgets.

Students pointed to individual organizations as providing particularly meaningful experiences (e.g., Resident Staff, University Judiciary Committee, Honor, the University Programs Council, Orientation Leaders, Class Councils, Greek letter organizations). They reported access to a broader scope of the University through these avenues, as well as meaningful connections with administrators.

Students noted that the environment can be competitive. This competitiveness was seen as both positive and negative. While it encourages them to challenge themselves, some feel it feeds the "checklist" and "everyone try to be a particular kind of leader" mentality. They recognize that these opportunities supported by the University are limited and competitive; the competitiveness will only increase with size.

Students argued for a conception of leadership that encompasses both leadership and followership; they want more listening to one another; and many expressed a sense that one's need to be in charge limits effectiveness and leads to recreating the wheel. The multiple student organizations with overlapping missions were given as an example.

Many report the need for more "connection" of activities and academics to career.

Students feel the tension between academics and activities. They expressed a need to balance, and once they know how to manage the academics, they can prioritize activities more. They prioritize what they are getting the most from, which can change, but most said it was their activities. At the end of the day, most reported that they were still willing to let their academics slip for other things – friends, activities, responsibilities. Echols and pre-med were exceptions to this pattern.

Students noted some limitations of the current model of involvement, particularly that university support does not always reach everyone. Some reported a general concern that the university is not equitably supporting organizations/students who aren't really involved, that there are those who are left out of the leadership experience, either because they're not in

the "chosen" organizations or because they don't join at all, particularly if they have to work. Concern exists about how to engage the entire community, and they worry that growth will make that harder. Some worry that leadership can be just "checking a box."

A few expressed a desire for more resources, including space, money and access to administrators and faculty.

The Jefferson Public Citizens program was mentioned as a great setting for leadership development.

This dimension – involvement – raised perhaps the highest levels of concern about the effect of growth on the quality and quantity of those experiences and the ability of student self- governance to survive the growth. One student noted, "we already have 233 Lawn applications, I can"t imagine reading 500-really strains self-governance-res life is where you are already seeing cracks; it"s what makes us unique and we are losing it."

They worry about the loss of the ability to form relationships with peers and faculty in larger environment.

Mentorship

In virtually every facet of the student experience, from academics to adjustment to involvement, students report that their peers, first those who are older and then those of the same year, are crucial in helping them make connections, discover opportunities, and navigate this place. They have a strong fear of that changing, getting harder as the place grows.

Honor

Honor is still very much perceived to be central to the UVA. student experience and something that sets us apart. However, there is some divergence in students' experience with and understanding of honor. Some report a strong sense that Honor (e.g., the Honor Committee and its policies and practices) and honor (e.g., integrity and ethical conduct) are intertwined, creating a unique environment of trust, ethical interaction, accountability to one's peers, and meaningful experiences. Others see Honor as getting in the way of honor due to its perceived emphasis on punishment, on a "mythical sense that UVA is different," and in its omission of things students feel should fall under its aegis, such as respect, sexual assault, drug use, or hate crimes. Some perceive the single sanction as reducing UVA.'s sense of honor. Several urged that we need to "Get Honor out of its "little box." Others reported that interaction with Honor provided amazing experience — exposes students to every emotion, but creates very strong people. "Nothing like it."

Regardless of students' opinion on H/honor, there is a strong sense that it makes the UVA. experience unique. There is still regular association with being able to leave things around without fear they will be stolen.

Public Service

Public service is largely defined and experienced by students as community service, with Madison House serving as the major vehicle, but also including organization-level service (APO, 100+ service organizations, etc.). Broader understanding that includes academic work and more indepth engagement with communities is facilitated through particular schools/majors (Nursing, Global Development) and the Jefferson Public Citizens program.

Some students describe a shift in their perception of service – from resume building to an opportunity to apply classroom experience in real world, to get outside of the "UVA bubble", to make broader impact.

"I"ve stayed in touch with reality through public service. It gives me a better real world vision—outside of the UVA. bubble. A social contract I have to abide by. Purpose through service. It makes me think about the real world, to stay connected, to stay grounded."

"I didn" trealize the bubble until I went on clinical work for nursing school; to see living conditions of folks in Cville was eye-opening. The things we do matter, but we tend to ignore needs to Charlottesville."

They note that service is "huge in exposing us to diversity."

Students highlighted that there is a learning component to service that translates into a more meaningful experience. Once they were able to identify this component as central to service, they indicated a stronger connection and affinity towards public service. Also, students readily identified that communities were affected by service and one needs to be mindful of the community they are working with.

Students value service, and have strong opinions on the "right" ways and reasons for doing it. They perceive a tension between being philanthropic and receiving credit for that service.

Diversity & Multiculturalism

When it comes to learning from different perspectives, students report that there are a few structures that help put diversity in place, but it's the organic student-to-student interactions that really solidify diversity in their experience.

Broad consensus exists that first-year dorms are the major –

sometimes only – setting where exposure to diverse perspectives takes place. That experience is seen as quite positive, and some yearn for more in the later years, but recognize that students separate into their communities, often by comfort zone, as they move through the University. However, some students describe very concerted efforts to get out of those comfort zones, of conscious seeking of different perspectives and experiences. They expressed concern about how to encourage that work in "Joe Wahoo."

There was about an even split on whether CIOs offer diversity of perspectives or allow one to remain in one's comfort zone. Classes are another source of exposure to diverse perspectives, including travel abroad. As noted earlier, service is also effective in this area:

"I have a little sibling through Madison House. I"m the same age as his Mom. It helps me step outside of UVA and realize UVA is not the real world."

Several noted that UVa is a university of thinkers; those students want to see more action. They perceive the University as a place that is slow to change.

They made a couple of suggestions for a university-wide experience in the first year, such as common reading or a class.

Students voiced strong concern that growth will increase the homogeneity (white students from NOVA) rather than increase diversity. They asked that we make sure growth adds to diversity rather than homogeneity.

Critical resources

Mentors, RAs, professors, academic deans, student affairs staff (Office of the Dean of Students & VPSA), Alumni Hall staff, UCS, fraternities, Dining Services ("those folks are there every day, make your life go smoother, they are helpful, deserve a lot of credit"), the Office of African-American Affairs, the LGBT Resource Center, the Student Activities Fund, and the Nursing School all were mentioned as critical to students' success. There was also a sense that the level of peer support here is unique. One student noted that University support of the arts was critically important – "That people take me seriously and care about the art that I'm creating and what I'm writing is huge."

There was recognition that some students have access to a different world in terms of resources – e.g., the distinction between UCS & COMM school resources seem enormous to them. Students noted a perception of the the "haves and have-nots" in this regard. Not all small schools are perceived as "haves," as students from the Architecture School noted they had nothing like McIntire's career resources. These distinctions also emerged in reference to some of the smaller academic programs, such as African-American Studies. Even students in the McIntire School acknowledged these distinctions in access to specialized resources.

Appendix B Interview Protocol from Phase 1 Needs Assessment

PRODUCED Alumni Final Interview Protocol

General Directions: EP introduces herself. Work for PRODUCED. Talks about the capstone. Why their help is needed. Answers will be confidential. Names will not be used. Info. used to evaluate aspects of the PRODUCED program so we can optimize the support and resources that are provided.

Community-specific

Directions: EP <u>briefly</u> describes what is meant by community a la Haythorthwaite, Payloff & Pratt just so they know what is meant by community. I'm trying to investigate whether there is a sense of community. It's okay if there is and it's okay if there isn't. My goal right now is to just see where we are and to find out how we can best offer support in this area.

be	te where we are and to find out now we can best	ojjer suppor	i ili iliis air		
1.	. Did you feel a sense of community as a PROD	OUCED stude	nt?		
			Yes [□ No □	Somewhat
	 1a. In what ways did you feel connected? 1b. What do you feel you got from this co 1c. What do you feel you contributed to t 1d. How did this community compare with 1e. Prior to enrolling – did you feel like the 	mmunity, if a his communit th other comr	nything? ty? nunities yo	u belong to?	
2.	. As a PRODUCED student, did you feel a sens	e of commun	ity among	or connected	ness to:
	 a. Other PRODUCED students b. Grounds-based students b1. Student groups b2. Student organizations c. Engineering faculty d. PRODUCED program staff e. UVA as an institution e1. Library e2. Career services e3. Other f. Your home/local community g. Alumni h. Other institutions i. Engineering students at other institution j. A wider engineering network / "the fiel 	_	No	Somew	what what what what what what what what
	"the profession" k. Potential employers	☐ Yes ☐ Yes	☐ No☐ No	Somew Somew	

Follow-up probe (after each item, ask):

0	How did these items contribute or not contribute to your sense of community?		
3.	Did any of these technologies and/or resources help foster or promote a sense of community?		
	a. Blackboard Collaborate		
Pr	obe (after each item, ask):		
	 In what ways did these technologies help you feel connected or make you feel distanced from the community? 		
4. What other resources, policies or programs could be offered to better foster a sense of community?			
5. Do you have any further thoughts about community that have not been discussed yet?			
6.	6. Would you be interested in volunteering to help out with and/or support community-building initiatives and activities for current PRODUCED students and/or alumni during the 2012-2013 school year?		

Appendix C Sample Alumni Interview Request Email (Phase 1 Needs Assessment)

Dear Student,

Congratulations on your recent graduation from the PRODUCED program!

My name is Erika Powell and I work for PRODUCED as an online course support assistant. I am also a 3rd year doctoral student in Instructional Technology at the Curry School of Education.

You may recall that we chatted briefly during the lovely graduation dinner given for your cohort in Lynchburg in early May if you were in attendance. As I may have explained that evening, I am beginning work on a project designed to build, strengthen and foster a sense of community for PRODUCED students. This work is being done on behalf of the PRODUCED program and for my doctoral dissertation/capstone.

I am writing to see if you would be available for a phone interview at some point between now and July 6th. The purpose of this conversation would be to better understand your experiences in the PRODUCED program and to find out what role, if any, community played in that experience. The insight and feedback you provide would be extremely valuable in helping optimize the types of supports and resources that PRODUCED offers.

Please respond to this email with a few dates/times that would work with your schedule. If you are available, we can coordinate accordingly.

Thank you in advance for	any	assistance y	ou might	be able to	provide.
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Sincerely,

Erika

Appendix D Interview Request Email Phase 2 Needs Assessment

Dear Current or Former Student,

I hope this message finds you doing well. You may recall that I work as a digital support assistant to help set-up and monitor PRODUCED classes. This year, I am also supporting Dr. Groves in developing and coordinating activities and initiatives that build, strengthen, promote and foster a sense of community for PRODUCED students.

Over the next few weeks, I will be interviewing current and former students about their experiences as PRODUCED students to help evaluate the program and assist with program development efforts. By doing so, I hope to gain a better understanding of your needs and also gain insight into how we create a supportive PRODUCED community that connects you to each other as well as the wider UVA community.

Might you be available for a phone interview at some point over the upcoming Thanksgiving break or at some point in December? I know the end of the semester can be busy. My schedule is flexible so just let me know what would work best for you.

Your participation in this interview would be completely voluntary. Completing the interview would be your consent for your responses to be compiled with others. Your confidentiality and anonymity would be assured and you will not be individually identified by name through your questionnaire or responses.

Sincerely,

Erika Powell PRODUCED Digital Support Assistant ep5fs@virginia.edu

Appendix E Interview Protocol for current and former PRODUCED students Phase 2 Needs Assessment

Specific procedural notes re: data collection

- o Collect demographic information from Susan Bagby (e.g. gender, date entered program, full-time/part-time, major/minor/concentration, region)
- \circ EP contacts participants via email or phone (3x)
- o Schedule interview (Skype; BB Collaborate; phone; anticipated completion time 1 hr.)
- o Distribute consent form and ask permission to record
- o Upon completion of the interview, send out conversation recap and thank you email.

Identify how students currently experience community (Current State)

- 1. Do you feel a sense of community as a PRODUCED student? Y/N
- 2. Describe your experience at UVA as a PRODUCED student:
 - a. To whom, what or where do you feel connected?
 - b. To whom, what or where do you feel disconnected or isolated?
- 3. What types of resources, programs or experiences have been meaningful to you as a PRODUCED student?
 - a. Professors
 - b. Classmates
 - c. Extra-curricular activities or supports
 - d. Professional COMMUNITY / Outside of UVA
- 4. What are your greatest needs as a student?
- 5. What are your interests outside of class & academics?

Determine gaps and needs (Desired State)

- 1. Besides access to classes and an engineering degree, what did you hope to gain by coming to UVa?
- 2. What types of resources/supports, individuals or programming do you want access to but currently do not have access to?
- 3. (Formal) What types of resources, supports, experiences or programming would help build or support the connections and bonds you make with professors and your coursework?
- 4. (Informal -1) What types of experiences, resources, supports or programming would

help you connect and bond with PRODUCED students from other parts of the state?

- 5. (Informal 2) What types of experiences, resources or programming would help you connect and bond with on-grounds students?
- 6. (Co-curricular) What types of help or assistance would you like from the library?
- 7. (Co-curricular) What types of help or assistance would you want to receive from Career Services?
- 8. (Co-curricular) What types of SEAS events would you want to be made available to you as an online student?

Understand how to solicit involvement & participation in community building activities (Bridge to achieving desired state)

- 1. We know that you have competing priorities and limited time as a student.
 - o How do you find out about events or programs that are available to you?
 - o How do you prioritize which ones you will participate in or become a part of?
 - o When are the best days/times to offer events or programming?
- 2. What motivates students to participate in activities that aren't directly related to their coursework given their schedules and other commitments?
- 3. What other barriers or challenges might be present with respect to community building and formation?

Additional questions

1. Final thoughts?

Interview Questions for Former PRODUCED Students

- Students were asked the same questions as current PRODUCED students (see Appendix G for list of questions) with the exception of the following two questions being added:
 - What motivated you to go from being an PRODUCED online student to an on-grounds student?
 - What are some of the biggest benefits and differences that you have found from being ongrounds as opposed to an online student?

Appendix F Interview questions with PRODUCED Program Director

Specific procedural notes re: data collection

- o Work with James to schedule interview (Skype; BB Collaborate; phone; anticipated completion time 1 hr.)
- o Distribute consent form and ask permission to record
- o Upon completion of the interview, send out conversation recap and thank you email.

Gain insight into the organizational mission, vision, and values for PRODUCED community.

- 1. What value does building these types of community add to your program?
 - a. Formal
 - b. Informal
 - c. Co-Curricular
 - d. COMMUNITY
- 2. What are the current strengths and weaknesses of the PRODUCED community (interactions, programming & supports)? [current state]
 - a. Formal
 - b. Informal
 - c. Co-Curricular
 - d. COMMUNITY
- 3. What might the ideal PRODUCED community look like to you in the next 3 to 5 years (interactions, programming & supports)? [desired state/vision]
 - a. Formal
 - b. Informal
 - c. Co-Curricular
 - d. COMMUNITY

Identify resources and potential strategies for community

- 1. What resources and/or alliances/partnerships are available and could be leveraged for building these types of community?
 - a. Formal
 - b. Informal
 - c. Co-Curricular
 - d. COMMUNITY
- 2. What motivates students to participate in these types of community?
 - a. Formal
 - b. Informal
 - c. Co-Curricular
 - d. COMMUNITY

Articulate system-wide barriers & challenges to community.

- 3. Where do students go to access or find out about what's happening in the community?
 - a. Formal
 - b. Informal
 - c. Co-Curricular
 - d. COMMUNITY
- 4. What dynamics, beliefs, attitudes or factors act as barriers and/or challenges to community formation and building?
 - a. Formal
 - b. Informal
 - c. Co-Curricular
 - d. COMMUNITY

Additional questions

2. Final thoughts?

Appendix G PRODUCED Student Survey Phase 3 Needs Assessment

A paper-based version of this survey is unavailable at this time. However, the online version of this survey can be found by visiting the following link:

http://inspirationaldraperies.com/Timur/ProducedSurvey_demo/login.html

The login information is provided on the screen.

Appendix H Invitation to participate in student survey email Phase 3 Needs Assessment

Dear PRODUCED student,

Congratulations on completing the first half of the spring semester! With spring break finally here, I hope that you'll make time for some well-deserved R&R and to also complete a survey that I am writing to inform you about.

You may recall that I support Dr. Groves in developing and coordinating activities and initiatives that build, strengthen, promote and foster a sense of community for PRODUCED students. Beginning today March 11th through April 1st, we would like to invite you to complete a survey intended to gather feedback and insights about your experiences as a PRODUCED student. Your responses will help the PRODUCED program assess and evaluate the current level of service. Your feedback will also help us develop strategies, resources and activities that connect you to the wider UVA community.

The survey should take approximately 25-35 minutes to complete. Should you complete the survey in its entirety, you will receive a \$10 gift certificate to Amazon.com as a token of our appreciation for your time and participation. Additionally, a summary of the final results can be made available to you upon request.

Your participation in this survey is completely voluntary and you can choose to withdraw at any time. Your name will not be associated with the data in any way. Any personally identifiable information will be coded as a number and not linked to your name or email.

A link to the survey can be found here. Your login name is your UVA email (e.g. mine is ep5fs@virginia.edu) and your password is your University ID number. If you do not know your University ID number, you can access it by logging into <a href="https://example.com/sisses/si

If you have any questions, concerns, wish to request a copy of the survey results or want to opt out of the survey completely, please let me know. I can be reached via email at ep5fs@virginia.edu.

On a related note, more exciting events and opportunities are headed your way in upcoming weeks so be sure to keep an eye on your Inbox for notes from Dr. Groves and I. Thank you in advance for your feedback and participation.

