Perceptions of the Influence of Ely's Conditions for the Implementation of Educational Technology: A Study within Community College Settings

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Abstract

Change is a concept that has been studied for generations and continues to evolve in the literature. An area of change is diffusion of innovation which examines how new technologies or innovations are spread throughout a population. Using Ely's (1990) eight conditions that facilitate the implementation of educational technologies, this study was conducted to measure the influence of those conditions for the implementation of technologies in community college environments. Within this study, 634 participants from 18 community colleges across Virginia were surveyed and identified the conditions they perceived to be most influential in regards to their decisions to implement a specific technology. The perceived influence of Ely's eight conditions was analyzed for differences between various technologies, as well as within various demographic groups. The findings of this study identify those conditions with highly perceived influences which may lead practitioners to ensure the more influential conditions are in place prior to future technology implementations with the goal of more successful implementations.

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Chapter 1 - Introduction

Problem

Community colleges are a major component of higher education within the United States. As of Fall 2011, there were 13 million students enrolled in one of the 1,132 community colleges in the country, accounting for approximately 44% of total undergraduates in the United States ("Community College Fact Sheet," 2013). With such a large number of students receiving instruction from community colleges, it is important to be knowledgeable about this body of faculty.

Technology plays a large role in all institutions of higher education, including community colleges. In 2013, higher education was expected to spend over $10 billion on technology products and services ("Education Technology Market Watch for K-12 and Higher Education," 2013). In spite of the large amount of capital invested into technology for higher education, access to the technology by faculty is not necessarily guaranteed. Furthermore, simply owning technology is not enough to ensure it is implemented into instruction. Many studies have been conducted on how four-year college and university faculty go about implementing technology within instruction (Gao, 2000; Georgina & Hosford, 2009; Hoffman, 2013). While there is a multitude of studies on four-year institution faculty implementing technology in the classroom, the literature on community college faculty implementing instructional technology is not as abundant.

Although there is considerable literature dealing with the diffusion of innovations and the conditions that facilitate the implementation of technologies, a significant problem yet to be addressed is insufficient information on the influence of conditions that facilitate implementation of educational technologies by community college faculty. As previously mentioned, simply having purchased technology does not always equate to technology availability to, or implementation by, faculty. If community college leadership wishes to improve the implementation of existing and future technologies for faculty, then the influence of those conditions that facilitate technology implementation should be explored and compared with one another.

Purpose

The purpose of this study was to extend the literature related to the perceptions of the influence of the conditions that facilitate implementation of educational technologies by community college faculty. As part of providing this additional information, the perceptions of the influence of conditions that facilitate implementation will be examined per specific technologies. Further, the perceptions of the influence of these conditions will be compared between various demographic categories include gender, age, highest degree obtained, employment status, years of teaching experience, and formats of courses taught. By identifying the perceptions of the influence of conditions, the implementation, planning, purchasing, and training of instructional technologies may be better designed for community colleges as a whole.

Theoretical Framework

This study is based on concepts derived from Rogers's (1962, 2003) Diffusion of Innovation theory and Ely's (1990, 1999) eight conditions that facilitate the implementation of educational technology innovations. Ely's work extended Rogers's Diffusion of Innovation theory into the realm of educational technologies.

Rogers (1962) began his work on the concept of diffusion in the 1960s focusing around how innovations from agriculture and farming start in one area or farm and eventually spread out or diffuse across multiple areas. While the origins started in the agricultural context, the idea of diffusion of innovations could be applied across multiple disciplines and venues. Ely (1990) took Rogers's approach and applied it to the implementation of educational technologies. Within his work, Ely defined two key areas; the transition from adoption to implementation and the eight conditions that facilitate the implementation of educational technologies. Within Rogers's work, the focus was on the adoption, or the initial decision to use a technology or an innovation. By building upon this work, Ely points out it is less important to focus on adoption and more important to focus on implementation which is actually using the technology or innovation within its intended context. In the context of educational technologies, one aspect of implementation is using technology as a tool for instructional purposes. Ely also identified and defined eight conditions that facilitate the implementation of educational technologies as (a) dissatisfaction with the status quo, (b) existence of knowledge and skills, (c) availability of resources, (d) availability of time, (e) existence of rewards and or incentives, (f) participation, (g) commitment, and (h) leadership.

This study was based upon Ely's eight conditions of implementation, which were built upon Rogers's previous work on diffusions of innovation. These eight conditions served as the framework of this study, which focused on the implementation of educational technologies in a community college setting.

Significance of the Study

This study's primary focus was to extend the literature related to the perceptions of the influence of conditions that facilitate implementation of educational technologies by community college faculty. As part of identifying the conditions that facilitate the implementation of educational technologies, one area that was examined was the perceptions of the influence of each of these conditions among different technology tools. By identifying these differences, professional development offerings and trainings can be customized per technology. If the conditions of successful implementation of a particular technology tool are known, the customized professional development can have a focus to ensure that those conditions are met, which may lead to a greater chance of successful technology implementation. Further, conditions can be put into place prior to technology implementation in an effort to promote a successful implementation.

Identifying possible differences in the perceptions of the conditions that facilitate technology implementation among demographic categories was another area with great importance. By identifying the differences among demographic groups regardless of the technologies involved, instructional leaders might better understand what influences these groups to implement technology resources. With this information, college leaders may be able to make decisions that could lead to improved implementation of existing and future technologies. This could be accomplished by adjusting the current approach to technology implementation by providing an environment that accommodates those conditions shown in the data. Possible conditions may include offering incentives, providing release time for technology training, or other conditions related to those conditions identified by Ely.

Research Questions

The focus of this research was to extend the literature on perceptions of the conditions that facilitate implementation of educational technologies by community college faculty. In order to obtain this information, the following research questions were investigated.

Research Question 1. What are the user perceptions of community college faculty regarding the influence of Ely's conditions for specific technology implementation among various technologies?

Research Question 2. What are the user perceptions of community college faculty regarding the influence of Ely's conditions for technology implementation between and within various demographics?

The first research question aims to identify perceptions of conditions that facilitate implementation of different technology tools. By identifying perceptions of conditions for successful implementation of a particular technology, training or professional development sessions for that technology can be customized in an effort to improve the implementation process. Those conditions perceived as influential could also be put into place prior to future implementations to promote a more successful implementation.

The second research question seeks to discover the user perceptions of the influence of Ely's (1990) conditions for technology implementation among various community college faculty demographics. Such demographics include age group, gender, highest degree obtained, employment status, teaching format, and years of teaching experience. By understanding what conditions are perceived to influence the implementation of technologies with respect to demographics, approaches to professional development may be customized to meet specific needs. With this customization of professional development, this may lead to the improved implementation of current and future technologies.

