

**SCHOLARSHIP PRACTITIONERS' PERCEPTIONS ON HOW TECHNOLOGY CAN
BE USED TO IMPROVE THE COLLABORATION LEARNING EXPERIENCE OF
DOCTOR OF EDUCATION PROGRAMS**

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Submitted to the Graduate Faculty of
the School of Education in partial fulfillment
of the requirements for the degree of
Doctor of Education

University of Pittsburgh

2017

UNIVERSITY OF PITTSBURGH

SCHOOL OF EDUCATION

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University of Pittsburgh, 2017

Despite the vast research on administrator and faculty perceptions about blended education delivery models, there has been a paucity of research conducted on graduate students' multimedia technology needs and preferences during group projects and collaborative assignments. A mixed methods survey that included closed-ended and open-ended questions was deployed to a population of 189 students belonging to three EdD cohorts at the University of Pittsburgh. One hundred three students started the survey, but only 98 completed the survey. The survey revealed the following findings through a combination of content analysis and frequency distributions that showed the students' preferred communication type, preferred multimedia communication technology, and preferred multimedia collaboration technology; (1) flexibility and convenience, (2) technology training, (3) technology limitations, (4) video conferencing, (5) video and audio podcasts, (6) Internet access, and (7) communication and feedback. When it came to students-to-students preferred communication and collaboration multimedia technology, 61 students' prefer Google Hangouts for their communication and 60 students' preferred Google Drive as their collaboration tool. Seventy-one students selected both synchronous and asynchronous as the student-to-instructor modes of communication during collaborative projects and assignments. Fifty preferred Google Hangouts as their synchronous communication choice and 31 chose Google Drive as their preferred asynchronous collaborative tool for sharing and

editing documents simultaneously. Through content analysis and identifying patterns of the open-ended answers, this study identified the following areas in this blended program that could improve the online collaboration between students and instructors: (1) Blackboard Learning Management System (LMS), (2) project group sizes, and (3) student-instructor communication and feedback.

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1.0 INTRODUCTION

Providing blended education which consists of a combination of online and face-to-face teaching, is at the strategic forefront of many postsecondary institutions in America as they deal with some of the trends that are threatening their current existence. According to Grummon (2010), some of the trends impacting higher education are economics, demographics, technology, learning, politics, and global education. Although the Bureau of Labor Statistics (2016) indicates the unemployment rate declined to 4.6% in November 2016 from 10.0% in October of 2009 the height of the Great Recession, recent reports in February 2017 show a slight unemployment increase to 4.7%. Uncertainties of a full economic recovery continue to trigger drops in higher education funding. As a result, many institutions are strategically thinking about new sustainable revenue structures that make business sense without compromising the quality of education and services provided to its students.

One of the strategic solutions being implemented by institutions is blended education. Although several studies have focused on administrators and faculty perceptions in regard to online and blended education delivery models (Murphy & Cifuentes, 2001; Harker & Koutsantoni, 2005; Hensley, 2005; Allen & Seaman, 2006; Conceicao 2006; Gahungu, Dereshiwsky & Moan, 2006; Oblinger & Hawkins, 2006; El Mansour & Mupinga 2007; McGee & Diaz, 2007; Mills, Yanes, & Casebeer, 2009; Hathorn & Hathorn, 2010; Koenig, 2010), there has been a paucity of research focusing on students working full time or ' perceptions about

blended learning. One area that institutions trying to implement online or blended programs need to understand is students' multimedia technology needs and preferences, so they can produce a quality product that delivers instruction in a way that is meaningful and useful to students. Insights from students on their technology needs and preferences will start to address some of the challenges of providing the highest quality blended courses that enhance the value of the student learning experience in blended classrooms.

One controversial issue in discussions of higher education recently has been its value. On the one hand, post-secondary education is facing scrutiny from consumers, politicians and the public due to the rising costs and increased student debt. On the contrary, a future without some form of post-secondary education does not seem promising for many. Institutional leaders have an opportunity to make sure their organizations are producing quality programs for its students. As more working students look to enroll in blended programs or courses, the biggest question that lingers over many people is whether these distance education opportunities can provide quality courses that can match or outperform their face-to-face competitors. The United States Department of Education's (2014) introduction of the "gainful employment" policy is an example of how serious the value and quality of post-secondary education is currently. This policy was introduced to protect students at career and for-profit colleges from being burdened with student loans they had no ability to pay back upon completion of their programs due to not being able to obtain well-paying jobs in their industry (U.S. Department of Education, 2014).

According to the former U.S. Secretary of Education Arne Duncan (2014), career colleges must be a stepping stone to the middle class. However, too many hard-working students find themselves buried in debt with little to show for it. That is simply unacceptable. These

regulations are a necessary step to ensure that colleges accepting federal funds protect students, cut costs and improve outcomes. We will continue to take action as needed.

Although this currently impacts career and for-profit institutions, stakeholders interested in non-profit institutions continue to review the cost and value of higher education for the same reasons. Leaders at tertiary institutions need to pay attention to this trend as they strategically work on coming up with effective solutions to solve this and other current trends impacting their institutions of higher education.

1.1 PROBLEM OF PRACTICE

1.1.1 Setting

As the University of Pittsburgh's (henceforth referred to as Pitt) School of Education redesigns its Doctor of Education (EdD) program and enters the space of a blended education delivery model for graduate students, the ability to develop and implement the highest quality program has the possibility of attracting many quality applicants seeking to enroll in this program. As the revised EdD program targets working practitioners (Earn your EdD in three, 2017) the organization understands that with this new program implementation, there are some opportunities for improvement. One of the ways of trying to improve the EdD program is by reviewing the student learning technology component. With most of the student-to-student and student-to-instructor engagement and learning taking place online via multimedia technology, understanding the students' technology needs and preferences during communication and collaboration on group projects and assignments can provide valuable feedback on what works

well and where the technology gaps are. Such technology information will provide the School of Education a chance to evaluate where they can make short or long-term goals towards improving the quality of the blended education of the EdD program.

Pitt's revised EdD has been modeled after the Carnegie Project on the Education Doctorate's (CPED) six principles –

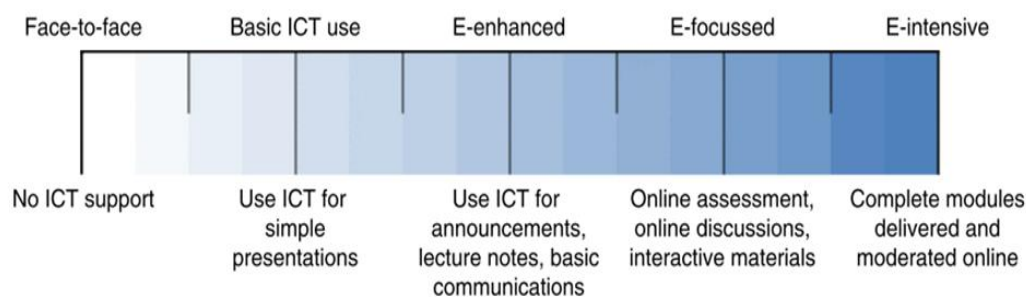
1. Engage with diverse communities and work toward social justice.
2. Leaders working towards positive change.
3. Provide opportunities for candidates to develop and demonstrate collaboration.
4. Provide opportunities for career experience to analyze problems of practice.
5. Learning to connect theory to practice.
6. Applying what has been learned to solve problems of practice (Development CPED Working Principles, 2007).

This study will focus on CPED principle #3 where programs need to provide opportunities for students to develop and demonstrate their ability to collaborate successfully in the online model of the EdD program they are enrolled in.

Understanding if these principles are being implemented and met from a students' perspective will provide the School of Education an opportunity to assess, prioritize and strategically implement some of the identified student needs that have the potential of improving the quality of the student learning experience in the program. Due to interests in multimedia technology and how it can be utilized to improve student-to-student and student-to-instructor online communication and collaboration, the scope of this project is limited to the third CPED principle, which seeks to provide opportunities for students to develop and demonstrate collaboration when working to solve complex education challenges (CPED, 2016).The inquiry of

this project focuses on identifying the current student EdD population at Pitt’s multimedia technology needs and preferences when working collaboratively on group projects.

Many institutions believe blended education “combines the best of both worlds” (Graham, 2006, p. 8), including the face-to-face and the online delivery models of education. The degree of Information Communication Technology (ICT) use depends on the amount of learning that is offered online. Figure 1 displays an ICT classification visual that is based on the level of online resources used to identify the degree of blending that a course or program can select.



Source: Adapted from Jones *et al.* (2009, p. 15)

Figure 1. Enhanced continuum of blended learning

Figure 1. Enhanced Continuum of Blended Learning

Figure 1 incorporates Jones, Chew, Jones, and Lau’s (2009) continuum of blended learning, which begins with no ICT use, then progresses through the most basic level of ICT used to support face-to-face teaching, and finally to intensive use, whereby the whole module is delivered online with minimal or no face-to-face interaction . Pitt’s EdD is offered mostly online with one face-to-face meeting a month per class, which puts it in the E-focussed realm. Understanding what online multimedia collaboration tools students need and prefer when

working on group projects and assignments would provide the School of Education a better chance of getting the right mix of ICT to facilitate the online component of the blended learning. Getting this right would be the difference between implementing a quality blended program that would improve the students' collaboration, engagement, learning experience, and outcomes from a quality program.

1.1.2 Problem of practice

While research on blended learning to date has brought attention to significant student satisfaction issues like ease of technology, lack of technology skills, previous online learning experience, and responsibility for personal learning (Zhao & Cziko, 2001; Baldwin and Lin, 2002; Peters & Araya, 2011; Pinto & Anderson, 2013), there are still some under-researched areas around students' needs and preferences that should be addressed. With a majority of the work in Pitt's blended EdD program being conducted online, what students need and prefer in the multimedia technology used is essential to the program. With some courses being designed to utilize group projects, special consideration needs to be provided when many of the meetings will be conducted virtually. As the program looks to improve its quality, an area that can be reviewed is the students multimedia technology needs and preferences during online collaborative work. The student-to-student and student-to-instructor communication and collaboration are key components of the blended program.

Many experienced traditional instructors are good at determining what would work best for their students in the courses they teach (Poth, 2016). However, with a new blended program that heavily utilizes digital technology for online discussions, online assessments, online collaborations, and online interactive materials, it is important to hear the students' voices about

their technology experiences. As students enroll and go through this program, providing them an opportunity to become part of the technology decision making process may enhance the collaboration learning experience of group projects.

My experience as a scholar-practitioner and a co-instructor in this blended EdD program has led me to believe the following are examples of why blended programs are gaining popularity: meeting in-person once a month, on-demand learning, and use of technology to support learning and student-to-faculty collaboration and engagement. The literature in Chapter 2 also supports this. Having been a student of the first cohort, I have firsthand experience of being part of a student population that worked in partnerships with instructors to adjust or better define some of the program requirements. On the one hand, it was exciting to be part of a new experience, but on the contrary, trying to balance graduate level work while working full time was challenging.

Many of the students in our first cohort were experiencing blended learning for the first time including myself and getting the right multimedia technology combinations between users with different experiences was a major challenge. Some of the graduate courses are designed for group projects. The ability to utilize multimedia technology to conduct virtual meetings for group projects was crucial in this program. Finding the right readily available, usable, and reliable technology that allowed us to integrate with Blackboard's Learning Management System (LMS) was critical to enhancing our online learning experience.

