International Journal of Doctoral Studies

An Official Publication of the Informing Science Institute
InformingScience.org

IJDS.org

Volume 13, 2018

A Preliminary Examination of Doctoral Student Retention Factors in Private Online Workspaces

Cathrine Ames *	Grand Canyon University, Phoenix, Arizona, USA	Cathrine.Ames@gcu.edu
Ronald Berman	Grand Canyon University, Phoenix, Arizona, USA	Ronald.Berman@gcu.edu
Alex Casteel	Grand Canyon University, Phoenix, Arizona, USA	Alex.Casteel@my.gcu.edu

* Corresponding author

Abstract

Aim/Purpose	The purpose of this quantitative descriptive study is to provide a preliminary examination of students' retention factors of engagement, communication, and isolation that may be affected by the introduction and use of online communities for dissertation development within an online doctoral program.
Background	This research is a continuation of the university's 5-year research initiative to address the high national rate of doctoral attrition by investigating whether private online workspaces provide a virtual platform to increase student interaction, enhance student communication, and reduce student perception of isolation.
Methodology	A quantitative descriptive study of 698 doctoral students (n_1 = 355, n_2 = 179, n_3 = 184) in the online environment across three survey periods over a span of 30 months.
Contribution	In 30 months, student engagement increased, perceptions of effective communication by students with dissertation committees improved, and student perceptions of isolation remained unchanged.
Findings	The implementation of online workspaces for doctoral students addressed factors experienced in online doctoral programs. The introduction of private doctoral workspaces significantly improved doctoral students' perceptions of more effective communication with their dissertation committees. Perceptions of isolation remained unchanged with the introduction of the technology.

Accepted by Editor Nicole A. Buzzetto-Hollywood | Received: October 3, 2017 | Revised: January 4, January 26, 2018 | Accepted: February 12, 2018.
Cite as: Ames, C., Berman, R., & Casteel, A. (2018). A preliminary examination of doctoral student retention factors in private online workspaces. *International Journal of Doctoral Studies, 13,* 79-107.
https://doi.org/10.28945/3958

Recommendations for Practitioners	Universities and faculty should make proactive efforts to utilize the online tools available to them to facilitate improved communication and reduce isolation within online doctoral programs.
Recommendation for Researchers	The implementation of online workspaces appears to mitigate some factors associated with student attrition, but the extent of these changes is unknown. Future research should continue to examine the factors of retention as a pathway to reducing attrition within the online learning environment.
Impact on Society	The implementation of private online workspaces appears to lessen factors associated with student attrition, providing opportunities for improved utilization of personal and university resources, improved professional standing for graduates, and an enhanced reputation for online learning programs.
Future Research	Further examination is needed to determine to what extent various communication methods affect a student's experience and increase connectivity between the student and the institution, as well as research to better understand the phenomenon of students' perceptions of isolation within online environments.
Keywords	online learning, private workspaces, retention, attrition, isolation, communication, student engagement, connectedness, doctoral programs

INTRODUCTION

For decades, attrition from doctoral programs has averaged between 40% and 70% (Bowen & Rudenstine, 1992; Gardner & Gopaul, 2012; Lovitts, 2001; Spaulding & Rockinson-Szapkiw, 2012) while attrition for online students is an additional 10% to 20% higher (Allen & Seaman, 2011; Marshall, Greenberg, & Machun, 2012; Rovai, 2002). Retaining doctoral students is a multifaceted problem affecting institutions and students worldwide. Doctoral student attrition is costly personally, professionally, and financially (Burkholder, 2012). Doctoral students incur debt, faculty invest time, and universities use resources for doctoral students who do not complete their program of study. Although doctoral students often experience high academic achievement in coursework (Ali & Kohun, 2006; Gardner, 2008; Lovitts, 2001), other factors contribute to doctoral attrition, such as navigating the complex dissertation stage (Baker, Pifer, & Flemion, 2013; Golde & Dore, 2001; Lovitts, 2001), and feelings of isolation (Gardner, 2008, 2010; Golde, 2005; Hawlery, 2003; Lovitts, 2001; Rovai, 2002; Tinto, 1993). Coursework is only one measure of academic status, and it is important that doctoral students are able to navigate the research terrain (Card, Chambers, & Freeman, 2016).

Completing the unstructured dissertation stage is a major component of experiencing success in a doctoral program. Many doctoral students drop out before completing the dissertation phase due to unclear expectations, poor communication, and feeling isolated (Golde, 2005). Smallwood (2004) refers to the high rates of attrition as a "scandal" and suggests that attrition is a fundamental problem of doctoral programs in the United States. The transition to independent scholarship can be daunting for doctoral students as they transform into independent researchers. Students experience challenges in the dissertation phase because the dissertation stage necessitates doctoral students transition from being dependent students participating in structured courses to independent students creating new knowledge (Ewing, Mathieson, Alexander, & Leafman, 2012; Golde & Dore, 2001; Lovitts, 2001). Doctoral students need extra support during the dissertation phase when they encounter unexpected problems, which intensify their challenges (Berman, Grant, & Markette, 2012; Gardner, 2008; Gomez, 2013; Lovitts, 2001).

The exponential growth of online learning is another factor that influences doctoral education and attrition. Online education offers the advantages of increasing flexibility, asynchronous instruction, bridging geographical barriers, and time for reflection. In contrast, online education can produce environments lacking in collaboration, leading to isolation and miscommunication. Although traditional

classrooms provide interaction for students, online students do not have the same opportunity, which causes a physical distance barrier (Ali & Kohun, 2006; Bolliger & Inan, 2012; Rovai, 2002). To accommodate the distinctive needs of online doctoral students, the focus is shifting to psychosocial aspects of integration, which includes offering technology-based tools for students, enabling connection to create a sense of community (Bolliger & Inan, 2012).

To explore online doctoral students in the dissertation stage, the current study examines several gaps in extant literature. As graduate programs experience unprecedented growth, high attrition rates are problematic (Ewing et al., 2012), particularly as more doctoral programs are going online (Rockinson-Szapkiw, 2012).This study also investigates which approaches are needed to increase persistence in doctoral students (Allen & Seaman, 2011; Bean & Eaton, 2000; Berman et al., 2012; Gardner, 2008). In addition, the current study is a preliminary examination of two technology-based advancements currently used as conduits to enhance effectiveness and retention within a doctoral program for doctoral students who are at the dissertation stage. The purpose of this quantitative descriptive study is to provide a preliminary examination of students' retention factors of engagement, communication, and isolation that may be affected by the introduction and use of online communities for dissertation development within an online doctoral program, and then to recommend that those factors be investigated in future study. The first system explored is the Doctoral Community Network™ (DC Network), which is an online scholarly community for doctoral students and faculty. The second system is the private doctoral workspace, a virtual website within the DC Network for doctoral students in the dissertation stage.

BACKGROUND

DOCTORAL COMMUNITY NETWORK

To address the growing concern of online doctoral attrition, a multi-year research initiative was introduced at the current university. The first phase of the research initiative was to launch the Doctoral Community Network. The DC Network is a student-driven, online scholarly community designed to help doctoral students complete their dissertation and program of study and is a forum visible to all doctoral students attending the university. In a web-based virtual location, the DC Network provides comprehensive support services to assist new researchers as they learn to become independent scholars, capable of producing high-quality research (Berman et al., 2012). Using a collaborative technology, the DC Network is a resource for new researchers to receive feedback on prospective research from a nationwide research community. Having confidence in research-related tasks may lead to successful completion of research (Kahn & Scott, 1997; Lambie, Hayes, Griffith, Limberg, & Mullen, 2014; Phillips & Russell, 1994), and research anxiety is more common in online students (DeVaney, 2010). Using the DC Network may mitigate research stress in distance barriers for novice researchers. Doctoral students can post research questions on the DC Network, and faculty and other doctoral students can offer feedback, suggestions, and references. In addition, the DC Network provides resources, templates, webinars, and video tutorials from experts in qualitative and quantitative research. Experts include faculty and support staff in the fields of social sciences, leadership, business, and technology.

PRIVATE DOCTORAL WORKSPACES

Expanding the DC Network in 2014 offered further support for doctoral students working on their dissertation. A private doctoral workspace, as the name suggests, is a private online environment accessible only to the doctoral student and the dissertation committee. The private doctoral workspace was established for each student to facilitate communication and progression as they interact with their committee members. The private doctoral workspaces enable doctoral students to share manuscripts, track milestones and communicate with committee members, and serve as repositories for items related to the dissertation, including documents and communication between committee mem-

bers, which are are maintained until the doctoral students graduate. Communication records include emails via the native system and recorded video conferences. Technological advances provide opportunities for effective communication for knowledge and information sharing, which may improve experiences for online students (Hogg & Lomicky, 2012). Before developing the private doctoral workspace, the dissertation communication process was fragmented, restricting dissertation committee oversight. Faculty and students communicated almost entirely through email. Thus, faculty and dissertation committee members were unable to ascertain the doctoral student's dissertation progress quickly and document revisions were unavailable and unorganized.

The private doctoral workspace is a unique reference and communication system, providing each doctoral student a method for communication and resources. The dissertation process is often misunderstood by doctoral students (Gardner, 2008; Golde & Dore, 2001; Lovitts, 2005), and acquiring research skills is fundamental for successful completion of a dissertation. Therefore, the private doctoral workspace is designed to support the needs of novice doctoral researchers who are learning to research and who may require assistance during the dissertation process. Since the research process may overwhelm new students, collaborative experiences in research forums may enable the development of research skills for novice researchers (Coryell & Murray, 2014).

Purpose of the Study

Educational shifts due to advances in technology and the influx of online doctoral students provide opportunities to examine new approaches to meet the needs of doctoral students in the dissertation stage. The purpose of this quantitative descriptive study is to provide a preliminary examination of student retention factors of engagement, communication, and isolation that may be improved by the introduction and use of online communities for dissertation development within an online doctoral program. With the popularity of online learning, it is increasingly important to reduce students' feelings of isolation (Ali & Kohun, 2007; Bolliger & Inan, 2012; Rovai, 2002). Moreover, this study seeks to offer preliminary feedback to guide the further development of the virtual workspace and tools for online doctoral leaners. Demand for online doctoral programs is increasing (Fuller, Risner, Lowder, Hart, & Bachenheimer, 2014), and researchers are investigating using virtual communities to reduce feelings of isolation in doctoral students (Berman, Radda, & Cross, 2013). In response to the incursion of online students, developments in technology, and continuing high rates of doctoral attrition, it is important to identify approaches that meet the needs of doctoral students in the twenty-first century.

Literature Review

Theoretical Framework

Bean's (1980) causal model of student retention provides the framework from which the hypotheses in the current study were derived. The theoretical framework is an important component because it provides meaning for the investigation, and it helps define the research scope. Student departure has long been a question of interest to administrators and scholars. Bean's model originates from Tinto's (1975) student integration model. Tinto's Model (1975) highlights that institutions of higher education can improve student persistence through student academic and social integration. Bean's model expands on Tinto's and demonstrates that there is a relationship between student retention and institutional commitment and student satisfaction with the institution. Bean submits that feelings of validation are important to students, and when students have a connection with the organization, it reduces their sense of isolation.