W	arm	regard	s,
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Erika

Appendix I Qualitative Themes and Codes for Phase 1 and 2 Needs Assessment

Phase 1 Codes

Theme	Codes
Pre-UVA Produced Community	CVCC; Connections made in Lynchburg
Extending the idea of Community	Work- layer of proximity; Work- extension of PRODUCED academic community; Work- reinforce connection; Overflow into personal life
Faculty Interactions	Faculty- Communication; Faculty- Frustrated with technology; Faculty- Not wanting to engage with PRODUCED students; Faculty- Understanding the online perspective
On-grounds and off-grounds students	On-grounds students- PRODUCED more tight knit community; On-grounds students- lack of connection to them; On-grounds students- access to opportunities, resources & events; On-grounds students- no easy way to connect
	PRODUCED program staff; Feedback & insights
eveloping Programming for dult students RODUCED experience	Entering the program; Classroom/Academic/Online Interactions; Peer support; Isolation; Distance; Ease of Access; Lost traditions; Student support resources; Identity & motivation; Technologies; Research; Other institutions

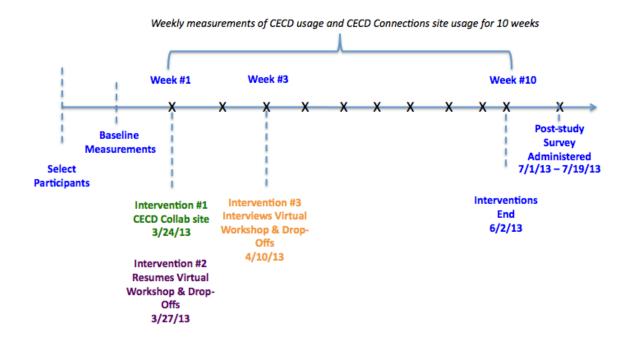
Phase 2 Codes

Theme	Codes
On-grounds and off-grounds students	Off-grounds students- unfamiliar with technology; Off-grounds students- working & communicating virtually; Advantages of on-grounds options: Easy to work together, Location facilities friendship, Bondinghanging out and de-stress, traditional college experience; Disadvantage of on-grounds option: Time and Physical presence
PRD Student Experience	Importance of place; Importance of orientation; Experience of community: Not sure what's going on at school, no need or desire to connect, limited experience due to length in the program; Representing the PRD online experience; Presence (fading back); Peer support: Bonding- hanging out and de-stress, Wanes with time in the program, Hard to build connection as time wanes, difficulty making out of class connections, Way to informally connect; PRD as an asset- prior work experience; Classroom/Academic/Online interactions; Labs
Faculty interactions	Office hours; Collab site organization; Access to teaching assistants; Consistence
Design- explicit needs or ideas	Facebook pages; Career Fairs; Connecting to other schools; Access to awards; Live-feed/stream; Recordings/on-demand; Feedback/question mechanism Access to symposiums; Guest speakers; Seminars Group projects; Demonstrations; Access to engineering clubs; Touchdown space & seamless integration; Free time (Me: time management series); Access to research: research as an internship option, research logistics and management; Take professor to lunch; Place-based gatherings (sports); Survey; Mentoring program; Engineering associations and professional organizations; Alumni connections; PRD student connection: Ways for PRD students to get to know each other; PRD peer support and networking opportunities

Phase 2 Codes

Theme	Codes
Design-explicit needs or ideas (cont.)	Academic coaching; Contact; E-Mail; Reaching inpersonalized and individualized contact; Groves/Moore or Professor get more attention; Collab: Collab Calendar, User-friendly Collab space; list of what's available; Priorities/Personal Interest: Personal interests (general), Personal interests (religion), Personal interest (priority-academic connection), Personal interest (career goals tie-in), Personal interest (work related), Personal interest (graded); Timing: Evening, Nights, Weekends, Afternoons between 1-3pm, Blocked with classes, Fridays; Offering events: Start small with offering events, Build a framework, structure or process, Individual participation & engagement/styles
Student services and events	Access to events because of faculty; Career services; Library: Library (no), Library (info retention)
PRD Mission	PRD mission to connect employers: James connecting students to job opportunities; PRD mission to stay in community
PRD Advantages	Flexibility
Why choose PRD/UVA?	UVA Brand; Charlottesville-location; Personal goal/Past history
Pre-UVA PRODUCED Community	Connecting with the community college; Pre-UVA PRD recruitment

Appendix J Time Series Design Study Timeline

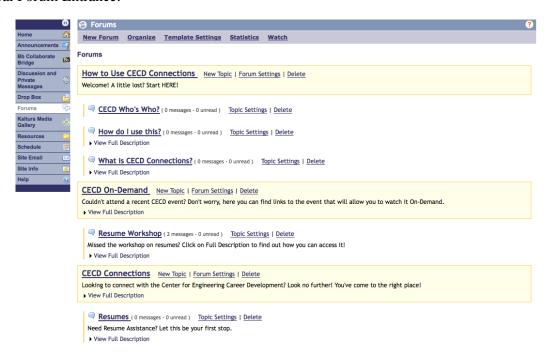


Appendix K Schematic of CECD Collab site

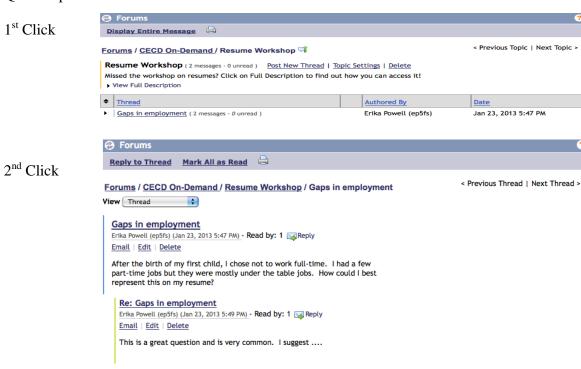
	How to use CECD Connections	CECD Who's Who How do I use this forum?
		What is CECD Connections?
Forums	CECD On- Demand	Recordings 1 and 2 Q&A
	CECD Connections	Links to CECD Resources Resumes
		Links to CECD Resources Interviews
		Links to CECD Resources Networking

Appendix L Screenshots from CECD Connections site

General Forum Entrance:



Q&A Capabilities



Appendix M Study Recruitment Email

Dear PRODUCED student,

You are invited to participate in a research study that aims to connect you to a variety of interviewing and resume resources offered through the Center for Engineering Career Development and similar offices here at UVA. This study is being conducted by Erika Powell, who is a doctoral student from the Curry School of Education at the University of Virginia and who also works in the PRODUCED program as a Digital Support Assistant. You are invited to participate in this study because of your enrollment in the PRODUCED program.

Participation in this study is voluntary and you may choose to withdraw at any time. Only Erika Powell will have access to the data. Results from the study will not affect your grades or standing in the program in any way. There are no significant risks related to participation in this study.

By taking part in this study, you will gain access to a series of interventions that will provide you with a) access to a Collab site called CECD Connections which houses a number of resources that can help you with your job or internship search, b) access to live and recorded CECD-led events on the topics of resumes and interviews; and c) increased opportunities for interaction with CECD staff.

The information collected for this study will be kept completely confidential. Observational notes, survey responses, attendance data and usage data about your Collab activity and use of CECD resources are the types of information that will be collected for the study. Reports of study findings will not include identifying information. This information will be kept on a password-protected computer and any printed copies will be kept in a locked file cabinet in Erika Powell's locked office. If you have any questions about this study, please contact Erika Powell at ep5fs@virginia.edu.

Should you have questions about your rights as a research participant, please contact Dr. Stephanie Moore, Director of Engineering Instructional Design, at slm6un@virginia.edu, Dr. James Groves jfg6e@virginia.edu or Dr. Patrice Grimes pgrimes@virginia.edu. They are supervising this study but do not have access to any data with personally identifiable information. They will only have access to final public research and reports related to this study.

Please review the attached consent forms. Then, respond to this email with a) your name and b) indicate whether you would like to participate by Monday, March 25, 2013. Should you choose to participate in the study, please also return electronically signed copies of the attached consent forms to Erika Powell at ep5fs@virginia.edu by 3/25 as well. You can electronically sign and date these consent forms and return them as a PDF. If you are unable to sign using electronic inking, please type your full name and date where indicated. Again, any information related to this study will remain confidential and will be accessible only to the researcher.

Kind regards,

Erika Powell Instructional Technology Digital Support Assistant University of Virginia

Appendix N Study Consent Form

Dear PRODUCED student [Insert Name],

Thank you for agreeing to participate in the CECD Connections study. Your involvement and participation is greatly appreciated. Below is a brief overview of the resources that will be available to you as part of this study:

CECD Collab site: Beginning March 25, 2013 you will have access to a Collab site called CECD Connections. Here, you will find directions for using the site as well as a variety of career development resources. The site has a Q&A Forum for you to post questions to CECD staff. Soon, we will hold two live events to help you with resumes and interviews. Not to worry if you are unable to make these live events as links to the recordings will be made available to you via this site. You will also find links to short surveys that we will need you to complete after you attend an event or view a recording. Please take some time to explore and familiarize yourself with the site's resources on 3/25 or shortly thereafter.

Resume Workshop: During the week of March 25, 2013 (DATE TBD Pending IRB approval), the CECD will offer a live resume workshop via MS Lync that will help you understand how to create a well-crafted resume. A recording of this event will be made available to you and will be placed on the CECD Collab site. Please use the Q&A feature to ask questions about any of the recordings or the topic of resumes, in general. After attending this workshop, you can also contact the CECD to schedule a special online "walk-in" hours and have your resume reviewed by CECD. Should you choose, you may also schedule a virtual meeting to review and discuss your resume with CECD staff.

Interviews Workshop: During the week of April 1, 2013P (DATE TBD Pending IRB approval), the CECD will offer a live interview workshop via MS Lync to orient you to the skills needed to successfully prepare for and perform during an interview. A recording of this event will be made available to you and will be placed on the CECD Collab site. Please use the Q&A feature to ask questions about the recording or the topic of interviews, in general. After attending this workshop, you can contact the CECD to schedule a one-on-one 45 min. virtual mock interviews or behavioral interview sessions

Should you have questions about your rights as a research participant, please contact Dr. Stephanie Moore, Director of Engineering Instructional Design, at slm6un@virginia.edu, Dr. James Groves jfg6e@virginia.edu or Dr. Patrice Grimes pgrimes@virginia.edu. They are supervising this study but do not have access to any data with personally identifiable information. They will only have access to final public research and reports related to this study.

Both the CECD and myself are very much looking forward to supporting you with these resources and the larger study. Thank you again for your participation. Please feel free to contact me if you have any questions at ep5fs@virginia.edu.

Warm regards,

Erika Powell Instructional Technology Digital Support Assistant University of Virginia

Letter of Consent CECD Connections

You are invited to participate in a research study that aims to connect you to a variety of interviewing and resume resources offered through the Center for Engineering Career Development and similar offices here at UVA. This study is being conducted by Erika Powell, who is a doctoral student from the Curry School of Education at the University of Virginia and who also works in the PRODUCED program as a Digital Support Assistant. You are invited to participate in this study because of your enrollment in the PRODUCED program.

Participation in this study is voluntary and you may withdraw at any time. Only Erika Powell will have access to the data. Results from the study will not affect your grade or standing in the program in any way. There are no significant risks related to participation in this study.

By taking part in this study, you will gain access to a series of interventions that will provide you with a) access to a Collab site called CECD Connections which houses a number of resources that can help you with your job or internship search, b) access to live and recorded CECD-led events on the topics of resumes and interviews c) increased opportunities for interaction with CECD staff.

The information collected for this study will be kept completely confidential. Reports of study findings will not include identifying information. Observational notes, attendance data and usage data about your Collab activity are the types of information that will be collected for the study. This information will be kept on a password-protected computer and any printed copies will be kept in a locked file cabinet in Erika Powell's locked office.

If you have any questions about this study, please contact Erika Powell at ep5fs@virginia.edu. Should you have questions about your rights as a research participant, please contact Dr. Stephanie Moore, Director of Engineering Instructional Design, at slm6un@virginia.edu, Dr. James Groves jfg6e@virginia.edu or Dr. Patrice Grimes pgrimes@virginia.edu. They are supervising this study but do not have access to any data with personally identifiable information. They will only have access to final public research and reports related to this study.

Should you choose to participate in the study, please provide an electronic signature. You can electronically sign and date these consent forms and return them as a PDF. If you are unable to sign using electronic inking, please type your full name and date where indicated. Again, any information related to this study will remain confidential and will be accessible only to the researcher.

Kind regards,
Erika Powell Instructional Technology Digital Support Assistant University of Virginia
Sign or Type your name here:
Write or Type today's date here:
Materials Release Consent Form Project Title: A Systems Approach to Developing a Total Learning Experience for Online Learners: A Performance Measurement of Career Development Interventions for Online Undergraduate Engineering Students
During the course of this study, you were recorded on audio and videotape. Upon completion of the study, the researcher may decide to use this information in a presentation or by the PRODUCED for improving future offerings and program developments. These materials may be designated "for research only" or "private."
If you designate the materials "for research only," your audiotape(s) and videotape(s) will be analyzed by the researcher and your information will be used to complete the research study and for program development purposes. In any future conference presentations or reports, your information will be reported in a way that does not identify you and your materials will be destroyed after the study is complete.
If you designate the materials "private," the audiotape(s) and videotape(s) will be housed on the CECD Connections Collab site for this project only. Your information will be used only for program development purposes and will be reported in a way that does not identify you. Such information will never be released to anyone outside of the PRODUCED program and your information will not be reported or included in any future conference presentations.
If in the future you wish to change the status of your audiotape(s) and videotape(s) you may contact Erika Powell at ep5fs@virginia.edu .
I hereby designate the audiotape(s) and videotape(s) for research only and give my permission for the researcher to use my materials as part of the research study. I want my materials to be reported so that they will not identify me and destroyed when the study is complete.

___ I hereby designate these materials as private and do NOT give my permission for my audiotape(s), and videotape(s) to be used by anyone outside of the PRODUCED program. The

materials will be housed on the CECD Connections Collab site.

Sign or Type your name here:	
Write or Type today's date here:	
Sincerely,	

Erika Powell Doctoral Candidate Instructional Technology Digital Support Assistant University of Virginia

Materials Release Form for future data analysis

Project Title: A Systems Approach to Developing a Total Learning Experience for Online Learners: A Performance Measurement of Career Development Interventions for Online Undergraduate Engineering Students

During the experiment, you were recorded on audio and videotape. I would like to ask permission to use your data for future research studies. For instance, I might use the information to discuss how to improve and shape interventions that foster a sense of online community. Your name will not be linked to these materials, as the data are linked only by an ID number. All videotapes and audiotapes will be securely stored on a password protected computer in a filing cabinet for up to 7 years and then destroyed. If you choose not to give permission to use your videotape and audiotape, there is no penalty. In the future, if you wish to change the status of your data, you may contact me at ep5fs@virginia.edu

I give permission for my data to be used for future research.
I do NOT give permission for my data to be used for future research. Please destroy once this study is complete.
Sign or Type your name here:
Write or Type today's date here:

Appendix O Program Director's email to participants

Dear PRODUCED student,

In a few days, my colleague Erika Powell will be sending a note inviting you to participate in a study that aims to connect you to a variety of interviewing and resume resources offered through the Center for Engineering Career Development and similar offices here at UVA. Erika's efforts are part of the *PRODUCED* program's overall focus on quality and improvement. I would be most appreciative if you could respond to her inquiry. Your participation in this study may help prepare you to enter the engineering profession. It will also play a critical role in shaping future *PRODUCED* program developments and offerings in the co-curricular arena.

Thank you for entrusting your education to the *PRODUCED* program and best wishes for a successful semester.

Best regards,

James

James F. Groves, Ph.D.
Associate Professor, Department of Engineering & Society
Associate Dean for Online Innovation
School of Engineering and Applied Science
University of Virginia
85 Engineer's Way, 017 Rice Hall
P.O. Box 400235
Charlottesville, VA 22904-4235

Ph: 434-924-6261 Cl: 434-227-1237

Appendix P Observational Checklist

CECD Connections Event Behavior Checklist
Before:
Event is publicized and RSVP link posted Circle all that apply: Email / Lync / CECD Announcements page / CECD list serv / Other Presentation, speaker contact information and/or relevant handouts are housed on CECD Connections Forum so that students can interact with content at their convenience. (*May also be done after*)
During:
Speaker is heard (Audio) Speaker is seen (Video) Speaker's presentation is shared (Desktop Sharing) Speaker interacts with PRODUCED students Acknowledges their presence Poses questions Invites PRODUCED students to share their experiences, thoughts or opinions Invites PRODUCED students to model, role play or to demonstrate a skill or idea Responds to student questions or remarks in chat window or out loud Engage in friendly chat or informal conversations
Speaker provides opportunities for small break out group activities or sessions ☐ Speaker provides feedback and guidance to students in those groups ☐ Speaker observes those groups ☐ Speaker comments on the group activity upon returning to the larger session
PRODUCED students interact with the speaker ☐ Ask questions via chat or using audio capabilities ☐ Ask for clarification ☐ Add to the discussion by expanding on a point using their experience ☐ Submit questions before or after on the CECD Connections Forum ☐ Engage in friendly chat or informal conversations
PRODUCED students interact with each other ☐ Share ideas or resources (*students may also make reference to doing this at a later time) ☐ Engage in friendly chat or informal conversations ☐ Ask each other about speaker comments ☐ Missed speaker comments (i.e. What did he/she say? Do you think he/she

	means?)
	☐ Makes personal remarks about speaker's comments
	After:
☐ Speaker "hangs	" around for a few minutes so that PRODUCED students can ask any
lingering questi	ons
☐ Presentation, sp	eaker contact information and/or relevant handouts are housed on CECD
Connections U'	VA Collab Forum so that students can interact with content at their
convenience. (*	may have been done in the before section*)
☐ Link to student	survey is posted
☐ Speaker or PRO	DDUCED staff participate in the Q&A Forum on the CECD Connections
Forum	

Level of Community Score:

Scoring Guide:

0	1	2	3	4	
	Underdeveloped	Emerging	Developed	Advanced	
 Session not held due to technical difficulties or cancellation Session is held but none of the bullet points related to the sections before, during and/or after have been met. 	25% of the bullet points related to the before, during and after sections have been met.	50% of the bullet points related to the before, during and after sections have been met.	75% of the bullet points related to the before, during and after sections have been met.	100% of the bullet points related to the before, during and after sections have been met.	

Observational Notes:

Appendix Q Post-event Survey

Thank you for attending the [INSERT EVENT NAME]. If you attended the event on [INSERT DATE] or watched the recording, please take a few minutes to provide feedback. Your opinion will be valued and used to shape future events. Thank you.

		Strongly Disagree (1)	Disagree (2)		Somewhat Disagree (3)	Somewhai Agree (4)	Agree (5)	Strongly Agree (6)
1.	I felt a stronger connection to the Center for Engineering Career Development.	1	2	3	4	5	6	
2.	I would recommend this event to other PRODUCED students.	1	2	3	4	5	6	
3.	I would be more likely to attend an event like this again.	1	2	3	4	5	6	
4.	I have a better understanding of the service offered through the Center for Engineering Career Development.		2	3	4	5	6	

Appendix R CECD Usage Report

Names of students who used
Names of students who used
Names of students who used

Appendix S End of Study Usage Survey

Q.1 Did you view any of the career development resources provided on CECD Connections Collab site?

If *yes*: In the table below please place an X next to any of the resources that you viewed:

Resource	Place an X in this column if you viewed the resource
How to Use the CECD Connections Site Section	
Who's Who on CECD Connections?	
What's What on CECD Connections?	
Resumes	
3/27 Resume Workshop Recording Link	
CECD Resume Prep Packet	
CECD Cover Letter Prep Packet	
UCS Writing Resumes	
UCS Writing Cover Letters & Thank You	
Letters	
UCS Career Development Model: Resumes	
Interviews	
4/10 Interview Workshop Recording Link	
CECD Traditional Interviews	
CECD Behavioral Interviews	
CECD Case Interviews	
CECD Questions to Ask an Interviewer	
UCS Career Development Model: Interviewing	
UCS Informational Interviewing	
CECD Informational Interviewing	
UCS Interview Stream	
General Job Search Tools & Resources	
Career Advice Videos – Career Spots	
Organize your Job Search – Career Shift	
Find Jobs & Internships – CavLink	
CECD Handouts	
Job Search Step-by-Step	
Alumni & Networking	
General Career Development Resources at	

T TT 7 A	·
1 1 1 / / /	
UVA	
CVII	

If no, what reason, if any, kept you from viewing the resources on the CECD Connections Collab site:

Reasons	Place an X in this column if you viewed the resource
Busy schedule - Just didn't have the time	
Study was completed by the time I was ready	
to use the site	
Couldn't figure out how to use the site	
I'm not looking for a job or an internship right	
now	
The topics that I wanted weren't available	
Other (please list)	

Appendix T Emails to Content Review Experts

Email to Career Services:

Dear Frances,

I am writing to see if you would be willing to review the attached questions before you head out or upon your return on January 2nd. These are the questions that I would like to include on the web-based survey that I will be distributing to PRODUCED students. You may recall that this survey is part of the larger needs assessment phase of my capstone project which seeks to identify which student support services and resources would be most likely to connect PRODUCED students to other parts of the UVA community. Prior to administering the survey, however, the first step is to have the items reviewed by content experts such as yourself or a delegate of your choosing. This is done to ensure the reliability and validity of the instrument.

At this point, I am only sending the questions from the survey that are related to the work done by the Center for Engineering Career Development. Feedback in the following two areas would be most helpful: a) whether the items & questions accurately represent the types of domain and practice areas that your department offers and covers and b) feedback on what you would change, delete, add or otherwise do differently.

If you would like to see the survey in its entirety or would like any further information, please let me know via email.

1110 11110 11 1110			
Many thanks for	your time.		

Best.

Erika

Email to Library:

Dear Fred.

Thank you for agreeing to review the survey questions. I have attached them to this message and if you would be willing to review them before you head out or upon your return on January 2nd that would be so very appreciated and most helpful.

As I may have explained, these are the questions that I would like to include on the web-based survey that I will be distributing to PRODUCED students. You may recall that this survey is part of the larger needs assessment phase of my capstone project which seeks to identify which student support services and resources would be most likely to connect PRODUCED students to other parts of the UVA community. Prior to administering the survey, however, the first step is to have the items reviewed by content experts such as yourself or a delegate of your choosing. This is done to ensure the reliability and validity of the instrument.

At this point, I am only sending the questions from the survey that are related to the work done by the library. Feedback in the following two areas would be most helpful: a) whether the items & questions accurately represent the types of domain and practice areas that your department offers and covers and b) feedback on what you would change, delete, add or otherwise do differently.

If you would like to see the survey in its entirety or would like any further information, please let me know via email and I will send accordingly.

Thank you again for your time.

Best wishes for a wonderful holiday season and a great start to 2013!

Warm regards,

Erika

Appendix U Results from PRODUCED Alumni Interviews (Needs Assessment – Phase 1)

PRODUCED Summer 2012 Graduates

Interview Results

Summary:

During the summer of 2012, Erika Powell, a 3rd year doctoral student at the Curry School of Education, conducted one-on-one interviews with recent graduates of the PRODUCED program. Graduates were initially contacted via email to solicit their participation and to also schedule the interview. At an agreed upon date & time, graduates were then interviewed via telephone and/or SKYPE. The interview period lasted from June 2012 until August 2012.