Often throughout the program, colleagues and I explored different technologies that we could use for our virtual group meetings. Very seldom did we meet in person, and when we did, we rarely had all participants available. We tried our best to see what tools we could use to either conference people into the meetings or record the formal meeting and make it accessible for

those not present. Having over 11 years of Information Technology (IT) experience and an interest in improving educational technology, in my third year of the program for my Supervised Internship project, I elected to become a co-instructor in the EdD program so as to experience the use of technology from an instructor perspective. The course Higher Education Institutional Strategic Planning (ADMPS 3104) led by my Advisor Dr. James Jacob was designed in a way that required virtual collaboration to take place. As Dr. Jacob's co-instructor, I was in charge of two of the four groups that scheduled a one-hour virtual meeting for each group once a week. I was also available throughout the week responding to emails, Blackboard discussions and sometimes scheduled one-on-one phone calls to clarify to student's what their individual assignments were and helped them align their areas of interest to the goals and objectives of the course.

The co-instructor internship and guidance from Dr. Jacob allowed me to see the different needs and preferences students have when engaging with instructors during communication and collaboration sessions. As a co-instructor, sometimes I was called upon to troubleshoot some of the connectivity issues some of the students run into when trying to join a conference call. Having the skill to navigate through technical matters without interrupting the other group members was a valuable asset as an instructor. Students' had the ability to continue working an interrupted without feeling the stress or anxiety of the student impacted by the technical challenges. Being able to resolve technological issues promptly allowed students to join the virtual group discussions without missing a lot of the group discussion.

Being able to familiarize myself with the students' choice of multimedia technology was a huge plus in managing the virtual meetings and the flow of the course throughout the semester. Our goal as instructors of this course was to eliminate any technology challenges students had so

as to allow them to engage and collaborate fully throughout the course. As a graduating student of the first cohort and with other students in my cohort with others behind me, we can identify students' multimedia technology needs, and preferences are when communicating and collaborating during group projects so as to enhance the students' learning experience the inquiry questions below.

1.1.3 Inquiry questions

The third CPED principle that seeks to provide opportunities for candidates to develop and demonstrate collaboration when working to solve complex education challenges influence the two questions that guide the inquiry of this dissertation.

1. What online communication and collaboration multimedia technology is preferred between the EdD graduate students when doing group work?
2. What online communication and collaboration multimedia technology is preferred by students when communicating and collaborating with instructors during team work?

1.2 ORGANIZATIONAL SETTING

The organization being researched for this study is the EdD students of the University of Pittsburgh's School of Education. According to the University of Pittsburgh's website (2016), the institution is a state-related research university, founded as the Pittsburgh Academy in 1787. Pitt is a member of the Association of American Universities (AAU), which comprises 62

preeminent doctorate-granting research institutions in North America. The School of Education's Doctoral Degree consists of the following eight key Areas of Concentration (ARCO):

1. Higher Education Management.
2. Education Leadership.
3. Language, Literacy, and Culture.
4. Science, Technology, Engineering, and Mathematics.
5. Social and Comparative Analysis in Education.
6. Special Education.
7. Health and Physical Activity.
8. Out-of-School Learning.

The Out-of-School Learning ARCO is a new concentration that is scheduled to start in the summer of 2017. At the time of this project, no student was in this ARCO.

The blended program under study is Pitt's revised EdD program that is part-time and was launched in 2014. According to the School of Education's website (2017), the program was started to assist education professionals looking to advance their careers. The main goals of this EdD program are to help graduates advance within their careers in educational administration and also as faculty within teaching centered colleges and universities (2017). The EdD program's part-time nature accommodates the needs of its students who are working in the field of education. Many people in the past could not differentiate the old EdD from the PhD program in the School of Education at Pitt. However, according to the School of Education's website (2017), the contrast is now much clearer. The PhD program remains a full-time program that helps to prepare graduates for research-oriented careers as well as faculty working for research and doctoral granting universities (2017).

The management of part-time working doctoral students in a blended delivery model program is different from managing full-time doctoral students in a traditional face-to-face traditional. The blended program has its students meet online the majority of the time, which requires a lot of planning and quality course designs that allow students to engage and learn throughout the program. Understanding some of the students' technology needs and preferences of the online component of blended learning may help instructors and course designers develop quality courses and assignments that allow quality student-to-student and student-to-instructor learning collaborations.

This research focuses on four main components of online collaboration required for graduate students working to solve complex group projects and assignments: (1) student-to-student online collaboration tools, (2) student-to-instructor online collaboration tools, (3) the students-to-student preferred multimedia communication tools, and (4) the students-to-instructor preferred multimedia communication tools that achieve effective communication and collaboration.

1.2.1 Carnegie project on the education doctorate (CPED)

According to CPED consortium's website (2016), the consortium was created in 2007 to critically examine the doctorate in education through dialogue, experimentation, critical feedback and evaluation. The professional doctorate in education prepares educators for the application of appropriate and specific practices, for the generation of new knowledge, and for the stewardship of the profession (About Us CPED, 2016). The consortium has influence in over 80 colleges and schools of education, which have committed resources to work together to achieve their mission

which is to strengthen, improve, support and promote the CPED framework through continued collaboration and investigation.

1.2.2 Stakeholders and key demographics

Although the technology used in online collaborative learning can be addressed from the perspectives of faculty and administrators, this inquiry focuses on 2014, 2015 and 2016 working students enrolled in Pitt's revised EdD program and the Carnegie Project on the Education Doctorate (CPED) consortium of which the School of Education is a member. Being able to capture students' perspectives of the 2014, 2015 and 2016 cohorts could highlight some of the critical technology needs and preferences they find best suitable for online collaborative learning for group projects and assignments. Pitt's CPED consortium membership and focus on CPED's third principle, which states that institutions should provide opportunities for candidates to develop and demonstrate collaboration (2017), provides a conceptual framework for this research.

1.2.3 Students

Several attributes make this EdD program attractive to working graduate students who come from diverse education fields. The ability to meet face-to-face with peers and faculty to bond and create a social and cultural model of learning to the flexibility and convenience of accessing the learning materials online are two main attractions of this blended program. The blended course delivery model introduces new learning opportunities that, if strategically planned and implemented well, can provide quality online collaboration opportunities that facilitate learning

for students. However, as the School of Education seeks to improve the quality of this blended EdD program, it is important to get the perceptions of the practitioners enrolled into this program so as to better understand what is working well, what needs improving, or what should be eliminated.

Understanding the system is important to improving the program (Bryk, Gomez, Grunow & LeMahieu, 2011). A major component of the system in higher education is the student population of an institution. Students can play a major role in improving the online collaboration required to complete complex group projects and assignments of the revised EdD program by providing feedback on their current use of technology to communicate and collaborate during their online meetings. The main online learning and collaboration technology platform students in the EdD program use is Blackboard's LMS in collaboration with Box's online file sharing and content management system. Understanding what students find positive or what the current limitations of these technologies are is important when looking to improve Pitt's EdD blended program. In addition to this, identifying what other multimedia technologies students prefer to use when working collaboratively on group projects and assignments will allow for more options and a better student online learning collaboration experience throughout the EdD program.

The evolution of technology has created new types of learning communities in which students can share expertise, understanding, and common values (Parsons and Ross, 2002). The technology used in the online component of blended learning needs to be considered when designing courses for students. Although there is no one-size-fits-all technology in blended learning, instructors need to know and have the ability to use technology that the majority of the students prefer when designing collaborative group or individual projects.

2.0 LITERATURE REVIEW

Researchers have documented students' perceptions of the pros and cons of online learning. To better understand students' perceptions on how to improve the online collaboration activities, they are tasked with when doing group projects in Pitt's EdD program. The literature on students' perceptions on the cons of online learning was reviewed. The goal of this review was to 1.) Identify what the literature indicates are barriers to online learning; 2.) To learn if some of these barriers also impact online collaboration, and 3.) To discover if these barriers can be overcome and turned into learning opportunities through the use of online multimedia technologies. Previous studies found online learning barriers in the following areas: 1) age (Rekkedel, 1983), 2) students' experiences with learning technologies (Hara, 1998; Hara & Kling, 1999; Koohang, 1989), 3) technology adoption and ease of use (Holloway & Ohler, 1991; Sherry, 1996; Talab & Newhouse, 1993), 4) learners support and technical problems leading to frustrations (Barron, Ivers, & Sherry, 1994; Yang & Durrington, 2010), 5) gender (Chen, 1986; Teo & Lim, 2000; Young, 2000), 6) learning effectiveness in the online space (Mungania, 2003), and 7) quality of online learning and programs (Biggs, 2003; Entwistle & Ramsden, 1983; Laurillard, 2002; Marton & Säljö, 1976a, 1976b; Mihai, 2009; Prosser & Trigwell, 1999; Ramsden, 2002).

2.1 DISTANCE LEARNING METAMORPHOSIS

In discussions of the origins of distance education, the common theme is that teaching and learning actions are performed via communication technologies and mailing services by teachers and students who are in different environments (Isman, 2005). Alkan (1998) defined the distance education as a teaching method provided through the varied environment and teaching units that interaction and communication between the planners and practitioners of educational, traditional teaching and learning methods activities and students have been specifically prepared for conditions that limit the application of classroom activities. Moore and Kearsley (2005) indicated that distance learning removes geographical barriers to engage learners at a distance. Over the years with significant improvements in ICT, many educators are incorporating technology into their courses.

Many people assume that online education is a relatively new phenomenon, perhaps due to the technology that is used to produce and deliver it; however, due to the evolution in ICT, online education has morphed from the traditional distance education where the first courses are estimated to date back to 1728, and the medium of communication was a newspaper (Arap, Ozcan & Tavukcu, 2011). Arap et al. (2011) proceeded to say that from the newspaper, distance learning moved to letters in 1833, in 1906 the post office, in 1919 the radio, in 1932 TV broadcast, and in 1986 computer conferencing via electronic mail. The evolution of technology has provided distance education options to be multifaceted and can be in the form of CD-ROM, interactive webinars, videos, podcasts and e-learning courses (Abd-Elseyed & Lawrence, 2013). The evolution of technology has allowed the creation of modern day blended courses and programs.

2.2 BLENDED LEARNING

According to the Educause Learning Initiative (2012), many institutions are having blended learning conversations, and the popularity of blended learning is attributed to the ongoing development of technology communication systems. Ellis and Goodyear (2010) made a similar point when they asserted that "the use of ICT in higher education makes it possible for universities to offer students much more flexible access to learning resources' (p. 2). The growth of blended learning can be attributed to issues with the early versions of e-learning where computer technologies were used mainly to improve the distribution of learning content (Hoic-Bozic, Mornar & Boticki, 2009). Finally, the growth of blended education can also be credited to the pressure of institutions seeking to increase participation and widen access to higher education (Jones & Lau, 2010).