Doctoral Programs Worldwide

The contour of global higher education is evolving to include more doctoral programs worldwide. Internationally, doctoral studies are increasing (Sampson, Johnston, Comer, & Brogt, 2015). Advanc-

es in information technology and communication modalities have allowed exponential expansion of programs worldwide. Upwards of 450 higher education programs exist globally, with half of the programs residing in the United States (Rumbley et al., 2014), which include approximately 311,204 international students who are enrolled in U.S. universities (Campbell, 2015). Outside of the U.S. borders, 48 countries worldwide support 217 institutions or centers focusing on tertiary education, and postsecondary education accounts for more than 170 million students worldwide (Rumbley et al., 2014). The higher education field is expanding to include increasing global participation, necessitating different infrastructures and approaches.

Prior research indicates that there are notable differences between doctoral programs worldwide. Doctoral programs in the United States typically require coursework that is followed by a dissertation. In contrast, European doctoral degrees tend to be research-based without the requirement of coursework (Freeman, Hagedorn, Goodchild, & Wright, 2014). Higher education in the United Kingdom focuses solely on the research project, which starts at the onset of the program. Doctoral students develop academic knowledge during the master's degree program and apply the knowledge toward research within the doctoral program (Barnett, Harris, & Mulvany, 2017). The student works alongside a mentor, usually a committee member, to develop and present research with minimal programmed coursework.

Unlike most North American universities, and similar to European programs, PhD students in Australia tend to not have structured coursework. The Australian PhD program is solely research-based (Fotovatian, 2012). However, Australia and other countries, including China and Iceland, have seen a recent shift toward the development of professional doctorates that emphasize field-based and applied research. Professional doctorates were developed to offer greater quantity of practical high-level knowledge, as well as to address high attrition rates associated with theory-based degrees, such as the PhD (Wildy, Peden, & Chan, 2015). Although similarities are found in European and Australian programs, other countries have different requirements.

Due to distinct differences in doctoral programs worldwide, making comparisons between various doctoral programs is challenging. For example, Misu (2012) conducted an international study to compare doctoral career studies; however, Misu found that analyzing the study survey was difficult due to country inconsistencies. For example, German doctoral candidates work with master supervisors for several years as paid employees. In contrast, South African PhD Educational students are part-time students, and, often, U.S. research assistants receive a part-time salary. France employs a collaborative partnership model in which, with the aid of university staff, company employees conduct research on behalf of the company (Angelier, 2012). Parameters for doctoral programs vary, and, to date, there is not a common methodology or accepted protocol across all international programs.

The emergence of global higher education in the 21st century has broadened the scope of higher education worldwide. The higher educational terrain comprises global criteria that may be articulated depending on the context of the country's standing in the labor market, the geopolitical climate, or the economy (Samuel, 2014). Thus, to understand parameters for doctoral programs on an international level, awareness of national infrastructure is necessary. Although there are notable international differences in doctoral programs, there are also commonalities. In terms of research production and creating new knowledge, doctoral candidates are valuable, regardless of the country in which they reside. In addition, doctoral programs worldwide are expanding, with highly developed countries comprising more programs for doctoral students. Differences between international doctoral programs can be mitigated somewhat through online delivery. Online doctoral programs permit students to reach across national borders to achieve a terminal degree.

Doctoral Attrition

To combat the high rates of doctoral attrition, leaders in higher education continue to examine strategies to increase the progress of doctoral students. The recent influx of online learning adds unique challenges to developing approaches to retain doctoral students. While some attrition is expected, student retention in higher education is a significant and ongoing problem (Council of Graduate Schools, 2010; Wildy et al., 2015). For universities that are focusing on how to compete in national rankings and improve instruction, termination of the PhD trajectory is detrimental (Van de Schoot, Yerkes, Mouw, & Sonneveld, 2013). Doctoral attrition is a decades-old and multifaceted problem, affecting institutions and students worldwide.

It is important to note that doctoral departure is not limited to students who are academically incapable of completing a doctoral degree. Often there is little academic difference between completers and noncompleters. Doctoral students feel ill-equipped for the rigors of the doctoral program or they lack of adequate financial resources; therefore, they fail to complete their dissertation (Van der Haert, Ortiz, Emplit, Halloin, & Dehon, 2014). Doctoral programs are demanding, and, frequently, students are surprised to find they are not prepared for the dissertation process (Baker et al., 2013; Golde & Dore, 2001; Holbrook et al., 2014; Lovitts, 2001). The dissertation stage is complex, involving independent scholarship that entails selecting a topic that contributes new knowledge to the field, designing a feasible study, synthesizing large amounts of empirical literature, successfully collecting data, and correctly analyzing the data. Students assert that the doctoral process is complicated and isolating, and they expect scaffolded learning assistance (Naidoo, 2015). Independent research can be daunting to novice researchers, as they are working alone to develop new research-related skills. Increasing doctoral retention requires developing holistic approaches that create opportunities for growth of doctoral students who are in the challenging dissertation stage.

Navigating the Dissertation Process

A central tenet of doctoral education is for students to transform from students to independent scholars so they can complete their dissertation and conduct research that adds to the existing body of knowledge in their fields. Doctoral students must apply what they have learned from their coursework to create new knowledge in their field of study. The transition from consumers of knowledge to creators of original research is challenging for new researchers (Lovitts, 2001). Coryell and Murray (2014) posit that novice researchers must learn to construct new knowledge and determine what research is valuable, and that process is overwhelming for new students. Many doctoral students are unprepared for the rigors of academia and are overwhelmed with the technology used in doctoral programs, as well (Salani, Albuja, & Azaiza, 2016).

Before the dissertation stage, doctoral students in the United States are usually enrolled in structured classroom environments. During the unstructured dissertation period, however, students must self-regulate their progress, produce scholarly writing, and navigate the research arena. A dissertation involves thinking in new and creative ways (Lovitts, 2005), which can present challenges. Inherent in the dissertation process are the requirements to problem solve, acquire research skills, think critically, be resourceful, work independently, and add to the existing body of knowledge. Berman et al. (2012) posited that doctoral students require additional support during the dissertation phase when they encounter unexpected problems. Supervisors are tasked with developing research competencies in students, while simultaneously encouraging independence (Orellana, Darder, Pérez, & Salinas, 2016). When students are confident in research-oriented activities, they more likely have the ability to perform research-related tasks (Lambie et al., 2014). Hence, to facilitate the progress of emerging scholars, it is important to develop pragmatic solutions to allow new researchers to become successful as they endeavor to produce academic research.

Online Doctoral Students

The ongoing proliferation of online doctoral students necessitates attention to the delivery of doctoral education to meet the unique needs of the online doctoral student. Demand for online doctoral programs is increasing (Fuller et al., 2014). In the twelfth annual report involving survey responses from over 2,800 universities and colleges about online higher education within the United States, the Babson Report stated that more than seven million students were enrolled in online classes in 2013 (Allen & Seaman, 2015). Overcoming the barrier of distance can be difficult for online instructors and students. Retention is lower in online programs than traditional programs (Hachey, Wladis, & Conway, 2012). This evidence indicates a need to provide approaches that enable progress for doctoral students who are geographically distributed.

Online learning is not new; however, the Internet has led to an increase in the proliferation of online educational opportunities. The traditional brick and mortar environment is losing its monopoly (Nguyen, 2015). Studies have identified that, while online students do not have an advantage of being face-to-face with peers and instructors, online environments can be just as effective as brick and mortar settings. According to a meta-analysis by Lack (2013), the difference between online education and traditional brick and mortar education is negligible. Scholars differ in their opinions on the effectiveness of online education. Kumar, Johnson, and Hardemon (2013) conducted an interview of nine doctoral students and concluded that online students and students in face-to-face programs had similar challenges. Whether the students were online or not, the students in the study wanted timely and concise feedback from faculty, especially because several of them worked full-time. Online doctoral students differ from traditional students in experiencing a sense of community, and understanding this concept is important to create infrastructures for support (Berry, 2017). Research consistently shows that many of the doctoral needs are similar between face-to-face and online doctoral students. Equipping online doctoral students so they can successfully reach benchmarks and contribute to their field is helpful in developing a program for success.

Another noticeable group of online students who are becoming increasingly common in doctoral programs are nontraditional students. Nontraditional students have careers, are older, are part-time students, and ultimately may not be seeking full-time faculty positions (Offerman, 2011). The doctoral process is complicated, and many students are novice doctoral students and simultaneously working professionals (Bennett & Folley, 2014). Educators are searching for approaches to respond to the needs of nontraditional doctoral students who are geographically distributed and part-time. Remote students must rely on systems that enable communication management such as email, video, and virtual learning environments (Orellana et al., 2016). It is important to examine methods that enable remote, nontraditional students to succeed in doctoral programs, especially as they enter the challenging dissertation phase. Even traditional students working on their dissertation communicate primarily with their dissertation chairs in an online format (Terrell, Snyder, Dringus, & Maddrey, 2012). In essence, many students in the dissertation stage become online students. Online dissertation students have no tangible connection with the physical institution or faculty members, which can present challenges.

Overcoming the barrier of distance during the dissertation stage can be difficult for doctoral students and faculty. To accommodate the unique needs of online doctoral students, the focus is shifting to include more integration, which includes offering technology-based tools for students to connect with peers and faculty members to create a sense of community (Bolliger & Inan, 2012). The interaction between students and instructors is essential (Sull, 2013; Vekkaila, Virtanen, Taina, & Pyhältö, 2016). Faculty play a central role in guiding doctoral students during the dissertation stage to facilitate student progress during the tenuous dissertation phase. Research shows that when doctoral students have access to faculty and the faculty spend time with the students, it contributes to student' success (Bagaka's, Badillo, Bransteter, & Rispinto 2015; Hoffman, 2014). It is advantageous for students to develop relationships with faculty because, through that association, it is likely they will receive more support and resources, enabling degree completion (Newberry & DeLuca, 2013). Mitigat-

ing potential distance barriers and cultivating a means of collaboration between online doctoral students and faculty can be essential for doctoral students' success. Much of the communication between doctoral students and their dissertation committees happens online (Kumar et al., 2013). Communication and physical distance between instructors and students are difficult to manage in virtual learning environments (Moore & Kearley, 2012). Providing adequate opportunities for interaction between students and instructors may help bridge the distance gap. Lack of communication can hinder online learning, but leaders can implement methods that offer opportunities for students to communicate, increasing the likelihood of developing a sense of community (Rovai, 2002). Based on this empirical evidence, it is critical that educational leaders endeavor to foster collaboration among faculty and students to increase doctoral student progress.

Several purported benefits are associated with good academic relationships between doctoral students and their supervisors or dissertation committees. Supervisor support, involving a multifactorial process, is instrumental for distance postgraduate success (Jones, 2013). Doctoral supervisors can provide invaluable direction for students such as resources, knowledge in the discipline, study structure, research skill development, regular feedback, and publishing opportunities. Although perceptions among doctoral students and their supervisors differ regarding the role of the supervisor (Orellana et al., 2016), extant research shows that adequate supervision reduces attrition (Pyhältö, Vekkaila, & Keskinen, 2015) and emotional exhaustion (Rigg, Day, & Adler, 2013), and doctoral students benefit when the supervision varies (Cornér, Löfström, & Pyhältö, 2017). Although doctoral students should transform from course-takers into autonomous researchers, supervisors can facilitate the development of independent scholars by offering their expertise and guidance. When supervisors have knowledge in the discipline of the student, it can hasten their progress, as supervisors can assist the students overcoming intellectual barriers (Gube, Getenet, Satariyan, & Muhammad, 2017). Evidence shows that student progress is associated with faculty connections (Anderson, Cutright, & Anderson, 2013); therefore, identifying technology that enables communication is warranted.