The purpose of conducting these interviews included:

- To begin determining the characteristics of PRODUCED students so as to optimize future design of learning experiences for current students
- To understand how PRODUCED students have experienced a sense of community
- To identify where gaps in PRODUCED students' connection to community might exist
- To understand the role that technology plays in fostering a sense of community
- To identify a list of graduates that could assist with future community building initiatives and activities

A total of six graduates were interviewed using a semi-structured interview process. All interviewees were males and had majored in Engineering Science through the PRODUCED program at the University of Virginia. The range of minors represented within the sample include: Materials Science, Mechanical Engineering and Electrical Engineering. On average, each interview took approximately 52 minutes to complete.

This report includes a summary of the comments and insights that graduates provided during their interviews. Where possible, data was coded to identify patterns within the interviewees' responses and to organize the data into larger themes. The order that the comments appear in does not reflect the priority that graduates placed on various issues.

Ultimately, this report is designed to serve as an informational tool to support the development of future community building activities within the PRODUCED program. Comments in [] represent insights or ideas that the researcher may have had while analyzing the data. These have been included in the report as in-situ comments so that the insight is linked directly to the data.

From the researcher's vantage point, the following appeared to be recurrent themes and/or important factors to keep in mind as future community building activities are designed and implemented:

- o Pre-UVA PRODUCED community: For many graduates, community formation took shape prior to entering the PRODUCED program at UVA. Many described the role that CVCC played in fostering a sense of community. Graduates also formed community by attending the same high schools and by living in the same communities. It would be interesting to continue investigating not only how students form community prior to enrolling in the UVA portion of the program but to also develop ways to best support this sense of community while students are at CVCC (or other community colleges throughout the commonwealth). Additionally, it would be worthwhile to develop supports that help students transition to the wider UVA PRODUCED community so that they can better interact with peers who may not have attended the same community college.
- Extending the idea of Community: Community building activities occurred not just in the classroom but in other places as well. For this group of PRODUCED students, their daily professional work environment was an area where community building occurred and was maintained.
- o **Faculty Interactions:** Communication appeared to be the biggest area of frustration for graduates. Emails and phone calls were the primary forms of communication that graduates used to reach out to faculty members. However, many were dissatisfied with the responses (or lack thereof) they received from faculty. Graduates also raised a number of key issues related to faculty interactions which included: a need for better accessibility after class, advanced awareness of when PRODUCED students would need to be on grounds, monitoring breakout rooms and developing an understanding of why online students are "quiet" participants.
- On-grounds and off-grounds students: During the interviews, graduates frequently compared their experiences to on-grounds students' experiences. While a few felt that they were more tight-knit than on-grounds students, others felt that on-grounds students had better access to faculty as well as resources and events that they themselves did not have access to. Additionally, at some points in the interviews, there appeared to be tension around working with on-grounds students. This represents a gap in resources, supports and/or programming available to help both on-grounds and PRODUCED students effectively interact and work together.
- O Developing programming for adult students: Graduates of the PRODUCED program had a tremendous amount of responsibility. Many worked full-time, had families, children, took care of relatives and/or had purchased new houses. Such responsibilities tend to set them apart from the "traditional college student" demographic found at UVA. If this type of demographic is prevalent in the PRODUCED program, community building activities will need to structured in ways that take their needs and constraints into account. In many respects, this presents both a challenge as well as an opportunity for future design efforts.
- o **PRODUCED as an asset**: As found in the interview responses found in this report, PRODUCED students possess a wealth of technical, professional and practical

knowledge. As some of the interview data suggests, this asset tends to be underutilized in their interactions with the university, their peers and with faculty. One important design challenge will be how to best showcase and recognize their talents and expertise.

Q5: Did you feel a sense of community as a PRODUCED student?

Yes	5
No	0
Somewhat	1

Q5a: In what ways did you feel connected?

o <u>CVCC:</u>

The CVCC experience appears to either mark the beginning of the formation of community and/or plays a significant role in fostering cohesion among PRODUCED students prior to their enrollment at UVA. The 2012 PRODUCED graduates mentioned feeling connected as a result of their experiences going through the program at CVCC. It gave them a geographical connection to each other as well as a shared history and set of shared experiences. Three out of the six respondents cited the benefit of having already gone to school and/or worked together while at CVCC. One graduate mentioned that in the absence of such a cohort, they probably would not have felt that level of community. He also noted that he did not connect with those outside of the CVCC cohort, at that deep of a level, as he progressed through the program.

This said, online interactions were important in helping students expand their sense of community to PRODUCED students who had not been a part of the CVCC program.

[See more below under UVA – Online interactions section]

o UVA:

Online interactions: 2012 graduates cited that this allowed them to form bonds with other students. Through these bonds, students could rely on each other, help each other out, study together, and also meet new students. This is consistent with the literature on the affordances on community.

Events: These were difficult to attend due to geographical distance and graduates' personal responsibilities.

Professors: Some made the graduates feel a part of the community while others did not. Not responding to email was one of the things cited as a practice that took away from graduates' sense of connectedness

o Work

Many of the graduates worked together in their professional careers. This reinforced their sense of connection to each other, created another layer of proximity within the community and also extended the PRODUCED community outside of the immediate academic environment.

o On-grounds students

PRODUCED graduates were aware of the difference between their experiences and those of traditional on-grounds students. One graduate, in particular, felt that because they relied on each other quite a bit, they were able to form a more tightly knit community than the traditional on-grounds students.

Q5b: In what ways did you feel unconnected?

o On-grounds students

Graduates felt a lack of connection to on-grounds students. They stated that ongrounds students had access to opportunities, resources and events that they themselves were unable to participate in. They also felt that there was no easy for them to interact with on-grounds students.

o <u>Classroom</u>

The classroom environment was also mentioned as an area where graduates felt unconnected. One graduate mentioned that the set-up of class did not allow them to linger and ask questions of the professor after class had finished. He felt that this was one of the differences between the traditional classroom setting and an online environment like PRODUCED.

Another graduate mentioned that professors' frustration with technology impacted their relationship with students. This graduate felt that professors interpreted PRODUCED as a program that made them go out of their way and, as a result, students were labeled as an inconvenience.

Q5c: What benefits did you derive from this community, if any?

o Academic

Being able to get together to work on homework was cited as a benefit. One graduate noted that the fact that the community was so intertwined and permeated through other aspects of their life, it really fostered a real sense of learning.

o Peer/Professional

Graduates felt that the community offered them an opportunity to build long-lasting relationships and friendships with each other. Two of the six additionally described how

these connections helped extend their professional network. Through interactions with their peers, graduates were able to make connections that, in some cases, landed them a job with their peers at other companies. Going through the same classes together and working together professionally appear to be the primary catalysts and, for some, advantages from which these opportunities arose.

o On-grounds Comparison

Graduates found an advantage in being able to work full-time or part-time while completing the program. One graduate described the advantage of being a PRODUCED student while also working in the Lynchburg community was that it brought together the academic and professional aspect and allowed for even more connections to be made. This aspect, in the graduate's opinion, is something that traditional college students won't do until after graduation.

Q5d: What do you feel you contributed to this community, if anything?

Technical & professional knowledge

One graduate explained that through involvement in the PRODUCED program, he was able to bring the technical and professional knowledge and skills he acquired at work to the academic setting. PRODUCED represented a space where this graduate could apply what he learned at work on a daily basis to their coursework. He was able to see the big picture because the work done in class had a practical application.

This is an aspect of the PRODUCED student experience that is a major asset and contribution to the community. In contrast to the traditional demographic of ongrounds students, PRODUCED students tend to have more work experience and, thus, represent a potential source of knowledge that could be shared with professors as well as traditional college-aged students.

Peer Support

Graduates saw their biggest contribution as being the help and support they could provide each other. A big area of support occurred during study sessions they arranged. Graduates also were able to support each other by sharing ideas and problem-solving. The friendships they formed also provided another type of peer support.

PRODUCED program improvement

Graduates felt another contribution came through the feedback and insights they offered related to improving the PRODUCED program. For example, a special project undertaken in an STS course helped instruct their peers in how to use tools for that particular class. Additionally, their feedback helped identify deficiencies in the platform, which also helped further improve the technologies used in the program.

Q5e: How did this community compare to other communities you belong to?

A few graduates were not quite sure how this community compared to other communities.

Academic:

Graduates felt that the PRODUCED community compared to academic communities they had been a part of previously. The tie that brought them together was working towards completing their degrees given a specific time frame. They also noted that the connection felt more tight-knit than their traditional experiences because there was a lot of emphasis on working together and helping each other. One factor that was mentioned which influenced their sense and development of community was how professors ran their classes.

Professional/Work

Graduates also compared the PRODUCED community to a professional or work community. One graduate said that like in a work setting he was able to part of a larger group but also work closely with a smaller team or set of colleagues.

Military:

One graduate compared the experience to time spent in the military. For him, this was because the bonds and friendships made through the PROGRAM carried over into his personal life outside of school.

Q5f: Prior to enrolling, did you feel a strong sense of community in PRODUCED?

Yes	3
No	3
Somewhat	0

Explain:

Pre-Community at CVCC

Graduates that felt that the sense of community they felt at CVCC prior to enrolling in PRODUCED to be an important factor in forming and maintaining once they began the UVA portion of the program. For one graduate, the Lynchburg group began forming a sense of community while studying together and taking the same classes at CVCC. This graduate also stated that the course in thermodynamics was where the strongest bond was formed. Another graduate noted that the bonding that occurred through CVCC made it easier for them to connect with each other rather than students from other areas. He felt that the bonds were actually stronger because he had met them in person.

Entering the Program

Graduates who did not feel a strong sense of community prior to entering the program, expressed concern about how they would compare to UVA grounds-based students. As the first group to go through PRODUCED, they worried whether the program would last but also recognized that the sense of community would develop over time. Dr. James Groves was their main point of contact.

Q6a: Did you feel a sense of community with respect to other PRODUCED students?

Yes	6
No	0
Somewhat	0

How did it contribute or not contribute to your sense of community?

Connections made in Lynchburg

The connections made at Lynchburg and CVCC were mentioned as key forces in helping create community amongst PRODUCED students. As many graduates had attended the same high schools, the community in Lynchburg provided graduates with a shared history and common geographical base. The sense of community that developed at CVCC helped graduates gain familiarity with each other.

Peer support

Connections made with PRODUCED students were mentioned as the bulk of the community feeling. Graduates felt that the PRODUCED student community provided a number of different types of support including: homework support, an outlet for venting and help with frustrating technologies. The peer support offered through other PRODUCED students also helped mitigate feelings of isolation.

Q6b: Did you feel a sense of community with respect to Grounds-based students?

Yes	0
No	4
Somewhat	2

How did it contribute or not contribute to your sense of community?

Graduates felt that this was an area that needed improvement. The sense of community established with on-grounds students was primarily established through group projects and/or presentations. However, graduates reported difficulty in working with grounds-based students for the following reasons:

- O Differences in work schedules (i.e. working with PRODUCED students was easier because their schedules were pretty much the same)
- o Difficulties in communicating (i.e. on-grounds students wouldn't respond to emails)
- General difficulties associated with group work and work styles (i.e. on-grounds students put off everything until the last minute and some individuals taking on more responsibilities than others)
- O Difficulties with the technologies (i.e. on-grounds students did not know what to expect with respect to the technology or viewed having to use extra technologies as a burden)

Graduates found it difficult to build relationships with on-grounds students. One also reported that on-grounds students often failed to recognize or see the value in the professional and experiences with real life application of content that PRODUCED

students had. Two graduates cited the importance of on-grounds students learning how to work virtually. They emphasized that working together, particularly in virtual environments, are needed in the workplace.

Q6c: Did you feel a sense of community with respect to student groups or organizations?

Yes	0
No	6
Somewhat	0

How did it contribute or not contribute to your sense of community?

Distance

Graduates felt that distance was a key factor that impeded their ability to connect with student groups or organizations. They reported being aware of the events and opportunities by virtue of being included on student list-servs. However, many could not attend or even justify taking the drive due to distance.

Other responsibilities

PRODUCED graduates also reported other responsibilities as barriers to connecting with this aspect of community. Responsibilities included in this category include factors such as work, school and family.

Ease of Access

One graduate noted that ease of access to these types of activities as a key factor. For example, one graduate described how his company often offered events via streaming technologies where he could ask questions live or watch at a later time. However, he could not attend those offered through UVA because of scheduling and/or because the

Elluminate technology was blocked on his computer at work. [In the future, such an approach might be worthy of exploration].

Another graduate noted that he was able to connect to organizations through his work community easily so he did not feel compelled to connect to student-run organizations at UVA. This graduate highlighted the need to be sensitive to ongrounds students energy and time if student organizations began offering meetings online. He suggested selecting only a few organizations to start with and choosing only ones that PRODUCED students had expressed an interest in participating in.

Q6d: Did you feel a sense of community with respect to engineering faculty?

Yes	2
No	0
Somewhat	4

How did it contribute or not contribute to your sense of community?

Graduates recognized that some faculty members did not seem to want to engage with PRODUCED students. They thought this could be due to the professor's general teaching style (i.e. they did not really engage or interact with the ongrounds students either) or their frustration with technology.

Factors/experiences that contributed to graduates' sense of community vis-à-vis engineering faculty include:

- o Trips to UVA to see professors in person
- o Professors who responded to their emails
- o Professors who returned their phone calls

Q6e: Did you feel a sense of community with respect to PRODUCED program staff?

Yes	6
No	0
Somewhat	0

How did it contribute or not contribute to your sense of community?

Graduates had very positive responses related to PRODUCED program staff. In particular, they applauded the efforts of Dr. Groves, Susan Bagby and Michael Redwine and John Baxter (sp.?). PRODUCED program staff felt that PRODUCED program staff:

o Really understood what students were going through and also understood the learning curve associated with delivering a program online

- Were people they could go to for help whenever they needed help with a problem or needed advice
- o Made them feel like someone was watching out for their interests

Q6f: Did you feel a sense of community with respect to UVA as an institution?

Yes	0
No	3
Somewhat	3

How did it contribute or not contribute to your sense of community?

Isolation

Graduates felt a sense of isolation from UVA as an institution. This was due in part to geographical distance but also because they did not know what resources were available to them.

Lost traditions

A few graduates noted that the online experience was different from the ongrounds experience. One felt that the traditions associated with UVA was lost in the online context. Another felt disconnected from architectural landmarks — important to the UVA tradition. Graduation was noted as the first event in which graduates felt connected to the institution.

Q6g: Did you feel a sense of community with respect to UVA resources such as the library?

Yes	2
No	3
Somewhat	1

How did it contribute or not contribute to your sense of community?

This question yielded mixed responses from graduates. Some graduates were aware of the resources available through the library but felt they did not really use or take advantage of them. One graduate relied more on the resources available though his work. One graduate felt that while he knew what was available to him through the library, he could have used more explanation and guidance and using those resources. Finally, one graduate felt that the library was a place where he really felt welcome. He was very satisfied with services that he received from library staff as an online student.

Q6h: Did you feel a sense of community with respect to UVA resources such as Career Services?

|--|

No	4
Somewhat	0

How did it contribute or not contribute to your sense of community?

Most of the graduates reported having very little interaction with Career Services. Two graduates were aware of the resources available through Career Services but did not take advantage because they already had jobs or internships. One graduate reported having already established connections through classmates enrolled in PRODUCED, church and individuals within the Lynchburg community. One graduate expressed an interest in seeing more local opportunities in Central Virginia available through the Career Services emails.

[This could be an area where Region 2000 connects more with UVA Career Services by posting local job announcements in list-serves and emails to students.]

Q6i: Did you feel a sense of community with respect to other resources or services?

Yes	2
No {N/A}	4
Somewhat	0

How did it contribute or not contribute to your sense of community?

Region 2000 and CAER

One graduate recognized Region 2000 and CAER's role in bringing together industry, academia and students.

Work

One graduate mentioned that he was able to expose UVA to different technical fields that he was involved in through work.

[This is an example of the types of contributions that the PRODUCED students can make to the UVA community.]

Q6j: Did you feel a sense of community with respect to your local home community?

Yes	3
No	2
Somewhat	1

How did it contribute or not contribute to your sense of community?

Two graduates felt that being able to complete their coursework from their home community was one of the biggest benefits of the PRODUCED program. One even

felt that his connection to his home community was much stronger because he was able to live there while completing classes. This, he noted, would have been lost had he been an on-grounds student. Another student felt that he never lost touch with his church and athletic community and was actually able to establish new groups in his community as a result of his work and school.

Of the graduates that reported "no", one did not really participate in community activities at home and the other felt that people in his community did not really understand the program.

The student who reported "somewhat" felt that he spent a lot of time online and parttime jobs in the community did not work with his class schedule. He also reported feeling a sense of isolation because he did not have a cohort.

Q6k: Did you feel a sense of community with respect to alumni?

Yes	0
No	4
Somewhat	2

How did it contribute or not contribute to your sense of community?

As this was the first PRODUCED group to graduate, connection to PRODUCED alumni did not readily occur. Graduates felt connected to each other as alumni upon graduation. Graduates did report occasionally connecting with prior UVA alumni through work but the program did not generate any new alumni connections.

Q6l: Did you feel a sense of community with respect to other institutions?

Yes	2
No	3
Somewhat	1

How did it contribute or not contribute to your sense of community?

CVCC

CVCC was the institution where students felt the strong sense of community. One graduate felt that participating in activities such as Open House, giving talks to CVCC students, and attending the Board of Visitors meeting helped maintain that connection.

Other institutions

Graduates did not feel a sense of community with respect to other institutions such as Liberty or Sweet Briar as a result of their involvement with PRODUCED. Two graduates

mentioned a sense of community with respect to the STS course that focused on the UVA-Germany partnership.

Q6m: Did you feel a sense of community with respect to engineering students at other institutions?

Yes	1
No	5
Somewhat	0

How did it contribute or not contribute to your sense of community?

Apart from the STS course with the UVA-Germany partnership, graduates did not feel a sense of community with respect to engineering students at other institutions as a result of the PRODUCED program. One graduate noted that the connections that he made with students outside of UVA occurred as a result of his work with student/co-workers at companies such as BMW and Areva. Another graduate noted that the fact that PRODUCED program did not branch out much was not a problem because he was not expecting that from the program.

Q6n: Did you feel a sense of community with respect to a wider engineering network/profession/field?

Yes	2
No	2
Somewhat	2

How did it contribute or not contribute to your sense of community?

Graduates mentioned feeling a connection with Areva and the companies that supported the PRODUCED program. One felt that he was able to connect to the engineering network as a result of his professional environment and the PRODUCED program. Three other graduates felt that they connected to the wider engineering profession more through work as opposed to PRODUCED activities.

CAER was also mentioned as a resource to connect graduates to the wider engineering profession. For one graduate, Dr. John Jones and Dr. Groves played a role in connecting students to the wider engineering network.

Q60: Did you feel a sense of community with respect to potential employers?

Yes	3
No	2
Somewhat	1

How did it contribute or not contribute to your sense of community?

Graduates recognized the time and energy that companies put into the program in order to make it a success. Another stated that this was the best part of the PRODUCED program because it helped him easily transition from student life to a career. One graduate recommended that the connection to potential employers be built earlier rather than later. He felt that while the connections were there when people needed them, they were not really advertised well. Three of the graduates were employed and did not need to access such resources while enrolled in the program.

Q7a: Did the UVA Collab site help foster or promote a sense of community?

Yes	3
No	1
Somewhat	2

In what ways did it make you feel connected or unconnected?

Graduates discussed UVA Collab in terms of its functionality. It was viewed as a place to store, organize and access materials such as homework and lecture notes. One graduate noted that the level of community felt with respect to UVA Collaborate depended on how a professor used it. For another graduate, discussion boards brought about a sense of community between PRODUCED students and on-grounds students. Two graduates also noted how the meeting capabilities associated with UVA Collab contributed to their sense of community.

Q7b: Did the PRODUCED website help foster or promote a sense of community?

Yes	0
No	4
Somewhat	2

In what ways did it make you feel connected or unconnected?

Graduates visited the PRODUCED website for information and updates about coursework. This was done mainly upon entering the program. One graduate was not sure where the site was located while another one did not frequent the site very often. One graduated noted that the site was better for drawing people into the program and shared the link with colleagues and friends who were interested.

Q7c: Did the UVA website help foster or promote a sense of community?