Blended courses provide students the opportunity to take ownership of their learning, interact with other students, which support an environment for collaborative learning, and provide the instructors numerous opportunities to assess students' knowledge gaps and address them while the content is being studied to enhance the real-time learning experience (Hawks, 1996). Some scholars such as Masie (2006) defined blended learning so broadly that "all learning is blended learning!" (p. 22). Graham's (2006) definition of blended learning is: "blended learning systems combine face-to-face instruction with computer-mediated instruction" (p. 5), which presents blended learning as a mixture of traditional face-to-face learning and distributed learning systems placing emphasis on the use of computer technologies. Blended learning is also defined as the integration of useful aspects of online and face-to-face learning environments where students and teacher interact both with and without the use of technology (Garrison & Vaughan, 2008; Tselios, Daskalakis, & Papadopoulou, 2011). Blended learning is

an approach that combines different delivery methods – online and face-to-face – and caters to various styles of learning (Wu, Tennyson, & Hsia, 2010). The ‘blend’ can involve the use of any form of instructional technology in combination with classroom teaching. Tselios et al. (2011) argued that “blended learning provides the opportunity to integrate advantages offered by online learning with the best practice and benefits of traditional learning (p. 225).” Blended learning is more than a simple integration of new information and communication technologies with face-to-face activities (De George-Walker & Keeffe, 2010).

At the same time, I believe blended learning provides working students a unique opportunity to learn courses provide an education model that requires students to participate in active learning via short video lectures, podcasts, e-learning materials and knowledge exchange among students in a collaborative learning environment. Students are tasked to read, view or listen to the main concepts before any online or face-to-face meeting. In Pitt’s EdD program, the majority of the learning takes place online. Students work and engage for four weeks online and formally meet as a class face-to-face once a month on a Saturday. For students to view course material and assignments, access to the Internet is required. The course content and assignments must also be accessible via different platforms like smartphones, tablets, e-readers and computers so as to increase access to the course material. The literature highlights some of the benefits of blended learning students enjoy.

2.2.1 Benefits of blended learning

Most of the literature views blended learning with the following positive attributes: (1) flexibility, (2) high activity/personal involvement, (3) ability to use simulations, and (4)

collaborative learning (Sexton, et al. 2000; Kunkler 2006; El Mansour & Mupinga, 2007; Garrison & Vaughan, 2008; Passiment, et al. 2011 & Moore 2014).

2.2.1.1 Flexibility

The flexibility regarding scheduling courses, online interaction and the instructors' availability attract many students to blended learning (El Mansour & Mupinga, 2007). Blended learning provides students the opportunity to achieve quality student-to-student and student-to-instructor interactions (Garrison & Vaughan, 2008). Students in blended courses are not constrained by time and space limitations like those who are enrolled in face-to-face courses (Beckwith & Cunniff, 2009; Olapiriyakul & Scher, 2006). Additionally, the blended model of education incorporates learning technologies into the educational experience, which allows students to take charge of their learning process (Biddix et al., 2014; Brunner, 2006).

According to the National Online Learners Priority Report conducted by Noel-Levitz (2014), convenience, flexible pacing for completing a program, and work schedule each contributed to the decisions of more than 90% of students who chose online education options.

As technology continues to evolve, with it comes opportunities to improve institutions. Grummon (2011) introduced the moving data storage, and some software functions to the cloud earn savings for many institutions. As electronic delivery of books, journals, and data continue to be experimented with on campuses as a way of keeping costs of education for students low (Grummon, 2011), improvements in multimedia technology should also be evaluated.

2.2.1.2 High activity/personal involvement

Blended learning, if utilized well, can close any collaboration gap amongst students and between students and instructors (Li-Ling, 2011). Learning communities can develop if students interact effectively during blended learning (Qiuyun, 2008). Garrison and Kanuka (2004) supported the learning communities' idea by highlighting the advantages of blended learning in creating a better sense of community without sacrificing high academic standards.

2.2.1.3 Ability to use simulations

Simulations bridge the gap between the classroom and the world of real-life business decision-making through experiential learning experiences in which students design, implement, and control business strategies (Romme, 2003). For students to acquire a real world arduous and relevant education, institutions need to make sure they are providing course material that explores current or up-and-coming concepts (Ed Week Staff, 2008; Oblinger, 2005).

2.2.1.4 Collaborative learning

Effective collaborative learning in blended programs is a successor of quality course design, and the importance of the design aspects of blended learning approaches is fundamental to supporting collaborative learning (Aldrich, 2006). The fundamental reconsideration of course design in light of new instructional and media choices and the learning strengths and limitations of each are important to facilitating a valuable collaborative space for students (Voos, 2003).

At the same time that I believe blended learning provides students all these advantages, I also believe that quality and effective student-to-student and student-to-instructor collaboration would improve the student learning experience of blended courses and programs.

2.3 ONLINE COLLABORATIVE LEARNING

The evolution of technology has allowed the higher education industry to create blended programs that utilize learning technologies such as Blackboard and WebCT to hold online lectures (Derntl & Motschnig-Pitrik, 2005; Olapiriyakul & Scher, 2006). Further advances have seen the use of free social networks for educational purposes like Wikispaces, Facebook, Twitter, LinkedIn, Skype, Google Plus Hangouts, Google Drive, iTunes U and YouTube (Steinberg 2013; Daniels, 2016).

Although these free social networks are available to many graduate students at Pitt, a study on the use of the popular Facebook site on achieving virtual collaborative group work by Fernández (2012) showed that an option for developing attachments or uploading non-video files with other extensions did not exist on Facebook. The lack of file sharing ability makes it difficult to complete graduate level online collaborative group work. Another issue identified was the inability of students to integrate Facebook to their work emails. As a result, the ability to address open action items on time from other virtual team members was impacted.

With free social networks, concerns around user personal data security and patterns of use arose. Lucas and Borisov (2008) pointed out that the centralized architectures of social networking websites require information transmission to go through central servers operated by Internet service providers. The benefits of the centralized architecture to the organizations that own these sites stem from controlling personal users' information and data to being able to build marketing profiles. However, as education institutions deal with big data in the 21st century like the exchange of sensitive student data both internally and externally, many institutions have invested in secure cloud-computing services like SharePoint or ServiceNow to exchange data

over such networks. Secure cloud-computing services minimize the breach of institutional data from technology criminals.

2.3.1 Collaboration theories

The literature indicated that most of the research on collaborative learning is rooted in the work of Piaget and Vygotsky (Dillenbourg, Baker, Blaye, & O'Malley, 1996). However, Estep (2002) argued that educators in the West have long embraced Piaget's work on cognitive constructivism, but little attention has been given to Vygotsky's model of social constructivism.

2.3.1.1 Cognitive constructivism

Piaget (1968) rejected the idea that learning was the passive assimilation of given knowledge and instead proposed that learning is a dynamic process comprising successive stages of adaption to reality during which learners actively construct knowledge by creating and testing their theories of the world. According to Piaget, children progress through a series of the following four critical stages of cognitive development (1) sensorimotor stage, from birth to age 2, (2) preoperational stage, from age 2 to about age 7, (3) concrete operational stage, from age 7 to 11, and (4) formal operational stage, which begins in adolescence and spans into adulthood (Cherry, 2017).

During the sensorimotor stage, from birth to age 2, children obtain knowledge through their sensory experiences and by manipulating objects. At the preoperational stage, from age 2 to about age 7, children learn through pretend play, but still struggle with logic and other people's point of view. At the concrete operational stage, from age 7 to 11, children start thinking more logically. However, they often struggle with abstract and hypothetical concepts. Children in the

concrete operational stage start to understand that their thoughts could be unique to them and not everyone shares the same thoughts. The final stage of Piaget's theory the formal operational stage, which begins in adolescence and spans into adulthood indicates children's logic increases. They have the ability to use deductive reasoning, and they have the capacity to understand abstract ideas (Cherry, 2017).

The key stage of Piaget's cognitive development in online collaborative learning is the formal operational stage. Students having the ability to utilize deductive reasoning, understand abstract ideas and having the capability to view complex group projects with multiple solutions could be a great asset when teams are working towards completing assignments.

2.3.1.2 Social constructivism

Social constructivism is both a social and cultural model of learning. Learning is influenced by both the culture in which the individual lives as well as the social process that shapes an individual's experience (Estep, 2002). In essence, Vygotsky believed that learning takes place in the context of a community. This collectivist approach stands in sharp contrast to Western theorists like Piaget who argue that learning is both individualistic and biologically developmental (Powell & Kalina, 2009).

Although online collaboration during group work or projects aligns closely to social constructivism, working students at graduate level courses bring with them some cognitive constructivism they have experienced in their lives and careers to their collaborative tasks. EdD courses like the Higher Education Institutional Strategic Planning designed around students examining current external trends impacting higher education institutions in America and developing strategic plans to address some of these trends as an institution allows students to bring their experiences to the collaboration projects. Students, who are or have been involved

with institutional strategic planning, bring to their group's real life and professional experience that students who have never been involved with strategic planning can learn from them. These experiences allow students to engage and debate amongst themselves as they work to solve complex group tasks. How these ideas are communicated and exchanged relies a lot on the multimedia technology used by students. Preceding research advocated that it is important to provide distance learners with multiple channels, both synchronous and asynchronous, to accommodate their preferences for different communication styles (Curtis & Lawson, 2001). In particular, the availability of synchronous communication tools appeared to be critical in the process of collaborative learning (Carr-Chellman, Dyer, & Breman, 2000).

Cognitive and social constructivism collaboration theories play a major role in online collaborative learning. The ability for students to apply critical thinking to abstract ideas and combine social and cultural experiences to complex their group projects could improve the online collaborative learning experience. The next section of this paper highlights some of the literature's key technology components needed when deciding the most robust online collaboration technology institutions should consider when designing their blended learning platforms.

2.4 QUALITY ONLINE COLLABORATION

As clarified by Harvey and Green (1993) 'quality' in higher education varies for different stakeholders and can be defined, improved and assured in a myriad of ways. Quality can be defined as an educational system in which the learner has a reasonable opportunity for success (Ragan & Sax, 2005), or as Gibbs (2010) helpfully noted, quality can be assessed along these

two parameters: (1) student engagement and (2) learning outcomes, which, while already reasonably well-examined (Coates 2006, 2013), are in need of even more sustained attention. Quality, in this interpretation, measures whether students, hence institutions and systems, are performing at appropriate levels and ways. Questions like: ‘Is student online engagement ‘good enough’? ‘Are student online learning outcomes ‘good enough’? fall under this conception of quality in higher education. Such questions are, of course, far from an exhaustive treatment of higher education quality but rather, in this study, matters that speak to the main pressures in the contemporary contexts of trying to understand what working graduate students in a blended course or program perceive as a quality online collaborative space when working on group projects.

Expectations are another critical link to assessing student satisfaction, a measure of the quality of higher education. To date, most studies have assessed satisfaction as a posteriori measure; that is, satisfaction is measured by a single item at the completion of the online course (Comm & Mathaisel 2002; Cobb 2011). With a blended learning program that meets face-to-face once a month, the instructor does not have to wait four weeks before the face-to-face meeting to check on the students. With improvements in technology and access to various digital meeting opportunities, course checkpoints by instructors can be introduced early during the online sessions rather than waiting for four weeks. Checkpoints can allow for feedback on the clarity of project expectations, what is working or what could benefit from reassessing or updating. Providing digital meeting opportunities can help create a culture of effectively collaborating amongst students and with instructors. This sort of nimbleness and ability to change in a timely fashion during a semester would contribute to improving the online collaboration for students

and instructors as they form partnerships to work on challenging group projects and assignments in blended online courses and programs.