Implementing Technology

Multimodal academic environments for online doctoral students are adapting to include approaches that meet the needs of online doctoral students. Distance education has changed significantly (Gooch & Watts, 2014; Simonson, Schlosser, & Orellana, 2011), and educational shifts due to evolving learning environments provide opportunities to enhance learning prospects for doctoral students. More research is needed to investigate online collaboration using video tools (Gardner & Gopaul, 2012). Web systems create communities for online students, and virtual technology has altered the way faculty interact, teach, and manage doctoral students (Maor Ensor, & Fraser, 2015). Using technological resources may enable communication, engagement, deeper learning, and student satisfaction. Deci and Ryan (2008) posit that personal satisfaction derives from motivation and that autonomy, competence, and relatedness is motivational. Thus, institutions that provide an environment that engages doctoral students may help them feel more satisfaction and relatedness with their learning environment, leading to program completion. Doctoral students are the next generation of academic scholars who will guide the future of universities (Niemczyk, 2013). Thus, incorporating technology into online doctoral programs may promote the development of scholars.

Decreasing Isolation

As online doctoral education becomes increasingly popular, feelings of isolation may rise despite greater availability of collaborative tools. According to Rovai (2002), online students feel social isolation due to the physical separation between the student and the institution. Although campus opportunities provide interaction for students, online students do not have that choice due to a physical distance barrier (Bolliger & Inan, 2012; Moore, 1989). Online students may feel isolated because they do not regularly meet face-to-face with faculty or peers. Isolation contributes to doctoral student attrition (Ali & Kohun, 2006; Alston et al., 2005; Golde & Dore, 2001; Hawlery, 2003; Lovitts, 2001;

Stallone, 2011). A study on doctoral programs in Denmark found that students who have an inclusive environment report fewer problems and have a better sense of community, which is necessary for successful productivity and degree completion (Christensen & Lund, 2014). Alston et al. (2005) suggested that for Australian students to be retained, colleges need to focus on both social and scholarly support. Although empirical evidence shows that isolation can be an issue with online students, other research demonstrates that online students do not experience feelings of isolation. Some online students favor working independently, seeking help only when needed (Pienaar, 2016). This context provides the basis for implementing strategies to engage online students to combat feelings of isolation that occur in some students during the dissertation stage.

The doctoral journey is complicated and lengthy. Feelings of isolation are common in doctoral students (Ali & Kohun, 2007; Gardner, 2010; Rovai, 2002), and isolation often intensifies during the dissertation stage. Feelings of isolation and an unstructured format during the dissertation process are major factors in doctoral attrition (Ali & Kohun, 2007). Furthermore, the uniqueness of a student's dissertation makes each experience distinct, which mandates working alone to some degree (Ali & Kohun, 2007). Offering opportunities for connectivity may increase the likelihood of doctoral success (Bean & Eaton, 2000). The interaction between students and instructors is vital (Sull, 2013); although doctoral students are experienced students, they need meaningful engagement and guidance during the dissertation phase of their program. Students are aware of the need to develop networks, but feelings of isolation make it challenging to foster connections (Baker et al., 2013). Multiple studies indicate that interaction between online doctoral students and faculty is important (Akarasriworn & Ku, 2013; Bagaka's et al., 2015; Borup, West, & Graham, 2012; Foronda & Lippincott, 2014; Hoffman, 2014; Newberry & DeLuca, 2013; Santora Mason, & Sheahan, 2013). Communities of learning provide an opportunity for individuals to collaborate, pursue academic goals, and receive academic support (Yuan & Kim, 2014). With the proliferation of online learning, cultivating interactivity may generate higher student satisfaction, leading to greater online doctoral persistence during the dissertation process.

Summary

The landscape of online doctoral education is evolving, providing benefits for online doctoral students made possible by advances in technology. Attrition in graduate programs remains problematic (Bowen & Rudenstine, 1992; Gardner & Gopaul, 2012; O'Keeffe, 2013), and strategies are needed to improve doctoral student progress (Allen & Seaman, 2011; Berman et al., 2012; Gardner, 2008). Existing empirical evidence identifies numerous challenges that commonly affect doctoral students. The doctoral experience is demanding (Baker et al., 2013; Golde & Dore, 2001; Hermann, Wichmann-Hansen, & Jensen, 2014; Lovitts, 2001), and retention of doctoral students in the dissertation stage is particularly difficult. The transition from coursework to the dissertation stage is challenging (Coryell & Murray, 2014; Gardner, 2010; Lovitts, 2005); the dissertation stage is largely self-directed, requiring students to work autonomously with support from their supervisor or dissertation committee. For doctoral students to successfully complete their program, a fundamental transformation must occur enabling the progression from course-takers to academic researchers.

Many doctoral students fail to successfully navigate the dissertation process. Developing scholars who have the ability and confidence to produce research is challenging (Rockinson-Szapkiw, Spaulding, & Lunde, 2017), particularly when doctoral students do not have the resources to cope with the demands of careers and work while completing their program of study (Baker & Pifer, 2015). A complex interplay of factors can make navigating the doctoral program elusive. Isolation is one factor that can impact online dissertation students. Positive interactions foster feelings of belonging and community among online students (Rovai, 2002; Yuan & Kim, 2014), and collaboration develops a collegial environment encouraging research (Lambie et al., 2014). Since receiving support increases doctoral engagement and lack of support and feedback is associated with a higher risk of student burnout (Vekkaila et al., 2016), this has broader implications for creating approaches that encourage

interaction between dissertation committees and online students. Teaching research skills to novice researchers is another process underpinning the doctoral journey. Instructors must teach research skills to doctoral students who do not spend a lot of time learning the methodology that they will use in their dissertation (Bernauer, Semich, Klentzin, & Holdan, 2013). Research depicts a disturbing picture of doctoral departure, and implementing technological management systems may improve the doctoral process. More research is needed on the effectiveness of online education (Nguyen, 2015), and how to improve the doctoral student process (Burkholder, 2012). Doctoral attrition is inevitable; however, applying technology to improve communication to create engagement opportunities may improve doctoral progress and retention.

Study Significance

Reviewing current empirical studies exposes several gaps in relationship to online doctoral students who are in the dissertation process. More research is needed to explore the high rates of graduate attrition, as graduate programs are currently experiencing unprecedented growth (Ewing et al., 2012). Further, more doctoral programs are going online (Rockinson-Szapkiw, 2012), and strategies are needed to use communication advances made possible by technology (Orellana et al., 2016). Additionally, approaches are needed to increase persistence in doctoral students (Allen & Seaman, 2011; Berman et al., 2012; Gardner, 2008). In addition, exploration of research from the students' perspective is needed (Golde & Dore, 2001; Lovitts, 2001). The current study advances research by providing a preliminary examination of how communication, connectedness, and isolation are affected by the introduction and use of online communities for dissertation development within an online doctoral program.

This study advances Bean's (1980) model of student retention, which identifies a relationship between student satisfaction and student retention. Bean's model denotes the significance of improving the students' research abilities by providing virtual tools. Orellana et al. (2016) call for more research investigating the needs of doctoral students at various stages of research to develop strategies using advances in communication made possible by technology.

DC Network

This quantitative descriptive study was a baseline investigation of two scholarly, web-based systems implemented at this university to enhance the progress of doctoral students in the dissertation stage. The aim of the study was to provide a preliminary examination of doctoral student and faculty usage and perceptions of the two systems through the examination of student perceptions of communication and isolation, and student engagement with the university, student committees, and content through the online systems. Similar research designs and investigations of retention have occurred within traditional ground learning environments, including amongst Australian nursing students (Milton-Wildey, Kenny, Parmenter, & Hall, 2014) and U.S. graduate students (Imus & Burns, 2015); however, there is a need for similar research within online graduate programs.

Currently, a trend in education is to incorporate web systems to encourage communities of students (Maor et al., 2015), and live communication enhances interaction (Martin, Parker, & Deale, 2012). Such systems were created to address known issues within online learning with the goal of enhancing communication (Stott & Mozer, 2016), reducing student isolation (Ashton, 2014; Durksen, Chu, Ahmad, Radil, & Daniels, 2016), and encouraging student engagement (Gray & DiLoreto, 2016). The first system of interest is the DC Network, which is an online scholarly community accessible to all doctoral students and faculty at this university.

Reducing doctoral attrition was the catalyst for developing the DC Network. Although many doctoral students finish their doctoral coursework and obtain candidacy, commonly, students fail to complete their dissertation (Gill, Brown, & Reifsteck, 2014). The DC Network provides research-related resources, such as dissertation templates, videos describing research methodology, lessons learned from

recent graduates, webinars covering current trends, and tools for novice researchers. Also, doctoral students can post questions on the DC Network and receive timely feedback; suggestions; a dissertation roadmap; and references from other students, faculty, and the full-time doctoral librarian. Lack of structure during the dissertation process can contribute to doctoral attrition because students must learn to research independently (Ewing et al., 2012). Implementing the DC Network was a solution to provide a variety of supplemental dissertation support and communication tools to assist doctoral students as they navigate their research studies while meeting the unique needs of individual students.

The primary event of interest within the DC Network is student engagement. Student engagement was measured by the self-reported frequency of use as gathered by survey (see Appendix).Global information for DC Network usage for all users across the study period was retrieved by reviewing archival data housed within the College of Doctoral Studies, providing an overall picture of usage. Records of logon frequency and activity of doctoral students and faculty were retrieved, sorted, and reviewed. Google Analytics reports user activity of the DC Network, and the usage history has been maintained since the inception of the DC Network in 2011.

METHODOLOGY

PRIVATE DOCTORAL WORKSPACE

The second system investigated in this study is the private doctoral workspace, which is a virtual site within the DC Network. The private doctoral workspace is an online group space reserved exclusively for doctoral students who are at the dissertation stage and their dissertation committee members, including the committee chair, methodologist, content expert, and faculty peer reviewers. Private doctoral workspaces are an extension of the DC Network and are virtual areas for dissertation students. Private communication enhances connectedness between the student and committee members, strengthening individual satisfaction, and encouraging persistence within the learning task (Gray & DiLoreto, 2016). The doctoral student and the dissertation committee share resources in the private doctoral workspace. Together, they communicate, share and review manuscript versions, and plan specific milestones toward the successful completion of the student's dissertation. Communications, milestones, and document versions are organized within the private doctoral workspace, which remains intact throughout the duration of the students' dissertation process. Dissertation, program, and faculty support influence attrition (Kennedy, Terrell, & Lohle, 2015). Seminal social learning theorists, such as Vygotsky (1978) and Bandura (1977), and distance learning theorists, such as Moore (1989), advocate that learning occurs in social environments, and sharing of ideas leads to deeper learning.

The research was conducted to address the following questions:

> Q1. How frequently do doctoral students seek interaction via online communities?
>
> Q2. Did the implementation of the private doctoral spaces improve student perceptions of the retention factor reduced isolation?
>
> H2: There was a significant improvement in student perceptions of reduced isolation.
>
> Q3. Did the implementation of the private doctoral spaces improve student perceptions of the retention factor communication?
>
> H3: There was a significant improvement in student perceptions of communication.

PARTICIPANTS

Doctoral students enrolled in EdD, PhD, and DBA programs at a medium-sized private university were asked to participate in the study. The study was delimited to include only students who had completed the academic coursework and were in the dissertation phase of their program, and IRB

approval was obtained from the university prior to data collection. Although the participants attended the same university, the doctoral students were globally distributed; however, most students (97%) accessed the DC Network from within the United States. A convenience sample approach was used to develop baseline insights about students.