Yes	2
No	3
Somewhat	1

In what ways did it make you feel connected or unconnected?

The UVA website helped graduates feel connected to what was going on ongrounds. Two graduates noted that the pictures on the front page helped draw them and/or determined what parts of the site they would explore further. One of the graduates noted that he able to see the events but was not able to participate. Parts of the UVA website that were most used included: calendar, email and UVA Collab.

Q7d: Did Blackboard Collaborate help foster or promote a sense of community?

Yes	5
No	1
Somewhat	0

In what ways did it make you feel connected or unconnected?

Blackboard Collaborate was the primary means of delivering class and the primarily vehicle that allowed graduates to communicate. One graduate especially liked being able to hold help sessions and organize group meetings. Features that graduates found contributed to their sense of community include:

- o **Chat:** It allowed them to talk amongst themselves. The chat feature also kept them from having to interrupt the class if they had a question.
- o **Breakout Rooms:** This feature allowed them discussion opportunities.
- Whiteboard: This feature could be used during group sessions to share and express ideas.

Q7e: Did Skype help foster or promote a sense of community?

Yes	3
No	2
Somewhat	0
{N/A}	1

In what ways did it make you feel connected or unconnected?

Graduates that indicated Skype did not promote or foster a sense of community did so because they used the service either minimally or used another service inside (e.g. Google Chat)

For one graduate, Skype was the most powerful tool available. Graduates cited the following benefits of Skype:

- o Ability to have multiple people on a call
- o Ease of use

- o Free
- Ability to send images and files
- o Did not take up a lot of screen space

Q7f: Did MS Lync help foster or promote a sense of community?

Yes	2
No	2
Somewhat	2

In what ways did it make you feel connected or unconnected?

Two graduates felt that they did not have enough time to form a connection using this technology because it was introduced later in their program. Two felt that MS Lync had tremendous potential for future students and felt that it should be pushed with them.

One had been exposed to MS Lync at work and thought that it was the most powerful tool for interacting with faculty and on-grounds student. One graduate did not see the need for MS Lync and felt that it did the same things as Gmail. However, another graduate mentioned that the class grouping feature was what set the technology apart from tools like Skype.

Q7g: What other technologies helped foster or promote a sense of community?

- o Cell phones (2)
- o Gmail/Google Chat
- o Face-to-face interactions
- o Tablet computers (3)
- o Video cameras (2)
- o Skype

In what ways did it make you feel connected or unconnected?

Cell phones: Graduates noted that they were good for longer conversations. One graduate highlighted the general importance of communication to the formation of community. For him, was an easy way to addresses the need to be in contact with each other, particularly since they did not live in dorms.

Google Chat: This was a primary form of communication because it was an easy way to just ask a question and graduates could use during the day when not in class.

Face-to-face: no further explanation provided

Tablets: Tablets were required hardware and, for one graduate, proved to be a common tool that everyone used. It was seen as an efficient way to provide answers and share information. Two graduates noted the downside of tablets and said that it could be a big barrier for students with limited budgets. One graduate also noted the importance of being able to select the right kind of table. In his case, he purchased an external one rather than a laptop. This presented a challenge for him when asked to come to grounds for lab.

Video cameras: The use of webcams helped create a more realistic experience for graduates (i.e. "made me feel like I was actually in the lab."). One graduate noted that student relationships were improved by a factor of 5 when they could be seen by faculty and other students. This student thought webcams should be mandatory.

Q8: What other resources, policies, supports, programs could be offered to help better foster a sense of community?

One graduate summarized the challenges faced by the PRODUCED program and explained, "It's not an easy thing to do – to bring people with jobs and school who live two hours away from each other." He felt that finding ways for students to be friends and communicate with each other was most important. Other graduates recommended the following:

Social

Developing a website that lists information about the students enrolled in classes. The website could list students' majors as well as their research interests outside of school.

Using Facebook or Twitter as optional resources for PRODUCED.

Exploring the potential of Second Life.

Research

Developing more opportunities for off-grounds students to be more involved in the ongrounds research. One graduate explained, "We bring the real-world experience. We have the tools and the experience to look at a problem from a different angle."

Classroom/Faculty

Using the webcam more (e.g. professors should take roll as students pop in).

Working with professors to provide detailed emails. Email is the primary method of communication for PRODUCED students so it does not help if professors are vague in their responses.

Professors should listen in on PRODUCED students' breakout room sessions so that they can get credit for participation as well.

Helping professors understand that PRODUCED students often don't have visual cues to see if they are talking over someone. As a result, they tend to be more quiet. One student expressed frustration at being penalized for his quietness, which was perceived by the professor to be a lack of participation.

Q9: Further thoughts?

Connecting to the University

One graduate felt especially disconnected from the university. He desired programming (e.g. orientation or even via Second Life) that would provide a context to understand the history of the university as well as current events.

Coursework

Another graduate felt frustrated during the last two months of the program when there was a problem related to coursework acceptance.

Expectations about Distance Education

One graduate did not expect to become close to on-grounds peers or faculty. While he was hopeful that there would be supports in place in the future to help mediate such connections, he acknowledged that part of the issue lies in the structure of distance education. As he explained, "Distance learning is just that – distant."

Technical difficulties

One student noted that he sometimes felt neglected as a PRODUCED student. This was particularly true when a technical difficulty occurred. For him, the technical difficulties caused a level of frustration that made him feel the most disconnected.

Faculty

Professors often did not give online students an opportunity to ask questions before or at the end of a lecture. This presented a challenge because students had to wait until they could get to email or to office hours so they could ask their questions.

Identity & Motivation

One graduate viewed himself as a professional who was going to school rather than a student who was working. The graduate noted that he and his peers viewed the degree as a means to an end. For this individual, the degree was essential to advancement but not necessarily a full-time focus like the traditional student.

Program Benefits

Being able to earn a degree from home was one of the biggest benefits noted for one graduate. Not having to disconnect from his home community and an adjusted time scale were also two additional selling points for this graduate.

Q10: Would you be willing and available to help with community building efforts in the future?

Yes	6
No	0
Somewhat	0

Appendix V Full Report of Phase 2 Needs Assessment Data

Current and Former PRODUCED Students

Interview Results

Summary:

During the fall of 2012, Erika Powell, a 3rd year doctoral student enrolled in the Instructional Technology program at the Curry School of Education, conducted one-on-one interviews with eight current and former PRODUCED (PRD) students. In total, the researcher interviewed six current PRD student and two former PRD students who had transferred to the on-grounds option.

Students were initially contacted via email to solicit their participation and to also schedule the interviews. At an agreed upon date & time, all but one of the students, who preferred an inperson interview, were interviewed via telephone or MS Lync. The interview period lasted from November 2012 until December 2012. The average interview completion time was 56 minutes, with shortest interview lasting 33 minutes and the longest one lasting 90 minutes.

These interviews were part of a larger needs assessment process to investigate online students' connection to each other and the wider university community. The purpose of these interviews was to:

- Explore how PRD students currently experienced and connected to each other as well as with the individuals, services and resources within the wider UVA community.
- Have students articulate their desired experience of community as PRD students.
- Understand how to best design for the PRD student community and to garner ideas
 for soliciting PRD student's involvement and participation in community building
 interventions and supports.

This report includes a summary of the comments and insights that current and former students provided during the interviews. Where possible, data was coded to identify patterns within the interviewees' responses and to organize the data into larger themes. The order that the comments appear in does not reflect the priority that students placed on various issues.

Ultimately, this report is designed to serve as an informational tool to support the development of future community building activities and initiatives within the PRD program. Comments in [] represent insights or ideas that the researcher may have had while analyzing the data. These have been included in the report as in-situ comments so that the insight is linked directly to the data.

From the researcher's vantage point, the following appeared to be recurrent themes and important factors to keep in mind as future community building activities are designed and implemented:

- On-grounds and off-grounds students: This is an area that needs more development. PRD students and on-grounds students are not connecting with each other. This causes both groups to miss out what each have to offer. Differences in lifestyles between traditional and non-traditional students is a primary cause of this disconnect. On-grounds students' lack of knowledge and skill with the communication technologies is an additional contributing factor. Overall, PRD students feel that on-grounds students don't want to reach out to them.
- O PRD student experience: The PRD student experience is a rich and unique one. Within the context of this experience, geography and location are important players that can either facilitate hinder or enhance connections that students make with each other and the university. The PRD orientation was an important event for many of the students interviewed. With regards to students' experience of community, the PRD students interviewed for this project were often unaware of what's going on at UVA, had no way to connect, or had not been in the program long enough to experience a sense of community. A few students also had no desire or need for a connection to community. Peer support is an important part of the PRD student experience and students often form small groups to study. That said, a few find it difficult to build connections as time wanes in the program and have difficulty making out-of-class connections with PRD students they haven't studied with.
- O Developing programming for adult students: Age and lifestyle are among the most important considerations to keep in mind when developing programming for adult students. Many PRD students are mature and/or have significant lifestyle and family commitments/responsibilities. These factors influence students' ability and willingness to participate in community building and extracurricular events.
- o **Faculty interactions:** PRD students overwhelming requested more consistent office hours in these interviews. They also requested better Collab site organization and access to teaching assistants. Many were aware that faculty adoption of the technologies often created difficulty but were not highly critical because they considered the program to be in development stage.
- o **Explicit design needs or ideas:** Of chief consideration to any design efforts was use of an integrated or pre-existing system. Students also requested access to recordings in the event that they could not attend live or virtual events. Feedback mechanisms that allowed them to interact with presenters or their peers were also requested. In general, the best times to hold events were evenings and weekends.
- o **Student services & events:** Students requested more access to Career Services. Their experience and use of the library was very limited and low.
- PRD mission: PRD students appreciated the opportunity to stay in their local community. They also appreciated when they were able to connect to local employers.

- **PRD advantages:** Enrolling in PRD offered students two primary advantages: flexibility and financial savings.
- o **Reasons for choosing PRD & UVA:** Access to the UVA brand was the main driving factor that led students to enroll in the PRD program. UVA was seen as a "good school" with a superior reputation compared to other local options. Students also liked being able to have access to Charlottesville. For a few students, attending UVA was connected to their personal goals and/or challenges they aspired to meet.
- Pre-UVA PRD community: Connecting with the community college and participating in pre-UVA PRD recruitment activities were influential experiences for some students. These activities added to students' sense of cohesion and identity as a PRD student.

Q1: Do you feel a sense of community as a PRD student?

Yes	6
No	0
Somewhat	2

Q2: Describe your experience at UVA as PRD student:

a. To whom, what or where do you feel connected?

Experience of community & Peer support

Students felt most connected to other PRD students. Assignments and curriculum play a significant role in PRD students' connection to each other. Connections between students were most often made because students were enrolled in the same classes. Students often get to know each other and interact as they complete and work on their assignments. However, they will also form bonds and organize according to their age and lifestyle. Students often form independent study groups around their assignments and through these groups offer additional support and assistance to each other. These types of groups allow them to begin forming community.

<u>Technologies – MS Lync</u>

MS Lync is a tool that many PRD students use to connect with each other. Some students also mentioned making use of Skype to connect and work on assignments together.

b. To whom, what or where do you feel disconnected or isolated?

Off-grounds students – unfamiliar with technology

PRD students felt least connected to on-grounds students (OGS). According to PRD students, many OGS are not connected to or well-versed in using MS Lync. As a result, PRD students'

interactions with OGS mainly occur via email, a medium that students noted does not have the same benefits as live interaction tools such as MS Lync.

PRD student experience - Classroom / Academic / Online Interactions

One PRD student also felt disconnected to OGS even when in the classroom. This student noted that some OGS had advanced information and knowledge about certain topic areas. These OGS could ask questions in participate in ways that he/she as a PRD student could not. From this student's perspective, there was currently no mechanism to interact with OGS that would allow him/her to access that information.

<u>Peer support – Wanes with time in the program & Difficulty making out of class connections</u>

PRD also felt disconnected from other PRD that they had not taken courses with. In particular, as students spend more time in the program, making connections becomes more difficult for them. Essentially, as students begin to specialize according to their minor/concentration areas, they find it difficult to maintain the group's cohesiveness because they no longer have shared academic goals or interests. While students attempt to check in with each other from time to time, they expressed having difficulty forming new groups and making new connections with other PRD students.

One student pointed to the lack of formal and informal forums, venues and/or tools for PRD students to get to know other PRD students with whom they had not connected with previously through their courses. Popular tools such as Facebook or a tool with matching capabilities akin to a dating site were two suggestions offered. This student also pointed out that seeing someone comment multiple times on a post or repeatedly ask questions online tends to be an attribute that makes students appear more approachable to their peers. [This is consistent with the literature on social presence and online students interactions/visibility. See articles by Oztok & Brett, 2011, Aragon, 2003; Beaudoin, 2002; Haythorthwaite, Kazmer & Robins, 2000]

Career Services & Library

Career Services and the library were also mentioned as places where students experienced a disconnect. One student felt that the online library was particularly confusing to navigate.

Office Hours

Office hours was also cited as an area where PRD students experienced a disconnect. Key aspects to making students feel more connected in this area included:

- Consistently offering office hours
- Ensuring that PRD students can participate in the same way that OGS participate during office hours
- Making sure that PRD students can see any examples or demonstrations that professors might use during office hours.

Q2: Former students only: What motivated you to go from the online to the on-grounds option? What is the biggest benefit and/or difference from being an on-grounds student as opposed to being an online student?

Advantages of on-ground option: Traditional College Experience

Of the two former PRD students interviewed, one said that having the opportunity to have the traditional college experience was a huge motivator to switch to the on-ground option. This student saw the traditional college experience as the biggest benefit of being an OGS. Being ongrounds enabled the student to socialize more through events such as parties. It also provided the student with an opportunity to explore things outside of his/her hometown and experience things that he/she had not been previously exposed to.

Advantages of on-ground option: Office Hours, Hanging Out & Ease of Working Together

The other student switched to the on-grounds option because he/she seems to thrive more with one-on-one contact with professors. The ability to be able to walk into a professor's office for office hours appealed to him/her. Being able to hang out with classmates and to also work on homework and assignments together was also seen as a benefit of choosing the on-grounds option.

Disadvantage of on-grounds option – Physical Presence

One stated drawback of choosing the on-grounds option was that students had to be physically present and more prepared. In contrasting his/her experience as PRD student, one respondent explained, "The disadvantage to the on-grounds option is that you still have to go to class. When I was an online student, I could wake up 5 minutes before class and was fine and didn't have to prepare much."

The other student noted that physically attending class made a difference in their participation. Being physically in class ensured that he/she did not fall asleep, required him/her to get dressed, and avoid distractions such as Facebook while in class. In contrast, as a PRD student, he/she was very aware that no one was watching and he/she could easily cover this up if the instructor called on him/her.

Disadvantage - Labs

Another stated drawback of the on-grounds option was participating in labs. It was difficult for one student to drive to grounds every week or every other week. Attending labs on grounds at UVA also required a significant time and monetary investment for students. One student also felt that administering the labs in batches caused them to fall behind OGS.

Working virtually and communicating with OGS & Age differentials

One student pointed to a difference in working with OGS. As a PRD student, he found working with OGS to be very impractical. The student pointed out that it was easier for OGS to talk to each other rather than PRD students and OGS would not talk to him/her. This student also pointed out differences between OGS' work styles and PRD students' work styles. He/she characterized PRD students as "older", "responsible", "organized", "hard working" and more inclined to "get the job done". In this student's eyes, OGS did not typically exhibit such characteristics.

Q3: What types of resources, programs or experiences have been meaningful to you as a PRD student?

a. Professors

Connecting at the Community College Level

One student enjoyed having the opportunity to engage in recruitment activities with community colleges alongside Dr. Groves on behalf of the PRODUCED program.

Office hours, Faculty Interactions & Adaptation of Technology

In general, students seemed to have difficulty obtaining consistent access to office hours. While students acknowledged positive examples of professors making arrangements to offer office hours and to learn the technology needed to hold office hours, many found professors to be slow to respond and/or struggled with integrating this component of instruction into their class offerings. That said, students were satisfied that professors would make themselves available outside of class if students had questions or if students requested assistance. MS Lync was mentioned as a useful tool that made connecting for office hours much easier.

b. Classmates

Classroom/Academic/Online Interactions

STS 1500 is a venue that students mentioned having frequent opportunities to collaborate. However, the majority of the blended classes offered through PRD are lecture based and students reported feeling that they did not have a chance to interact or collaborate with OGS. Some students also said that they felt hesitant to chime in and answer in lecture-based environments.

PRD students also experienced difficulty with hearing OGS' questions and noted that instructors often forget to repeat OGS' questions. Being unable to hear OGS' questions was mentioned as a hindrance of the online option for some PRD students.

PRD students experience - Peer support & Age differentials

A significant part of the PRD student experience is the support that they receive from their peers and the interactions they have in study groups. PRD students reported forming study sessions/groups often. Typically, they reach out to each other via Lync, Skype, Blackboard

Collaborate or email. Groups have been as large as 6 people. Students reach out to each other when they aren't sure what to do. Together, they share their findings and progress or work through the problems in small groups.

PRD students tend to reach out to PRD students who are more vocal or participate more in class. Younger PRD students tended to lean on older PRD students during stressful times. Older PRD students were viewed as having more experience and were very supportive.

Working and communicating with OGS & Advantages of OGS option – Easy to Work Together

PRD students expressed difficulty communicating with OGS students. In their view, OGS did not check email regularly and weren't used to working online. However, as online students, PRD students felt that they tend to pay more attention to electronic communications such as email than OGS do. PRD students felt that OGS relied more on being able to get together physically to work on and/or hold each other accountable for completing assignments because they could conveniently meet on-grounds. This makes working with OGS challenging for PRD students and one student explained, "We can't go to the person's room and say, 'Did you turn the assignment in?"

Working & Communicating with OGS - Age Differentials

PRD students also pointed out the differences between their life responsibilities and those of OGS. Many PRD students have significant life responsibilities (e.g. spouses, children, full-time employment, daily errands etc...) and must schedule and distribute the time they spend on class activities much differently from the traditional OGS. Many feel that OGS don't understand this part of their experience. OGS, in their opinion, are more inclined to work on an assignment late at night, don't contribute until hours before an assignment is due and/or are unresponsive to emails. This is considered "last minute" and an "inconvenience" for many PRD with significant life responsibilities who need to allocate or plan their time differently. More significantly, one PRD reported feeling that such differences in work styles caused him/her to feel left out of a project and made him/her have to ask the course instructor to intervene.

c. Extra-curricular activities or supports

Age differentials, Unawareness & Time

Extra-curricular activities or supports are, on the whole, limited and not easily accessible to PRD students. However, students appreciated when professors organized and made arrangements for students to attend events virtually.

The demands of work and school keep students from participating in many extra curricular programs. Many students feel that they just didn't have time. One student noted that offering and extending extracurricular activities would be more important to the 18-22 PRD student demographic.

For those new to the program, the first semester tends to be intense and students don't have a chance to partake much in these extra-curricular activities. Two students were simply unaware of what was available to them and thought a listing of resources would be helpful.

Students learn about events and supports via email invitations. However, for those students who received the invitations, there was no incentive to draw them into campus. As one student explained, "We see the emails but just can't hop in the car and make the 2.5 hour drive. So, you wind up missing a lot." For this student, events related to work or professional opportunities and development would be most welcomed.

Collab site organization & Feedback mechanisms

One student found it particularly hard to reach out to find out what was going on. He/she was uncertain of who to ask if they needed something and was reluctant to "burden" Dr. Groves with questions. While the student applauded the PRD Collab site, he/she often felt that he/she didn't know who to go to if he/she had a question. Another student suggested creating another tab on the PRD Collab site specifically for extracurricular events. Creating a Facebook group was also mentioned as a tool that could help students interact with peers and ask questions of them. In the end, regardless of the platform (e.g. Facebook or Collab), students wanted to include and provide access for alumni participation as well.

d. Professional COMMUNITY / Outside of UVA

<u>Career Fairs, Developing Programming for Adult Students, PRD Student Experience – Unawareness, Engineering Associations & Professional Organizations</u>

Meaningful access to the professional engineering community outside of UVA was quite mixed. Two students were unaware of how to tap into this resource. For one of these students, his/her focus had been to graduate and he/she hadn't spent much time planning beyond that. This student also had significant family responsibilities and found it difficult to do school work and engage and connect with the professional engineering community. The other student also had no idea how and where to connect with the professional engineering community. He/she was aware that the field was difficult to break into and welcomed any support in this area. One way he/she suggested doing this was by connecting students to employers via laptop and chat during career fairs.