2.4.1 Collaborative technology – Simple, interactive, engaging, and enhancing

The development of a virtual campus is often based on the social constructivist theory, which supports an idea that tools for learning should be applied so dynamic and flexible environments are created and so that learners can develop their knowledge also through virtual communication (Kybartaitė, Nousiainen, & Malmivuo, 2013). Blended learning relies considerably on virtual communication when students and faculty are not in the face-to-face classroom. Students' online collaboration needs are crucial to designing blended courses. Establishing these preferences can provide evidence-based guidance on what collaborative technology institutions should incorporate.

Buzzetto-More (2008) reported that student attitudes towards technology are influential in determining the educational benefits of online learning resources and experiences. According to Han, Nelson, and Wetter (2014), understanding how technology is embedded in students' lives, its usefulness, and how it can be repurposed for learning is necessary. Knowing this can help institutions make the right technological selection, and blended learning design that can be integrated with the technology students bring with them to their courses and programs.

No collaboration technology is perfect, but depending on students' needs, some are better suited than others, so administrators have to evaluate what would serve both the students and their institution best. Selecting the right technology is essential to students' quality of collaboration learning experience. The technology and software chosen by an institution should be simple to navigate and robust enough to allow effective collaborative platforms for students,

faculty and the online facilitators a chance to exchange ideas, data, and links that facilitate learning and improve student outcomes.

Oliver et al. (1997) suggested that the term, interactivity, describes the form of communication that supports enabling dialogue between the learner and the instructor and is an important attribute of technology-supported educational environments. Having meaningful and reliable communication mediums like email, Skype, social media networks, VoIP, phones, bulletin boards, chat and desktop conferencing are a great way of improving the input quality of distance learning. Interactivity results in a learner-centered instruction where the student's experience resembles a personal interaction with the instructor. Increased interaction improves students' achievement and attitudes towards learning (Bunyarit, Hussin & Hussein, 2009).

Interactive technology has allowed e-learning to move from textbook or classroom metaphor to more experimental learning models. According to Chandra (2002), such tools provide educators an opportunity to build into the course interactive, experiential exercises that allow the instructor to obtain a highly accurate image of the students' levels of understanding. Student engagement fades if there is no other purpose (Kolb, 2013). The technology should also allow students to do things they could not do if they were not on an online platform, and it should facilitate a deeper or different learning opportunity.

The gap between understanding what working graduate students enrolled in blended programs need, want, bring and value as useful student-to-student and student-to-faculty collaborative technology and what institutions consider important needs to be closed by enhancing research on this topic. Understanding this would help institutions better prepare and support its instructors through the design and implementation of blended courses and programs. Institutions would have data that can help them improve the program coherence needed when

implementing the blended education delivery model. The data gathered from this research could also provide institutions leverage when deciding the technologies and preferred vendors. Partnering with technology companies should be encouraged; often these relationships provide both parties a chance to design and develop new cutting edge technology or services that can be used to improve the blended learning online collaboration experience for students.

2.4.2 Conceptual framework

Collaboration development is the third of six principles that CPED has identified as a crucial skill needed by students in schools providing the CPED inspired EdD practitioner programs. In a Task Force Report on the Professional Doctorate (2007), the goal was to have the professional EdD represent preparation for the transformation of a field of professional practice, just as the PhD represents preparation for the possible transformation of the core knowledge in a discipline. The preparation of developing students into effective communicators and collaborators as they forge to build partnerships required to solve complex education trends are skills needed to address 21st-century education challenges.

Pitt's EdD program is delivered via a blended model with most of the student-to-student and student-to-instructor correspondence occurring virtually. With courses designed to utilize groups of students to address complex issues impacting education in America, finding ways how students and instructors can utilize multimedia technology to communicate and collaborate during group projects is important to the learning experience of this program.

Group projects with students from diverse professional backgrounds are the sort of settings that allow students to bring, share and apply their experiences to some of the simulations of the course. These situations provide rich opportunities for student-to-student learning and

engaging through communication and collaboration. Having the ability to utilize virtual multimedia technology and occasional face-to-face meetings provides an excellent opportunity for students and instructors to participate in these group projects. As this blended EdD program utilizes the online more than the face-to-face delivery model, understanding the students' multimedia technology needs and preferences when communicating and collaborating during group projects, provides the School of Education a chance to enhance the online collaboration component of this program.

3.0 METHODOLOGY

This chapter presents an overview of the research design, study participants, survey instrument and data analysis.

3.1 RESEARCH DESIGN

A mixed methods survey was used to understand students' multimedia technology needs and preferences when communicating and collaborating virtually during group projects. The purpose of the survey is to answer two research inquiry questions that focus on what online communication and collaboration multimedia technology is preferred between the EdD graduate students when doing group work and what online communication and collaboration multimedia technology is preferred by students when communicating and collaborating with instructors.

3.2 STUDY PARTICIPANTS

The EdD program at Pitt currently has the following three cohorts 2014, 2015 and 2016 with approximately 55 to 60 students enrolled in each cohort. The survey and data collection targeted the currently enrolled EdD student population for this study. The EdD program is part-time, and

the students enrolled into it work fulltime as education practitioners. The majority of the time students engage virtually with one face-to-face meeting each month for a total of four face-to-face meetings in a semester.

3.3 SURVEY INSTRUMENT

The data collection method was a mixed methods survey that includes both closed-ended and open-ended questions. The EdD population survey was developed with insights from peers, members of my research committee and the literature presented in Chapter 2. The closed-ended questions were targeted at getting specific data like the Area of Concentration (ARCO), cohort year, communication, and collaboration preferences. Moreover, open-ended questions target capturing any emerging online communication and collaboration needs and themes. The survey was administered to the current EdD students enrolled in 2014, 2015, and 2016 cohorts who represent eight main ARCOs: Through a presentation style format that was open to question and answers, findings were shared with my research committee members during my dissertation defense. The committee members are members of the School of Education's EdD Committee and program instructors. The hope was through these findings, the School of Education's EdD Committee and instructors can enhance the student-to-student and student-to-instructor online collaboration component of this program.

Surveys are a common data collection instrument used to identify students' perspectives on blended learning (Akkoyunlu & Soylu, 2008; Blankson & Kyei-Blankson, 2008; Kember, McNaught, Chong, Lam, & Cheng, 2010; Waha & Davis, 2014). With the help of an advisor and research committee, a self-administered online survey that contains two open-ended and 12

closed-ended questions were developed and used to collect some quantitative and qualitative information from the students enrolled in the EdD program at the time of the study. The design of the survey allowed the collection of quantitative and qualitative data.

Survey questions 1 and 2 captured the background of the students (cohorts and ARCO). Questions 3, 4, 5, 6 and 7 answered inquiry question 1, which asked: “What online communication and collaboration multimedia technology is preferred during student-to-student group work?” Survey question 8 addressed the technology needs students have when using communication and collaboration multimedia technology during group assignments. Survey questions 9, 10, 11 and 12 answered inquiry question 2: “What online communication and collaboration multimedia technology are preferred by students when communicating and collaborating with instructors during group work?” This question analyzed asynchronous and synchronous communication, the two main preferred types of interaction used in blended learning as well as the multimedia tools students preferred to use. Question 13 was a scaled question that assesses whether online communication and collaboration multimedia technology have been an essential component of the student-to-instructor communication throughout this blended EdD program. Question 14 is an open-ended question that allows students to provide additional communication and collaboration multimedia technology information that was not covered in the survey. Information from question 14 helped identify any emerging themes from the survey that impact collaboration learning through multimedia technology. Table 13 in the appendix presents a summary of the research design that has been discussed in this chapter.

3.4 RECRUITING PARTICIPANTS

Various methods of recruiting were used to get students to participate. My initial plan was set out to study the 2014 Cohort. As a member of the 2014 Cohort in the Higher Education Management ARCO, I used the last face-to-face class of the 2016 summer semester to introduce my problem of practice topic to my peers and notify them to expect an online survey from me in the future. Upon meeting with my research committee in the fall of 2016, we felt it was best to also include the 2015 and 2016 Cohorts to my study so as to get a broader perspective of my study.

In the fall of 2016, I was a co-instructor to my advisor Dr. James Jacob. We taught the Higher Education Institutional Strategic Planning (ADMPS 3104) graduate course for the EdD Higher Education Management 2016 ARCO. I had the opportunity to share with these students what my problem of practice was and notified them to expect a survey from me shortly. As for the rest of the 2016 and 2015 Cohort, the notification went out through a regular email to all the students in the EdD program when the online survey was ready for deployment. The email formally introduced my problem of practice and included to the message was an informed consensus form notifying participants that all Institutional Review Board (IRB) protocols would be followed. Protocols like all the data collected would be anonymous and will be stored in a protected location, and their participation in the study had no foreseeable risks. All responses would remain anonymous and that their involvement would assist in furthering the study of blended graduate education with the possibility of improving the current student-to-student and student-to-instructor communication and collaboration learning experience quality of Pitt's EdD program.

3.5 DATA ANALYSIS

Basic statistics analysis was applied to the quantitative section of the survey, and content analysis was applied to the qualitative data collected from the survey. Frequency distribution was used to show the students preferred communication type, preferred communication multimedia technology, preferred multimedia collaboration technology cross-tabulated between Cohort and ARCO. Content Analysis is the categorization of text analysis. It analyzes the form and substance of the communication. Underlying meanings and ideas are revealed through analyzing patterns in elements of the text, such as words or phrases (Yang, 2008, p. 689). Here, texts are empirically coded based on a researcher's created coding system to make observations about the messages conveyed (Babbie, 1999, 286). A pattern is repetitive, regular or consistent occurrences of data that appear more than twice (Saldana, 2013).

Patterns were established by exporting my data from Qualtrics the survey tool to NVivo for Mac so as to organize the qualitative data into theme nodes. Patterns could have been identified through exporting to Word or Excel, however, due to my curiosity in education technology, I preferred to use NVivo. NVivo is a qualitative data analysis software package produced by QSR International, an Australian company. It has been designed for qualitative researchers working with multimedia information where deep levels of analysis on small or large volumes of data are required (Wikipedia, 2017). The qualitative theme nodes created in NVivo represented the topics found from my survey data that addressed the two open-ended questions. One question inquired what specific multimedia technology needs in regards to online communication and collaboration would help students complete the EdD program and the second

open-ended question was aligned to identifying any additional multimedia technology communication and collaboration that has not covered in the survey.

Through content analysis applying inductive reasoning was used to analyze data from students' open-ended questions and additional comments in the closed-ended questions (Saldana, 2013). Utilizing the node functionality in NVivo for Mac, I was able to systemically group student's responses into the following main themes (1) flexibility and convenience, (2) technology training, (3) technology limitations, (4) video conferencing, (5) video and audio podcasts, (6) Internet access, and (7) communication and feedback. The next section shows the results of my online survey.

4.0 RESULTS

Students from 2014, 2015, and 2016 EdD cohorts participated in this survey. The survey was sent to 189 EdD students listed on the University of Pittsburgh's (Pitt) education website. According to the EdD Education website, the 2014 Cohort had 61 students, the 2015 Cohort had 63 students, and the 2016 Cohort had 65 students. However, Pitt's education website does not have an updated list of which students are no longer active or have taken a temporary leave of absence from the program. Of the 189 students who received the electronic survey via email, 103 students started the survey and 98 completed the survey. Table 1 below shows the breakdown of the survey responses by ARCO and cohort.