A survey (see Appendix) was administered to the doctoral students three times. The first survey distribution to the 803 qualifying students was in June 2014, and 380 dissertation students participated, which was a 47.3% response rate. The second time the survey was administered was 4 months later, in October 2014. In October 2014, 803 surveys were again distributed, and 191 were returned, resulting in a 23.8% response rate. The third survey distribution was December 2016 to a student population of 3,531, and 288 dissertation students participated with an 8.2% response rate. There were only five DBA responses in the initial June survey, and one DBA response in the follow-up October survey. Therefore, the DBA surveys were eliminated from analysis. Similarly, there were 40 PhD responses in June and only 11 PhD responses in October. The December 2016 survey collected 7 DBA and 97 PhD responses. Again, those surveys were not counted in the final analysis. The number of EdD responses resulted in a larger number of respondents, with 335 EdD responses in June 2014, 179 responses in October 2014, and 184 in December 2016, and is reported in Table 1.

Table 1. Number of Doctoral Student Responses by Degree Program

Degree program	June 2014 Responses (*n*)	October 2014 Responses (*n*)	December 2016 Responses (*n*)
EdD	335	179	184
PhD	40	11	97
DBA	5	1	7
Total Respondents	380	191	288

Survey

The researchers created a survey which was used to identify doctoral student perceptions of private doctoral workspaces' capacity to reduce isolation and increase communication between doctoral students and their dissertation committees, and to measure how frequently doctoral students engaged with the broader doctoral community through the DC Network. The survey was identical for survey 1 and 2, with survey 3 modified slightly to more clearly differentiate between DC Network and private online workspaces. Survey questions were developed based upon similar instruments examining communication, isolation, and engagement (e.g., Chen, 2001; Horzum, 2015; Huang, 2002; Sandoe, 2005). Student interactions, as measured by number of logins per week, were differentiated between those that did not log in, those that logged in once per week, and those that logged in two or more times per week. Although interaction is not a substantial contributor towards student satisfaction, it is a leading factor in dissatisfaction and attrition (Cole, Shelley, & Swartz, 2014). As such, it was important to examine to what extent students were interacting with the Doctoral Community, with a log in of at least once per week judged as a minimum desired interaction rate. Prior to administering the research created survey, the survey was reviewed and modified by experts in the field, with the resultant survey containing seven questions. Participants were asked to provide information on three questions related to program type, start date, and course, and three survey questions. The survey concluded with an optional question for students to include their name and email if they wanted to be considered for additional related research. The first question related to weekly student engagement as measured by self-reported logins (never, 1 time per week, or 2 or more times per week). The next two items asked students to use a 5-level Likert rating scale (ranging from strongly disagree to strongly agree) to rate the statements that the private doctoral workspace helped the student to reduce iso-

lation and the student uses the resources within the private doctoral workspace to communicate with his or her dissertation chair and committee. The survey items were as follows:

> Q1: I log on to the DC Network: 0 times per week, 1 time per week, 2 or more times per week
>
> Please rate the following statements using the following:
> 1 = Disagree strongly, 2 = Disagree, 3 = Neither Disagree nor Agree, 4 = Agree, 5 = Agree Strongly
>
> Q2: The Learner Dissertation Page in the Doctoral Community Network helps me reduce isolation.
>
> Q3: I use the resources within the Learner Dissertation Page to communicate with my Dissertation Chair and committee.

Procedure

The survey was distributed via a link within the DC Network during the three survey periods. The opportunity to participate was made available for a two-week period, and then the link removed from the DC Network. Participants selecting the link were sent to an online survey tool to complete the informed consent form and the research survey. Participants were offered the opportunity for follow up by the researchers. Data collected were scrubbed for completeness, with incomplete surveys eliminated using pairwise deletion. Data for this research were limited to responses from EdD students to provide a consistent sample within the three survey intervals.

Responses for the first question were measured as a frequency of participants who reported using the DC Network zero, once, or at least twice once a week as compared to the overall number of respondents. Isolation was measured on a 5-point Likert scale ranging from disagree strongly to agree strongly of those doctoral students who responded to the item stating that using the private doctoral workspace reduced a sense of learner isolation as compared to the total number of respondents. Question 3 was measured on a 5-point Likert scale of students responding to the statement that the private doctoral workspace assisted the learner in effectively communicating with the dissertation committee, as compared to the total number of respondents. Data from the surveys were collected and imported into SPSS (ver. 24) for examination of descriptive statistics and exploration of differences using analysis of variance. A Tukey post hoc test was used to determine differences among groups when results of the ANOVA were statistically significant.

Results

Survey of Private Doctoral Workspaces

The purpose of this study was to develop an understanding of whether the DC Network and the private doctoral workspaces enhanced communication and engagement, and reduced isolation in doctoral students, to enable persistence toward degree completion. Administering three surveys, across a period of 3 years to 698 doctoral students (n_1 = 335, n_2 = 179, n_3 = 184) in the dissertation stage provided data to examine whether the private doctoral workspaces reduced isolation and increased communication and engagement between doctoral students and their dissertation committees. The survey questions focused on the usage of the private doctoral workspace, communication with the dissertation committee, and feelings of isolation. Overall, results indicate that students are using the private doctoral workspaces, usage is increasing communication, and isolation among doctoral students remains unchanged.

Research Question #1: How frequently do doctoral students seek interaction via online communities?

Participants were asked to report the frequency of weekly interaction with the DC Network. Responses are indicated in Table 2. Across the survey period, self-reported use of the DC Network remained relatively constant. Based upon self-reporting evidence, doctoral students embraced the doctoral workspaces as a means of interaction with the university, peer groups, and their committees, with the number of students interacting at least weekly ranging from 92.9% to 94.4%.

Table 2. Frequency of Doctoral Student Self-reported Logins into the DC Network

Survey Period	N	0 times per week	1 time per week	2 or more times per week
June 2014	328	6.3%	34.3%	59.4%
October 2014	179	5.6%	25.7%	68.7%
December 2016	184	7.1%	25.5%	67.4%

Research Question #2: Does interaction in a private doctoral workspace reduce doctoral student perception of isolation?

Three groups of doctoral students ($n_1 = 259$, $n_2 = 155$, $n_3 = 183$) were surveyed at three separate times, June 2014, October 2014, and December 2016 and asked to rate how the private doctoral workspace assisted in reducing isolation, using a 5-point Likert scale. The means and standard deviations are reported in Table 3. Data was screened for missing values. An analysis of variance was performed on the dependent variable, isolation, for each of the three groups. There was not a significant difference between the groups, $F(2, 594) = 1.582$, $p = .207$. The preliminary results indicate that the private doctoral workspaces did not change the perception of isolation amongst participants. Caution should be used in interpreting this result as the examination was preliminary in nature using an instrument that has not been examined for reliability or validity. Additionally, the assumption of independence of groups cannot be verified due to the anonymity requirement of the surveys.

Table 3. Descriptive Statistics of Doctoral Learner Perceptions of Learner Dissertation Page Reducing Isolation

Survey Group	N	Mean	Standard Deviation
June 2014	259	2.95	1.044
October 2014	155	2.76	1.134
December 2016	183	2.94	1.140

Research Question #3: Do private doctoral workspaces help doctoral students to communicate more effectively with their dissertation committee?

Over the course of 30 months, three surveys were administered to doctoral learners ($n_1 = 259$, $n_2 = 155$, $n_3 = 182$). Participants were asked to rate on a 5-point Likert scale (disagree strongly to agree strongly) the effectiveness of the private doctoral workspace as a tool for assisting the learner in communicating with the dissertation committee. Means and standard deviations are reported in Table 4. Data was screened for missing values. An analysis of variance was performed on the dependent variable, communication, for each of the three groups that indicated significant differences among the groups, $F(2, 593) = 21.654$, $p < .0001$. A Tukey post hoc test was conducted to examine differences between groups, indicating a significant difference between the December 2016 group with both the June 2014 group ($p < .0001$), and the October 2014 group ($p < .0001$), indicating that there is a perception that the private doctoral workspace improved effective communication with dissertation committees by doctoral learners over time. The difference between the June 2014 and October

2014 groups was not significant (p = .753). The nature of the research is descriptive with the intention of providing an overall sense of improvement in perceptions of improved communication by doctoral learners with the dissertation committees. As such, the results should be interpreted as preliminary and not construed as causal. However, the results are encouraging and suggest the need for a more focused examination of the phenomenon.

Table 4. Descriptive Statistics of Doctoral Learners Who Indicate Their Private Doctoral Workspace Helps Them Communicate More Effectively With Their Dissertation Committee

Survey Group	N	Mean	Standard Deviation
June 2014	259	3.03	1.047
October 2014	155	2.95	1.197
December 2016	182	3.64	1.077

Data of DC Network Usage

The DC Network provides comprehensive support services to guide novice researchers as they learn to become independent researchers, capable of producing scholarly research. Using a collaborative technology, the DC Network offers a method for new researchers to receive feedback from the research community.

Beginning in 2011 and continuing through 2016, student and faculty usage of the Doctoral Community Network has increased considerably. By December 2016, the college had created over 3,531 private workspaces for dissertation committees, one for every dissertation student. Yearly user activity, reported by Google Analytics, has grown to over 4.2 million page views in 2016, a 984% increase since reporting began in 2011 (see Figure 1). Activity tracking was implemented using aggregate annual page views instead of reporting the number of visits to avoid double counting activity as doctoral students connect to the DC Network using a variety of different computers. It is for this reason that the page views metric was selected as the default activity metric when this project began in 2010. However, as user activity continues to increase, it becomes increasingly important to understand the precise number of unique user visits and those activities completed. To accomplish this, a system development effort is underway that when completed in 2018 will provide aggregate and user specific activity tasks and logon information.

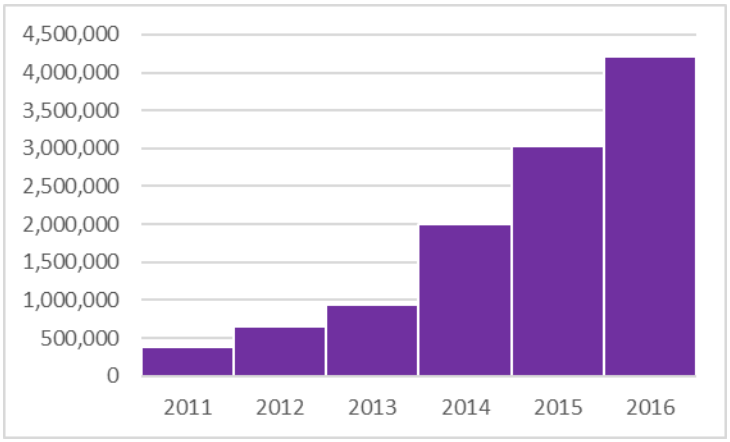

Figure 1. DC Network page views by students and faculty from 2011 to 2016.

Although 97% of users accessed the system from within the United States, international students other than Canada comprised 2.03% of page views. International page views included community

members from Jamaica, South Korea, Mexico, Ukraine, Nigeria, Taiwan, Kenya, Grenada, British Virgin Isulands, Colmbia, Puerto Rico, Japan, U.S. Virgin Islands, Bahamas, China, Germany, United Kingdom, Poland, Spain, Russia, Haiti, Nepal, Greece, India, Hong Kong, Belize, and other countries. The increase in usage of the DC Network can be attributed to the many support processes it offers novice researchers who need resources to assist them during their doctoral program.