Two students expressed more of a connection to the engineering professional community. One student had actually connected to an internship that Dr. Groves had shared with him/her. This student was extremely appreciative and remarked, "There are a lot of companies out there but you can't find them on your own. But one of the reasons that we can is through PRODUCED. That was the biggest selling point – getting year round employment experience. Having that work experience sets you apart." Both students were appreciative that Dr. Groves was actively seeking engineering firms. Students also noted that Frances Hersey was very helpful by providing resume assistance and emails regarding employers' visits and job opportunities.

Another student knew the information was out there but noted the extra steps needed to get involved in them. While he/she felt that the university and the program did a good job at sending out announcements and raising students' awareness, his/her current work commitments and obligations prevented him/her from taking advantage of the career options and opportunities. He/she felt that if he/she had been a PRD student that wasn't already employed, he/she would definitely take more advantage of the advertised opportunities.

Access to engineering clubs and professional organizations

One student looked into professor engineering groups but discovered everything was on-grounds. He/she requested way to connect with groups in his/her area or from his/her location to the ongrounds professional engineering groups.

Q3. Former students only: What types of resources, programs or experiences have been meaningful to you as a PRD student and now as a on-grounds student?

Currently as an OGS student:

Advantages of on-grounds option - Physical presence, Fading back

The advantages and affordances of physical presence was reiterated by former PRD students on numerous occasions. For one student, being on-grounds and physically in class made them pay more attention and be more deliberately focused and made it harder for them to fade back. This student explained, "Actually physically going to class makes a difference. I can't come to class in [undergarments], can't fall asleep because the professor is watching...As a PRD student, you are very very aware that no one is watching you. Can do what you want. If a professor calls on you, you can just say the mic is not working."

Extra-curricular activities, Office Hours, and Friendships

Being on grounds provided former PRD students with access to extra-curricular groups and activities (e.g. ping pong club) that they did not have as PRD students. Additionally, former PRD students found that access to office hours was better. As OGS, they enjoyed being able to just walk into a professor's office

Former PRD students found it easier to find people to hang out with the on-grounds option. As PRD students, they did not always have a solid group of peers in the program to hang out and "just de-stress" with. The on-grounds option not only facilitated friendships more easily, it also gave these two former PRD students more of a sense of community and to opportunity to interact with peers their own age.

Advantages of on-grounds option – Co-curricular student services & events

Former PRD students found that access to co-curricular student services & events to be more meaningful with the OGS option. In particular, easier access to the library, career fairs, Career Day, employer presentations and activities was one of the biggest advantages of being on-

grounds. As OGSs, they feel they can more easily attend and access such resources; but, admittedly, do not fully use these resources. In contrast, while PRD students, they felt often out of the loop and disconnected from the professional engineering community. For one student, having access to these resources was what motivated him/her to switch from the PRD option to the on-grounds option.

While PRD students:

Faculty interactions with technology

One student really appreciated that faculty tried to learn the technology and make the online experience a good one for them.

Student Support Staff & Resources

One student appreciated student support staff such as Susan Bagby & Mary Lane. These staff members provided help and assistance with transferring courses from the community college and assistance to students when it came time for them to declare their majors.

PRD student – Peer Support

Both students appreciated the bonds they formed with older PRD students. They found the older PRD students had more experience and were very supportive and nurturing during stressful times.

Labs

Former PRD students found that attending labs was hard. Their concerns centered mostly around travel logistics and costs. As one student explained, "I had to get a hotel room and because of the distance, I didn't want to drive back the same day."

Q4: What are your greatest needs as a student?

<u>Time / Design - Time management seminars</u>

At least three students mentioned needing more time. Time seems to be a big factor for the 4th year students. Students expressed a need for more free time as well as more hours in a day and more days in a week. [This suggests a potential design need for resources to help students with time management (e.g. seminar/workshop)]

Co-curricular student services & events: Symposiums & Career Services

One student requested access to the symposiums available through SEAS.

Greater access to Career services was also an explicitly stated need. Two students expressed interest in having access to career development information and job opportunities as well as venues to apply career development skills. One student recommended that PRD students be

provided with a list of companies attending upcoming career fairs. This student also recommended surveying students to see which companies they would like to speak with during career fairs and thought this would be an effective way to increase students' access to available job opportunities.

<u>Faculty – Communication, Faculty – Collab site organization, and Faculty - teaching assistants</u>

Students brought up the need for better communication with professors. Communication with professors seemed to be inconsistent and dependent upon the instructor. As one student explained, "Some professors make themselves available and some don't". Another student suggested that it would help if instructors would better arrange and organize their Collab sites.

A related need was that students experienced difficulty getting in touch with teaching assistants. While teaching assistants set up times to assist students, their schedule wasn't always conducive to PRD students' schedules. Students felt that it would be nice to have more of these sessions or have them offered at different times (e.g. after working hours).

Working & Communicating Virtually

Improved communication between on-grounds students and PRD students was also a need. Working virtually often proved to be difficult because PRD students and OGS students did not communicate effectively about their projects. PRD students often felt that they either got stuck doing all of the work with little input from OGS or were excluded from projects. They struggled to find a balance between being proactive in their attempts to work with OGS students and worried that they are perceived as pushy if they are too proactive.

Design Feedback/Question Mechanism

One student requested a resource where they could ask questions to program staff and other students. This student felt reluctant to flood Dr. Groves with questions because of his already full schedule and responsibilities. He/she thought that a forum that would allow students to post their questions and have them answered by Dr. Groves, other PRD staff, and/or other students would be useful.

Advantages of Physical Presence

One student brought up the role of physical presence. For this student, being physically present would help him/her focus better, minimize distractions, and reduce the number of technology glitches. As he/she explained, "Even though classes are recorded, taking classes online requires a certain degree of discipline. You lose stuff and can't go back to figure out what's been said because you don't have time."

[This student's insights could reflect a number of needs that need further exploration and attention. First, it reflects the need for the PRD program to continue with its Quality Control efforts. Second, it reflects the need for PRD students to be aware of the challenges of being an

online student as well as to be provided resources and supports that best support their success as online students.]

PRODUCED student identity

Of particular interest is that one student prided themselves on not being needy. This student felt that not needing a whole lot was one of the attributes that helped him/her get through the program.

Former students only:

What were your greatest needs as a PRD student? What is your greatest need as an ongrounds student?

Faculty - Office hours

One former PRD student felt that his/her biggest need while enrolled in the PRD program was to connect one-on-one with professors. Many professors did not offer live chats for office hours and this student thought that having such supports would have made for a better experience.

Faculty – Faculty consistency

One former PRD student articulated a need for professors to be more consistent with their assignments and assessment. He/she explained, "Some professors are consistent and you know the tests are going to be like homework...With other classes, it's all over the place. The tests are hard but the homework is easy or vice versa."

Faculty - Technology

One former PRD student mentioned the need for professors to be more tech savvy while teaching in the PRD technology-mediated environment. This student felt that older professors were most resistant and most ill-adept at using the technologies because they were used to lecturing or writing on the chalkboard. This student felt that this aspect of the student experience would change as more professors become accustomed to teaching the program.

OGS Advantage - Location facilitates working together

One former PRD student felt that having a way to meet and work with other students in the program was much needed. He/she noted that being able to personally meet and work with other students was one of the biggest advantages between the OGS option and the PRODUCED option.

Q5: Besides access to classes and an engineering degree, what did you hope to gain by coming to UVA?

UVA brand

The UVA brand played a big role in influencing students' decision to enroll in PRD. Access to the school name and brand was a huge selling point. Name recognition was important as it was seen as a factor that helped students' future career advancement and progression. For one student, attending UVA was an affirmation that they could compete and be successful at a top school. For two students, completing a degree at UVA "looked better" and was deemed more of an accomplishment than attending programs other universities such as ODU. UVA was seen as an "amazing school" because professors at the institutions have stellar credentials, are active researchers and have excellent track records.

One student felt the quality of UVA and the PRD program was reflected in the program leadership and the program development efforts of the interviews being conducted on the students for the needs assessment. This student remarked, "I didn't realize Dr. Groves was going to work so hard for this program. Just the fact that you're calling to see what we needs brings security."

Online Education - Flexibility & Ease of access

For one student, enrolling in the PRD program provided the student with an opportunity to learn without having to be on campus. Given this student's current responsibilities and life circumstances, being able to take classes online and from a well-known institution was the biggest selling point.

Geography/Location & PRD mission to stay in the community

The geographic location of UVA was also seen as a benefit. The program has major appeal because it allows students to stay in their home community and to establish themselves professionally while staying local. Additionally, Charlottesville was close enough for students to visit. This offered a level of appeal because the UVA grounds were characterized as beautiful and a "fun place to visit".

Personal motivation / Self-actualization

For a few students, attending UVA helped them to complete a challenge they had set out to achieve earlier in their life and/or allowed them to reach a lifelong dream/goal.

PRD program flexibility

One student was attracted to the PRD program because the program had more flexibility than other engineering programs. This student was reluctant to get locked into a specific type or discipline within engineering at this stage in their development. The degree offered through the PRD program provided more long-term freedom and options for this student.

PRODUCED student connections

For one student, the connection and conversation that he/she made with a PRD student helped with his/her decision to enroll in UVA. This student worked with a fellow PRD student and was

able to get inside information about the program that ultimately influenced his/her decision to apply.

Former students only:

a. What did you hope to gain by coming as a PRD student?

Geography/Location & PRD mission to stay in the community

For one former PRD student, enrolling in the PRD program provided a way to stay in their home community while also taking online classes.

PRD program flexibility

One former PRD student was drawn to the program because it combined two of his/her interests: robotics/megatronics and engineering science. Programs that he/she had investigated previously did not have such flexible options.

b. What did you hope to gain transferring as an OGS student?

OGS Advantage – Better performance & Faculty – Office hours

One student felt that being on-grounds helped his/her performance. As this student explained, "I learn better when I'm in person with someone". Physically being in class allowed him/her to do better in his/her courses. The student attributed this to being able to see the professor and to being able to attend office hours.

OGS Advantage - Traditional College Experience

For both students, the idea of having an authentic college experience was highly appealing. Living in a dorm and attending classes was seen as an opportunity to grow, mature and be independent. One student, in particular, felt that being in Charlottesville would help them be nearer to the action of campus rather than having to drive long distances to get to grounds.

PRD Advantages – Financial Savings

PRD was an appealing option to one student because it saved him/her \$25,000. While enrolled in the program, this student did not have to pay for living expenses, housing and/or other social events like concerts and parties. As the student explained, "It all adds up in the end."

Q6: What types of resources/supports, individuals or programming do you want access to but currently do not have access to?

Peer support – study groups & ways to communicate

Two students noted that the ability to study together and communicate with each other was essential to PRD students' success. One student desired to have a way to form bigger study groups with both PRD students and OGS students so that they could get insight into how other students are interpreting and approaching the homework problems. This student explained how important these types of exchanges would be and remarked, "In one professor's class, there are like 4 ppl. who give responses and they go back and forth with the professor – if we could tap into their knowledge like tap them on the shoulders like we would do in class and say 'hey, you were explaining that. Could you tell me more?""

Experience of community & Design (List of What's Available)

A few students were unaware of what resources were available to them as PRD students. Many had not looked into what was available and requested an itemized list of what is available.

Career Services

One student requested greater access to Career Services.

Research

One student requested access to more research opportunities. This student was actively trying to incorporate research into their program of study and into their internship experience. Having access to graduate students and/or research projects that could supplement their research skills and experiences would be ideal in this student's opinion. This student thought it would be useful to develop a procedure or process to connect students to research opportunities. This student also thought it would ideal to be able to do their independent research project over the summer or have a way to substitute a research experience for an internship experience.

Place-based gatherings

One student requested access to place-based gatherings such as football games. While he/she was aware that PRD students did not have access to these events because they don't pay the student fee, he/she felt it would be nice to have occasional access to these types of events.

Engineering clubs

One student requested access to engineering clubs. While enrolled in community college, he/she participated in a robotics club. Although he/she is not sure how that would work, he/she would like to have that opportunity at the college level.

Design - Connection with other schools

One student articulated a desire to connect with other schools (e.g. Darden and McIntyre) to expand into the business & management side of engineering.

Former students only:

What types of resources/supports, individuals or programming did you want access to as a PRD student but did not have?

Communication, System Complexity, Seamless Integration

One student found system complexity to be a problem both while enrolled in PRODUCED and even now as a current OGS student. This made communication and transmission of information difficult. As the student explained, "There were so many things that I didn't realize that I had to do but didn't do...You have to study to get through some of the processes or run around and talk to this person or that person. It's easy to miss an email and SIS is too complicated."

Faculty – Technology Frustration & Communication

One former PRD student noted that a couple of professors did not really understand the technologies used in the program and would have liked them to have more knowledge and comfort with the technologies used in the program. While a PRD student, this student also would have liked more communication and contact with professors. This often interfered with their homework and academics. He/she would mostly communicate via email with the professors but by the time the professor answered the email about the homework, it was already past due.

What types of resources/supports, individuals or programming do you want access to as an on-grounds student but currently do not have access to?

None that students could think of.

Q7: What types of resources, supports, experiences or programming would help build or support the connections and bonds you make with professors and your coursework?

The following resources, supports, experience and programming would help support connections between PRD students, professors and the coursework:

- Faculty Office Hours Students found faculty office hours to be an inconsistent part of their program experience. As one student explained, "Some professors have them and some don't." Availability of office hours was also a concern and one student noted that office hours were not always made available at a time that was conducive to PRD student's schedules. Another student appreciated having recordings of office hours available but pointed out that this rarely occurred. Additionally, even though listening to the recordings was helpful, students did not have a mechanism to ask questions about the topics or points made during the office hours afterwards. In general, students felt that making office hours more available and accessible would be a big help.
- **Place-based gathering** Placed-based gatherings were mentioned as experiences that helped students connect to their professors and each other. As one student explained, "Meeting people in person helps create a personal connection." One student suggested that an inperson mtg. once a semester would help greatly.

The PRD program orientation was one place-based gathering that students found helpful because it introduced students to Dr. Groves and Dr. Moore. It also helped both students and professors get acquainted. Students understood the difficulties of planning and coordinating place-based events and offered the following suggestions: weekend picnic, opportunities to meet when students come in to pick up books, or even surveying students on the types of place-based events they would like to attend. One student even recommended a "Take your Professor to Lunch" event that could be adapted in an online format.

- Audio & Video Consistent audio & video transmission was important to students because it helped them be able to put a voice to a face. PRD students tend to miss a lot of the questions that OGS students ask questions or offer explanations. This is unfortunate because PRD students also learn from their OGS counterparts. Students stressed the need for professors to reinforce use of the student in-class mics so that they would not miss out.
- Faculty Adaptation of Technology Faculty's comfort and ability to use technology was also mentioned. As one student noted, "Faculty has got to get used to this technology. It's not all that different except we're not on-grounds." At the same time, this student recognized that the system was still in its infancy and was optimistic about faculty adaptation of the PRD technologies as the program matured.
- **UVA Collab site Organization** One student requested that different/additional pre-class materials be posted on Collab to prepare them and to keep them up-to-date.

Former students only:

What types of resources/supports, experiences, or programming would have helped you build or support the connections and bonds you made with professors and your coursework as a PRD student? What types of resources/supports, experiences, or programming would help build or support the connections and bonds you made with professors and your coursework as on-grounds student?

The following resources, supports, experiences and programming were mentioned:

- **Faculty Office Hours** One student mentioned that access to faculty office hours would have been a welcomed addition of his/her experience in the program.
- Faculty Consistency One student expressed mixed feelings towards connecting and interacting with professors. As he/she explained, "It really depends on the professor. Some are really open and I can go up to them. Some make me feel bad and inferior. I wouldn't think about going up to those ones."
- "Take Your professor to Lunch" events "Take Your Professor to Lunch" is a very popular event that occurs on-grounds. It is part of the UVA on-grounds tradition and allows student to invite a professor to lunch. It gives student an ability to get to know professors better and become acquainted outside of the classroom environment. One student

recommended adapting this very popular on-grounds event to an online format or holding a 1x a month in-person event, with Skype capabilities for those who are unable to attend.

Q8: What types of experiences, resources, supports or programming would help you connect and bond with PRD students from other parts of the state?

- Mentoring program One student recommended having a mentoring program that either matched students with PRD alumni or matched 3rd & 4th year students to each other. A program like this would provide a way for students to give & receive feedback about working with professors or succeeding in particular classes. It would also encourage bonds and relationships to form that otherwise might not. As one PRD student explained, "Fraternities and sororities serve that purpose for OGS. While PRD is not a fraternity or sorority, it does have it's own culture."
- PRD Peer Support Students mentioned wanting a way to know the backgrounds of some of the PRD students and thought that having this information would help them form bonds. Indeed, as students progress in the program, it often gets harder for them to keep in touch and/or make new friends. They often do not know who to reach out to and do not have a basis for finding out their commonalities or differences. One student highlighted the affordances of having these type of interactions and noted, "It would be helpful if we knew whether they [other PRD students] took a particular class or planned to take a class or if they have work experience related to the subject matter so they could explain how things works."
- Placed-based gathering Orientation was a place-based event that students appreciated having. Students thought that having a placed-based gathering around a sports event (e.g. basketball in the spring or football in the fall) or social event (e.g. cookout) would help. Students were enthusiastic about the idea of free or discounted tickets being offered to them but also recognized that part of the reason why their tuition was affordable was because they don't pay the student fees associated with such activities. One student pointed out that students' schedules are busy and that students tend to take those types of place-based events for granted. Another student welcomed the idea of place-based gatherings but questioned the feasibility of gathering all of the PRD students together. To solicit and encourage involvement, one recommendation was that sports or social place-based gatherings be sponsored by the university or PRODUCED program directly rather than individual students.
- No Need for Community For one student, creating bonds was not necessarily a priority. As he/she explained, "I have friends already." [While this student's comments suggests that he/she has a solid support base, the need to build upon that base and/or provide a base for PRD students who do not have such support cannot be overlooked. Likewise, in designing for a PRD community, it's important to keep in mind that some students simply won't see a need for it.]

Former students only:

What types of experiences, resources, supports or programming helped or would have helped you connect and bond with PRD students from other parts of the state?

The following resources, supports, experiences and programming were mentioned:

- Peer Support (study groups): Study groups helped one student connect with other PRD students from other parts of Virginia. By participating in these study groups, this student was more motivated to complete homework assignments. As she/he explained, "I have a hard time getting started and spend hours playing around. But once I get sparked, I get going. [Other PRD student] would send me a homework sample and that would spark me to look at their work and I'd steam roll all the way to the end. Even now that I'm on-grounds now, I still study with that PRD student to this day."
- Orientation/Luncheon: One student mentioned that the PRD luncheon before the summer was instrumental in helping him/her meet other PRD students. This event helped him/her put a name to a face, provided a way for him/her to introduce himself/herself to the group as well as meet incoming PRD students and PRD students that he/she didn't know very well.

Q9: What types of experiences, resources or programming would help you connect and bond with on-ground students?

OGS and PRD Interactions – Working & Communicating Virtually

A few PRD students were unsure of the types of resources, experiences or programming that would help connect them to OGS students. One student felt that creating a bond with OGS students and connecting with them would always be a challenge as such a dynamic was an inherent part of the online education experience.

Physical distance was also mentioned as a major factor affecting interactions between OGS and PRD students. PRD students rely on virtual resources or resources provided through laptops and are more adjusted to online interactions. OGS, however, are more inclined to meet at the library.

Another point raised during the interviews was the issue of OGS' perceived resistance towards interacting with PRD students. One student explained, "They won't interact with us if they don't have to. The issue is not *us* reaching out and working with them. It's *them* working with and reaching out to *us*."

One PRD recognized a potential value in being able to build relationships with OGS students. This student pointed out that OGS build relationships with each other to a point that they can help each other network and will also hire each other especially when they obtain employment in larger companies. For this student, developing a connection between OGS and PRD students would also contribute to building alumni spirit between the two groups.

OGS & PRD Interactions – Technology

Lync was mentioned numerous times as a technology that could connect OGS & PRD students. This said, PRD students felt that OGS students would need to be more familiar with the online tools available to them. PRD students perceive OGS students to be particularly lacking in that

area. One PRD student stated, "They don't understand the capabilities and power of tools like Lync". Another student felt that OGS simply refused to use such technologies.