Summary

Community colleges continue to play an increasing role within higher education with millions of students enrolled in one or more of the over 1,000 community colleges across the United States ("Community College Fact Sheet," 2013). Expenditures by bodies of higher education on technology eclipsed over $10 billion in 2013 ("Education Technology Market Watch for K-12 and Higher Education," 2013). Due to these factors, it is important to identify and understand perceptions of the conditions that facilitate the implementation of educational technologies by community college faculty. The research questions within the study aimed to identify perceptions of conditions that facilitate implementation between different technology tools and the conditions of implementation between demographic groups. Chapter 2 offers a review of the literature germane to this study.

Chapter 2 - Review of the Literature

Introduction

Chapter 2 presents the literature that is related to this study. Within this review of literature are sections on community colleges in the United States which includes views of faculty, instructional technology including taxonomies of educational technology tools, change theory including the theory of diffusion of innovation, and past studies related to the implementation of technology in educational settings.

Significant amounts of funding have been put into place to support educational technology. In 2013, institutions of higher education were expected to spend more than $10 billion on technology products and services, leading one to believe that ample technology resources are available to faculty members ("Education Technology Market Watch for K-12 and Higher Education," 2013). However, simply providing faculty with technology equipment does not mean faculty members are ready to use the technology or more importantly, are prepared to use technology to effectively deliver instruction. In order to support the implementation of technology into instruction, it is essential to identify the user’s perceptions of the conditions that facilitate implementation.

Research into how to support the implementation of technology into instruction is not a new topic within the field of instructional design and technology. Many studies exist within this wide realm of research including studies on K-12 teacher implementation of technology, student use of technology, and faculty within higher education integrating technology (An & Reigeluth, 2012; Gao, 2000; Georgina & Hosford, 2009; Inan & Lowther, 2010; Keengwe, Schnellert, & Mills, 2012; Kyei-Blankson, Keengwe, & Blankson, 2009). However, studies specifically focusing on the influence of conditions that facilitate the implementation of educational technology within a community college setting are not as abundant. For most technology implementation studies involving community colleges, the data are descriptive in nature and provides basic counts or tallies (Hoffman, 2013; Tabata & Johnsrud, 2008).

Due to the lack of studies on the influence of conditions that facilitate the implementation of educational technology within community college settings, further study in this area is warranted. The following review of existing literature will outline the history of community colleges, instructional technology, and previous studies of faculty implementing technology. Providing an overview of what is currently understood will establish a basis for how this study can further the knowledge base of the implementation of educational technology in community college settings.

Community Colleges

Background and history. The development of community colleges in the United States began many years ago, shortly after the Civil War. With the passage of the Morrill Act in 1862, federal lands were used to set up public universities and colleges across the nation ("Morrill Act of 1862," 2006). The establishment of these land grant based colleges set up the development of smaller, junior colleges that were designed to provide vocational training as part of their constantly evolving curriculum. Eventually over time, this small group of junior colleges developed into the familiar nationwide system of community colleges of today (Koos, 1924).

In their beginning days, community colleges offered a variety of curriculum and course options, with several similar to university curriculum offerings. In the years immediately succeeding the end of World War II, many community college curriculums switched from an academic focus to one of a vocational or training focus. The purpose of this transition was to allow for soldiers returning from the war to become trained for the new jobs generated by the U.S. economy now that the war effort had concluded (Thornton, 1960).

Today, community colleges continue to offer diverse curriculum for both credit and non-credit students. These academic programs serve as transfer programs to four-year colleges and universities, as vocational or technical training, and as adult or continuing education. As of 2013, more than 13 million students attend a community college in the United States, making it one of the most popular options for higher education among students ("Community College Fact Sheet," 2013).

Faculty body. Many quantifiable statistics on post-secondary faculty, including those in community colleges, are readily available to researchers and the general public. The National Study of Postsecondary Faculty (NSOPF) is one study produced by the National Center for Educational Statistics (NCES) by collecting national data on faculty in all postsecondary institutions (National Center for Education Statistics, 2013). Within these data is information pertaining to faculty demographics, employment status, and other attributes related to institutions. Within the NSOPF data, it is noted that only about 37% of community college faculty are employed full-time while adjuncts make up the remaining 63%. Also noted are a 53% male to 47% female ratio for full-time faculty with part-time coming in at 55% male and 45% female. Additional information is found in Appendix C, *Table C1*. In regards to academic qualifications for community college faculty, more than 75% earned a master's degree, and another 12% earned a doctorate degree. Detailed information about academic qualifications is found in Appendix C,

Table C2. In regards to employment status, only 28% of part-time faculty considered their community college employment as their primary source of employment. The average income for full-time faculty was $48,353 while their part-time colleagues averaged $9,976. Details on income levels are found in Appendix C, *Table C3*. For tenure and tenure tracks, 68% of full-time faculty were either tenured or on a track which could lead to tenure, compared to just 3% of part-time faculty. Additional information on tenure tracks is found in Appendix C, *Table C4*.

Instructional Technology

The evolution of technology over the past century has allowed for significant changes in the way we work, play, communicate, and function in society. In a relatively short period of time, humans went from taking months to cross the ocean to being able to communicate instantly with people on other continents. The invention of so many various technology tools allows us to obtain information at the touch of a button that we otherwise would have to memorize or look up in printed materials. Because of these advancements, educators are able to leverage these newly found abilities to provide instruction in new and innovative ways.

The application of technology into education or instruction is a field unto itself in Instructional Design and Technology (IDT). The definition of IDT has been modified throughout the years by the Association for Educational Communications and Technology (AECT) organization as the understanding within the field and technology itself continues to evolve. Reiser (2001) defined IDT as "the analysis of learning and performance problems, and the design, development, implementation, evaluation and management of instructional and non-instructional processes and resources intended to improve learning and performance in a variety of settings, particularly educational institutions and the workplace" (p. 53). Prior to Resier's (2001) work, Seels and Richey (1994) stated the AECT definition as "Instructional Technology is the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning" (p. 1). In 2008, AECT revised the definition of the field using the research of Januszewski and Molenda (2008) to reflect a view of educational technology instead of instructional technology in order to clarify how the field is viewed by professionals. Januszewski and Molenda (2008) noted "Educational Technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources" (p. 2). Whether referred to as instructional technology, instructional design and technology, or educational technology, practitioners and educators often use these terms interchangeably.

Others have also provided their own related definition of instructional technology. Smith and Ragan (1999) defined instructional design as "the systematic and reflective process of translating principals of learning and instruction into plans for instructional materials, activities, information resources, and evaluation." (p. 2). Dick, Carey, and Carey (2005) referred to the term instructional design as "the entire Instructional Systems Development process." (p. 3). According to Dick et al. (2005), the components of instructional systems development included analysis, design, development, implementation, and evaluation.