Results on the DC Network

In 2016, DC Network activity continued to increase over prior years as users viewed over 4.2 million pages. As shown in Figure 2, there was an increase from quarter to quarter for total views, except for third to fourth quarter views, which was expected due to the two-week break in studies at the end of each year. During this period, users remained on this site on average for 7 minutes 3 seconds and most often visited their private area for their dissertation committee and university wide dissertation resources (program specific, templates, and forums).

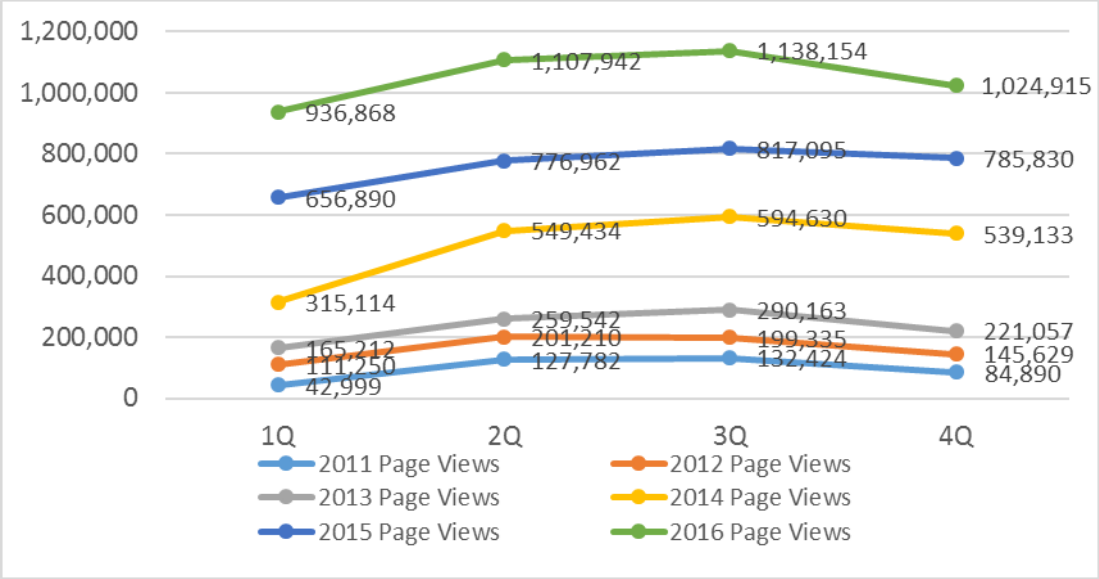

Figure 2. DC Network page views for each quarter from 2011 to 2016.

Since 2010, membership in the DC Network has increased with the addition of approximately 100 new users per month. For example, in the month of August 2016, DC Network membership increased by 4.7% from the previous month to a total of 12,044 users. User activity during this month also increased as it was reported that 1,079 users (9% of membership) uploaded 5,577 files while 753 users (6% of membership) drafted 4,149 comments. Forums continued to be very active with 3,852 new forum topics initiated by 768 users (6% of membership). Most frequently viewed content was related to dissertation and research process, including dissertation milestones, Academic Quality Review, and dissertation residencies. Similarly, most downloaded content included 2016 Dissertation Milestone Guide, dissertation residencies, Prospectus Template, and Alumni dissertation defense presentation recordings.

Discussion

Online doctoral students can be constrained by time limits, lack of research experience, communication challenges, and feelings of isolation during their doctoral journey. Guiding this study was the desire to provide preliminary information on whether online dissertation students experienced in-

creased engagement and communication, and reduced feelings of isolation after the introduction of online communities within the doctoral program. Three surveys were distributed during a 30-month period, revealing that the increase in usage of the private doctoral workspaces may be attributed to acceptance of the private doctoral workspace, housed within the DC Network, as a convenient and effective method to communicate with members of the dissertation committee. The DC Network, which is a virtual scholarly network for doctoral students, provides a comprehensive support system for new doctoral researchers, offering feedback from the entire global research community that is affiliated with this university. Similarly, online workspaces are another technological approach to augment connectivity in online doctoral programs. This paper draws from Bean's causal model of student retention (1980). Bean posited that increased student interaction with the learning environment results in positive student self-efficacy, reduced stress, and internal locus of control, which increase student motivation and persistence, with the outcome of program completion (Bean & Eaton, 2000). This university is seeking to improve doctoral student satisfaction by providing a web-based scholarly community to enable progress through the doctoral program.

The introduction of the doctoral workspaces significantly improved doctoral students' perceptions of effective communication with their dissertation committees, further supporting the idea that the workspaces are useful for doctoral students. The findings of this study showed that the doctoral students' feelings of isolation remained steady during the 30 month reporting period. The finding can be attributed to the fact that not all doctoral students experience feelings of isolation during the doctoral program; therefore, their feelings of isolation would not change during the 30-month reporting period. The doctoral workspaces provide an effective communication modality for dissertation students and their committee members and easy access to plethora of doctoral resources. Improving engagement opportunities by implementing a collaborative environment for online doctoral students may facilitate satisfaction and provide tools that enable program persistence. A reoccurring theme in doctoral education is the unavoidable attrition of doctoral students (Bowen & Rudenstine, 1992; Gardner & Gopaul, 2012; Lovitts, 2001; Spaulding & Rockinson-Szapkiw, 2012). Although some attrition is inevitable, providing support in the form of web-based communities for online doctoral students as they navigate the unfamiliar and complex research requirements may be one solution to improve retention.

The dissertation component of the doctoral program can be daunting for novice researchers who require acclimation to the nuances of academia. Although doctoral degrees are grounded in research, many doctoral students are unprepared for the research component of their program (Baker et al., 2013; Golde & Dore, 2001; Holbrook et al., 2014; Van der Haert et al., 2014). This highlights the importance of the interaction between doctoral students and their dissertation chairs and committees because the chairs and committee members can be valuable resources for inexperienced researchers. Results of the current study showed that that using the doctoral workspace helped doctoral students to communicate more effectively with dissertation chairs and committee members over time. In the December 2016 survey, which was 30 months after the introduction of the private workspace, there was a statistically significant improvement in perceptions of effective communication in students surveyed when compared to those surveyed shortly after the system's introduction. Helping doctoral students communicate more effectively with their dissertation committees is one way to aid in program success. Usage of the private doctoral workspaces allowed doctoral students to access resources, easily engage with faculty, visit scholarly repositories, and access tools to help them complete their program of study. During the dissertation process, many students are working virtually; therefore, student communication is typically in an online format (Terrell et al., 2012), and collaboration with faculty is important for doctoral students to experience meaningful progress (Sull, 2013; Vekkaila et al., 2016). The substantial increase in communication in this study offers compelling evidence that using the doctoral workspace may be providing value to the online doctoral students who were surveyed.

The doctoral experience can be an isolating journey for students, which can lead to attrition. Reducing feelings of isolation in part-time students who are not co-located can be challenging. This study sought to understand whether implementing web-based communities for online doctoral students reduced feelings of isolation. Preliminary results indicated that the introduction of private doctoral workspaces did not change perceptions of isolation. It is important to note, however, that a low score or lack of change does not indicate that students feel isolated; rather, the preliminary results indicated that the private doctoral workspaces did not change the students' perceptions. Existing research has demonstrated that isolation can be problematic for online students. Online students often feel isolated since they are not meeting in person at brick-and-mortar environments (Ali & Kohun, 2007; Hoffman, 2014; Newberry & DeLuca, 2013). Prior research also indicated that interconnectedness and interactions with others are critical components of dissertation completion (Baker et al., 2013; Lovitts, 2001; Rovai, 2002; Sull, 2013; Vekkaila et al., 2016). Although prior research recognizes the issue of isolation in doctoral students, more work is needed to cultivate solutions to this problem. To improve retention in online doctoral students who do feel isolated, it is important for leaders in higher education to develop solutions to mitigate feelings of isolation in online doctoral students.

The DC Network, a web-based community explored in this article, also showed promising results in regards to providing a virtual space that can help online dissertation students progress in their research. The study results showed that page views of the DC Network had a significant increase of 984% from 2011 to 2016. The increase of approximately 100 users per month certainly accounts for the high increase in page views. However, it is speculated that because the DC Network offers a means for building an online community of scholars while providing unlimited research resources, page views also increased due to the benefits the DC Network offered to students who were learning how to become autonomous researchers. Usage of the DC Network has increased significantly, indicating that it is valuable for doctoral students.

Technology is becoming increasingly important to support doctoral education (Bennett & Folley, 2014; Borup et al., 2012; Foronda & Lippincott, 2014; Maor et al., 2015; Rockinson-Szapkiw, 2012), and this study attempts to offer guidance in the development of effective technological approaches for doctoral students to increase interaction between the doctoral students and their dissertation committees. The increase in global higher education in the 21st century and advances in technology provide more opportunities to develop online programs, allowing students worldwide to add tremendous value to the research community by adding to existing bodies of knowledge. Student and faculty expectations must align because perceived lack of support by faculty and the institution can negatively influence a student's institutional commitment (Bean, 1980; Jones, 2013; Martinsuo & Turkulainen, 2011). The authors speculate that as students and faculty continue to become more acquainted with the benefits of the private doctoral workspaces and the DC Network, and as usage becomes more entrenched in the faculty culture, the advantages of the workspaces and the DC Network will continue to manifest, improving the doctoral students' sense of satisfaction, communication, and program commitment, and perhaps offering opportunities to reduce students' perception of isolation.

It is important to note that that technology is simply a tool, and that successful retention strategies are dependent upon the andrologogical implementation of the technology. Furthermore, due to the current expansion and proliferation of global higher education, a technical infrastructure for effective communication is also important to allow geographically distributed individuals to connect and align expectations. This becomes essential for online doctoral students who are navigating the challenging dissertation stage. Physical distance can be difficult to manage in online environments (Berry, 2017; Moore & Kearley, 2012; Orellana et al., 2016). Implementing modalities that increase engagement opportunities between doctoral students and their dissertation committees can provide a scaffolding for success in online doctoral programs, particularly during the dissertation stage.

Recommendations

This study represents one part of the university's multiyear initiative to addresses improvements in the doctoral program to increase doctoral retention. As supported by the present research and Bean's (1980) causal model of student retention, the following recommendations for future research are suggested.

Within asynchronous online learning environments, communication is known to increase a student's sense of connection with the learning environment (Moore, 1989), which increases institutional commitment (Bean, 1980), and enhances a student's chances for persisting within a program (Bean & Eaton, 2000). Further examination is needed to determine to what extent various communication methods affect a student's experience and increase connectivity between the student and the institution. Modalities may include, but are not limited to, email, discussion threads, document exchange, video conferencing, and face-to-face meetings.

Factors of student isolation are complex and not simply a factor of increased communication, but are also related to a student's locus of control (Ye & Lin, 2015). Further research is needed to better understand the phenomenon of students' perceptions of isolation within online environments and how locus of control is affected. This study could be a catalyst to investigate isolation and locus of control in other areas, such as students in online master's degree programs.

Expectations for student interaction within the private doctoral workspace are primarily established by dissertation chairs. It is recommended to examine the faculty perceptions of those factors that influence positive student communication in the dissertation phase and to understand dissertation chairs' priorities for communication within private doctoral workspaces. Additionally, student autonomy and locus of control are essential elements of student motivation and persistence (Bean & Eaton, 2000; Deci & Ryan, 2008). An examination of student autonomy in the context of locus of control is warranted: specifically, investigation into student needs for structure and learning scaffolding. Such research may consider online environment structure, dissertation milestones and programming, student personality traits and other psychological constructs, and the effectiveness of institutional efforts to develop students into independent and self-reliant researchers.