Specific Recommendations/Requests

- One student recommended that mixed groups of PRD and OGS students work together for an entire semester. This student remarked, "In class we do randomized break out groups. However, one time does not form a basis for a relationship and the relationship must be sustained over a specific period of time."
- Access to engineering associations.

Former students only:

What types of experiences, resources, supports or programming helped or would have helped you connect and bond with on-grounds students?

OGS & PRD Interactions – Working & Communicating Virtually

One student described an effective interaction that occurred in his/her STS 4500 class. In this setting, OGS students were allowed to have a laptop and the instructor encouraged OGS to login and join groups with the PRD students. This student recommended that during future classroom discussions, professors could choose 4 or 5 OGS with laptops and allow them to form mixed groups with PRD students so that they can get to know each other better.

The other student was unsure of what would help PRD and OGS groups connect more. This student highlighted an apparent social divide between the two groups and noted that both find working with each other challenging. This student began to describe the nature of these challenges and explained, "While PRD students often complain about the same difficulties, they are high maintenance and tough to work with for a traditional OGS."

Q10: What types of help or assistance would you like from the library?

Library

Many PRD students interviewed for this project had not really engaged with the library and were unfamiliar with the library's offerings. The primary reason, as expressed by students, was that they did not have to complete projects or courses that required them to use the library. A few students had only had taken a small amount of classes through the program and, therefore, had focused more on technical courses. In general, students said they weren't very familiar with the layout or how to navigate the library's website.

One student recalled the library presentation from orientation but felt that he/she didn't quite fully retain the info. This student had a positive impression of the library. He/she noted that the librarian seemed receptive to student's questions but the student admitted to not reaching out due to time and schedule constraints. Another student was quite satisfied with the research skills obtained through STS 4500 and did not feel a need to reach out to the library.

Former students only:

What types of help or assistance have you gotten from the library as an on-grounds student? What types help or assistance helped or would have helped you connect with the library as a PRD student?

Library

One former PRD student found the "Talk Online to a Librarian" function helpful even though he/she did not use it very often.

Another former PRD student liked being able to attend the workshops that teach students how to research topics using Virgo. This student wished that he/she knew how to use the library portion of the website back when he/she was a PRD student. While the student appreciated having the library presentation at orientation, he/she also felt that the timing of this information was also worthy of attention. He/she explained, "Timing might be important too. Like if you give me something at the beginning of the semester, I won't really pay attention to it as much as if I could access when the time is right. Maybe the professor could say 'watch this video' when it's time for me to do these things."

Q11: What types of help or assistance would you want to receive from Career Services?

The following type of assistance and help was requested:

- Interviews
- Recruiting events
- Applying for Jobs
- Resumes
- Networking
- Available job & internships opportunities
- General career development seminars

Career Services

In general, very few students had actually reached out to Career Services or the CECD. Some students seemed unfamiliar with how to access this resource and did not know if they would be able to interact with CECD staff via phone or online. Others had a basic awareness of the office and how to use it but had simply not reached out to it. The two students who had reached out to the office were both satisfied with the service that they received and had plans to use it again or thought other students would benefit from it.

Former students only:

What types of help or assistance have you gotten from Career Services as an on-grounds student? What types help or assistance helped or would have helped you connect with Career Services as a PRD student?

Career Services

Of the two former PRD students interviewed for this project, one was not sure what would have helped. The other was unaware of the type of services offered through the Career Development Office but thought that most PRD students needed help with interviews and resumes. As a PRD student, he/she was only aware of CavLink but could not figure out how to use it. This student was receptive to the idea of working with the CECD over the Internet.

Q12: What types of SEAS events would you want to be made available to you as an online student?

SEAS Events

Students were unaware of the SEAS events that were available to them. While students see the events advertised in the email and were interested in them, there was no way for them to attend virtually so they often feel that they miss out on them. Access to guest speakers, symposiums and seminars would be welcomed as well as senior presentations from other engineering science majors. One student also would love to be able to come to a luncheon on-grounds.

Broadcasts/Recordings

One student thought that broadcasting and recording the events would be helpful. However, he/she pointed out that students can't always watch the broadcasts at work or while at their internship sites. For this reason, the student recommended providing recordings so that students can listen and watch these events at their convenience.

Former students only:

What types of SEAS events have you connected with as an on-grounds student? What types help or assistance helped or would have helped you connect with SEAS as a PRD student?

Broadcasts/Recordings

One former PRD student thought that streaming/broadcasting campus events would have been an ideal part of his/her PRD experience.

Wider UVA connection

One former PRD student mentioned that attending music concerts helped them feel a sense of connection with the wider UVA community and OGS student.

O13: We know you have competing priorities and limited time as a student.

- o How do you find out about events or programs that are available to you?
- o How do you prioritize which ones you will participate in or become a part of?
- When are the best days/times to offer events or programming?

Emails

Students overwhelmingly found out about events and programs available to them via email.

Prioritization

Events tied to grades were most prioritized. However, if Dr. Groves or Dr. Moore extended an invitation or mentioned an event, students were more likely to consider attending them. Events that were tied to students' personal or professional interest and goals were also highly prioritized.

Scheduling

The best days/times to offer events or programming were evenings, Friday afternoons like Dr. Groves' open hours sessions, and weekends in the afternoon.

Design Considerations

The following features were brought up as aspects to consider when designing interventions for PRD students:

- **Live stream/broadcast and recordings** Students requested a way to participate and take part in events via live stream or recordings in the event they are unable to attend because of the geographical distance or because of time and schedules.
- **Having presenter contact information** Students wanted to have a way to contact presenters if they were unable to attend or if they wanted to follow-up with the speaker.
- **Feedback loop** Students requested a mechanism to be able to correspond with presenters PRODUCED staff and/or their peers if they had a question or wanted to connect further.
- Collab calendar Having a Collab calendar listing upcoming events would help students keep track of offerings. Students particularly wanted to have one integrated system that would inform them of the events and would help them keep track of these events.
- Reaching in Students repeatedly brought up the idea of "reaching in". "Reaching in" was described as personalized contact and/or interactions between PRD students and program staff in ways that make them feel included and remembered. "Reaching in" goes beyond mass emails and list serves. Instead, it is one-on-one contact that is tailored to students' interests, strengths and personal and academic goals and makes students feel valued and included. As one student explained, "Email is good but it comes down to the individual reaching out to the student to make sure they get included in things."

Former students only:

We know you have competing priorities and limited time as a student.

• How do you find out about events or programs that are available to you now and as a PRD student?

- o How do/did you prioritize which ones you will participate in or become a part of now and as a PRD student?
- When are/were the best days/times to offer events or programming now and during your time as a PRD student?

Emails, Word of Mouth & Flyers

Former PRD students found out about events or programs mostly via email. Email was and continues to be the standard medium to communicate and promote events. However, one student pointed out that emails are often easy to miss and expressed a desire for another medium. As ongrounds students, they find out about activities and events via friends, roommates, flyers and/or chalking announcements outside.

Prioritization

This group of students prioritized events based on the event's connections to their personal interests. For instance, one student placed a high priority on events connected to his/her religion and religious community and background. Events that could improve classroom performance or teach a student something they hadn't learned in class also received a high priority.

Scheduling

Weekends between 1 pm and 3 pm or after 5 pm during the week was ideal for one former PRD student. Now, as an OGS student, weekends and evenings (between 5 pm and 7 pm) are best for this student. The other former PRD student also felt weekends were best and noted that these times were ideal for students like him/her that did not have family or work responsibilities. This student also pointed to Fridays after labs as a potential gathering time for activities and noted that most PRD students did not have much to do after the Friday labs. He/she pointed out that this time could be used to take advantage of the free concerts and events that happen on grounds when planning activities intended to gather PRD students.

Q14: What motivates student to participate in activities that aren't directly related to their coursework given their schedules and other commitments?

Students mentioned being motivated by:

- Activities that were tied to grades or awards (e.g. course requirement or provided extra credit)
- Individuals who invited them to attend an event or activity. Invitations from Dr. Groves, Dr. Moore and/or their current course instructor were more likely to get students' attention.
- The event room and location. One student noted that if he/she knew there would be tech support in a particular room, he/she was more likely to attend.
- Availability of a recording

- Timing. Two students noted that it was easier for them to attend an event if it occured on a traditional school day or if it were following a class. Both students were employed and found it was easier to block time off from work if events were held close to when they already had class.
- Events that related to their professional work and performance
- Intrinsic factors (e.g. desire for success, reputation, and sense of accomplishment)
- Personal interests

During this portion of the interview, two students made additional comments worthy of mention. One student pointed out that some students may simply not want to connect to events. As he/she explained, "Some people just want to work and do their school work". This is a reminder that not every student will want to participate in community building activities. Another student highlighted the need to have someone that regularly checks in with students. This student felt that the program was missing someone who could "regularly check in with students, to check in to see how they were doing, check in on their grades, help them plan for the future, make sure they were on track and guide them and push them in the way to go."

Q15: What other barriers or challenges might be present with respect to community building and formation?

Geography

Students mentioned geography and distance as the biggest barriers and challenges. One student commented, "Geography makes it harder for people to get together." Another student noted some of the challenges and explained, "You have people from all over the state of Virginia, which isn't very small. Trying to build that sense of community is difficult and to ask someone to give up their weekend and drive 3 or 4 hours isn't a great idea. There really has to be something worthwhile. Most people entering in the PRD program have accepted the distance perspective. It can be done but not sure how."

Interestingly, orientation played an important role in helping bridge the challenges of distance and geography. Orientation allowed students to meet and interact with other students. Many students used the connections established during orientation as a basis and a springboard for future contact and interactions. As one student explained, "Orientation is a good way to start the community feeling." One student also noted that students are more inclined to keep in touch with and IM other PRD students that they met at orientation who are geographically close or are enrolled in the same classes.

Developing Programming for Adult Students

PRD student's lifestyles present a challenge to community building and formation. As one student explained, "I would say that a lot of us are employed and with that type of schedule, it's

tough to fit any extracurricular activities." Essentially, PRD students often have significant life responsibilities and schedules that may make them less inclined to participate in community building activities. [Future community building efforts must take this into account and be flexible and adapted to these needs in ways that allow PRD students to participate at times that are convenient for them and conducive to their schedules. Recordings coupled with ways for students to interact online will also be key to providing ways that students can participate before or after a virtual event.]

<u>Design – Framework and Infrastructure</u>

One student pointed out that building a basic framework and infrastructure would be a significant challenge. For this student and also for another student, the PRD program was still in development and the infrastructure for community was also under development. Students stressed the need to have that infrastructure easily and seamlessly integrate with other systems so that students would not have to complete a "dozen steps to provide or use the service". Students were confident that once a structure was in place, people would use it. Two simple suggestions for building this infrastructure were mentioned. One suggestion was to have a digital support person in attendance at engineering organization or engineering events. Another suggestion was to give students access to events via live feed or streaming.

Former students only:

What other barriers or challenges might be present with respect to community building and formation from your perspective as on-grounds students and also as a former PRD student?

Isolation, Individual participation & Peer support

Isolation was mentioned as a barrier and a challenge to community building by former PRD students. Feelings of isolation varied depending on students' location and their own individual participation styles. For example, students in Lynchburg had a larger group and community to interact with while students in smaller towns such as Danville may have only 1 or 2 other students to interact with. Students who tended to be shy also had difficulty reaching out for help or introducing themselves and may, as a result, feel more isolated.

Q16: Final thoughts?

Peer & alumni connections

One student requested more venues for PRD students and alumni to share their experiences and how they arrived at their career path. Having insight and perspective into the "tricks of the trade" and how PRD alumni and students got ahead in their careers was very important to this student and helped enrich his/her learning experience.

Q17: Would you be interested in volunteering to help out with and/or support community-building initiatives and activities this year?

Due to time constraints, this question was not asked of every PRD student. However, three current PRD students expressed an interest in volunteering and supporting community building efforts.

Appendix W Full Report of Phase 3 Needs Assessment Data

PRODUCED Student Survey

Spring 2013 Results

Summary:

During the spring of 2013, Erika Powell, a 3rd year doctoral student enrolled in the Instructional Technology program at the Curry School of Education, administered an online survey to current PRODUCED students. The purpose of this survey was to:

- Explore how PRODUCED students currently experience connections to student, faculty, university and alumni communities.
- Identify student needs and articulate gaps in the program's ability to meet those needs.
- Understand how to solicit PRODUCED involvement & participation in future community building activities.

This survey was part of a larger needs assessment process to gather feedback and insights about students' experiences in the PRODUCED program. The survey responses described in this report can be used to help the program assess and evaluate the current level of service as well as identify gaps in program performance. The feedback and data included in this document can also help program administrators develop strategies, resources and activities that better connect PRODUCED students to the wider UVA.

The survey period lasted a little over a month and ran from March 11, 2013 through April 5, 2013. Students were invited to participate in the survey via email. During the survey period, they were sent three follow-up reminder emails. Students completing the survey in its entirety received a \$10 gift certificate to Amazon.com as a token of appreciation for their time and participation. This survey took about 30 to 45 minutes for students to complete and had a 100% response rate. Additionally, a summary of the final survey results and report were made available to students upon request. At the writing of this report, none of the PRODUCED students have requested a copy of the report or survey findings.

Section 1: Demographics

Of the 19 students surveyed for this project, an overwhelming majority of them were males (79%). With respect to age demographics, the heaviest concentration of students tended to be in their 20s or in their 40s. Indeed, a little over half of the students surveyed were between the ages of 20 and 29 (52%). Meanwhile, students between the ages of 40 to 49 constituted 27% of the survey respondents.

The majority of PRODUCED students were employed in either full-time or part-time jobs or internships (64%). Of that percentage, at least half of the students surveyed were employed full-time (32%). Only 36% of PRODUCED students were not currently employed. Within the PRODUCED program, a significant percentage of students were enrolled at UVA while taking at least 10 or more credits (68%).

These results suggest that future interventions, resources and/or supports targeted towards students in the PRODUCED program must be sensitive to the demographics that characterize the group. Regardless of their age, it is evident that most students enrolled in the program juggle two main responsibilities: work and school. Inasmuch, future interventions should be offered at convenient times for students or offered as recordings so that students can access them at times more convenient to their schedules. Future interventions should also have clear tie-ins and connections to student's professional or academic progress and development.

Future inquiries might also examine the types of responsibilities that students have in their home/personal lives. An understanding of these factors might shed further light on the PRODUCED student demographic and help program staff best design for the population. Future inquires and/or iterations of this survey might also examine how these factors vary according to the two distinct student populations found within the respondent pool. In general, as the PRODUCED program grows, it will be important to track demographic information so as to best understand the constraints and demands that this population faces and to ultimately maximize the design of future interventions so that they target student's needs.

Table 1: Demographic Composition of Survey Respondents

Gender:

Genati		
Item	N	Percentage
Female	4	21%
Male	15	79%

Age:

1150.		
Item	N	Percentage
19 and under	0	0%
20-24	5	26%
25-29	5	26%
30-34	3	16%
35-39	0	0%
40-44	2	11%
45-49	3	16%
50 or over	1	5%
Prefer not to Answer	0	0%

Enrollment status:

Item	N	Percentage
10 credits or more	13	68%
Less than 10 credits	6	32%

Employment status

Item	N	Percentage
Full-time	6	32%
Part-time	3	16%
Full time Internship	0	0%
Part time Internship	3	16%
Not employed	7	36%
Prefer not to Answer	0	0%

Section 2: General Questions about Community

Section 2 of this survey gauged students' current level of community and connection to various facets of the student experience that are unique to the UVA community. These aspects include students' connection to: faculty, other PRODUCED students, on-grounds students, the School of Engineering and Applied Sciences, the Center for Engineering Career Development, the library, local businesses, local engineering job opportunities, PRODUCED alumni, and, last but not least, UVA engineering alumni.

This section also measured gaps in student satisfaction and the importance that they attribute to feeling connected to each of these facets. For purposes of this report, student satisfaction is interpreted as the "what is" or current state. The importance they place on that connection is interpreted as the "what should be" or desired state.

All questions in this section were measured using a 6 point Likert scale as follows:

1 = Strongly Disagree

2 = Disagree

3 =Somewhat Disagree 5 =Agree

4 = Somewhat Agree 6 = Strongly Agree

Survey results indicated that students generally did not feel an overall sense of community in the PRODUCED program (M = 3.95, SD = .97).

The areas where students experienced the most disconnect included their connection to: onground students (M = 2.37, SD = .90), UVA engineering alumni (M = 2.53, SD = 1.31) and events at SEAS (M = 2.79, SD = 1.44). On the survey, students indicated disagreement when asked whether they felt a connection in these three areas.

As detailed in Table 2, the areas where students felt less of a disconnect but still indicated a level of disagreement when asked whether they felt a connection to aspects of community included their connection to:

- CECD staff (M = 3.05, SD = 1.31)
- Library staff (M = 3.05, SD = 1.35)
- Events at the CECD (M = 3.21, SD = 1.62)
- PRODUCED alumni (M = 3.42, SD = 1.39)
- Resources at SEAS (M = 3.53, SD = 1.35)
- Local businesses (M = 3.53, SD = 1.74)
- Local engineering opportunities (M = 3.63, SD = 1.64)
- Resources and services at the CECD (M = 3.68, SD = 1.45)
- Library resources (M = 3.84, SD = 1.01)
- Faculty (M = 3.89, SD = 1.20)

Students felt most connected to other PRODUCED students (M = 4.21, SD = .98).

The lack of connection that PRODUCED students indicated feeling with respect to their sense of community is an aspect of the program that the program should seek to address. Feelings of community contribute to online course success, their satisfaction, performance, and interactions (Bishop, 2007; Charalambos, Michalinos, & Chamberlain, 2004; Littleton & Whitelock, 2005; Liu, Magjuka, Bonk, & Lee, 2007; Rovai, 2002; Russo & Benson, 2005; Schwiebert, 2008).

In an effort to help the program prioritize which areas would be ideal to start with, this portion of the survey included a gap analysis. Again, this was done by comparing students' satisfaction levels to the importance that they place on aspects of community.

As illustrated in Table 3, survey results indicated that the smallest gaps in means existed with respect to student's connection to UVA engineering alumni (gap = .21), on-grounds students (gap = .21) and PRODUCED alumni (gap = .31). Moderate performance gaps existed in library resources (gap = .63), PRODUCED students (gap = .68), Faculty (gap = .79), CECD staff (gap = .84), and CECD events (gap = .95). The largest gaps were found in students' connection to:

- SEAS events (gap = 1.05)
- CECD resources and services (gap = 1.06)

- SEAS resources (gap = 1.16)
- Local businesses (gap = 1.69)
- Local engineering job opportunities (gap = 1.79)

Interestingly, the results did not reveal a gap in student's connection to the library staff (gap = -.32). This particular data point suggests that performance exceeds students' expectations. In interpreting this data, however, it is important to note though that the data collected for this survey reflects only the students' perspective and not gaps engineering faculty might perceive.

These survey results represent potential program performance and improvement opportunities for the PRODUCED program to consider addressing in the future with respect to community. While this portion of the survey clearly identifies the main performance gaps, program administrators should further examine the cause behind these gaps. Additionally, it will be important to consider the financial and staffing costs associated with closing these gaps using techniques such as cost benefit analysis.

In the interim, program administrators should focus on closing the performance gaps that are most aligned to and/or enable them fulfill the program's vision, goals, mission and strategic objectives. Providing engineering students with ways to stay in their home communities while receiving quality education at UVA so that they can ultimately obtain local employment as engineers is one of the cornerstones of the PRODUCED program. Thus, future efforts should focus on student's career development.

Whether such investments will have direct impact on student's sense of community has yet to be determined. Thus, the program should continue to administer surveys such as this one and research how students' sense of community changes as more resources are directed to the areas covered in this portion of the survey. Examining how this data changes over time and researching which have the most impact will also be imperative to future program development efforts.