Table 1. Survey Response Breakdown by Cohort and ARCO

		EdD Area of Concentration (ARCO)								Total
		Higher Education Management	Education Leadership	Language, Literacy, and Culture	Science, Technology, Engineering, and Mathematics	Social and Comparative Analysis in Education	Special Education	Health and Physical Activity	Out-of-School Learning	
EdD Cohort	2014	8	13	9	2	5	4	0	0	41
	2015	6	6	6	3	4	2	0	0	27
	2016	11	5	3	1	4	5	4	0	33
	Total	25	24	18	6	13	11	4	0	101

The initial research design included performing a cross tabulation between cohort and ARCO to see if there were noticeable multimedia technology needs and preference differences

between 2014, 2015 and 2016 cohorts and ARCOs. However, during the data analysis, I found that there were no noticeable multimedia technology needs and preference differences between 2014, 2015, and 2016 cohorts and ARCOs.

The research question, “What online communication and collaboration multimedia technology are preferred during student-to-student group work?” was answered through survey questions that were both open and closed-ended. The questions provided a list of common synchronous and asynchronous communication and collaborative applications that are being used in the EdD program and were identified in the literature. Students were asked to select the applications they used and preferred. With new technology constantly arising, students were given the option to list any application they used or preferred that was not provided to them as an option to select.

Students were asked if they communicated with team members during group projects. Of those students, 100% responded that they communicated amongst each other during group work. Varieties of common collaborative synchronous communication applications identified in the literature and from personal use as a student were listed on the survey instrument. The applications included Skype, Microsoft Lync, Google Hangouts, FaceTime, Slack, and Zoom. Students were asked what synchronous communication applications they used when communicating with other students during group work. Table 2 presents the types of synchronous applications used among students during group projects across the three cohorts.

Table 2. Used Student-to-Student Synchronous Applications by Cohort

		Used Synchronous Applications							Total
		Skype	Microsoft Lync	Google Hangouts	FaceTime	Slack	Zoom	Other (GoToMeeting & GroupMe Chat)	
EdD cohort	2014	10	1	37	7	0	1	11	39
	2015	13	1	19	3	0	2	8	26
	2016	3	0	19	2	0	1	15	28
	Total	26	2	75	12	0	4	34	93

Table 3 presents the type of synchronous applications used among students during group projects across the ARCOS.

Table 3. Used Student-to-Student Synchronous Applications by ARCO

		Used Synchronous Communication Applications							Total
		Skype	Microsoft Lync	Google Hangouts	FaceTime	Slack	Zoom	Other (GoToMeeting & GroupMe Chat)	
EdD Area of Concentration (ARCO?)	Higher Education Management	9	1	24	1	0	2	7	24
	Education Leadership	3	0	19	2	0	0	5	23
	Language, Literacy, and Culture	7	0	11	4	0	0	5	15
	Science, Technology, Engineering, and Mathematics	2	1	5	2	0	0	2	6
	Social and Comparative Analysis in Education	2	0	9	0	0	2	6	11
	Special Education	3	0	7	3	0	0	6	11
	Health and Physical Activity	0	0	0	0	0	0	3	3
	Out-of-School Learning	0	0	0	0	0	0	0	0
	Total	26	2	75	12	0	4	34	93

In the open answer option where students were asked to provide additional applications that had not been covered by the survey, an interesting insight into the GroupMe mobile group chat application appeared. GroupMe is a mobile application that works on smartphones powered by Apple's iOS, Google's Android, and Microsoft Windows operating systems (GroupMe, 2017). GroupMe can be used as a synchronous or as an asynchronous communication application. Despite the GroupMe application's existence since 2010 (Wikipedia, 2017), students from the 2016 cohort had 15 users, 2015 had two users, and the 2014 cohort had zero GroupMe mobile group chat users.

Survey question 5, a closed and open-ended question which was a follow-up on question 4, looked to identify the students' preferred synchronous application. Students were asked, based on the synchronous communication applications they had used or are using, what they preferred during group projects. Students were asked to select one of the applications listed in the question, and if none of the options provided represented their preference, they were provided an option to write in the application of their choice. When designing the survey, I thought students from the different cohorts and ARCOs might prefer different synchronous communication applications. However, there was no notable difference, as shown in Tables 4 and 5.

Table 4. Preferred Student-to-Student Synchronous Applications by Cohort

		Preferred Synchronous Communication Applications.							Total
		Skype	Microsoft Lync	Google Hangouts	FaceTime	Slack	Zoom	Other (GoToMeeting & GroupMe Chat)	
EdD cohort	2014	1	0	32	1	0	2	2	38
	2015	1	1	15	3	0	1	5	26
	2016	0	0	15	2	0	0	10	27
	Total	2	1	62	6	0	3	17	91

Table 5. Preferred Student-to-Student Synchronous Applications by ARCO

		EdD Area of Concentration (ARCO)								Total
		Higher Education Management.	Education Leadership	Language, Literacy, and Culture	Science, Technology, Engineering, and Mathematics	Social and Comparative Analysis in Education	Special Education	Health and Physical Activity	Out-of-School Learning	
Synchronous communication application	Skype	0	0	2	0	0	0	0	0	2
	Microsoft Lync	0	0	0	1	0	0	0	0	1
	Google Hangouts	21	16	11	3	7	4	0	0	62
	FaceTime	0	1	2	2	0	1	0	0	6
	Slack	0	0	0	0	0	0	0	0	0
	Zoom	1	0	0	0	2	0	0	0	3
	Other (GoToMeeting & GroupMe Chat)	2	5	1	0	2	5	2	0	17
	Total	24	22	16	6	11	10	2	0	91

The findings on student-to-student asynchronous collaboration applications used to exchange information were: 91 of the students used email, 83 used Google Drive, 73 used Blackboard Discussions, 54 used Box, and 50 used Blackboard Wikis as noted in Table 6.

Table 6. Students-to-Students' Usage of Asynchronous Applications by ARCO

		EdD Area of Concentration (ARCO)								Total
		HEM	Education Leadership	LLC	STEM	SCAE	Special Education	Health and Physical Activity	Out-of-School Learning	
Asynchronous applications used during collaboration with other students	Blackboard Wikis	7	20	9	3	4	4	3	0	50
	Blackboard Discussions	18	16	14	6	6	9	4	0	73
	Box	17	8	4	4	7	10	4	0	54
	Google Drive	20	22	16	5	9	8	3	0	83
	Wikispaces	1	2	1	2	0	2	1	0	9
	Facebook	2	1	10	0	2	0	0	0	15
	Twitter	0	1	0	0	0	0	0	0	1
	LinkedIn	1	5	0	0	2	0	0	0	8
	Email	21	21	17	6	12	10	4	0	91
	Other (GroupMe, Panopto, Office 365)	8	0	3	2	3	3	1	0	20
Total		24	23	18	6	12	11	4	0	98

Of the asynchronous applications listed in Table 6 that students used during student-to-student group work collaboration throughout the EdD program, students' preferences are listed in Table 7 below.

Table 7. Student-to-Student Preferred Asynchronous Collaboration Applications

		EdD Area of Concentration (ARCO)								
		HEM	Education Leadership	LLC	STEM	SCAE	Special Education	Health and Physical Activity	Out-of-School Learning	Total
Asynchronous collaboration applications	Blackboard Wikis	0	3	0	0	0	0	1	0	4
	Blackboard Discussions	6	5	7	3	4	3	2	0	30
	Box	12	1	3	0	3	4	0	0	23
	Google Drive	15	17	11	3	5	8	1	0	60
	Wikispaces	0	0	0	0	0	0	0	0	0
	Facebook	1	0	7	0	1	0	0	0	9
	Twitter	1	1	0	0	1	0	0	0	3
	LinkedIn	0	0	0	0	0	0	0	0	0
	Email	7	6	9	1	7	4	2	0	36
	Other (GroupMe, Panopto, Texts)	4	0	2	2	1	4	1	0	14
Total		24	23	18	6	11	11	4	0	97

There was no noticeable difference between the student-to-student asynchronous preferred collaboration applications. Students across all three cohorts preferred the Google Drive application as shown in Table 8.

Table 8. Student-to-Student Preferred Asynchronous Collaboration Applications by Cohorts

		Student-to-Student Preferred Asynchronous Collaboration Applications										
		Blackboard Wikis	Blackboard Discussions	Box	Google Drive	Wikispaces	Facebook	Twitter	LinkedIn	Email	Other (GroupMe, Panopto, Texts)	Total
EdD Cohorts	2014	1	9	6	31	0	7	0	0	16	4	40
	2015	1	9	5	14	0	0	1	0	10	4	26
	2016	2	12	12	15	0	2	2	0	10	6	31
	Total	4	30	23	60	0	9	3	0	36	14	97

In question 9, Students were asked about their student-to-instructor communication preference when working online and collaborating on group work assignments. Being a student and IT project manager who often utilizes synchronous communication because it allows project teams to clarify some of the complex challenges we encounter, I thought students would prefer the synchronous communication mode when communicating with instructors. However, to my surprise, students across all cohorts did prefer both the synchronous and asynchronous communication mode when engaging with instructors during group work as shown in Table 9.

Table 9. Student-to-Instructor Preferred Communication Mode by Cohort

		Student-to-Instructor Preferred Communication Mode by Cohort			Total
		Synchronous	Asynchronous	Both Synchronous and Asynchronous	
EdD cohorts	2014	1	7	32	40
	2015	1	3	23	27
	2016	1	9	21	31
	Total	3	19	76	98

In question 12, students were also asked what synchronous and asynchronous communication multimedia technologies they preferred when communicating with instructors during group work. Table 10 shows that students across the cohorts preferred the Google Hangouts application for their synchronous communication.

Table 10. Student-to-Instructor Preferred Communication and Collaboration Applications by Cohort

		Student-to-Instructor Preferred Communication and Collaboration Applications by Cohort															
		Phone	Skype	Instant Message Chat	Google Hangouts	FaceTime	Slack	Zoom	Blackboard Wikis	Blackboard Discussions	Box	Google Drive	Wikispaces	Podcasting Audio	Podcasting Video	Other (email, LinkedIn, Panopto, Office 365)	Total
EdD Cohorts	2014	9	10	9	25	7	0	2	3	14	7	19	0	2	3	2	32
	2015	11	5	7	13	2	0	1	1	10	5	8	1	0	0	4	23
	2016	8	1	2	12	0	1	1	0	5	4	4	0	2	2	1	19
	Total	28	16	18	50	9	1	4	4	29	16	31	1	4	5	7	74

Across the ARCOs, there was no notable difference in the preferred student-to-instructor communication and collaboration applications. The patterns were the same across ARCOs, as shown in Table 11.

Table 11. Student-to-Instructor Preferred Communication and Collaboration Applications by ARCO

		Student-to-Instructor Preferred Communication and Collaboration Applications by ARCO															Total
		Phone	Skype	Instant Message Chat	Google Hangouts	FaceTime	Slack	Zoom	Blackboard Wikis	Blackboard Discussions	Box	Google Drive	Wikispaces	Podcasting Audio	Podcasting Video	Other (email, LinkedIn, Panopto, Office 365)	
EdD Area of Concentration (ARCO)	Higher Education Management	8	2	2	20	2	1	1	0	4	6	8	0	1	1	3	20
	Education Leadership	3	2	6	11	2	0	1	1	7	2	11	1	0	0	0	17
	Language, Literacy, and Culture	6	5	3	5	1	0	0	0	7	2	4	0	0	0	0	12
	Science, Technology, Engineering, and Mathematics	2	0	2	1	1	0	0	1	1	1	2	0	1	1	2	4
	Social and Comparative Analysis in Education	2	1	2	9	0	0	2	1	4	2	2	0	1	1	1	9
	Special Education	5	6	3	4	3	0	0	1	5	3	4	0	1	2	1	9
	Health and Physical Activity	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
	Out-of-School Learning	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	28	16	18	50	9	1	4	4	29	16	31	1	4	5	7	74

Of the students who strictly selected asynchronous communications as their favored student-instructor mode of collaboration applications during group work, their preferred applications were very similar to those who chose synchronous and asynchronous communications.