As in Bean's (1980) investigation into student persistence, it is recommended that a similar study investigating factors of institutional commitment and individual satisfaction by students in online environments be conducted both within U.S. and international student bases.

Limitations

As with any study, there are several limitations in this study. This study reflects solely on the university in question along with its curriculum, faculty, and its unique online support structure. Further, the article did not explore demographic questions such as age, occupation, and ethnicity as they were not necessary for this research. Lack of demographical information limited analysis of the data and understanding of the participants. The results are not generalizable to other doctoral programs at other universities without additional research. This study was conducted as a preliminary investigation to determine factors worthy of future consideration and examination, and, as such, was limited to investigating the extent to which student engagement was occurring and to surveying student perceptions of communication and isolation. The survey was limited to quantitative questions, eliciting preselected responses from the doctoral students. Further, the survey was created by the lead researcher and has not been validated.

Conclusions

The purpose of this study was to develop an understanding of whether the private doctoral workspaces, housed within the DC Network, for dissertation students reduced student isolation and increased communication and engagement between doctoral students and their dissertation committees

and the research community affiliated with this university. Feelings of isolation can impede doctoral program completion (Gardner, 2010; Rovai, 2002; Sull, 2013; Vekkaila et al., 2016), and usage of technology can enhance online communication (Maor et al., 2015; Rockinson-Szapkiw, 2012; Stott & Mozer, 2016). In addition, the study offers preliminary feedback on usage that will help inform further development of the virtual tools for online doctoral students. However, it is equally important to recognize that the use of these tools is driven by other factors, including university curriculum and syllabus requirements (Bean & Eaton, 2000), committee relationships and proactive management of the student (Burkard et al., 2014), and student characteristics, such as personality traits (Bolliger & Erichsen, 2013), achievement goals (Adesope, Zhou, & Nesbit, 2015), persistence, passion, and grit (Wolters & Hussain, 2015), and motivations (Xie & Huang, 2014), amongst other factors. As such, it is impractical to assume that a technological implementation will completely address the issue of doctoral retention; rather, technology provides the means for addressing issues created by geographic, communication, and psychological distances (Moore, 1989).

Preliminary data indicate students regularly access their private doctoral workspace, which was created for students and their dissertation committee. With this access, students state they communicate more effectively with their committees and faculty. Study results showed that student feelings of isolation remain unchanged with use of the doctoral workspace. The technological tools created within the DC Network and private doctoral workspaces facilitated increased levels of engagement in doctoral students that accessed the virtual spaces at least once a week. Facilitating and enhancing interactions between the student and the learning environment is a critical first step in improving retention (Bean & Eaton, 2000).

An element in reducing isolation for some students is to foster collaboration between faculty and students (Bagaka's et al., 2015; Christensen & Lund, 2014; Foronda & Lippincott, 2014; Hoffman, 2014; Sull, 2013). According to Gardner (2008), faculty should remember the tenuous nature of the independent dissertation phases and remain in close contact with their advisees. Isolation can be a significant factor, adversely influencing the completion of the dissertation in the doctoral program of study.

The findings of this exploratory study did not reveal that access to a private dissertation workspace reduced isolation. Only 36% of students reported that the private doctoral workspace assisted in reducing a sense of isolation. It is essential to understand if the remaining students did not feel isolated and, therefore, did not need a tool to feel less isolated, or if the private doctoral workspace does not adequately address the students' needs for connectedness. As such, further research is necessary.

The research in this study identified that the private doctoral workspaces enabled doctoral students to communicate more effectively with members of their dissertation committee. Live communication enables interaction (Gray & DiLoreto, 2016; Martin et al., 2012), and web-based systems can enhance communication (Stott & Mozer, 2016) which may reduce isolation (Ashton, 2014; Durksen et al., 2016). The challenges of independent doctoral research coupled with the lack of student experience (Golde & Dore, 2001) amplify the need for on-going communication between the student and their dissertation committee. This approach may also be applied to other disciplines such as master's thesis, independent study, group projects performed at the undergraduate level, and in business programs. The use of private doctoral workspaces and DC Network for doctoral students completing a detailed long-term research project shows promise.

REFERENCES

Adesope, O. O., Zhou, M., & Nesbit, J. C. (2015). Achievement goal orientations and self-reported study strategies as predictors of online studying activities. *Journal of Educational Computing Research, 53*(3), 436-458. https://doi.org/10.1177/0735633115603989

Akarasriworn, C., & Ku, H. Y. (2013). Graduate students' knowledge construction and attitudes toward online synchronous video conferencing collaborative learning environments. *Quarterly Review of Distance Education*, *14*(1), 35-48. Retrieved from http://www.sciepub.com/reference/129966

Ali, A., & Kohun, F. (2006). Dealing with isolation feelings in IS doctoral programs. *International Journal of Doctoral Studies*, *1*(1), 21-33. https://doi.org/10.28945/58

Ali, A., & Kohun, F. (2007). Dealing with social isolation to minimize doctoral attrition: A four-stage framework. *International Journal of Doctoral Studies*, *2*(1), 33-49. https://doi.org/10.28945/56

Allen, I. E., & Seaman, J. (2011). *Going the distance: Online education in the United States*. Report of the Babson Survey Research Group. Retrieved from http://sloanconsortium.org/publications/survey/going_distance_2011

Allen, I. E., & Seaman, J. (2015). *Grade level: Tracking online education in the United States*. Retrieved from http://onlinelearningconsortium.org/read/survey-reports-2014/

Alston, M., Allan, J., Bell, K., Brown, A., Dowling, J., Hamilton, P., Williams, R. (2005). 'SERPS up': Support, engagement and retention of postgraduate students—a model of postgraduate support. *Australian Journal of Adult Learning*, *45*(2), 172-190.

Anderson, B., Cutright, M., & Anderson. S. (2013). Academic involvement in doctoral education: Predictive value of faculty mentorship and intellectual community on doctoral education outcomes. *International Journal of Doctoral Studies*, *8*, 195-201. https://doi.org/10.28945/56

Angelier, C. (2012). *CIFRCE grants and careers of former grant holders*. Paper presented at the Joint European Science Foundation-Luxembourg Research Fund Workshop: How to track researchers' careers, 9-10 February, Luxembourg. Retrieved from www.researcherscareers.eu

Ashton, J. (2014). Using multimedia to build a sense of community with online distance learners. *Journal of Instructional Research, 3,* 97-106.

Bagaka's, J. G., Badillo, N., Bransteter, I., & Rispinto, S. (2015). Exploring student success in a doctoral program: The power of mentorship and research engagement. *International Journal of Doctoral Studies, 10,* 323-342. https://doi.org/10.28945/2291

Baker, V. L., & Pifer, M. J. (2015). Antecedents and outcomes: Theories of fit and the study of doctoral education. *Studies in Higher Education*, *40*(2), 296-310. https://doi.org/10.1080/03075079.2013.823936

Baker, V. L., Pifer, M. J., & Flemion, B. (2013). Process challenges and learning-based interactions in stage 2 of doctoral education: Implications from two applied social science fields. *The Journal of Higher Education*, *84*(4), 449-476. https://doi.org/10.1353/jhe.2013.0024

Bandura, A. (1977*). Social learning theory*. Upper Saddle River, NJ: Prentice-Hall.

Barnett, J. V., Harris, R. A., & Mulvany, M. J. (2017). A comparison of best practices for doctoral training in Europe and North America. *FEBS Open Bio, 7*, 1444–1452. https://doi.org/10.1002/2211-5463.12305

Bean, J. P. (1980). Dropouts and turnover: The synthesis and test of a causal model of student attrition. *Research in Higher Education*, *12*(2), 155-187. https://doi.org/10.1007/BF00976194

Bean, J. P. & Eaton, S. B. (2000). A psychological model of college student retention. In J. M. Braxton (Ed.), *Reworking the student departure puzzle* (pp. 48-61). Nashville, TN: Vanderbilt University Press.

Bennett, L., & Folley, S. (2014). A tale of two doctoral students: Social media tools and hybridized identities. *Research in Learning Technology*, *22*(1), 1-10. https://doi.org/10.3402/rlt.v22.23791

Berman, R., Grant, G., & Markette, N. J. (2012). Doctoral community network: A case study of the perceptions of doctoral learners regarding a private, scholarly learning community. *Journal of Educational Technology*, *10*(3), 1-11. Retrieved from http://scholar.lib.vt.edu/ejournals/JTE/

Berman, R., Radda, H. & Cross, T (2013). *The impact of a voluntary scholarly community on online students*. Presentation at the Sloan-C 19th Annual Consortium – International Conference on Online Learning, Lake Buena Vista, Florida, November 20-22, 2013.

Bernauer, J. A., Semich, G., Klentzin, J. C., & Holdan, E. G. (2013). Themes of tension surrounding research methodologies education in an accelerated, cohort-based doctoral program. *International Journal of Doctoral Studies*, *8*, 173–193. https://doi.org/10.28945/1921

Berry, S. (2017). Student support networks in online doctoral programs: Exploring nested communities. *International Journal of Doctoral Studies, 12,* 33-48. https://doi.org/10.28945/3676

Bolliger, D. U., & Erichsen, E. A. (2013). Student satisfaction with blended and online courses based on personality type. *Canadian Journal of Learning and Technology, 39*(1), 1-23.

Bolliger, D. U., & Inan, F. A. (2012). Development and validation of the online student connectedness survey. *The International Review of Research in Open and Distance Learning*, *13*(3). https://doi.org/10.19173/irrodl.v13i3.1171

Borup, J., West, R. E., & Graham, C. R. (2012). Improving online social interaction through asynchronous video. *Internet and Higher Education*, *15*(3), 195-203. https://doi.org/10.1016/j.iheduc.2011.11.001

Bowen, W. G., & Rudenstine, N. L. (1992). *In pursuit of the Ph.D.* Princeton, NJ: Princeton University Press. Retrieved from: http://drum.lib.umd.edu/bitstream/1903/13885/1/ONLINE%20Final%20Thesis.pdf

Burkard, A. W., Knox, S., DeWalt, T., Fuller, S., Hill, C., & Schlosser, L. Z. (2014). Dissertation experiences of doctoral graduates from professional psychology programs. *Counselling Psychology Quarterly, 27*(1), 19-54. https://doi.org/10.1080/09515070.2013.821596

Burkholder, D. (2012). Returning counselor education doctoral students: Issues of retention, attrition, and perceived experiences. *The Journal of Counselor Preparation and Supervision*, *4*(2). https://doi.org/10.7729/42.0027

Campbell, T. A. (2015). A phenomenological study on international doctoral students' acculturation experiences at a U.S. university. *Journal of International Students, 5*(3), 285-299.