Through the culmination of work by numerous researchers, a working definition of instructional technology can be derived. Based on the previous work of various researchers, instructional technology can be viewed as the theory and ethical practice of the analysis, design, development, implementation, management, and evaluation of processes and resources for the purposes of facilitating learning and improving performance in educational and workplace settings. Reflecting on this definition, it most resembles the view presented by Reiser (2001) with elements of Dick et al. (2005) and ethical practice from Januszewski and Molenda (2008).

Given our working definition of instructional technology, one should note there are multiple domains within the field that are interrelated. While the definition makes clear mention of resources for learning, the instructional phases of design, development, implementation, and management are encompassing of those resources to ensure whatever technology tools used within instruction are done so in a planned, methodical manner. It is through the implementation of technology within instructional planning and delivery where instructional technology takes shape.

Taxonomies of Educational Technology. The need for educational technologies resides in the purpose or intent of the instruction to be delivered. According to Dick et al. (2005), instruction should be systematic in nature, planned through for each phase of the analysis, design, development, implementation, and evaluation sections of instruction. Therefore, the selection of educational technologies should be based on the goals and objectives of the instruction to be delivered. In order to best choose a technology to be implemented within instruction, one must know the types of technology available.

In an effort to differentiate the various types of technologies available, Bruce and Levin (1997) developed their taxonomies of educational technology. Bruce and Levin, through their research, decided to focus on the media aspect of technology. They argued that the main purpose of any technology should be the interaction of the technology with the user or student, not the physical or operational features of the technology. Media links the student to additional capabilities through their use such as connecting with other students, instructors, information, or anything else previously not connectable without the media. As the student continues to learn with the assistance of the media, the media becomes more transparent and the focus remains fixed on the instructional objective rather than using the technology or media.

Bruce and Levin (1997) identified four main areas within their taxonomy; media for inquiry, media for communication, media for construction, and media for expression.

Media for inquiry. As the name suggests, media for inquiry is media or technology designed to further investigate a topic or idea (Bruce & Levin, 1997). Within media for inquiry, theory building is one group where media focuses on models, simulations, outlining and visualization tools, and virtual reality. Data access is another group within media for inquiry that connects to external resources such as hypertext, digital libraries, and databases of multiple content types including text, images, videos, and audio. Data collection is yet another group within media for inquiry where technology is used to extend human senses. High-tech sensors for things ranging from temperature to humidity to bodily functions fall into this group. Video and audio recordings fall into data collection, as do electronic surveys used to collect information from individuals. Data analysis is the final group within media for inquiry where the data collected is turned into actionable information. Technologies including statistical software, spreadsheets, and visualization software for tables and graphs fall into this area.

Media for communication. One crucial skill that most everyone needs to have in everyday life is the ability to communicate effectively (Bruce & Levin, 1997). Whether it is to a supervisor, colleague, friend, parent, child, or anyone else, communication is a necessary skill to function in society. Within the media for communication group, document preparation is one important area. Here, document processing, graphics, spelling and grammar checking, and desktop publishing are encompassed within this group. Electronic communication is another area within media for communication. This group focuses on technologies such as email, synchronous and asynchronous conference delivery, and web services. Collaborative media is the next group, which includes shared document systems like Google Docs and other collaborative systems like Microsoft SharePoint. Finally, media for communication also includes teaching media. Within teaching media, drill and practice systems, simulations, and electronic tutoring systems fall in this area.

Media for construction. Beyond obtaining information as we saw in media for inquiry, and sharing information as we saw in media for communication, the next category is the creation of things using media for construction (Bruce & Levin, 1997). Media for construction is using technology to make changes to, or create, things within the real world. For example, robotics and assembly line technologies fall into this group. Computer-aided design is also another media type that falls into this category.

Media for expression. Similar to construction, media for expression is also for creation, but more in the arts and less in practical hands-on production. Media for expression allows for the drawing and painting of art works as well as the composition of music and videos (Bruce & Levin, 1997). Animation is also another area encompassed by media for expression. Any media used to create art, whether visual or audio, can be classified into this category of media types.

Planning for technology. Technology implementation in an educational setting is not something that happens haphazardly or overnight. It is a process that involves communicating with stakeholders, detailed planning, implementation, and follow up evaluation ("U.S. Department of Education releases National Education Technology Plan," 2005). Models for technology planning resemble many instructional design models in which several common steps including analyzing information, developing a strategic plan, implementing the plan, and evaluating the results of its implementation are shared.

The specific sequence of technology planning as noted by Nguyen and Frazee (2009), involves exploration, analyzing, developing, and implementing. In their model, exploring involves identifying the relevant stakeholders such as faculty, students, administrators, and support personnel as well as any outside vendors or partners that may play a role. After identifying the stakeholders, one should outline the methods in which decisions will be made and the communication channels to be used. Of the possible decision making methods, there are three main ways; authoritative where the leader makes the decisions and informs their subordinates, consultative where the leader seeks advice then makes the decision, and consensus where responsibility is shared through the group and an agreement is made by way of a majority voice for decisions. No one method is considered superior to another as each has its own strengths and weaknesses. Finally, a method for communication needs to be determined. Whether it is face-to-face meetings, electronic communication, or a hybrid approach, this same protocol must be followed by all stakeholders in order for communication to be successful and effective.

After exploring the situation, the next step is to analyze the current environment. In this step, information should be collected that will help frame technology planning (Nguyen & Frazee, 2009). Key information may include mission and vision statements, planning roadmaps, and any previously made project plans. This data should focus on areas that stakeholders feel are in need of improvement as well as those areas that appear to be functioning well. Information can be collected through various methods including interviews, surveys, or focus groups. Finally in this step, the key stakeholders who will be a part of the development phase of the technology plan should be selected.

In the development phase, it is now time to put together the ideas and start writing the plan. When writing, it is important to continually refer to the school's vision and mission statements to keep in focus what is most important to the school (Nguyen & Frazee, 2009). If the school's vision and mission statements do not exist or are outdated, it is time to revise or create new ones. Within the actual plan, projects and programs should be identified, prioritized within a roadmap, as well as resources needed including personnel and finances. It is possible that more projects will be presented than there are resources available in which either a plan to obtain additional resources or delaying lower priority projects will need to be made.

Now that all planning has been completed, it is now time to implement the technology plan. Just before reaching this step however, stakeholders should be included in one final review of the technology plan for their endorsement or last minute revisions (Nguyen & Frazee, 2009). The high-priority projects identified in the roadmap should be those areas where the plan is implemented first with additional projects following based on the priority, as determined within the plan. Progress of all projects should be monitored and successes and impediments should be reported to stakeholders. Finally this plan should be routinely updated to reflect new technologies and new ideas. It is recommended to provide updates to the existing plan once per year with a complete revision to the plan every three to five years.