In question 13, a scale-type question, students were asked when meeting online, how effective multimedia technology has been when communicating and collaborating with instructors during group work throughout the blended EdD program. Overall, this item found that multimedia technology plays an integral role in the program as shown in Table 12.

Table 12. Students' Perceptions on Multimedia Technology Communication and Collaboration Instructor Helpfulness

Level of Helpfulness	Percentage	Count
4. Helpful	39%	38
2. Slightly helpful	22%	21
5. Very helpful	18%	17
3. Neutral	15%	15
1. Not at all helpful	6%	6
Total	100%	97

4.1 STUDENTS' ONLINE COMMUNICATION AND COLLABORATION TECHNOLOGY NEEDS

This section combines the responses of the two open-ended questions that were in the survey. Question 8, asked students what their specific multimedia technology needs were when communicating and collaborating online. Question 14, asked students what additional multimedia technology information they would like to share that was not covered in the survey. The responses from these two open-ended questions provided the study participants an opportunity to provide more needs and preferences that may not have been covered in the survey. It made sense to combine the answers from the two questions because they provided the following emerging themes from their answers: (1) flexibility and convenience, (2) technology training, (3) technology limitations, (4) video conferencing, (5) video and audio podcasts, (6) Internet access, and (7) communication and feedback.

4.1.1 Flexibility and convenience

Sixteen survey participants indicated that flexibility and convenience were important needs in helping them work towards the completion of their EdD. Some students highlighted the importance of having simple-to-use technology that is robust enough to have multiple users accessing and updating collaborative documents as shown in the following responses:

- “I prefer an application or mode of communication that is relatively simple and allows each other to see changes/conversations in real time.”
- “The ability to simultaneously edit and contribute to shared documents is needed during online group work collaboration efforts.”

The capacity to have multiple team members editing or creating content simultaneously on a shared document was a common theme listed by students in the open-ended question. I have included a few selected examples from some notable students' responses here:

- "I need the ability to share documents and communicate with my team."
- "Access to documents in real time, so that multiple team members can edit documents simultaneously."
- "Cases in which students were required to use the wiki were difficult because only one student can edit at a time, whereas all team members can contribute at the same time on, say, a Google doc."
- "Platforms that will allow groups to discuss and edit assignments in real time, such as Google Docs and Google Hangouts."

Also, a second, related theme of the convenience of being able to access material on one's own free time emerged as shown by these students' responses:

- "I am in need of mostly asynchronous collaboration application(s) since my schedule does not always allow me to be online when my classmates are available."
- "I am so busy I don't check Blackboard Discussions like I should because my job is not in front of a computer."

Students in different locations utilized multimedia technology so as to communicate and collaborate with each other during group projects. Having the convenience of connecting through multimedia technology was indicated in the following responses:

- "my group needed a tool that would allow us to have conversations with each other even when we could not meet in the same physical space."
- "I need an app that connects me in real time when needed."

The flexibility and convenience of accessing course information or group project materials via mobile devices were a significant need for the student participants. Chat applications where students can engage synchronously and asynchronously depending on their availability provided additional flexibility. Some students shared responses that support the importance of mobile devices in this program as shown in the examples below:

- “The emailing is great because it comes to my phone.”
- “Most of the collaboration happens through smartphone. We use iMessage, What'sApp, and GroupMe.”

The ability to have a blended program that provides its students a wide range of tools to access their course material and options to engage and collaborate amongst peers and instructors through different multimedia technology is an integral component of this program. The results of the survey support the appeal of the flexibility component of students in blended courses not being constrained by time and space limitations (Beckwith & Cunniff, 2009; Olapiriyakul & Scher, 2006). The results also showed that, through the use of technology, students were able to take charge of their learning process due to groups deciding when to meet and selecting what applications to use for their communication and collaboration exercises (Biddix et al., 2014; Brunner, 2006).

4.1.2 Technology training

The significant role technology plays in a blended graduate program that relies a lot on technology cannot be underestimated. An example of the importance of the use of technology was articulated in the quote below:

There is no way that you could manage this course without the use of communication and collaboration multimedia technology. It is a component of the program that is not “directly” listed as a requirement, but without it, it would be nearly impossible to complete group projects or assignments to a level deemed satisfactory. Professors do not necessarily make this clear to students or support the level of need when it comes to using all the different modes of technology. It is a missing piece of the program.

Including technology in a blended program requires a certain level of technology skills on the part of students so that they can accomplish assigned tasks. Some students felt that training for both students and instructors was needed when trying to use unfamiliar applications. These students’ responses support the idea of technology training:

- “I would have liked more training on Blackboard and Wikispaces.”
- “I am a quick learner with technology, but for those that it does not come easily, it can be exceptionally challenging.”
- “I think they should offer mini training sessions for students that are not familiar with technology.”
- “Instructors should learn how to use technology more effectively.”
- “Some instructors are very comfortable and flexible with online collaboration and communication while others are not. It is frustrating when there are more efficient programs/methods of communication that would make online collaboration easier for the group but the instructor is not flexible with the technology.”
- If this program is going to be promoted as a blended program, then faculty need to engage in yearly technology training. It is unacceptable to be taught in a blended format by someone who has little technology know-how.”

This finding of the need for training for students and instructors indicated in the results supports what the literature indicates. The intensive use of technology highlights the significance of Jones et al. (2009) continuum of blended learning. The more intense the technology use, the more the need for technology training for the new students and instructors joining the program. The LMS should have the ability to integrate seamlessly with some modern communication and collaboration applications so as to allow students to navigate, engage, and collaborate with their peers and instructors. If instructors understand the capacity of the LMS, instructors would have the ability to design interactive courses and experiential exercises for group or individual learning (Chandra, 2002).

4.1.3 Technology limitations

The task of trying to find a one-size-fits-all Learning Management System (LMS) is daunting. With several companies in the education technology space, there are various options to select. At the time of this study, the University of Pittsburgh's EdD program used Blackboard as their LMS. The results of the survey showed 19 students expressed some needs that the Blackboard LMS were missing from the program. These students felt that these missing needs would help them navigate through the coursework and program better. The following are a few selected comments that assist in determining the areas students felt that Blackboard's LMS could be improved either via enhancement of the technology or through instructor course setup:

- "Better system of notification when you have a new message or someone has made a change to a document, Instant messaging function."

- “Using the Blackboard Wiki function is challenging. I strongly prefer Google Drive for any collaborative assignment.”
- “Blackboard needs to be either updated or replaced. It is archaic and clunky.”
- “The format of the discussion boards sometimes fell flat. A format in which it feels more like a real conversation may have been more beneficial. Or a middle ground between these two formats.”
- “The Blackboard feature is helpful in navigating the EdD courses, but it should be suggested that a more uniformed format is followed across the courses (requirements and setup on the technology component) in order to make it easier on the students. “
- “Standard operating procedures for all courses. A more realistic goal might be standardization amongst faculty teams teaching one course.”

The survey also identified that sometimes the choice of synchronous communication technology was limited to the number of the group members. Although the popular free Google Hangouts synchronous communication application was the preferred application of choice, project group sizes impact the use of this application. The restriction of the number of users in some of the applications is a limitation of technology that users need to be aware. Therefore, courses that had large project groups opted to use other voice or video conferencing applications like GoToMeeting as long as a member of the team had a paid subscription.

4.1.4 Video conferencing

Some students expressed that the availability of video conferencing during the scheduled face-to-face monthly meetings and video podcasts would enhance the blended learning experience. The following students' responses support this idea:

- “It would be great if we had video conference capability to use when/if we have to miss an in-person class.”
- “For me, a combination of space to video chat periodically, a space for online and ongoing document collaboration, and regular email is what worked best.”
- “I think utilizing video chat has been very helpful with collaboration.”

The ability for students to also engage with instructors through video conferencing during group work provides students and instructors an opportunity to clarify or make adjustments to the group projects providing students an opportunity of an enhanced online learning experience, demonstrated by the following student comment:

- “I would have liked more interaction with faculty in between classes via video conference applications. I think we have a very simplistic view of online education. Given the amount of technology available and the way us students process information, online blogging seems a bit antiquated.”

4.1.5 Video and audio podcasts

Seven students felt that video and audio recordings by instructors were beneficial to their learning. Below are a few examples of the students' responses that highlight the value of video and audio recordings.

- “I like the recorded videos that our professors made. It is easier for me to obtain information when it is explained verbally...it would have been very helpful if online communication were more interactive through videos or lectures in real time.”
- “I think it would be great to have our classes videotaped especially if a student cannot make class due to a work engagement.”
- “I just wanted to follow up on the podcast idea. I think that would be a very helpful tool for faculty to utilize. I know that I use podcasts for my learning outside of the classroom environment, and I find it both extremely helpful as well as convenient for a working schedule. I would support increases in these tools.”

4.1.6 Internet access

The multimedia communication and collaboration technology applications used in this program required students and instructors to have access to online technologies to engage in group work. Students indicated that a fast, reliable Internet connection was necessary during the use of video conferencing applications when working collaboratively during group work. One student commented that having fiber optics Internet provided them faster connectivity at home when communicating and collaborating during group work. Another student indicated that having access to course materials and project work anywhere and at any time was essential to completing the EdD program.

4.1.7 Communication and feedback

Students were asked in the last survey question, which was the second open-ended question, to share any additional online communication and collaboration multimedia technology that was not covered in the survey. Seventeen students pointed out possible opportunities for improvement with the current instructor to student communication and feedback mechanisms. Opportunities ranged from turnaround time it takes to get feedback from some instructors to how the program information is disseminated to the students. The following comments support this finding:

- “There have been times that no response or a large delay with instructors responding to questions and concerns with projects and grading.”
- “In most of the other classes in the program, there was limited interaction with faculty outside of standard email or feedback delivered through Blackboard.”
- “Most professors have been wonderful with online communication. Some have been less engaged with online communication with students.”
- “Some faculty posted online lecture content and then regularly engaged in ongoing discussions (preferred), while others engaged only during face to face class time. For a hybrid program, it would be preferred if faculty construct the virtual space as much as the face-to-face space. In addition, clarity and consistency in communication is vital in such an online heavy program.”
- “Mixed messages from instructors was a common theme in the following scenarios: 1) instructors had different expectations between one another, evidenced in class and online 2) instructors gave different instructions/had different expectations than what was

presented in class or online, or vice versa. In this sense, the hybrid nature did not work well for me.”

- “It has been very inconsistent. Not all faculty have been tech savvy, which makes communication difficult.”

These participants expressed some of the challenges that come with online learning that is heavily reliant on online technology. Being able to have questions answered by instructors promptly was important to the participants.