Table 2: PRODUCED Students' Connection to, Satisfaction with and Importance Placed on Facets of Community

Question/Item:

Question/Item.					
Item	Mean	Median	Range	Std. Deviation	Variance
Overall I feel a sense of community in the PRODUCED program	3.95	4.00	4	.97	.94
Faculty					
I feel connected to faculty	3.89	4.00	4	1.20	1.44
I am satisfied with my current level of connection to faculty	3.95	4.00	3	1.22	1.49
It is important for me to feel connected to faculty	4.74	5.00	3	1.05	1.10
PRODUCED stud	ents				
I feel connected to PRODUCED students	4.21	4.00	3	0.98	0.96
I am satisfied with my current level of connection to PRODUCED students	4.21	5.00	3	1.13	1.28

It is important for me to feel connected to PRODUCED students	4.89	5.00	4	.99	.98
On-grounds stude	nts				
I feel connected to on-grounds students	2.37	2.00	3	.90	.81
I am satisfied with my current level of connection to on-grounds students	3.58	4.00	4	1.35	1.82
It is important for me to feel connected to on-grounds students	3.79	4.00	4	1.23	1.51
Events at SEAS	}				
I feel connected to events at SEAS	2.79	3.00	4	1.44	2.07
I am satisfied with my current level of connection to events at SEAS	3.32	4.00	4	1.45	2.10
It is important for me to feel connected to events at SEAS	4.37	4.00	3	.83	0.69
Resources at SEA		4.00		1.05	1.02
I feel connected to resources at SEAS	3.53	4.00	4	1.35	1.82
I am satisfied with my current level of connection to resources at SEAS	3.68	4.00	4	1.42	2.02
It is important for me to feel connected to resources at SEAS	4.84	5.00	3	.76	.58
Events at CECD			_		
I feel connected to events at the CECD	3.21	3.00	5	1.62	2.62
I am satisfied with my current level of connection to events at the CECD	3.68	4.00	4	1.49	2.22
It is important for me to feel connected to events at the CECD	4.63	5.00	3	1.01	1.02
Resources and Services at					
I feel connected to resources and services at the CECD	3.68	3.00	5	1.45	2.10
I am satisfied with my current level of connection to resources and services at the CECD	3.89	4.00	4	1.45	2.10
It is important for me to feel connected to resources and services at the CECD	4.95	5.00	3	0.78	0.61
CECD Staff					
I feel connected to CECD staff	3.05	3.00	4	1.31	1.72
I am satisfied with my current level of connection to the CECD Staff	3.58	4.00	4	1.43	2.04
It is important for me to feel connected to the CECD staff	4.42	5.00	4	1.12	1.25
Library Resource	es				
I feel connected to the library's resources	3.84	4.00	3	1.01	1.02
I am satisfied with my current level of connection to the library's resources	4.11	4.00	4	1.10	1.21
It is important for me to feel connected to the Library's resources	4.74	5.00	3	0.73	0.53
Library Staff Library Staff	3.05	2.00	4	1 25	1.02
I feel connected to the library's staff	3.05	3.00	4	1.35	1.82

I am satisfied with my current level of connection to the library's staff	4.11	4.00	4	0.99	0.98
It is important for me to feel connected to the library's staff	3.79	4.00	4	1.44	2.07
Local Businesses	S				
I feel connected to local businesses	3.53	4.00	5	1.74	3.06
I am satisfied with my current level of connection to local businesses	3.42	3.00	5	1.71	2.92
It is important for me to feel connected to local businesses	5.11	5.00	3	0.94	0.88
Local Engineering Job Op	portunities				
I feel connected to local engineering job opportunities	3.63	4.00	5	1.64	2.68
I am satisfied with my current level of connection to local engineering job opportunities	3.58	3.00	5	1.80	3.24
It is important for me to feel connected to local engineering job opportunities	5.37	5.00	2	0.68	0.46
PRODUCED Alur	nni				
I feel connected to PRODUCED alumni	3.42	4.00	4	1.39	1.93
I am satisfied with my current level of connection to PRODUCED alumni	3.74	4.00	5	1.37	1.88
It is important for me to feel connected to PRODUCED alumni	4.05	4.00	4	0.97	0.94
UVA Engineering Al	umni				
I feel connected to UVA Engineering alumni	2.53	2.00	4	1.31	1.72
I am satisfied with my current level of connection to UVA Engineering alumni	3.47	4.00	5	1.43	2.04
It is important for me to feel connected to UVA Engineering alumni	3.68	4.00	3	0.89	0.79

Table 3: Gaps Analysis of Student's Connection to Various Aspects of Community

Faculty:

· ·	Mean	Median
Satisfaction vs. Importance	.79	1.00

PRODUCED students:

	Mean	Median
Satisfaction vs. Importance	.68	0.00

On-grounds students:

	Mean	Median
Satisfaction vs. Importance	.21	0.00

SEAS events:		
Satisfaction vs. Importance	Mean 1.05	Median 0.00
SEAS resources:		
Satisfaction vs. Importance	Mean 1.16	Median 1.00
CECD events:		
Satisfaction vs. Importance	Mean .95	Median 1.00
CECD resources and services:		
Satisfaction vs. Importance	Mean 1.06	Median 1.00
CECD staff:		
Satisfaction vs. Importance	Mean .84	Median 1.00
Library resources:		
Satisfaction vs. Importance	Mean .63	Median 1.00
Library staff:		
Satisfaction vs. Importance	Mean -0.32	Median 0.00
Local businesses:		
Satisfaction vs. Importance	Mean 1.69	Median 2.00
Local engineering job opportunities:		
Satisfaction vs. Importance	Mean 1.79	Median 2.00
PRODUCED alumni:		

Satisfaction vs. Importance

UVA engineering alumni:

274	

Mean

0.31

Mean

Median

0.00

Median

Section 3: Communication and Collaboration with PRODUCED Students

All questions in this section were measured using the following frequency-based scale:

1 =Several times a day 4 =Once a week

2 = Once a day 5 = Never

3 =Several times a week

As shown in Table 4, survey results indicated that Lync (M = 2.32, SD = 1.34) and email (M = 2.95, SD = 1.18) were the top tools that students used to communicate with each other. Both tools were used on a daily basis. Blackboard Collaborate was also used relatively frequently (M = 3.47, SD = 1.58) along with Skype (M = 3.74, SD = 1.73). These tools were used several times a week. Social media (M = 4.68, SD = .95) and Google tools like G-chat (M = 4.63, SD = .60) were used only on a weekly basis. A few students also listed text and telephone as other communication and collaboration tools used between PRODUCED students.

This data is consistent with qualitative findings collected during the program's needs assessment. Program administrators should continue investing in platforms similar to Lync as they allow students to collaborate with each other in real time and have capabilities that make it easy for them to share, exchange information and interact with each other.

Table 4: Frequency of Communication and Collaboration Tools used by PRODUCED Students with Other PRODUCED Students

Item	Mean	Median	Range	Std. Dev.	Variance
BB Collaborate	3.47	4	4	1.58	2.50
Lync	2.32	3	4	1.34	1.80
Skype	3.74	5	4	1.73	3.00
Social Media	4.68	5	4	.95	.90
Google	4.63	5	2	.60	.36
Email	2.95	3	4	1.18	1.39
Other:					Text (1) Telephone (1)

Section 4: Current & Desired Level of Community among PRODUCED Students

This section measures the current and desired levels of community between PRODUCED students. All questions in this section were measured using a 6 point Likert scale as follows:

1 = Strongly Disagree 4 = Somewhat Agree

2 = Disagree 5 = Agree

3 = Somewhat Disagree 6 = Strongly Agree

For the current state, survey respondents somewhat agreed that the PRODUCED program was able to provide opportunities for them to communicate (M = 4.47, SD = 1.50), share resources and exchange ideas (M = 4.42, SD = 1.61), collaborate on homework and study together (M = 4.05, SD = 1.35). They somewhat disagreed that the program was able to provide bonding opportunities and opportunities to develop friendships outside of class (M = 4.05, SD = 1.35) but somewhat felt that the tools and resources to do so were available (M = 4.16, SD = 1.50). In general, survey respondents agreed that the resources and tools to contact (M = 5.47, SD = .51) and share resources and exchange ideas (M = 5.16, SD = .83) were available. Table 5 summarizes the current state as well as the desired states for these items.

Data displayed in Table 6 further reinforces the idea that students believe that resources are available to foster community between themselves. Indeed, the gaps in this section were very small – with the smallest gaps seen amongst tools and resources that allow students to contact and collaborate with each other (gap = .06) as well as exchange ideas (gap = .26).

The largest gaps appear to be in the program's ability to provide opportunities for students to bond and develop friendships with other PRODUCED students outside of class (gap = 1.10) and to study and collaborate with each other outside of class (gap = 1.16).

As described in Section 2: General Questions about Community, performance gaps between PRODUCED students desired level of community were moderate but not as high as other gaps. Increased activities and opportunities that help students socialize and collaborate might include regular online study halls as well as physical events such as regional or on-grounds meetups. Such opportunities might be a low-cost and/or low effort ways to address these needs.

Table 5: Current and Desired Level of Community between PRODUCED Students

Current State:

Current State.					
Item	Mean	Median	Range	Std. Dev.	Variance
	Opportuni	ties			
PRD provides opportunities for me to contact and communicate with other PRD students outside of class	4.47	5.00	4	1.50	2.25
PRD provides opportunities for me to share resources and exchange ideas with other PRD	4.42	5.00	4	1.61	2.59

students outside of class					
PRD provides opportunities for me to bond and develop friendships with other PRD students on homework and/or projects outside of class	3.79	4.00	4	1.32	1.74
PRD provides opportunities for me to study and collaborate with other PRD students on homework and/or projects outside of class	4.05	4.00	4	1.35	1.82
	Resources				
PRD provides resources and tools for me to contact and communicate with PRD students outside of class	5.47	5.00	1	.51	.26
PRD provides resources and tools for me to share resources and exchange ideas with other PRD students outside of class	5.16	5.00	3	.83	.69
PRD provides resources and tools for me to bond and develop friendships with other PRD students outside of class	4.16	4.00	5	1.50	2.25
PRD provides resources and tools for me to study and collaborate with other PRD students on homework and/or projects outside of class	4.74	5.00	5	1.24	1.54

Desired State:

Item	Mean	Median	Range	Std. Dev.	Variance
item					
	Opportunit	ies			
PRD provides opportunities for me to contact and communicate with other PRD students outside of class	5.32	5.00	1	.58	.34
PRD provides opportunities for me to share resources and exchange ideas with other PRD students outside of class	5.21	5.00	2	.63	.40
PRD provides opportunities for me to bond and develop friendships with other PRD students on homework and/or projects outside of class	4.89	5.00	3	.81	.66
PRD provides opportunities for me to study and collaborate with other PRD students on homework and/or projects outside of class	5.21	5.00	2	.71	.50
	Resources	S			
PRD provides resources and tools for me to contact and communicate with PRD students outside of class	5.53	6.00	1	.51	.26
PRD provides resources and tools for me to share resources and exchange ideas with other PRD students outside of class	5.42	5.00	1	.51	.26
PRD provides resources and tools for me to bond and develop friendships with other PRD students outside of class	5.00	5.00	3	.82	.67

PRD provides resources and tools for me to	5.47	5.00	1	.51	.26
study and collaborate with other PRD students					
on homework and/or projects outside of class					
· ·					

Table 6: Gap Analysis of Connection between PRODUCED students

	What Is	S	What Should	Be	Gap	
Item	Mean	Median	Mean	Median	Mean	Median
		Opportunities				
PRD provides opportunities for me to contact and communicate with other PRD students outside of class	4.47	5.00	5.32	5.00	0.85	0
PRD provides opportunities for me to share resources and exchange ideas with other PRD students outside of class	4.42	5.00	5.21	5.00	0.79	0
PRD provides opportunities for me to bond and develop friendships with other PRD students on homework and/or projects outside of class	3.79	4.00	4.89	5.00	1.10	1.00
PRD provides opportunities for me to study and collaborate with other PRD students on homework and/or projects outside of class	4.05	4.00	5.21	5.00	1.16	1.00
		Resources				
PRD provides resources and tools for me to contact and communicate with PRD students outside of class	5.47	5.00	5.53	6.00	0.06	1.00
PRD provides resources and tools for me to share resources and exchange ideas with other PRD students outside of class	5.16	5.00	5.42	5.00	.26	0.00
PRD provides resources and tools for me to bond and develop friendships with other PRD students outside of class	4.16	4.00	5.00	5.00	.84	1.00
PRD provides resources and tools for me to study and collaborate with other PRD students on homework and/or projects outside of class	4.74	5.00	5.47	5.00	.73	0.00

Section 5: Increasing Opportunities for Community Among PRODUCED students

This section asked respondents to consider a list of strategies, ideas and suggestions that could potentially help PRODUCED students interact, communicate, collaborate, bond, and connect more with each other. Items were scored using the nominal group technique in which each respondent ranked the options (i.e. strategies, ideas and suggestions) from 1 (most important) to 10 (least important) item that would help them connect to each other outside of class. The total rank scores were then added together for each item. Items with the lowest total rank score represented high priority whereas items with the highest total rank score indicated an item with low priority.

As displayed below in Table 7, the top three strategies that the PRODUCED program should consider prioritizing are investing in an online hub, creating a PRODUCED newsletter and implementing a peer mentoring program.

As illustrated in qualitative findings from an earlier needs assessment conducted for this program, the ideal online hub would provide students with a place to find out about other students in the program as well as house general information about the program (e.g academic coursework, relevant resources at the university, financial aid, etc...). Features such as student profiles that list student's major/concentration, year, location, coursework taken, professional & academic interests and/or specialty, study preferences and hours of availability would provide information to help facilitate better connections. A PRODUCED newsletter is also an idea that the program might consider pursuing. Students find it difficult to keep abreast of each other when not actively taking classes together. A newsletter might include notes about student achievements or accomplishments, student classifieds, and other types of information that foster a general sense of cohesiveness around the PRODUCED student identity (i.e. program changes, updates, staff, job opportunities, and/or online learning tips). Lastly, a peer mentoring program would be a third priority for the program to potentially pursue. Such an intervention could be designed in a way that allows more senior PRODUCED students to partner with incoming students via independent virtual meetings or a more formal mentoring program. Given many student's current responsibilities and availability constraints, it will be important for the program to structure a mentoring program in a way that holds students accountable for meeting together and is seen as a value-added opportunity for professional development for both the mentor and the mentee. Should the peer mentoring program be implemented, the program might consider a small incentive or token of appreciation for participating students (e.g. certificate, stipend, etc...).

Table 7: Prioritization Results for Increasing PRODUCED Students' Connection with Each Other

Strategy / Idea / Suggestion	Total	Priority
Online Hub	59	1
PRODUCED Newsletter	77	2

Peer mentoring program	80	3
Online teambuilding activities	93	4
Activities on UVA grounds (tickets to sports events, visits to grounds, picnics, etc)	102	5
Regional dinners or meetups	103	6
Facebook page	108	7
Student blogs	118	8
Student town hall meetings	131	9
Student Council or Student Government	174	10

Section 6: Using Communication and Collaboration Tools with On-Grounds Students

All questions in this section were measured using the following frequency-based scale:

1 =Several times a day 4 =Once a week

2 = Once a day 5 = Never

3 =Several times a week

Overall, survey results indicated that PRODUCED students communicated with on-grounds students far less frequently than they communicated with other PRODUCED students outside of class. Indeed, each of the collaborate and communication tools were used, at best, only once a week. This said, email (M = 4.26, SD = .73) and Blackboard Collaborate (M = 4.53, SD = .77) were the top tools that PRODUCED students used to communicate with on-grounds students.

This data is also consistent with qualitative findings collected during the program's needs assessment. Qualitative data from that assessment suggested that tools such as Lync and Blackboard Collaborate are ideal for collaborative work with on-grounds students because of their functionality and ability to allow to have students work in real time.

Table 8: Frequency of Communication and Collaboration Tools used by PRODUCED Students with On-grounds Students

Item	Mean	Median	Range	Std. Dev.	Variance
BB Collaborate	4.53	5	2	0.77	0.59
Lync	4.74	5	1	0.45	0.20
Skype	4.84	5	1	0.37	0.14
Social Media	4.95	5	1	0.23	0.05
Google	4.63	5	2	0.60	0.36
Email	4.26	4	2	0.73	0.53
Other:					

Section 7: Current and Desired Levels of Community with On-grounds Students

This section measures the current and desired levels of community between PRODUCED students. All questions in this section were measured using a 6 point Likert scale as follows:

1 = Strongly Disagree 4 = Somewhat Agree

2 = Disagree 5 = Agree

3 =Somewhat Disagree 6 =Strongly Agree

For the current state, survey respondents mostly disagreed that the PRODUCED program provided opportunities for them to communicate (M = 3.47, SD = .96), share resources and exchange ideas (M = 3.00, SD = .94), bond and develop friendships (M = 2.53, SD = .90), and study and collaborate with on-grounds students (M = 3.57, SD = 1.21). While formal opportunities may not be there, PRODUCED students somewhat agreed that the resources were there to communicate (M = 4.42, SD = .77), share resources and exchange ideas (M = 4.11, SD = .81) and to study and collaborate (M = 4.16, SD = .90). They somewhat disagreed though that there were resources to bond and develop friendships with on-grounds students (M = 3.32, SD = 1.16). Table 9 summarizes the current state as well as the desired state for these items.

Table 10 further reinforces the idea that students believe that resources are available to foster community between themselves and on-grounds students. The gaps in this section were very small compared to the available opportunities – with the smallest gaps seen amongst tools and resources that allow students to contact and communicate with on-grounds students (gap = .53), sharing resources and exchanging ideas (gap = .73) as well as studying and collaborating (gap = .95). The largest gaps appear to be in the program's ability to provide tools for students to bond and develop friendships with on-grounds students outside of class (gap = 1.15) as well as opportunities to contact and communicate (gap = 1.11), share resources and exchange ideas (gap = 1.58), bond and develop friendships (gap = 1.63), and study and collaborate (1.63).

As described in Section 2: General Questions about Community, performance gaps between PRODUCED students desired level of community with on-ground students were small and not as high as other gaps. Needs assessment data from earlier research on the program uncovered some of the tensions that impede successful interactions between PRODUCED students and ongrounds students. When the program addresses this gap, further investigations and inquiries that capture the perspective of both groups will be needed so as to best scaffold and optimize the intervention designs that could facilitate interactions.

Table 9: Current and Desired Level of Community between PRODUCED Students and On-grounds students

Median

Std. Dev.

Variance

Range

Mean

Current State:

Item	Mean	Median	Range	Std. Dev.	Variance
	On	portunities			
PRD provides opportunities for me to contact and communicate with on-grounds students outside of class	3.47	4.00	4	0.96	0.92
PRD provides opportunities for me to share resources and exchange ideas with on-grounds students outside of class	3.00	3.00	3	0.94	0.88
PRD provides opportunities for me to bond and develop friendships with on-grounds students on homework and/or projects outside of class	2.53	3.00	2	0.90	0.81
PRD provides opportunities for me to study and collaborate with on- grounds students on homework and/or projects outside of class	3.37	3.00	4	1.21	1.46
	I	Resources			
PRD provides resources and tools for me to contact and communicate with on-grounds students outside of class	4.42	4.00	3	0.77	0.59
PRD provides resources and tools for me to share resources and exchange ideas with on-grounds students outside of class	4.11	4.00	3	0.81	0.66
PRD provides resources and tools for me to bond and develop friendships with on-grounds students outside of class	3.32	3.00	5	1.16	1.35
PRD provides resources and tools for me to study and collaborate with on-grounds students on homework and/or projects outside	4.16	4.00	4	0.90	0.81

of class

Desired State:

Desired State:					
Item	Mean	Median	Range	Std. Dev.	Variance
	Op	portunities			
PRD provides opportunities for me to contact and communicate with on-grounds students outside of class	4.58	5.00	2	0.90	0.81
PRD provides opportunities for me to share resources and exchange ideas with on-grounds students outside of class	4.58	5.00	4	0.96	0.92
PRD provides opportunities for me to bond and develop friendships with on-grounds students on homework and/or projects outside of class	4.16	4.00	4	1.07	1.14
PRD provides opportunities for me to study and collaborate with on- grounds students on homework and/or projects outside of class	5.00	5.00	2	0.67	0.45
	I	Resources			
PRD provides resources and tools for me to contact and communicate with on-grounds students outside of class	4.95	5.00	2	0.62	0.38
PRD provides resources and tools for me to share resources and exchange ideas with on-grounds students outside of class	4.84	5.00	2	0.90	0.81
PRD provides resources and tools for me to bond and develop friendships with on-grounds students outside of class	4.47	4.00	4	1.02	1.04
PRD provides resources and tools for me to study and collaborate with on-grounds students on homework and/or projects outside of class	5.11	5.00	2	0.74	0.55

Table 10: Gap Analysis of Connection between PRODUCED students and On-grounds Students

Gaps:

Item	What Is Mean	Median	What Shoul Mean	d Be Median	Gap Mean	Media
		Opportunities				
PRD provides opportunities for me to contact and communicate with on-grounds students outside of class	3.47	4.00	4.58	5.00	1.11	1.00
PRD provides opportunities for me to share resources and exchange ideas with on-grounds students outside of class	3.00	3.00	4.58	5.00	1.58	2.00
PRD provides opportunities for me to bond and develop friendships with on-grounds students on homework and/or projects outside of class	2.53	3.00	4.16	4.00	1.63	1.00
PRD provides opportunities for me to study and collaborate with on-grounds students on homework and/or projects outside of class	3.37	3.00	5.00	5.00	1.63	2.00
		Resources				
PRD provides resources and tools for me to contact and communicate with on-grounds students outside of class	4.42	4.00	4.95	5.00	0.53	1.00
PRD provides resources and tools for me to share resources and exchange ideas with on-grounds students outside of class	4.11	4.00	4.84	5.00	0.73	1.00
PRD provides resources and tools for me to bond and develop friendships with on-grounds students outside of class	3.32	3.00	4.47	4.00	1.15	1.00
PRD provides resources and tools for me to study and collaborate with on-grounds students on homework and/or projects outside of class	4.16	4.00	5.11	5.00	0.95	1.00

This section asked respondents to consider a list of strategies, ideas and suggestions that could potentially help PRODUCED students interact, communicate, collaborate, bond, and connect more with on-grounds students. Items were scored using the nominal group technique in which each respondent ranked the options (i.e. strategies, ideas and suggestions) from 1 (most important) to 10 (least important) item that would help them connect to each other outside of class. The total rank scores were then added together for each item. Items with the lowest total rank score represented high priority whereas items with the highest total rank score indicated an item with low priority.