While Nguyen and Frazee (2009) present a solid framework of developing a technology plan, their work should not be considered exhaustive of the different approaches or topics to consider within technology planning. Other areas to be considered within a technology plan also include well-defined goals and strategies, professional development plans, budget forecasting, and assessment of previous years' plans (Norton, 2013; Vanderlinde & Van Braak, 2013). While goals are essential, it is important to break these goals down into objectives that are well defined, measureable, and within a specific timeframe; a process very similar to writing instructional objectives (Mager, 1975). Those stakeholders who are responsible for administering a school's budget should play a key role in forecasting budget revenues and expenditures so the technology plan will be in alignment with the college's overall budget. While assessment or evaluation was not specifically outlined in the work by Nguyen and Frazee (2009), it was included as part of their implementation phase. Whether it is part of another step or a step within itself, a technology plan should be evaluated as to its effectiveness on a recurring basis to set the stage for minor and major revisions.

Common uses of technology in education. The review of the literature has explored the need for technology implementation, taxonomy of different types of technology or media, and planning for technology at an institutional level. Aside from looking from a supervisor or management point of view, it is important to identify the impacts that technology has directly in the classroom.

Educational technologies are used in the classroom in a multitude of ways. Some of the most common educational technologies used in classroom environments include computers, the Internet, course websites, email, audio-visual equipment, presentation software such as PowerPoint, curriculum specific software, conferencing equipment, and course or learning management software. Each of these different technologies has the potential to affect the way a faculty member instructs or how a student learns based on the newly acquired abilities one receives through their use (Bruce & Levin, 1997).

The use of computers, the Internet, course websites, and email focuses on the area of access to information. Computers, whether it is large desktops or the small mobile devices of today, provide a portal to the shared resources available on the Internet. Course websites provide faculty a place to post information about the course, instructional content, and access to related information. Email provides a communication channel so students are able to freely converse with the instructor and other students. These technologies can be categorized as media for inquiry with some features of media for communication (Bruce & Levin, 1997).

Audio-visual equipment in classrooms allows the instructor, and in some cases students as well, to share information to a larger audience. Many classrooms today are equipped with podiums that provide computers and projectors along with connections for personally owned devices such as laptops and tablets, speakers, and document cameras. Combined with the presentation software such as PowerPoint, large groups can receive instruction that is presented from one location. If additional groups of students who are not physically in the same location, they can be included within the instruction using conferencing equipment, either audio, video, or both. Course management software also provides a method of not only presenting information, but also communication channels to the instructor or other students. These technologies fall into the group media for communication (Bruce & Levin, 1997).

While much of the technologies used for general-purpose instruction are communicative in nature, other technologies are needed for the creation of content. This is typically the case for specialty software that is unique or specific to a curriculum or course. Curriculum specific software is designed to allow a student to apply acquired knowledge to a product. For example, computer-aided design (CAD) software is specific to engineering or architectural classes where the creation of building plans or product design occurs. Photoshop software is specific to graphic design classes where a visual product is being created. Other curriculum specific software may include automotive software to diagnose engine problems or a keyboarding program to teach typing skills. This level of technology falls into the group of media for construction (Bruce & Levin, 1997).

The use of technology in education must be seamless to the point where instructional goals and objectives determine what and how technology will be used. Technology usage must be encompassing and not an isolated area unto itself. Technology use in education did not start out as an idealist approach but rather developed over time through the sharing and dissemination of new ideas on how to use technology within instruction (Dockstader, 1999). The way new ideas or methods are disseminated and finally rejected or accepted is known as diffusion. When this same concept is applied to physical objects rather than intangible ideas, the process is known as adoption. In order for an educational institution to fully accept instructional technology, it is important to understand the progression of diffusion and adoption.

Motivators of technology implementation. An instructor's decision to use or not use technology within their instruction is a choice that is based on many different factors. Researchers have looked at instructors at all levels including K-12 and higher education for reasons and preferences for technology usage (Heffernan, 2012). However, little information currently exists as to why technology is or is not used from a theoretical point of view (Starkey, 2010).

Within the current literature, a number of factors have been reported to be a motivator for integrating technology into instruction. Those factors include feeling competent in using technology, owning personal technology devices, having adequate technology support available, and participating in training (Dusick & Yildirim, 2000; Heffernan, 2012; Starkey, 2010; Stokes, 2009). Other factors of motivation identified by higher education faculty include having enough technology resources, not having an overburdening workload, having release time, tenure status, financial incentives, and teaching discipline (Fleagle, 2012; Hoffman, 2013). Finally, the organization's and individual faculty member's positive attitudes on the usefulness of technology plays a role as a motivator (Dusick & Yildirim, 2000). It should be noted that lack of these above factors could result in a barrier to their use (Starkey, 2010).

While current literature indicates the motivators of technology implementation by instructors of all institutions of education, especially K-12, the body of knowledge on the influence of conditions that facilitate implementation by community college faculty is not as well developed. Given the rapid pace of technology advancement and changes, this remains an area that warrants further investigation.

Barriers of technology implementation. Similar to motivators of technology implementation, barriers have also been explored at the various levels of educational institutions. Bingimlas (2009) categorized the barriers found in the literature into extrinsic and intrinsic barriers. The intrinsic or internal barriers identified are access, support, and time. The barrier of access refers to not being able to get to or use technologies due to limited resources. In an educational environment, this could be due to lack of computer lab space or equipment that may be checked out. The support barrier surrounds the acceptance of technology as a useful tool by instructional peers and school administration. If this level of support does not exist, one may not be as inclined to use technology within their own classroom. Lack of available professional development opportunities or support to attend these training sessions also falls under support barriers (Ertmer, 2005). Finally, time can be considered an internal barrier. Time is needed to learn new technologies and to explore how they can be used within specific instructional settings. Without time set aside specifically for the purpose of planning instruction with technology or learning new technologies, technology implementation is less likely to happen (Butler & Sellborn, 2002; Ertmer, 2005).

As is the case with motivators of technology implementation, it is vital to identify the barriers so they can be addressed. While many barriers have been identified, these studies focus on the context of general education or K-12. Further investigation of barriers and motivators in the community college context is warranted. To better understand the phenomena of barriers and motivators of technology implementation, it is beneficial to examine the related concept of diffusion and the works of the researchers who have contributed to this field of study.

Creating and Supporting Change

Change is viewed as the process of converting an existing system from the status quo into something new. A type of change identified by Rogers (2003) is innovation where "an idea, practice, or object that is perceived as new by an individual or other unit adoption" (p. 12). In today's world, many innovations are technological innovations allowing for the terms "innovation" and "technology" to be used interchangeably (Rogers, 2003). Change can be a complex process and is an area of research unto itself. Change is affected by many factors including economics, politics, culture, technology, attitudes, perceptions, and communication (Rogers, 2003; Surry & Gustafson, 1994). Given the complexity of change, it is appropriate to explore previously defined models of change.