As shown in the students’ responses, online collaborative work requires both synchronous and asynchronous communication. Students engage in synchronous communication when they schedule to meet online to discuss assigned projects and share documents through applications that are asynchronous in nature. The student-to-student and student-to-instructor preferred communication and collaboration applications were selected based on the flexibility and convenience, the ease of use or familiarity of the technology, the availability, and access to the technology. As students expressed why they preferred certain multimedia technologies as opposed to others during group work, we start to see why these technologies are preferred. The following items emerged from the survey as areas of the current blended EdD program that could use improvement: (1) Blackboard Learning Management System (LMS), (2) Project Group Sizes, and (3) Student-Instructor Communication and Feedback.

5.0 RECOMMENDATIONS AND CONCLUSION

The purpose of this study was to understand better what online multimedia communication and collaboration technology tools students need and prefer when working on group projects in a blended EdD program. The survey that was deployed generated data that highlight students' technology needs and preferred collaboration applications during student-to-student and student-to-instructor collaboration. Most likely because the program relies on the heavy use of multimedia media technology when working collaboratively, students felt the role of technology was necessary.

One recommendation would be to assess the level of technology training required using something similar to Jones et al.'s (2009) continuum of blended learning. The continuum ranges from no ICT use, then progresses through the most basic level of ICT used to support face-to-face teaching, and finally to intensive use, whereby the whole module is delivered online with minimal or no face-to-face interaction.

5.1 BLACKBOARD LEARNING MANAGEMENT SYSTEM (LMS)

The School of Education's EdD program uses Blackboard as an LMS where students and instructors engage and collaborate throughout the program. In online learning, students need tools that facilitate or improve the ability to communicate and collaborate during group projects.

Blackboard has features like the mobile collaborative application that works well for those users who prefer having access and like responding to course content via their mobile devices. However, one of the most notable limitations experienced with the Blackboard LMS in the survey was the lack of notification when content had been added to discussions or documents that students were developing. Notification alerts would allow quicker student-to-student or student-to-instructor responses that might improve engagement and collaboration.

As students and instructors work collaboratively on group or personal projects, the flexibility of technology applications plays a crucial role towards completing the program. Since students and instructors may have different needs and expectations during the program, the results of this survey indicate students prefer communication platforms like Google Hangouts that allow them to communicate amongst team members and instructors in real time. Students preferred a collaborative tool like Google Drive that allows multiple team users to edit and update shared documents simultaneously. Knowing the first three cohorts' multimedia technology needs and preferences can allow the School of Education to come up with a list that they can share with the IT and faculty LMS technology support team. The advantage of knowing what users need and prefer in an LMS could provide an organization a prioritized list of enhancements that they can share with a vendor during contract renegotiations. Upon receiving the enhancement list, Blackboard's Technical Account Manager assigned to Pitt can review the list with the hope of first identifying customer account configurations and application training opportunities.

If exploration of the configurations and enhancements fails, the daunting process of finding a new LMS that can easily integrate with other applications and can accommodate the students' and instructors needs for communication, collaboration and course management starts.

The list of students' needs and preference should be added to the overall identified LMS goals and expectations. Having these key features identified will help narrow down the vendor and application selection process.

Like many other technologies out there, instructors may not be using Blackboard to its full capacity. Before shopping around for the next new, expensive LMS, the technology support office could learn and share any configurations or enhancements that could be made to Blackboard so as to meet some of these students' needs.

5.2 PROJECT GROUP SIZES

Sixty-two of the student participants selected Google Hangouts as the preferred synchronous communication application because of its ability to handle both video and audio communication during group work discussions. Although Google Hangouts is popular with many students, this would only work well based on the number of students connected to a given video hangout session. According to the Google Hangouts Help page (2017), video calls can include up to ten people and 150 people in one Hangout chat group. The Hangout chat is when people are invited to an instant messaging group where participants can exchange messages synchronously and asynchronously. If students and instructors are planning group projects, it is important that consideration be given to the group size. Such planning would allow for a better online multimedia technology communication and collaboration experience with the right size of students in a group. However, if groups are large, finding technologies that handle larger groups is critical. Most free application providers that cater for smaller groups do offer options for larger groups, but these offers come with a fee.

Instructors and course designers should consider student group sizes as a limitation of multimedia technology as they design project assignments for students. Structuring group projects so that students are dependent on one another creates student interdependence (Johnson, Johnson & Smith, 1991). Complex projects often require a higher degree of communication and collaboration efforts. Instructors and course designers have the ability to design projects with manageable group sizes that allow for quality work. Some students expressed the following concerns about group sizes:

- “Technology that is more suited for large groups. Google chat is great, but not for more than five people.”
- “Blackboard is clunky, and the discussion boards are difficult to follow if more than 15 people are involved...smaller groups sizes, five people maximum.”

Some courses, especially the foundation courses, that had all the cohort students in them, had larger groups. The discussion boards and posts were a bit challenging to follow. Designing discussion board posts with the knowledge of having smaller groups could be beneficial. Dividing 55 to 65 students into manageable groups sometimes makes collaboration challenging especially for new students and instructors to the blended learning model for the first time.

5.3 STUDENT-INSTRUCTOR COMMUNICATION FEEDBACK

Student satisfaction and success are also enhanced by receiving timely feedback from their instructor (Kirby, 1999; Yukselturk & Yildirim, 2008). In contrast, delayed or limited feedback causes problems in student-instructor interaction (Kirby, 1999). Providing timely and detailed feedback in a blended program with many students could be challenging for new instructors

teaching in this model. Students' needs often differ, which makes the online learning feedback process challenging. Understanding that instructors have different preferences of engagement or feedback mechanisms, instructors and the EdD committee members working in collaboration should develop some feedback guiding principles and expectations. Students' needs and preferences should be factored in during the creation of these best practices.

Since working online provides students the flexibility of working on school assignments as a group or individually at any time of the day, faculty-to-student feedback expectations need to be set and articulated to the students. Although 76 of the students in this survey agreed that a mix of the synchronous and asynchronous mode of communication is the preferred student-to-instructor feedback channel, access to all communication and collaboration technology on-demand does not mean students will receive instant feedback. The course should be designed with virtual meeting hours with instructors. If a group submits a question or questions via asynchronously, instructors should be able to acknowledge at least they have received the asynchronous message within 24 hours. If the question or questions can be answered asynchronously, the instructor should work towards providing answers through this mode in 48 hours or sooner. If the question or questions are complex and require deeper engagement, then the instructor needs to acknowledge the receipt of the asynchronous message, and if the instructor has weekly virtual meeting hours, the instructor should ask the group or a few of its members to attend the designated virtual meeting hour. Team members can brief those unable to participate in the virtual meeting.

5.4 LIMITATIONS

The technical limitations of some of the students could have led to the dissatisfaction of Blackboard. The frustration of not being tech-savvy could draw people away from the new to a familiar technology they already use. The time it would take to learn a technology that is only used for school and not for work or any other day-to-day activities perhaps is a barrier for students to embrace Blackboard fully.

Being a member of the first cohort seeking to obtain feedback from peers and other students from the other two cohorts presented the opportunity to take a deep dive into one of the key elements of this EdD program; however, it also included some limitations. The challenge of being part of the program as a student and as an instructor was that I was heavily immersed and vested in the program and, thus, may have introduced bias in the study.

Another limitation experienced was the lack of follow-up questions that one cannot obtain immediately from some answers provided from the open-ended questions. For example, when a student responded to what multimedia technology he or she needed to complete the EdD program by stating that “more organized Blackboard pages would be helpful” or “Blackboard needs to be either updated or replaced because it is clunky,” not being able to ask for examples to better understand the challenges these students faced would provide better data for this study. Including a follow-up mechanism to questions that pertain to students’ technology feelings or including interviews to the data collection methods would have benefitted this study.

A few students displayed a lack of understanding of how blended learning is supposed to be delivered. An example of this is when students wanted to be able to interact simultaneously with other enrolled students and instructors via video or web conferences during the face-to-face meetings. This idea was brought up so students’ who were not able to make the once a month

face-to-face meeting would be able to still participate in those course sessions. This type of delivery is not part of the blended learning delivery model.

5.5 AN INSIDER'S REFLECTION ON THIS STUDY

It is important to note that as a student and an instructor in the EdD program, I was both an insider and an outsider. I experienced the challenges of technology preferences in group work as a student in different study groups across my coursework but also experienced the instructor side of splitting students up into groups and responding to their technology needs and preferences. This section reflects on my engagement with the themes and findings as well as my experience in both the student and instructor roles.

As an IT professional seeking to understand business challenges from an internal and external perspective and working collaboratively with other members of the organization to design, develop and implement technology solutions, I knew that the technology user experience was key to how we worked on our group projects. Some of the challenges I witnessed with some group or cohort members led me to see the opportunity to improve the online multimedia technology use in this program. I wanted to see the students excelling, the program growing, and the School of Education continuing to expand its reputation of being a world-class institution. Relevancy of the program is necessary so that many years down the road, my education qualifications are forever linked to an institution that has a sound reputation and commands respect from its peers.

The ability to stay objective required discipline from a research perspective when making interpretations based on the data gathered from the student surveys. With guidance from my

research advisor and members of the research committee, I hope this potential bias was managed, so any findings and recommendations provided are valid and of value.

5.5.1 Importance of Internet access

When I was in the major cities, I had few Internet connectivity challenges. However, when in rural parts of Kenya, video conferencing applications like Google Hangouts and Skype often froze due to the poor Internet mobile connections. Rural Internet connectivity does not only impact developing countries; it is a domestic issue here in America as well. For example, in some parts of Western Pennsylvania, where some EdD students may live or work, Internet connectivity could be a challenge. Therefore, when traveling even in the US, attempting to schedule synchronous group work sessions required participants to consider the locations where they would be connecting from and the type of communication medium (e. g. either video and audio or audio conference) they would select. Without Internet access, as a student or instructor, I would not have been able to carry out my responsibilities successfully.

5.5.2 Instructor feedback

Instructor feedback was a tool that I felt was relevant to my learning as a student in this program. However, when I was as an instructor for the Higher Education Management 2016 cohort, I quickly understood the feedback challenge from an instructor's perspective. Since many students do work in the evenings after coming home from work, they sent questions late at night. Since I was an instructor who was working as an IT professional during the day, it was not easy to address all the emails I received promptly. Sometimes the only chance I had to check my email

was the next evening. When this happened to me as a student, the feeling of anxiety provided additional stress to the daily activities of a student working full time while attending to family needs. As an instructor, I managed to make some adjustments with the hope of providing the students a better feedback experience. As the group or individual assignments developed throughout the semester, I developed an email reading and response system. If the question was straightforward, I answered it with an option of asking the students to call me back or for us to set up a time for a brief call. If the question appeared that the students needed further guidance on an idea, I asked to schedule a 30-minute call or video conference so that we could brainstorm through the notion. This approach seemed to work because we had split the class into groups that were managed by two instructors. However, many instructors' workloads and other commitments may make this feedback and communication approach challenging.

5.5.3 Video podcasts and technology limitations

Official opportunities to learn from video podcasts in this program were few. As a student, I found the short 10 to 15-minute videos the instructors recorded about the readings and the YouTube video links they shared as key concepts of what we were learning in our Policy as a Lever for Change enhanced my learning. The material in video format provided me a different opportunity of understanding the key concepts we were learning that week. As an instructor, the thought of taking the time to record video or audio podcasts just could not fit my schedule. If podcasts are to be incorporated into courses, planning and perhaps recording them before the semester would be ideal.