As displayed below in Table 11, the top three strategies that the PRODUCED program should consider prioritizing are extending opportunities for multidisciplinary student projects, providing PRODUCED students with access to student clubs and organizations, and creating student competitions made of interdisciplinary teams of on-grounds and PRODUCED students. Currently, these types of activities are mostly available to on-grounds students and no efforts have been made to extend them to PRODUCED students. Thus, these findings suggest that providing access, extending opportunities and creating space for PRODUCED students and ongrounds students to interact and intermix would be a basic way to bridge the gap between the two groups.

Table 11: Prioritization Results for Increasing PRODUCED Students' Connection with On-grounds students

Strategy / Idea / Suggestion	Total	Priority
Extend opportunities for multidisciplinary student projects (e.g. solar cars) to PRODUCED students	43	1
Provide PRD students access to student clubs and organizations	46	2
Create student competitions made of interdisciplinary teams of ongrounds and PRD students	54	3
Provide opportunities for PRD students and on-grounds students to participate in virtual teambuilding	58	4
Ensure that PRD students have	82	5

representation in student council	
or student government	

Section 9: Connecting to SEAS

This section considered PRODUCED students' connection to SEAS. Survey respondents were asked to indicate how often they participated in events or workshops offered through SEAS. The first part of this section of the survey employs a frequency-based scale as follows:

- 1 = Never
- 2 = 1 to 3 times per semester
- 3 = 4 or more times per semester

In the second part of this section of the survey, respondents prioritized and rank ordered the strategies/ideas/suggestions that would help increase their connection to SEAS. This section was scored using the nominal group technique described in previous sections of this report.

Overall, as shown in Table 13, PRODUCED students never really connected with SEAS (M = 1.32, SD = .48). The top three strategies/ideas/suggestions that would help them connect with SEAS more include extending opportunities for them to attend: (1) company presentations, (2) alumni talks and (3) research symposiums (Table 14). This connection could be established by offering these types of events virtually or by creating ways for students to attend them in person (i.e. travel stipends). Regardless, the program will need to find ways to record these events for students to watch according to their own schedule and to participate in the same ways that ongrounds would (i.e. submitting questions and interacting with the speaker).

Table 13: PRODUCED Student Connection to SEAS

Item	Mean	Median	Range	Std. Dev.	Variance
About how often per semester do you participate in events or workshops offered through SEAS?	1.32	1	1	0.48	.23
1 = Never 2 = 1 to 3 times per semester 3 = 4 or more times per semester					

Table 14: Prioritization Results for Increasing PRODUCED Student's Connection to SEAS

Strategy / Idea / Suggestion	Total	Priority
Company presentations	41	1
Alumni talks	57	2
Research symposiums	58	3

Student competitions	66	4
Meet & chat with SEAS faculty, department chairs or deans online	70	5
Award ceremonies	107	6

Section 10: Connecting to the Library

This section considered PRODUCED students' connection to the UVA library. Survey respondents were asked to indicate how often they made use of the resources available through the library. The first part of this section of the survey employs a frequency-based scale as follows:

- 1 = Never
- 2 = 1 to 3 times per semester
- 3 = 4 or more times per semester

In the second part of the survey, respondents assessed their ability to perform various library-related skills and tasks. The scale used to code student's responses was as follows:

- 1 = Yes
- 2 = No
- 3 = Somewhat

In the third part of this section of the survey, respondents prioritized and rank ordered the strategies/ideas/suggestions that would help increase their connection to the library. This section was scored using the nominal group technique described in previous sections of this report.

Results for this portion of the survey are displayed in Tables 15 through 17. Overall, as shown in Table 15, respondents did not make much use of the resources available through the library (M = 1.95, SD = .95). As indicated in Table 16, most students were able to perform most library related tasks. With the exception of using reference management tools (M = 2.21, SD = .71), students were able to perform the following tasks:

- Accessing journals and books from off-grounds locations (M = 1.37, SD = .68)
- Employing research skills (M = 1.58, SD = .90)
- Using engineering databases (M = 1.47, SD = .61)
- Using the online engineering subject guides (M = 1.79, SD = .79)

As shown in Table 17, the most important ways that the program can support students' connection to the library is by offering supports that (1) ensure that they can access journals and books from off-grounds locations (2) help them employ research skills and (3) help them use and navigate the engineering databases.

As a next step, the program might consider investigating to what degree of confidence students are able to perform these tasks as these current survey results do not illustrate such depth.

Additionally, interview data from a previous needs assessment for the program suggested that students benefited from having an opportunity to meet with the library staff during the beginning of the year orientation. Survey and prior needs assessment results seem to support that these sessions along with work done in the Science and Technology research seminars introduce students to library-related skills. As per one student suggestion during the needs assessment interviews, the program might consider offering on-demand / just-in-time training videos on these skills/topic areas because such knowledge often gets forgotten over the course of the year.

Table 15: PRODUCED Student Connection to the Library

Item	Mean	Median	Range	Std. Dev.	Variance
About how often per semester do you make use of the resources available through the library?	1.95	2	2	0.71	0.50
1 = Never 2 = 1 to 3 times per semester 3 = 4 or more times per semester					

Table 16: Ability to Perform Library-Related Skills and Tasks

	Mean	Median	Range	Std. Dev.	Variance
Access journals and books from an off-grounds location (e.g. UVAAnywhere, Interlibrary Loan (ILL), digitizing resources, ask a librarian, etc)	1.37	1	2	0.68	0.46
Employ research skills (e.g. choosing a research topic, finding reliable sources, citing sources, etc)	1.58	1	2	0.90	0.81
Use engineering databases (e.g. Compendex, Scirus, TechXtra, Science.gov, Web of Science, etc)	1.47	1	2	0.61	0.37
Use the online engineering subject guides	1.79	2	2	0.79	0.62
Use reference management tools (RefWorks, Mendeley, etc)	2.21	2	2	0.71	0.50

Table 17: Prioritization Results for Increasing PRODUCED Student's Connection to the Library

I	Strategy / Idea / Suggestion	Total	Priority
	2		

Access journals and books from an off-grounds location (e.g. UVAAnywhere, Interlibrary Loan (ILL), digitizing resources, ask a librarian, etc)	47	1
Employ research skills (e.g. choosing a research topic, finding reliable sources, citing sources, etc)	50	2
Use engineering databases (e.g. Compendex, Scirus, TechXtra, Science.gov, Web of Science, etc)	54	3
Use the online engineering subject guides	63	4
Use reference management tools (RefWorks, Mendeley, etc)	71	5

Section 11: Connecting to the CECD

This section considered PRODUCED students' connection to the Center for Engineering and Career Development (CECD). Survey respondents were first asked to indicate how often they made use of the resources available through the CECD. The first part of this section of the survey employs a frequency-based scale as follows:

- 1 = Never
- 2 = 1 to 3 times per semester
- 3 = 4 or more times per semester

In the second part of this section of the survey, respondents prioritized and rank ordered the strategies/ideas/suggestions that would help increase their connection to the CECD. This section was scored using the nominal group technique described in previous sections of this report.

Overall, as shown in Table 18, PRODUCED students never really connected with SEAS (M = 1.32, SD = .48). As illustrated in Table 19, the top three strategies/ideas/suggestions that would help them connect with SEAS more include extending opportunities for them to (1) work on their resumes, (2) be oriented to the resources available through the CECD and (3) gain assistance with interview techniques and strategies.

It is important to point out that working to increase student's connection to the CECD may be an important step in helping the program address the larger gaps that were pointed out earlier in this report. Indeed, should the program choose to address the major gaps of connecting students to local businesses and engineering job opportunities, the resources and supports offered through the CECD will be indispensible in equipping students with the skills needed to successfully interact and network with potential employers. For this reason, it is recommended that the program continue to strengthen the ties and connections made with the CECD.

Table 18: PRODUCED Student Connection to the Library

	Mean	Median	Range	Std. Dev.	Variance
About how often per semester do you make use of the resources available through the CECD?	1.32	1	1	0.48	0.24
1 = Never 2 = 1 to 3 times per semester 3 = 4 or more times per semester					

Table 19: Increasing PRODUCED Student Connection to the CECD

Strategy / Idea / Suggestion	Total	Priority
Resumes (e.g. resume critique, creating a first resume, highlighting certain skills, etc)	55	1
Orientation to the resources available through the Center for Engineering Career Development	65	2
Interviewing techniques & strategies (e.g. mock interviews, interview preparation, interview coaching, etc)	85	3
Internships and Job search	87	4
Career Fairs	89	5
Networking & Communicating effectively	119	6
Starting a new job (negotiating salaries, meeting new co-workers, orienting yourself, what to ask for, etc)	133	7

Continuing to graduate school (applications, personal statements, financing & scholarships, etc)	154	8
Using social media for a job search (e.g. Facebook, LinkedIn, Twitter, etc)	156	9
Career transitions (e.g. changing fields, navigating a promotion, etc)	167	10
Personal branding	194	11
Opportunities for women in engineering	207	12
Opportunities for underrepresented populations in engineering	218	13

Section 12: Connection to the Wider Engineering Community

This section measures the current and desired levels of community between PRODUCED students and professional organizations and the wider engineering community. All questions in this section were measured using a 6 point Likert scale as follows:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Somewhat Disagree
- 4 = Somewhat Agree
- 5 = Agree
- 6 = Strongly Agree

In general, students did not feel connected to engineering student organizations at UVA (M = 2.37, SD = 1.26), non-engineering student organizations (M = 2.11, SD = 1.10), engineering honor societies (M = 2.47, SD = 1.47) or national or statewide professional engineering organizations (M = 2.37, SD = 1.16). While students were also not satisfied with their level of connection to these types of organizations, only their connection to engineering student organizations (M = 4.26, SD = 1.05), engineering honor societies (M = 4.05, SD = 1.22) and national or statewide professional engineering organizations (M = 4.58, SD = .77) were of some importance.

In an effort to help the program prioritize which areas would be ideal to start with, this portion of the survey included a gap analysis. Again, this was done by comparing students' satisfaction levels to the importance that they place on aspects of community.

As illustrated in Table 21, survey results indicated that the smallest gaps in means existed with respect to student's connection to engineering honor societies (gap = .47) and engineering student organizations at UVA (gap = .94). The largest gap was seen in students' connection to national or statewide professional engineering organizations (gap = 1.74). Interestingly, the results did not reveal a gap in student's connection to non-engineering UVA student organizations (gap = -.21). This could be due in part to student demographics such as age and/or life and work responsibilities. The program should monitor the changes in this gap as the PRODUCED student demographic changes.

Table 20: PRODUCED Student Connection to the Wider Engineering Community

Item	Mean	Median	Range	Std. Deviation	Variance		
Engineering student organizations at UVA							
I feel connected to engineering student organizations at UVA	2.37	2	4	1.26	1.59		
I am satisfied with my current level of connection to engineering student organizations at $\ensuremath{\mathrm{UVA}}$	3.32	4	4	1.25	1.56		
It is important for me to feel connected to engineering student organizations at UVA	4.26	4	3	1.05	1.10		
Non-engineering student of	organization	ıs					
I feel connected to non-engineering student organizations	2.11	2	3	1.10	1.21		
I am satisfied with my current level of connection to non- engineering student organizations	3.58	4	4	1.43	2.04		
It is important for me to feel connected to non-engineering student organizations	3.37	3	4	1.34	1.80		
Engineering Honor Socie	eties at UVA						
I feel connected to engineering honor societies at UVA	2.47	2	5	1.47	2.16		
I am satisfied with my current level of connection to engineering honor societies at UVA	3.58	4	4	1.46	2.13		
It is important for me to feel connected to engineering honor societies at UVA	4.05	4	4	1.22	1.49		

National or Statewide Professional Engineering Organizations						
I feel connected to national or statewide professional engineering organizations	2.37	2	4	1.16	1.35	
I am satisfied with my current level of connection to national or statewide professional engineering organizations	2.84	3	4	1.38	1.90	
It is important for me to feel connected to national or statewide professional engineering organizations	4.58	5	2	0.77	0.59	

Table 21: Gap Analysis of Students' Connection to the Wider Engineering Community

Engineering student organizations at UVA:

Satisfaction vs. Importance	Mean 0.94	Median 0
Non-engineering UVA student organizations: Satisfaction vs. Importance	Mean -0.21	Median -1
Engineering honor societies at UVA		

	Mean	Median
Satisfaction vs. Importance	0.47	0

National or statewide professional engineering organizations:

		M	ean	Median
Satisfaction vs. Importance			1.74	2

Section 13: Involvement in Engineering Organizations & the Engineering Community

This section of the survey gauged students' involvement in professional engineering and student organizations using frequency counts. Results are displayed in Tables 22 through 24. For the most part, PRODUCED students are not involved in organizations that could connect them to the wider engineering community. There is a desire to connect to engineering student organizations, with the American Society of Engineers being the organization that students mentioned the most. However, survey results did not indicate much student interest in connecting with engineering honor societies or engineering organizations at the national or state level. This suggests that the program might need to do some work around helping students see the value and benefit in connecting to such organizations.

Table 22: Current and Desired Student Involvement in Engineering Student Organizations

Are you involved in any engineering student organizations?

	Total
Yes	1
No	18

Please list the name(s) of any student organization(s) that you are a part of:

- Tau Beta Pi
- Raven Society

Would you like to be involved in any engineering student organizations?

	Total
Yes	12
No	7

Which engineering student organizations would you like to be connected to?

Organization	Frequency
Alpha Omega Epsilon	2
Society of Women Engineers	3
Engineering Students without Borders	3
Engineering Student Council	2
American Society of Mechanical Engineers	5
ASM/TMS International	3
National Society of Black Engineers	1
Tau Beta Pi	1
Solar Car Team	3
Institute of Electrical & Electronics Engineers	7
Other:	

Table 23: Current and Desired Student Involvement in Engineering Student Honor Societies

Are you involved in an engineering honor society?

	Total
Yes	1
No	18

Please list the name(s) of any student organization(s) that you are a part of:

- Tau Beta Pi
- Raven Society

Would you like to be involved in an engineering honor society?

		Total
Yes		2

No	17

List of honor societies that PRD students would like to be a part of:

Raven Society

Table 24: Current and Desired Student Involvement in National or Statewide Engineering Professional Organizations

Are you involved in any national or statewide engineering professional organizations?

	Total
Yes	1
No	18

Please list the name(s) of any national or statewide engineering professional organizations that you are a part of:

- ASM
- IEEE

Would you like to be involved in any national or statewide engineering professional organizations?

	Total
Yes	4
No	15

List of national or statewide engineering students that PRD students would like to be a part of:

None listed

Final Survey Comments

Below is a listing the final comments that students provided about the survey. These suggestions have been categorized by theme:

Capturing the Student Perspective

- Compile a database of pros and cons, feedback and journals from students. Doing this
 may change how classes are presented, how students interact and how PRODUCED
 students are represented within UVA.
- Conduct exit interviews
- Bring PRD students into development process for round table discussion to direct the program experience

Satisfaction with the Program

- Satisfied with the program and feel that it is sufficient as is
- Enjoy being in the program and overall very happy with it
- Very thankful and appreciative of the opportunities to provide continued feedback via surveys such as this
- Liked the ideas that this survey made them think about. In particular, one student liked the idea of having PRD students develop more of a bond with each by making them study together and idea exchange more possible. This student felt that this would create a way for them to feel more comfortable talking to each other on a daily basis regarding their studies.

Program Technologies

- Students see Lync as a valuable tool
- Program should address the BB Collaborate issues

PRODUCED Student Experience

- One student doesn't feel deprived because he/she cannot attend all the speeches and events because he/she is busy with other responsibilities in their home community (e.g. work, church and family obligations). His/her primary concern is to learn the material and to get a degree that is equivalent to an on-grounds when looking for and applying to jobs.
- Students sometimes miss comparing homework with student before class. While Lync helps, daily meetings are better.
- There is difficulty with lab work and student suggested on ground meeting 1x or 2x a month

PRODUCED and On-grounds student interactions

- Classes that are offered completely online are the best. The mixed ones are more challenging. On-grounds students forget to hit microphones or seem to forget the PRD students.
- PRODUCED students do not expect on-grounds students to reach out to them. One student explained, that it is a harder task because on-ground students have so many things going on that it's harder for them to reach out

Appendix X Facilitator Guide Quick Sheet

Tips for Presenting via MS Lync

- **1.** Prepare for your presentation ahead of time. Remember to:
 - Make sure you are in a quiet, comfortable location.
 - Keep a glass of water nearby in case you get thirsty while presenting.
 - Have a clock or timer nearby.
 - Rehearse your presentation beforehand.
 - Get familiar, experiment and/or do a test run with the technology platform beforehand.
- **2.** Background noise and interruptions can be quite distracting to participants. Remember to:
 - Turn off or silence your phone.
 - Minimize any potential distractions (e.g. close your office door, hang your do not disturb sign on the door, etc...).
 - Close any programs that are not relevant to your presentation (e.g. email, Skype, games, Facebook/Twitter, etc...).
- **3.** You will not be able to make physical gestures or use your body to get students' attention in the same way that you do when leading an in-person meeting or seminar. So, highlight what you want participants to look at on the slides and remember to:
 - Use your mouse to point to a section on the slide.
 - Use graphics in your slides to highlight important ideas/points (e.g. boxes, shading etc...).
 - Set expectations and ground rules at the beginning (e.g. tell students when & how they should ask questions).
 - Communicate, articulate and enunciate clearly. Be descriptive with your words because participants will be guided by your voice.
- **4.** Students may or may not see and/or pay attention to what is happening in the IM chat window. If their individual video feed is turned off, they also will not be able to see each other. So, remember to:
 - Read any questions that come in through IM out loud.
 - Refer to students by name when answering or responding to questions.
 - Ask students to say their name before asking a question. This will help them get to know each other virtually.

- **5.** Interaction and collaboration are essential to a good session. Here are a few ideas ways to make participants feel at ease:
 - Introduce yourself.
 - Acknowledge participant's presence: Ask students to quickly state their names or to introduce themselves (time permitting), say "hello" and welcome them to the session, and/or simply ask whether they can hear/see the broadcast.
 - Ask participants questions and/or invite participants to share their experiences or demonstrate a skill/idea/concept.
 - Allow for group work, observe groups and give feedback.
 - Thank them for attending and "Hang around" after a session to answer questions. Alternatively, provide participants with your contact information so they can contact you with questions.
- **6.** Technology can be unpredictable at times. It is always a good idea to test out audio, video, software and/or delivery platforms beforehand. You might also consider sending your slides ahead of time to yourself or to a colleague/support assistant in case you need to broadcast from another computer. However, if an issue arises, remember to:
 - Restart the computer (this is often the simplest fix).
 - Keep calm and reschedule if necessary.
 - Communicate with participants. They may or may not be able to tell if the problem is occurring on their end or yours.
 - Email or Lync are usually the fastest ways to get in touch with participants. In the case of a complete network or platform outage, consider initiating a phone chain.