Change Models. Change models provide an overview or blueprint of how change occurs in sequence. It is estimated that more than 50 models of change have been created by researchers, highlighting all the various complexities that come with change (Gundy & Berger, 2016). Of the various models that exist, more prevalent ones include Rogers' Diffusion of Innovations theory, Strategies for Planned Change (Zaltman & Duncan, 1977), Concerns-Based Adoption Model (CBAM) (Hall & Word, 1987), systematic change (Reigeluth & Garfinkle, 1994), and Ely's (1990) conditions for change.

Diffusion of innovation. A researcher who has provided substantial contributions to the field of diffusion theory is E.M. Rogers with his 1962 book "Diffusion of Innovations". Rogers (1962, 2003) first developed his theory of diffusion in the 1960s and has continued to evolve his theory as technological advances have made their way into society. Among his theories include the five stages of innovation decisions, individual innovativeness, the rate of adoption, and perceived attributes.

Rogers's (1962, 2003) theory of the innovative decision process is one of the foundations of diffusion theory. As shown in *Figure 2*, the process of deciding to use an innovation is broken into the five stages of knowledge, persuasion, decision, implementation, and confirmation where an individual who is considering adopting a new innovation progresses through this sequence. In the first stage, an individual must be aware or have knowledge of the innovation. Then they must be persuaded that the advantages of the innovation are enough to consider using the innovation. From here, the individual must make a decision as to whether or not to pursue the innovation for their use. Once it is decided to use the innovation, it must be implemented by purposefully using it in a specific context. Finally, the individual must confirm their decision to use the new innovation by either accepting or rejecting it. Additional researchers, including Ely and Surry (1999), have focused on the implementation phase due to its connection to instructional design models.

Rogers's (1962, 2003) theory of individual innovativeness is one of the more popular and widely known theories. In this theory, he states that certain individuals are more inclined to being innovative and will adopt new ideas sooner than individuals who are not as innovative. Rogers categorizes individuals as innovators, early adopters, early majority, late majority, and laggards in terms of their timing to adopt new innovations. These categories of various levels of adopters can be placed on a bell-curve with the early majority and late majority adopters taking up the largest percentages.

Rogers's (1962, 2003) theory of the rate of adoption looks at how quickly new innovations are accepted rather than the specific individuals who come to accept or reject the innovation. In this theory, there is a time period in the middle of the adoption window where the rate of adoption increases quickly. This increased rate of adoption coincides with the early and late majority groups of adopters getting involved that compose a large percentage of the population.

Another theory by Rogers (1962, 2003) is that of perceived attributes of the innovation. In this theory, individuals who are evaluating the innovation for adoption base their judgment on the perception of an innovation's attributes. The five attributes of innovation are trialability, observability, relative advantage, complexity, and compatibility. In order for an innovation to have a successful rate of diffusion, it needs to meet expectations within those five attributes. An innovation must be tried out prior to adoption, it must provide positive results that are observable, there must be an advantage to using this innovation over existing tools, it cannot be too complex to use, and it must be compatible with existing methods and procedures.

Stages of adoption of educational technology. Along the lines of adoption and diffusion but looking more specifically into instructional technology, Christensen (1997) offers the following stages of the adoption of technology in education. In Christensen's model, the stages instructors progress through for full adoption of a technology are awareness, learning the process, understand and apply the process, gain confidence, adapt to other contexts, and apply to new contexts.

In Stage 1, the instructor is simply aware the technology exists but has not used it in any way (Christensen, 1997). In the next stage, the instructor is learning the fundamentals of the technology but is not applying it to any instructional context. In the third stage, the instructor now understands the fundamentals and is starting to apply it in the classroom at a very basic level. In stage four, the instructor has gained confidence in using the technology and is using it for specific lessons or units. In the next stage, the technology starts to become transparent and is viewed as a teaching tool, not something separate. In the sixth and final stage, the technology is now fully integrated into the teaching curriculum.

Ely's conditions of implementation. Ely (1990, 1999) built from Rogers's (1962) diffusion of innovation work by applying it directly to the context of educational technology. When examining instructional design models, implementation is a phase in most all models. Because implementation is a crucial step within instructional design and technology, Ely, among others, focused on this phase of Rodgers's initial work. Within his own work, Ely focused on two particular areas, transitioning the focus from adoption to implementation and identifying the conditions that facilitate the implementation of educational technologies.

Rogers's (1962, 2003) work focused on the adoption of an innovation. With adoption, this was simply viewed as the initial decision to use a technology or innovation. Whether it was used in the proper context or fully understood was irrelevant to defining an innovation as adopted. Ely's (1990) research on educational technologies viewed beyond the adoption stage and into implementation. According to Ely (1999) implementation is a stage in most all instructional design models. Therefore, the focus of educational technology must shift from simply adoption into that of implementation.

Ely's (1990) work also focused on what factors or conditions facilitate the implementation of educational technologies. Through his work, he identified eight conditions: dissatisfaction with the status quo, knowledge and skills, resources, time, rewards and incentives, participation, commitment, and leadership. These conditions allow technologies to be not just adopted, but implemented. Ely's (1990) conditions are interrelated with each other in various combinations, allowing the presence of one condition to be a factor of another condition while at the same time the absence of one condition creating a barrier to another condition. Ely asserts his conditions emphasize the environment where implementation occurs which align with Rogers's (1962, 2003) views of diffusion. Rogers's (1962, 2003) research focused on the attributes of the person adopting the innovation in a given setting as well as the nature or characteristics of the innovation itself. Ely's conditions that facilitate implementation are as followed.

Dissatisfaction with the status quo. This condition is where the users feel that things could be better but are not sure where to begin to make improvements. If individuals are not happy with the way things currently are, they may seek to improve them. Dissatisfaction with the status quo is related to leadership (Ely, 1999) as well as connections to other conditions. If individuals are content with current conditions, new technologies will appear as unnecessary and not needed. This would make many of Ely's other conditions such as participation, commitment, and leadership difficult to achieve when the perception of the need of change does not exist (Christensen, 2000).

Knowledge and skills exist. To implement a technology, individuals must have the skills and knowledge to use that technology. Knowledge and skills are linked to resources, leadership, commitment, and rewards and incentives (Ely, 1999). Conversely, a poor needs analysis, poor goals or objectives, poor instructional design, poor methodology, and negative attitudes can act as a barrier to obtaining the necessary knowledge and skills to implement a new technology or innovation (Ensminger, 2001). To obtain necessary skills, many institutions, particularly educational institutions, offer in-service programs, professional development opportunities for faculty, and other methods of education. As part of developing such skills, instructional objectives of education and professional development sessions need to be made clear, measureable, and obtainable for the participant to be successful (Ensminger, 2001).