The video podcast theme arose in the answers to the open-ended question 9 that asked students for their specific technology needs and question 14 that asked students for additional

perspectives on the technology offerings of the program. Even though instructors can create video or audio recordings, the policies behind intellectual property copyrights are strict. According to University of Pittsburgh Policy 11-02-02, Section II, Part A, Item 5: “Recording, Transmission, and Related Classroom Technology,” instructors may use classroom recordings related to classroom activities, but only for personal and non-commercial educational purposes while employed by the University of Pittsburgh. The content of the Classroom Recording may not belong to the University, but the recording, which is also protected by copyright, does. (Intellectual Property Rights Regarding Lecture Recordings, 2015). It would be beneficial to find out from instructors if some of these restrictive policies hold them back from producing recordings or live conferences for their asynchronous or synchronous materials. As I read through the responses to the open-ended questions, I wished I had included a survey question that addressed the level of technology readiness when students started the program. Getting to understand the degree of preparedness would help determine the standard of technology training required for students joining the program. The first week of orientation and onboarding was one filled with anxiety. Despite having worked in IT for over ten years, being introduced to citation applications like Mendeley, Endnote, and Zotero felt daunting. Not understanding that a blended program would be technology intensive was challenging, especially when working virtually on group projects. It would have been beneficial to know the technology expectations before or during orientation.

5.6 CONCLUSION

Learning how to collaborate and form partnerships are becoming essential tools educational leaders need to have to start addressing some of the challenges education is facing in the 21st century. Collaborating and forming partnerships is CPED's third principle, which indicates the importance of those skills for EdD programs. The goal of this research was to explore Pitt's School of Education school-wide EdD program through the lens of how learning about students' multimedia technology needs and preference can improve the quality of the online collaboration amongst students and with instructors working on group projects and assignments in the blended EdD program designed for working practitioners. Results from this research do provide the School of Education an understanding of how its current students are utilizing multimedia technology to accomplish group projects throughout the program. The results highlight students' multimedia technology needs and preferences when communicating and collaborating with each other and with instructors.

Virtual group collaboration for working practitioners in different locations with different schedules presents a challenge when trying to find the right time for the project members to meet, engage and collaborate towards completing assigned projects. With improvements in ICT, higher education has seen the use of different free or paid multimedia technology synchronous and asynchronous applications.

Multimedia technology is a significant component to this EdD program according to all the students that took the survey. From the results, students' responses indicated that online collaborative work requires a combination of synchronous and asynchronous communication. The flexibility and convenience of technology and the ease of use or familiarity of particular applications and the accessibility to technology were key components that led to the selection

and preferred use of the applications the students selected during student-to-student and student-to-instructor collaboration. Despite the appreciation of the flexibility and convenience of technology applications, students felt the following areas could be enhanced to improve their online student collaboration learning experience; Blackboard LMS, project group sizes, and student-instructor communication and feedback.

As the use of technology keeps evolving at a rapid pace, institutions offering some form of online learning need to be evolving as well. This dissertation provides an opportunity to add to the literature on students' multimedia technology needs and preferences in the field of blended learning. This research leaves the opportunity for instructors to share their perspectives on the program as future work. As students continue being a paying customer, the immediate service that is expected from instructors needs to be realistically evaluated. Institutions offering online or blended programs need to evaluate their instructors differently due to the additional roles their instructors play in online and blended learning.

6.0 DISSEMINATION PLAN

The goal of disseminating the research findings to the EdD Committee would allow them to review the findings and possibly start making program adjustments for the current and future students.

6.1 GOALS AND TARGET AUDIENCE

By disseminating these results of the research, my hope is to see the School of Education's EdD program improve the synchronous and asynchronous communication and collaboration technology offerings by selecting technology that is flexible, convenient, and easy to use for its students and instructors. Knowing this information can provide instructors and course designers an opportunity to set up clear technology guidelines and expectations for their courses. The survey data also provide the School of Education an opportunity to streamline the program's virtual environment through approved online learning technology best practices in a way that is consistently integrated with the current Blackboard LMS. The online learning technology best practices would allow for courses in the LMS to be set up uniformly so as to eliminate some of the student navigation challenges due to the different set ups experienced by students throughout the program. Incorporating online learning technology best practices would provide on-demand training on how to effectively use the preferred technology in the EdD program.

6.2 DISSEMINATION ACTIVITIES

For the dissemination, the researcher will provide a one page graphic-based summary of findings and a presentation to the School of Education's EdD Committee. This graphic will then be distributed broadly to instructors and online course designers affiliated with the program. The presentation will focus on the purpose of this survey, findings, limitations, and recommendations. The presentation will also be open to any of the interested EdD students.

APPENDIX A

APPLIED INQUIRY PLAN

Table 13. Applied Inquiry Plan

Inquiry/Questions	Evidence	Method	Analysis
What online communication and collaboration multimedia technology is preferred between the EdD graduate students when doing group work?	<p>Survey responses to the questions students answer about their multimedia communication and collaboration preferences when working on group assignments.</p> <p>Survey responses to students multimedia technology needs when working on group assignments.</p>	<p>Closed-ended survey questions with an option of writing additional information.</p> <p>Open-ended survey question that allows students to indicate what their multimedia technology needs are for them to complete the EdD program.</p>	<p>Quantitative – numbers to show the preferred communication type, preferred communication multimedia technology, preferred multimedia collaboration technology cross-tabulated between Cohort and ARCO.</p> <p>Qualitative - content analysis of open-ended questions based on new communication and collaboration multimedia technology emerging themes that were not covered in the survey questions.</p>

Table 13 (continued)

<p>What online communication and collaboration multimedia technology are preferred by students when communicating and collaborating with instructors during team work?</p>	<p>Survey responses to the questions students answer about their multimedia communication and collaboration preferences when communicating with instructors during assigned group work.</p> <p>Survey responses assessing whether online communication and collaboration multimedia technology have been essential components of the student-to-instructor communication throughout this blended EdD program.</p>	<p>Five points Likert scale question evaluating how helpful is the student-to-instructor communication throughout the EdD program.</p> <ol style="list-style-type: none"> 1. Not at all helpful 2. Slightly helpful 3. Neutral 4. Helpful 5. Very helpful 	<p>Frequency distribution to show how students' perceive the level of helpfulness they perceive the student-to-instructor communication throughout the EdD.</p>
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APPENDIX B

SURVEY

1. Which of the following EdD cohorts do you belong?
 - a. 2014
 - b. 2015
 - c. 2016
2. What is your EdD Area of Concentration (ARCO)?
 - a. Higher Education Management
 - b. Education Leadership
 - c. Language, Literacy, and Culture
 - d. Science, Technology, Engineering, and Mathematics
 - e. Social and Comparative Analysis in Education
 - f. Special Education
 - g. Health and Physical Activity
 - h. Out-of-School Learning
3. Do you or did you communicate with team members during group work during the weeks you are online? **Yes** or **No** [If yes, go to question 4, if no go to question 6]
4. Did you use any of the following online synchronous communication applications with other students when doing group work in any of your EdD courses? Select all that apply
 - a. Skype
 - b. Microsoft Lync
 - c. Google Hangouts
 - d. FaceTime
 - e. Slack
 - f. Zoom
 - g. Other (please specify)
5. Based on what you selected in the previous question, which synchronous communication application do you prefer? Select one.

- a. Skype
 - b. Microsoft Lync
 - c. Google Hangouts
 - d. FaceTime
 - e. Slack
 - f. Zoom
 - g. Other (please specify)
6. Did you use any of the following online asynchronous collaboration applications with other students when doing group work in any of your EdD courses? (Select all that apply.)
- a. Blackboard Wikis
 - b. Blackboard Discussions
 - c. Box
 - d. Google Drive
 - e. Wikispaces
 - f. Facebook
 - g. Twitter
 - h. LinkedIn
 - i. Email
 - j. Other (please specify)
7. Based on what you selected in the previous question, which asynchronous collaboration application(s) do you prefer? (Select all that apply.)
- a. Blackboard Wikis
 - b. Blackboard Discussions
 - c. Box
 - d. Google Drive
 - e. Wikispaces
 - f. Facebook
 - g. Twitter
 - h. LinkedIn
 - i. Email
 - j. Other (please specify)
8. What are your specific needs in regards to online communication and collaboration multimedia technology that would help you complete the EdD program?
9. When working on group projects what is your preferred mode of online communication with instructors?
- a. Synchronous [If synchronous is selected, go to question 10]
 - b. Asynchronous [If asynchronous is selected, go to question 11]
 - c. Both synchronous and asynchronous [If asynchronous is selected, go to question 12]

10. If you selected synchronous communication, what communication multimedia technology do you prefer when communicating with instructors during group work?
- a. Phone
 - b. Skype
 - c. Instant Message Chat
 - d. Google Hangouts
 - e. FaceTime
 - f. Slack
 - g. Zoom
 - h. Other (please specify)
11. If you selected asynchronous communication, what multimedia technology do you prefer when collaborating with instructors during group work?
- a. Blackboard Wikis
 - b. Blackboard discussions
 - c. Box
 - d. Google Drive
 - e. Wikispaces
 - f. Podcasting audio
 - g. Podcasting video
 - h. Other (please specify)
12. If you selected both synchronous and asynchronous communications, what multimedia technologies do you prefer when collaborating with instructors during group work?

Synchronous

- a. Phone
- b. Skype
- c. Instant Message Chat
- d. Google Hangouts
- e. FaceTime
- f. Slack
- g. Zoom
- h. Other (please specify)

Asynchronous

- a. Blackboard Wikis
- b. Blackboard discussions
- c. Box
- d. Google Drive
- e. Wikispaces
- f. Podcasting audio
- g. Podcasting video
- h. Other (please specify)

13. Regarding student communication with faculty throughout this hybrid EdD program, has online communication and collaboration multimedia technology been a helpful component during group work between students and instructors?

1. Not at all helpful
2. Slightly helpful
3. Neutral
4. Helpful
5. Very helpful

14. What else would you like to share about online communication and collaboration multimedia technology that has not already been covered in this survey?

APPENDIX C

INFORMED CONSENT

You are invited to participate in research that explores the potential of improving the student-to-student and student-to-instructor collaboration during group work or projects conducted during the week's students meet online.

My name is Oscar Radoli, and I am a member of the 2014 new EdD cohort at University of Pittsburgh, in the Higher Education Management Area of Concentration (ARCO). You were selected as a possible participant because you are enrolled in this new EdD program.

The purpose of this research is to identify what multimedia technology students' need or prefer when communicating and collaborating during the EdD group work assignments or projects during the weeks you meet or met online. The data collected will be anonymous and will be stored in a protected location.

Your participation in this study will last approximately 10 minutes. If you choose to participate, click on the link at the end of this message that will take you to a Qualtrics survey that can also be accessed from a computer or any portable device.

There are no foreseeable risks involved for participants. All responses will remain anonymous. There are some benefits to this research, particularly from the perspective of furthering the study of blended/hybrid graduate education and the possibility of improving the current student-to-student and student-to-instructor communication and collaboration quality of Pitt's EdD program. Your participation is greatly valued and appreciated.

Your participation is entirely voluntary, and you may withdraw from this project at any time without any penalty. If you have any questions about the research, please call me at 412.952.9721 or osr2@pitt.edu.

To take the survey, please click on the link below or copy and paste this in a browser.

https://pitt.col.qualtrics.com/SE/?SID=SV_0IjGHbJGQWhBIBT

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