Card, K., Chambers, C. R., & Freeman, S., Jr. (2016). Is there a core curriculum across higher education doctoral programs? *International Journal of Doctoral Studies*, *11*, 127-146. https://doi.org/10.28945/3409

Chen, Y. (2001). Dimensions of transactional distance in the world wide web learning environment; A factor analysis. *British Journal of Educational Technology, 32*(4), 459-470. https://doi.org/10.1111/1467-8535.00213

Christensen, M. K., & Lund, O. (2014). Doctoral education in a successful ecological niche: A qualitative exploratory case study of the relationship between the microclimate and doctoral students' learning to become a researcher. *International Journal of Higher Education, 3*(3), 103-113. https://doi.org/10.5430/ijhe.v3n3p103

Cole, M. T., Shelley, D. J., & Swartz, L. B. (2014). Online instruction, e-learning, and student satisfaction: A three year study. *International Review of Research in Open & Distance Learning, 15*(6), 111. https://doi.org/10.19173/irrodl.v15i6.1748

Cornér, S., Löfström, E., & Pyhältö, K. (2017). The relationships between doctoral students' perceptions of supervision and burnout. *International Journal of Doctoral Studies, 12,* 91-106. https://doi.org/10.28945/3754

Coryell, J. E., & Murray, K. (2014). Adult learning and doctoral student research forum participation: Insights into the nature of professional participatory experience. *International Journal of Doctoral Studies, 9,* 309-327. https://doi.org/10.28945/2075

Council of Graduate Schools. (2010). *PhD completion and attrition: Policies and practices to promote student success.*

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie Canadienne, 49*(3), 182-185. https://doi.org/10.1037/a0012801

DeVaney, T. A. (2010). Anxiety and attitude of graduate students in on-campus vs. online statistics courses. *Journal of Statistics Education*, *18*(1), 1-15. https://doi.org/10.1080/10691898.2010.11889472

Durksen, T. L., Chu, M., Ahmad, Z. F., Radil, A. I., & Daniels, L. M. (2016). Motivation in a MOOC: A probabilistic analysis of online learners' basic psychological needs. *Social Psychology of Education: An International Journal, 19*(2), 241-260. https://doi.org/10.1007/s11218-015-9331-9

Ewing, H., Mathieson, K., Alexander, J. L., & Leafman, J. (2012). Enhancing the acquisition of research skills in online doctoral programs: The Ewing Model. *Journal of Online Learning and Teaching*, *8*(1), 34-44.

Foronda, C., & Lippincott, C. (2014). Graduate students' experience with synchronous, interactive video conferencing within online courses. *The Quarterly Review of Distance Education*, *15*(410), 1–8. Retrieved from http://connection.ebscohost.com/c/articles/99363437/graduate-nursing-studentsexperience-synchronous-interactive-videoconferencing-within-online-courses

Fotovatian, S. (2012). Three constructs of institutional identity among international doctoral students in Australia. *Teaching in Higher Education*, *17*(5), 577–588. https://doi.org/10.1080/13562517.2012.658557

Freeman, S., Hagedorn, L. S., Goodchild, L. F., & Wright, D. A. (Eds.). (2014). *Advancing higher education as a field of study: In quest of doctoral degree guidelines*. Sterling, VA: Stylus. Retrieved from https://www.kobo.com/us/en/ebook/advancing-higher-education-as-a-field-of-study

Fuller, J., Risner, M., Lowder, L., Hart, M., & Bachenheimer, B. (2014). Graduates' reflections on an online doctorate in educational technology. *Techtrends: Linking Research & Practice to Improve Learning* [serial online]. *58*(4):73-80. https://doi.org/10.1007/s11528-014-0771-4

Gardner, S. K. (2008). "What's too much and what's too little?" The process of becoming an independent researcher. *The Journal of Higher Education*, *79*(3), 326-350. https://doi.org/10.1353/jhe.0.0007

Gardner, S. K. (2010). Contrasting the socialization experiences of doctoral students in high and low completing departments: A qualitative analysis of disciplinary contexts at one institution. *The Journal of Higher Education, 81*(1), 61–81. https://doi.org/10.1080/00221546.2010.11778970

Gardner, S. K., & Gopaul, B. (2012). The part-time doctoral student experience: A literature review. *International Journal of Doctoral Studies*, *7*, 63-78. https://doi.org/10.28945/1561

Gill, D. L., Brown, P. K., & Reifsteck, E. J. (2014). The EdD in kinesiology at UNCG: An online doctoral program? *Kinesiology Review, 3*(4), 221-226. https://doi.org/10.1123/kr.2014-0057

Golde, C. M. (2005). The role of the department and discipline in doctoral student attrition: Lessons from four departments. *Journal of Higher Education*, *76*(6), 669-700. https://doi.org/10.1080/00221546.2005.11772304

Golde, C. M., & Dore, T. M. (2001). *At cross purposes: What the experiences of doctoral students reveal about doctoral education*. Philadelphia, PA: A report prepared for the Pew Charitable Trusts.

Gomez, D. (2013). Leadership behavior and its impact on student success and retention in online graduate education. *Academy of Educational Leadership*, *17*, 13-38. Retrieved from http://connection.ebscohost.com/c/articles/87744063/leadership-behavior-impact-s

Gooch, D., & Watts, L. (2014). Social presence and the void in distant relationships: How do people use communication technologies to turn absence into fondness of the heart, rather than drifting out of mind? *AI & Society*, *29*(4), 507-519. https://doi.org/10.1007/s00146-013-0492-9

Gray, J. A., & DiLoreto, M. (2016). The effects of student engagement, student satisfaction, and perceived learning in online learning environments. *International Journal of Educational Leadership Preparation, 11*(1), 1-2.

Gube, J., Getenet, S., Satariyan, A., & Muhammad, Y. (2017). Towards "operating within" the field: Doctoral students' views of supervisors' discipline expertise. *International Journal of Doctoral Studies, 12,* 1-16. https://doi.org/10.28945/3641

Hachey, A. C., Wladis, C. W., & Conway, K. M. (2012). Is the second time the charm? Investigating trends in online re-enrollment, retention and success. *Journal of Educators Online*, *9*(1), n1. https://doi.org/10.9743/JEO.2012.1.2

Hawlery, P. (2003). *Being bright is not good enough*. Springfield, IL: Charles C. Thomas.

Hermann, K. J., Wichmann-Hansen, G., & Jensen, T. K. (2014). Quality in the PhD process: A survey among PhD students at Aarhus University. Aarhus, Denmark: Aarhus University. Retrieved from http://www.au.dk/fileadmin/www.au.dk/kvalitetiphd/KVALITET_1_PHD_DA_.pdf

Hoffman, E. M. (2014). Faculty and student relationships: Context matters. *College Teaching*, *62*(1), 13-19. https://doi.org/10.1080/87567555.2013.817379

Hogg, N., & Lomicky, C. S. (2012). Connectivism in postsecondary online courses: An exploratory factor analysis. *Quarterly Review of Distance Education*, *13*(2), 95. Retrieved from http://eric.ed.gov/?id=EJ1005842

Holbrook, A., Shaw, K., Scevak, J., Bourke, S., Cantwell, R., & Budd, J. (2014). PhD candidate expectations: Exploring mismatch with experience. *International Journal of Doctoral Studies, 9,* 329-346. https://doi.org/10.28945/2078

Horzum, M. B. (2015). Interaction, structure, social presence, and satisfaction in online learning. *Eurasia Journal of Mathematics, Science, & Technology Education, 11*(3), 505-512. https://doi.org/10.12973/eurasia.2014.1324a

Huang, H. (2002). Student perceptions in an online mediated environment. *International Journal of Instructional Media, 29*(4), 405-422.

Imus, F. S., & Burns, S. (2015). What to consider before beginning graduate education: A pilot study. *AANA Journal, 83*(5), 345-350.

Jones, M. (2013). Issues in doctoral studies -Forty years of journal discussion: Where have we been and where are we going? *International Journal of Doctoral Studies*, *8*, 83-104. https://doi.org/10.28945/1871

Kahn, J. H., & Scott, N. A. (1997). Predictors of research productivity and science-related career goals among counseling psychology graduate students. *The Counseling Psychologist, 25,* 38-67. https://doi.org/10.1177/0011000097251005

Kennedy, D. H., Terrell, S. R., & Lohle, M. (2015). A grounded theory of persistence in a limited-residency doctoral program. *The Qualitative Report*, *20*(3), 215-230. . Retrieved from http://nsuworks.nova.edu/tqr/vol17/iss31/

Kumar, S., Johnson, M., & Hardemon T. (2013). Dissertations at a distance: Students' perceptions of online mentoring in a doctoral program. *International Journal of E-learning & Distance Education*, 27, 21.

Lack, K. A. (2013). Current status of research on online learning in postsecondary education. *Ithaka S+ R, zuletzt geprüft am*, *3*, 2013.

Lambie, G. W., Hayes, B. G., Griffith, C., Limberg, D., & Mullen, P. R. (2014). An exploratory investigation of the research self-efficacy, interest in research, and research knowledge of Ph.D. in education students. *Innovative Higher Education, 39*(2), 139–153. https://doi.org/10.1007/s10755-013-9264-1

Lovitts, B. E. (2001). *Leaving the ivory tower: The causes and consequences of departure from doctoral study*. Lanham, MD: Rowman & Littlefield.

Lovitts, B. E. (2005,). Being a good course-taker is not enough: A theoretical perspective on the transition to independent research. *Studies in Higher Education*, *30*(2), 137-154. https://doi.org/10.1080/03075070500043093

Maor, D., Ensor, J. D., & Fraser, B. J. (2015). Doctoral supervision in virtual spaces: A review of research of web-based tools to develop collaborative supervision. *Higher Education Research & Development, 35*(1), 172-188. https://doi.org/10.1080/07294360.2015.1121206

Marshall, J., Greenberg, H., & Machun, P. A. (2012). How would they choose? Online student preferences for advance course information. *Open Learning: The Journal of Open, Distance and e-Learning*, *27*(3), 249-263. https://doi.org/10.1080/02680513.2012.716656

Martin, F., Parker, M. A., & Deale, D. F. (2012). Examining interactivity in synchronous virtual classrooms. *The International Review of Research in Open and Distance Learning*, *13*(3), 228-261. https://doi.org/10.19173/irrodl.v13i3.1174

Martinsuo, M., & Turkulainen, V. (2011). Personal commitment, support, and progress in doctoral studies. *Studies in Higher Education*, *36*(1), 103-120. https://doi.org/10.1080/03075070903469598

Milton-Wildey, K., Kenny, P., Parmenter, G., & Hall, J. (2014). Educational preparation for clinical nursing: The satisfaction of students and new graduates from two Australian universities. *Nurse Education Today, 34*(4), 648-654. https://doi.org/10.1016/j.nedt.2013.07.004

Misu, T. (2012). *Careers of doctorate holders project: Challenges for the future.* Paper presented at the Joint European Science Foundation-Luxembourg Research Fund Workshop: How to track researchers' careers, 9-10 February, Luxembourg, www.researcherscareers.eu

Moore, M. G. (1989). Three types of interaction. *American Journal of Distance Education, 3*(2), 1-6. https://doi.org/10.1080/08923648909526659

Moore, M. G., & Kearley, G. (2012). *Distance education: A system view of online learning* (3rd ed.). Belmont, CA: Wadsworth CengageLearning.

Naidoo, D. (2015). Understanding non-traditional PhD students habitus—Implications for PhD programmes. *Teaching in Higher Education, 20*(3), 340-351. https://doi.org/10.1080/13562517.2015.1017457

Newberry, R., & DeLuca, C. (2013). Building a foundation for success through student services for online learners. *Online Learning Journal*, *17*(4). https://doi.org/10.24059/olj.v17i4.385

Niemczyk, E. K. (2013). Preparing researchers of tomorrow. *Critical Issues in Higher Education, 8,* 51-66. https://doi.org/10.1007/978-94-6209-046-0_5

Nguyen, T. (2015). The effectiveness of online learning: Beyond no significant difference and future horizons. *MERLOT Journal of Online Learning and Teaching, 11*(2), 309-319.