Resources are available. On top of being able to use a technology, resources or those technologies must be readily available (Ely, 1999). It is impossible to implement changes without the required resources. Resources can be anything that is needed for successful implementation of the technology or innovation which includes funds, hardware and software, support, and other supplemental materials related to the innovation. Resources are related to the other conditions of commitment, leadership, and rewards. Ensminger (2001) contends that the development of return on investment models will improve the availability of resources.

Time is available. Implementers of technology must have time available to learn, use, and reflect on how they are using the technology (Ely, 1999). The time to do this should be provided by their institution for the specific purpose of learning how to use the technology. Time availability is linked to commitment, leadership, participation, and rewards. Time availability should go beyond the actual implementation and learning to use the innovation and should also include time to develop skills to use the innovation, personal reflection, and integration of the innovation into general use. One of Rogers's (1995) innovation attributes is that of "trialability" in that the implementation of an innovation may take repeated efforts, and hence time, to effectively and fully implement.

Rewards or incentives exist for participants. Reasons to change or use a new technology should exist in rewards that benefit the implementer in some fashion (Ely, 1999). Rewards may vary from teaching materials to personal assistance but should benefit the implementer directly. The most common types of rewards are release time, financial bonuses, and recognition. Participation, time, dissatisfaction with the status quo, and resources are linked to rewards and incentives. Leadership is also an area connected to rewards in that if a leader provides rewards or incentives, that action demonstrates their commitment (Ensminger, 2001).

Participation is expected and encouraged. The individuals using the technology should be a part of the decision making process to have a sense of ownership of the decision to implement. At a minimum, people should feel they have an opportunity to comment on the technologies that will directly impact their work (Ely, 1999). Participation includes direct participation when possible, shared decision-making, communication among all those involved, or if direct participation is not possible individual's ideas are shared through a representative. Participation is linked with commitment, time, rewards, and knowledge and skills. Participation can be achieved by identifying and including key stakeholders such as faculty, staff, and administrators in a variety of contexts (Ehrmann, 2000).

Commitment by those who are involved. The use of technology being supported by key players in the organization such as department heads or academic deans is necessary for implementation. Support from this level of the organization will aid in the implementation of a technology (Ely, 1999). The endorsement of the implementation of the innovation of technology is visible and provides continual support. By providing rewards and incentives, time, feedback, and encouragement, commitment is displayed by leaders in organizations (Ensminger, 2001).

Leadership is evident. Leadership at the executive levels of the organization as well as those involved in the day-to-day support of implementation is the final factor that supports implementation. Inspiration and motivation by those individuals that are admired and respected at an institutional level is key for successful implementation. Leadership is linked to time, commitment, participation, rewards, and resources (Ely, 1999). Not only are official titled administrators considered leaders but also early adopters of technology and those with influential status (Ehrmann, 2000).

Past Studies

In reviewing the literature, it is important to note previous studies on faculty perceptions of instructional technology in educational environments. The literature provides a plethora of research on instructional technology in K-12 environments (An & Reigeluth, 2012; Inan & Lowther, 2010; Khe Foon & Brush, 2007) and four year colleges and universities (Fleagle, 2012; Kelly, 2005; Thomas, 2011). However the depth of knowledge on community college faculty use of instructional technology is not as well developed, particularly an understanding of the influence of conditions that facilitate implementation. While K-12 and four-year college environments are not identical to community colleges, the lessons learned from these areas can establish a basis of knowledge for research specifically focused within the community college environment.

Four-year college studies. Kelly (2005) examined how technology is used among fulltime faculty at a four-year college and found that faculty members are receptive to technology for instructional purposes but desired a higher level of organizational support as well as professional development opportunities to use the technology. The study recommended the formation of a technology development committee to oversee these improvements.

In a comparable study, Thomas (2011) investigated the factors that lead university faculty to use technology within their instruction. The sample population used in the study was a mixture of full-time and adjunct faculty. However, less than ten percent of the sample was adjunct faculty and no comparisons were drawn between the two groups. Her findings concluded that the factors that significantly contributed to technology implementation were having adequate instructional resources, having computer use experience, the level of course taught, gender, faculty rank, and the experiences of teaching online, with adequate instructional resources being the most significant factor.

Fleagle (2012) performed a similar but different study that focused on identifying motivators to increase technology use by university faculty and then develop a plan to increase those motivators. The qualitative research methodology employed in the study limited participation to full-time faculty only. In her research, the theme of pedagogy and technology needing to be inclusive for technology implementation to be successful emerged as a top finding. In order for this to occur, it was suggested to provide adequate support in the form of a technology specialist to assist faculty in becoming comfortable with technology to the point of transparency in instruction.

K-12 schools studies. Technology implementation has been a major focus of several organizations including the International Society for Technology in Education (ISTE) and its state-level affiliates. With the increased scrutiny of school performance in recent years, educators have looked in many directions for assistance including through the use of technology.

Inan and Lowther (2010) examined teacher characteristics and school environments to identify factors leading to technology implementation in the classroom. Through their research, they found that the number of years of teaching negatively affected technology implementation. However, computer proficiency, teacher attitude, and school-level support of technology positively affected technology implementation.

In their study, Khe Foon and Brush (2007) identified barriers to technology implementation as being lack of resources, school support and culture, attitudes, and current skills of teachers. They were able to identify strategies to work around these barriers, which include having a shared vision about technology implementation within the school, obtaining sufficient resources, and conducting professional development activities to promote a level of comfort with technology implementation.

Community college studies. While the depth of literature surrounding technology implementation by community college faculty is not as developed as that of university faculty and K-12 teachers, some research currently exists. Payne (2004) conducted a study to identify the perceptions of instructional technology by full-time faculty at a particular two-year college. In her study, she examined a particular community college of which 42 full-time faculty responded. The respondents reported they were in the process of adopting instructional technology but were not experts and still needed additional assistance for true implementation. In this study, faculty also reported on their comfort level of technology use.

In his study, Walker (2007) focused strictly on community college business faculty, both full-time and adjunct, to identify their perceptions of instructional technology, their utilization, their motivators and barriers to its use, demographic groups, and the academic deans' perception of instructional technology. This study was conducted through a nation-wide survey, reaching out to 400 community colleges however, only 260 faculty members meeting the criteria of the study responded. Using the demographics of faculty members, differences in technology use were noted among the different groups including between the full-time and adjunct faculty members. His study reported the self-perceptions and utilization of instructional technology use is greater in full-time community college business faculty than in their adjunct counterparts. The study also reported that the motivators and barriers of technology use are different between the two faculty groups. Walker focused exclusively on community college business faculty and did not focus on conditions of implementation.

Blended studies. Meyer and Xu (2009) used existing NCES data to conduct their research comparing university and community college faculty in regards to educational technology use. Using data from over 1,000 institutions and more than 5,000 faculty responses, they concluded that factors such as age, highest degree obtained, and teaching loads had the greatest influence on technology use within instruction. There were no comparisons drawn between full-time and adjunct faculty in their study.

Ormand (2006) compared full-time community college faculty with full-time four-year university faculty on perceptions, utilization, motivators and barriers, and demographics as it relates to instructional technology use. In this study, a particular community college was compared to a particular four-year institution with over 600 respondents. In his findings, it was reported that full-time community college faculty differed from full-time university faculty in that community college faculty tend to use instructional technology earlier in the adoption phase and reported to use technology more frequently compared to university faculty. However, the common findings between both groups were the need for increased availability, reliability, and simpler use of instructional technologies for use in the classroom.

Implementation studies. There are previous studies focusing specifically on Ely's (1990) conditions as well as studies focusing on the implementation of Ely's (1999) condition in various contexts. More recent studies in contexts focusing on education and technology include computer integration in K-12 contexts (Bauder, 1993), Internet integration in schools (Ravitz, 1999), and within online educational programs (Ensminger, Surry, & Miller, 2003). Other implementation studies including one by Surry, Jackson, Porter, & Ensminger (2006) considered the relative importance of Ely's (1990) conditions among various demographics.

Bauder's (1993) study looked at the perceived relative importance of Ely's (1990) conditions within the implementation of computers in instruction in the K-12 environment. In her study, Bauder (1993) surveyed classroom teachers using a Likert scale with statements that align to Ely's (1990) conditions relating to their implementation of computers in the classroom. The results of her study found various correlations among Ely's (1990) condition, and a significant difference between rural and suburban teachers in regards to rewards, leadership, and time. There was also many differences in teacher perceptions of the conditions among the elementary, middle, and high school levels.

Ravitz (1999) expanded Bauder's (1993) study in the context of K-12 schools by focusing on Ely's (1990) conditions as they relate to the use of the Internet within instruction. Within his nationwide study, Ravitz (1999) found great correlation among the various conditions. The condition that was the strongest predictor for Internet use was dissatisfaction with the status quo. Within his conclusions, Ravitz (1999) suggested that in order for implementation to be successful, Ely's (1990) conditions should be in place prior to beginning the implementation process, not during or after. Subsequent researchers later began to study Ely's (1990) conditions prior to implementations.

Ensminger, Miller, and Surry (2002) took to the idea from Ravitz (1999) of evaluating the presence of Ely's (1990) conditions prior to implementation in their study focusing on the implementation of online educational programs. This varies from past studies where the research was performed after implementation had already occurred. The researchers were able to evaluate conditions prior to implementation by surveying faculty on which conditions were most influential in a fictitious scenario regarding a new online degree program. The conditions of skills and knowledge, resources, and dissatisfaction with the status quo were perceived by participants as being most important.

Surry, Jackson, Porter, & Ensminger (2006) later looked at the perception of the relative importance of each of Ely's (1990) eight conditions within demographic categories of age, gender, ethnicity, educational degree, career field, and technology proficiency. They were able to do so by surveying participants across educational and business fields using a previously developed implementation profile instrument which required participants to answer a "force choice" between two statements, each statement aligned with a different one of Ely's (1990) condition. Scores were tallied upon the conclusion of the survey with a value indicating the number of times a participant selected that condition. From an overall perspective, resources and participation rated the highest respectively while commitment and leadership rated the lowest of the conditions. A review of age showed variation within all groups with dissatisfaction with the status quo and resources being significantly different. Within gender, ethnicity, and career fields there were no statistically significant differences among the conditions. Among the various groups of educational level, statistically significant differences were found among dissatisfaction with the status quo, skills and knowledge, and resources. Within the groups of varying technology proficiencies, statistically significant differences appeared in knowledge and skills and participation. With findings spread out across the spectrum, the researchers suggested future related studies.

Summary

Technology implementation in an instructional environment is not a new concept nor is it something that has not been previously studied. There are multiple studies in the K-12 environment as well as the four-year university setting on implementation. While there are some studies in the community college context, the body of literature is not nearly as abundant as that of K-12 schools or four-year universities.

Various studies based on Ely's (1990) conditions have been performed in the past. Based on the works of Rogers (1962; 2003), Ely (1990; 1999), and various other researchers after them, implementation factors vary based on the environment and the technologies or innovations. This welcomes further investigation of the perceptions of the influence of Ely's (1990) conditions within the context of community college environments.

Studies focusing specifically on community college faculty and their levels of technology implementation are few. Of the studies that exist for technology implementation by community colleges faculty, they either are in comparison to four-year university faculty or focus on a specific group of faculty. Due to the high percentage and significant number of community college faculty members, as well as the limited research on technology implementation by community college faculty, this is an area that warrants further study. The absence of identifiable data related to the perception of the conditions that facilitate implementation of educational technologies by community college faculty presents an opportunity to add to the body of knowledge through additional study. Furthermore, no studies that used Ely's (1990) conditions that facilitate the implementation of educational technology in a community college setting were identified. An opportunity to further the body of knowledge exists by researching the perception of the influence of Ely's (1990) conditions that facilitate technology implementation by community college faculty.

Chapter 3 - Methodology

Introduction

This chapter describes the methodology used in determining community college faculty perceptions of the influence of Ely's (1990) conditions that facilitate the implementation of educational technology. Perceptions of the influence of Ely's conditions among various types of technologies and among community college faculty demographic groups were examined as part of this methodology.

Purpose

The purpose of this study was to extend the literature related to the perceptions of the influence of the conditions that facilitate implementation of educational technologies by community college faculty. As part of providing this additional information, community college faculty perceptions of the influence of Ely's (1990) conditions were determined and then measured by way of survey research. Through the survey data collection method, differences in the perceptions of the influence of Ely's conditions were determined among various educational technologies as well as faculty demographics. Such faculty demographics included age group, gender, highest degree obtained, employment status, course format, and years of teaching experience.

Research Questions

This study explored two areas critical to technology implementation by community college faculty: perceptions of the influence of Ely's (1990) conditions for implementation among various technology tools, and perceptions of the influence of Ely's conditions for technology implementation among various community college faculty demographics.

Research Question 1. What are the user perceptions of community college faculty regarding the influence of Ely's conditions for specific technology implementation among various technologies?

Research Question 2. What are the user perceptions of community college faculty regarding the influence of Ely's conditions for technology implementation between and within various demographics?