Offerman, M. (2011). Profile of the nontraditional doctoral degree student. *New Directions for Adult and Continuing Education*, *2011*(129), 21-30. https://doi.org/10.1002/ace.397

O'Keeffe, P. (2013). A sense of belonging: Improving student retention. *College Student Journal, 47*(4), 605-613.

Orellana, M. L., Darder, A., Pérez, A., & Salinas, J. (2016). Improving doctoral success by matching PhD students with supervisors. *International Journal of Doctoral Studies*, *11*, 87-103. https://doi.org/10.28945/3404

Phillips, J. C., & Russell, R. K. (1994). Research self-efficacy, the research training environment, and research productivity among graduate students in counseling psychology. *The Counseling Psychologist, 22*, 628–641. https://doi.org/10.1177/0011000094224008

Pienaar, J. (2016). Caught in the spotlight: Engaging distance students. *Journal of Academic Perspectives*, 1-14.

Pyhältö, K., Vekkaila, K., & Keskinen, J. (2015). Fit matters in the supervisory relationship: Doctoral students and supervisors perceptions about the supervisory activities. *Innovations in Education and Teaching International*, *52*(1), 4-16. https://doi.org/10.1080/14703297.2014.981836

Rigg, J., Day, J., & Adler, H. (2013). Emotional exhaustion in graduate students: The role of engagement, self-efficacy and social support. *Journal of Educational and Developmental Psychology, 3*(2), 138-152. https://doi.org/10.5539/jedp.v3n2p138

Rockinson-Szapkiw, A. J. (2012). Investigating uses and perceptions of an online collaborative workspace for the dissertation process. *Research in Learning and Technology*, *20*. https://doi.org/10.3402/rlt.v20i0.18192

Rockinson-Szapkiw, A. J., Spaulding, L. S., & Lunde, R. (2017). Women in distance doctoral programs: How they negotiate their identities as mothers, professionals, and academics in order to persist. *International Journal of Doctoral Studies, 12,* 49-71. https://doi.org/10.28945/3671

Rovai, A. P. (2002). Development of an instrument to measure classroom community. *Internet and Higher Education*, *5*(3), 197-211. https://doi.org/10.1016/S1096-7516(02)00102-1

Rumbley, L. E., Altbach, P. G., Stanfield, D. A., Shimmi, Y., Gayardon, A. De, & Chan, R. Y. (2014). *Higher education: A worldwide inventory of research centers, academic programs, and journals and publications* (3rd ed.). Charlotte, NC: Information Age Publishers. Retrieved from https://www.sensepublishers.com/catalogs/bookseries/global-perspectives-on-higher-education

Salani, D., Albuja, L. D., & Azaiza, K. (2016). The keys to success in doctoral studies: A preimmersion course. *Journal of Professional Nursing, 32,* 358-363. https://doi.org/10.1016/j.profnurs.2016.01.005

Sampson, K. A., Johnston, L., Comer, K., & Brogt, E. (2015). Developing evidence for action on the postgraduate experience: An effective local instrument to move beyond benchmarking. *Higher Education Research & Development, 35*(2), 337–351. https://doi.org/10.1080/07294360.2015.1087469

Samuel, M. A. (2014). Doctoral career path studies: Exchanging paradigms across international borders. *South African Journal of Higher Education*, *28*(5).

Sandoe, C. (2005). *Measuring transactional distance of online courses: The structure component* (Doctoral dissertation). Retrieved from http://scholarcommons.usf.edu/etd/844

Santora, K., Mason, E., & Sheahan, T. (2013). A model for progressive mentoring in science and engineering education and research. *Innovative Higher Education*, *38*(5), 427-440. https://doi.org/10.1007/s10755-013-9255-2

Simonson, M., Schlosser, C., & Orellana, A. (2011). Distance education research: A review of the literature. *Journal of Computer Higher Education, 23*(2-3), 124-142. https://doi.org/10.1007/s12528-011-9045-8

Smallwood, S. (2004, January 16). Doctoral dropout. *The Chronical of Higher Education*. Retrieved from http://chronicle.com/article/Doctor-Dropout/33786/

Spaulding, L. S., & Rockinson-Szapkiw, A. J. (2012). Hearing their voices: Factors doctoral candidates attribute to their persistence. *International Journal of Doctoral Studies*, *7*,199-219. https://doi.org/10.28945/1589

Stallone, M. N. (2011). Factors associated with student attrition and retention in an educational leadership doctoral program. *Journal of College Teaching and Learning*, *1*(6), 17-24. https://doi.org/10.19030/tlc.v1i6.1952

Stott, A., & Mozer, M. (2016). Connecting learners online: Challenges and issues for nurse education – Is there a way forward? *Nurse Education Today, 39,* 152-154. https://doi.org/10.1016/j.nedt.2016.02.002

Sull, E. C. (2013, January 31). Student engagement in the online classroom. *The Chronicle of Higher Education*. Retrieved from http://chronicle.com/article/Student-Engagement-in-the/136897/?cid=ja&utm_source=ja&utm_medium=en

Terrell, S. R., Snyder, M. M., Dringus, L. P., & Maddrey, E. (2012). A grounded theory of connectivity and persistence in a limited residency doctoral program. *The Qualitative Report*, *17*(62), 1-14. Retrieved from http://www.nova.edu/ssss/QR/QR17/terrell.pdf

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research, 45*(1), 89-125. https://doi.org/10.3102/00346543045001089

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago, IL: University of Chicago Press.

Van der Haert, M., Ortiz, E. A., Emplit, P., Halloin, V., & Dehon, C. (2014). Are dropout and degree completion in doctoral study significantly dependent on type of financial support and field of research? *Studies in Higher Education, 39*(10), 1885-1909. https://doi.org/10.1080/03075079.2013.806458

Van de Schoot, R., Yerkes, M. A., Mouw, J. M., & Sonneveld, H. (2013). What took them so long? Explaining PhD delays among doctoral candidates. *Plos ONE, 8*(7), 1-11. https://doi.org/10.1371/journal.pone.0068839

Vekkaila, J., Virtanen, V., Taina, J., & Pyhältö, K. (2016). The function of social support in engaging and disengaging experiences among post PhD researchers in STEM disciplines. *Studies in Higher Education. 5,* 222–235. https://doi.org/10.1080/03075079.2016.1259307

Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.

Wildy, H., Peden, S., & Chan, K. (2015). The rise of professional doctorates: Case studies of the Doctorate in Education in China, Iceland and Australia. *Studies in Higher Education, 40*(5), 761. https://doi.org/10.1080/03075079.2013.842968

Wolters, C. A., & Hussain, M. (2015). Investigating grit and its relations with college students' self-regulated learning and academic achievement. *Metacognition and Learning, 10*(3), 293-311. https://doi.org/10.1007/s11409-014-9128-9

Xie, K., & Huang, K. (2014). The role of beliefs and motivation in asynchronous online learning in college-level classes. *Journal of Educational Computing Research, 50*(3), 315-341. https://doi.org/10.2190/EC.50.3.b

Ye, Y., & Lin, L. (2015). Examining relations between locus of control, loneliness, subjective well-being, and preference for online social interaction. *Psychological Reports*, *116*(1), 164-175. https://doi.org/10.2466/07.09.PR0.116k14w3

Yuan, J., & Kim, C. (2014). Guidelines for facilitating the development of learning communities in online courses. *Journal of Computer Assisted Learning, 30*(3), 220-232. https://doi.org/10.1111/jcal.12042

APPENDIX

Survey 1-June 2014, Survey 2-October 2014

Demographics

1. Please identify your Program of Study.
   - EdD
   - DBA
   - PhD
2. Please identify the year of your Program start.
   - 2008
   - 2009
   - 2010
   - 2011
   - 2012
3. Please identify your current Dissertation Course.
   - DIS 955 – 965
   - DIS 966 – 968
   - DIS 969 – 075
   - PSY 955 – 965
   - PSY 966 – 968
   - Other

Research Questions

4. I **log on** to the DC Network
   - 0 times per week
   - 1 time per week
   - 2 or more times per week

5. I feel **connected** to Faculty in my Program of Study.
Disagree strongly, Disagree, Neither agree nor disagree, Agree, Agree strongly

6. My Learner Dissertation Page in the Doctoral Community Network helps me to reduce **isolation** during the dissertation phase.
Disagree strongly, Disagree, Neither agree nor disagree, Agree, Agree strongly

7. My Learner Dissertation Page in the Doctoral Community Network helps me **communicate** more effectively with my dissertation committee.
Disagree strongly, Disagree, Neither agree nor disagree, Agree, Agree strongly

Survey 3, December 2016

Demographics

1. Please identify your Program of Study.
    - EdD
    - DBA
    - PhD
2. Please identify the year of your Program start.
    - 2008
    - 2009
    - 2010
    - 2011
    - 2012
    - 2013
    - 2014
    - 2015
3. Please identify your current Dissertation Course.
    - DIS 955 – 960 – 965
    - DIS 966 – 968
    - DBA 955 – 960 – 965
    - DBA 966 – 968
    - PSY 955 – 960 – 965
    - PSY 966 – 968

Research Questions

4. I **log on** to the DC Network
    - 0 times per week
    - 1 time per week
    - 2 or more times per week

5. I feel **connected** to Faculty in my Program of Study.
Disagree strongly, Disagree, Neither agree nor disagree, Agree, Agree strongly

6. The Learner Dissertation Page in the Doctoral Community Network helps me to reduce **isolation.**
Disagree strongly, Disagree, Neither agree nor disagree, Agree, Agree strongly

7. I use the resources within the Learner Dissertation Page to **communicate** with my Dissertation Chair and committee.
Disagree strongly, Disagree, Neither agree nor disagree, Agree, Agree strongly

BIOGRAPHIES

Cathrine Ames is the Institutional Review Board Research Specialist at Grand Canyon University, College of Doctoral Studies in Phoenix, Arizona. Dr. Ames is also an Adjunct Faculty Member in the College of Doctoral Studies, at Grand Canyon University. Dr. Ames is the former cofounder and co-president of the Doctoral Community Cohort for doctoral students at Grand Canyon University. She was previously an elementary teacher and Vice Principal. Her research interests include doctoral retention, emerging technology, virtual teams, learning communities, blended learning, online environments, connectivity, effective communication, and leadership. E-mail: Cathrine.Ames@gcu.edu

Ronald Berman. As an Assistant Dean for the College of Doctoral Studies, Dr. Berman is responsible for overseeing the development and implementation of long-term strategies that enhance the effectiveness of Doctoral Education at Grand Canyon University. He is the primary architect of the Doctoral Community Network™ and the program chair for the Doctor in Business Administration Program. Dr. Berman has presented at numerous national and international conferences. His research interests include data analytics, virtual learning communities, research processes, and strategic directions and technologies to enhance retention of doctoral learners. He participates in doctoral dissertation committees and teaches innovation, leadership, technology, and analytics. E-mail: ronald.berman@gcu.edu

Alex Casteel is a senior methodologist and academic quality reviewer at Grand Canyon University, College of Doctoral Studies, in Phoenix, Arizona. He provides formative feedback and evaluation of dissertation manuscripts to ensure those manuscripts meet the standards of quality and scientific merit as set forth by the University for learners in the EdD, PhD, and DBA programs. He is a business owner and formerly worked in corporate e-learning. His research interests include the influence of psychological constructs within online learning environments, retention within virtual environments, implementation of technology-based solutions, and learner interactions. Email: alex.casteel@my.gcu.edu