The focus on community college faculty developed through the review of literature, which indicated a need for further studies in the area of instructional technology implementation by this population. Community colleges provide postsecondary education to a significant portion of undergraduate and continuing education students in the United States ("Community College Fact Sheet," 2013). The list of technology tools used by community college faculty members is diverse and wide-ranging. Determining the perceptions of the influence of Ely's (1990) conditions by faculty that implement particular technology resources may contribute to a greater understanding of possible differences in faculty perceptions.

Community college faculty are also a diverse group of individuals (National Center for Education Statistics, 2013). Faculty members range greatly in regards to age, gender, highest degree obtained, employment status of full time versus adjunct, course format, and years of teaching experience. An examination of Ely's (1990) conditions of implementation as it relates to faculty demographics will add to the known body of knowledge.

The research questions for this study are based on Ely's (1990, 1999) conditions that facilitate the implementation of educational technologies, which is a derivative of Rogers (1962, 2003) theory of diffusion of innovation.

Research Design

This study was conducted using an online survey to collect data from community college faculty members across the Virginia Community College System (VCCS) with the goal of learning about their perceptions of the influence of conditions influencing their implementation of educational technologies. The survey method of research allows researchers to identify trends, opinions, or attitudes of members of the sample (Creswell, 2009). The results by virtue of the survey will be quantitative in nature and provide numeric values of those faculty perceptions as they relate to technology implementation.

Population

The population and subsequent sample for this study were faculty members, both fulltime and adjunct, of for-credit courses taught within the Virginia Community College System (VCCS) during the spring 2015 semester. The VCCS, founded in 1966, is the governing body of the community colleges within the Commonwealth of Virginia. Supporting 23 community colleges across the Commonwealth, the VCCS provides administrative and planning support as well as shared resources from a state agency level. The colleges within the VCCS are spread throughout the state and provide both credit and non-credit courses for its students and provide a comprehensive list of academic programs and trainings.

All 23 community colleges in Virginia were solicited for faculty participation in this study. After sharing researcher IRB documents and study proposals, 18 of the 23 colleges agreed to participate. Upon agreement to participate by the colleges, invitations to participate in the study were sent to faculty members teaching within those 18 community colleges via email. These 18 community colleges reflected a variety of geographic areas across the state of Virginia.

Instrumentation

The data collection tool used in this study was a survey instrument found in Appendix A. The survey instrument was developed by the researcher and based on findings in the review of the literature. The instrument was designed to capture faculty perceptions regarding the influence of Ely's (1990) eight conditions that facilitate the implementation of educational technology.

The survey instrument was broken into multiple sections including faculty demographics, questions asking if they use particular technologies, followed by the rating of statements that align to Ely's (1990) eight conditions that facilitate the implementation of educational technology.

Within the faculty demographics, characteristics recorded included gender, age, highest degree obtained, faculty employment status (fulltime or adjunct), years of teaching experience, and course format (online, face-to-face, or mix). In the review of the literature, these characteristics were indicated to be possible factors in instructional technology implementation (Dusick & Yildirim, 2000). This study compared the perceptions of the influence of Ely's (1990) conditions for each of the faculty demographics listed above.

After completing the demographics section, respondents were presented a list of 17 technologies, such as Blackboard Learn, that are available for use in typical VCCS classrooms. For each technology, the respondents were asked if they use that technology in their classroom instruction with the answer options of yes or no.   A complete list of the technologies is found in Appendix A. All of the technologies examined in this study fall into the communication category as defined by the taxonomy laid out by Bruce and Levin (1997). A few of the technologies may also fall into the inquiry category, depending on how they are used. In the context of instructional delivery in a classroom, technologies are commonly used by faculty to communicate instructional messages or content and to facilitate inquiry. Therefore it is suitable these technologies fit into both the communications and inquiry categories from Bruce and Levin's taxonomy.

The technologies used in this survey were determined through an examination of commonly found technologies in VCCS classrooms. In order to provide generalizable information, technologies used are referred to their generic terms. For the purposes of this study, Learning Management System was Blackboard Learn, Presentation Software was Microsoft PowerPoint, Word Processing Software was Microsoft Word, Online Virtual Collaboration was Blackboard Collaborate, and Online Technology Training was Atomic Learning. Within the survey itself, the technologies were referred to by the brand names which are most identifiable by faculty.

After answering yes or no for all technologies on the list, the respondents were presented with a list of eight statements for each technology for which they answered 'yes'. These eight statements were aligned with Ely's (1990) eight conditions for the facilitation of educational technologies. Ely's conditions and their aligning statements are shown below in *Table 1*.

Table 1. Ely's Conditions and Aligning Statements

Ely's Condition	Statement in Survey
Dissatisfaction with the Status Quo	My instructional methods and strategies benefit more from the use of this technology than they did from prior technologies.
Existence of Knowledge and Skills	I have the skills and knowledge necessary to use this technology.
Availability of Resources	This technology is readily available whenever I need to use it.
Availability of Time	My college provides time to learn how to use this technology.
Rewards or Incentives Exist	My college provides rewards and incentives to use this technology.
Participation	I had an opportunity to participate and be heard during the decision making process to select this technology.
Commitment	My academic dean or department head actively supports the use of this technology.
Leadership	College leadership (VPs and higher) are committed to the use of this technology.

Only the statement was shown within the survey and not Ely's (1990) corresponding condition. Each statement was evaluated by the respondent according to the condition's level of influence on his or her implementation of a technology. Respondents used a rating scale of one to five, with one representing no influence, two having little influence, three having some influence, four having major influence, and five having extreme influence.

Pilot Study and Validity. Ely's (1990) conditions were identified through research based on Rogers's (1962) theories of innovations. In a follow up to his original publication on the eight conditions, Ely (1999) further established the validity of his conditions through the analysis of his and other researcher's studies that used the conditions as a framework in multiple contexts. In an effort to ensure the survey tool clearly communicated Ely's conditions, a pilot study was conducted.

Prior to the large-scale collection of data using the survey tool, a small group of individuals was selected by the researcher to conduct a pilot study of the survey tool. The purpose of this pilot study was to get input from participants on the clarity of the wording and the flow of the survey tool. The individuals were selected because of their experiences in doctoral studies or their experiences and knowledge in survey design. The findings of the pilot study are detailed in Appendix D.

Comments that came from the pilot study included informing participants of the duration and current percentage of the survey complete, clarity on the Blackboard Learn and classroom presentation station / podium, and how to determine if support exists at the Vice President or Dean level for a technology. In response to these concerns, the survey tool was modified to add the term "podium" along with "presentation station". Percentage complete of the survey was included at the bottom of each page. Support from a Dean or Vice President should be apparent to the participant and would be absent if unclear.

The final survey instrument was developed from the results of the pilot study. On the first screen of the final survey, respondents were presented with demographic questions. The second screen contained a list of all 17 technologies and the respondents were asked if they use each technology with a yes or no radio button. Only those technologies selected as being used by the respondent were followed up with questions regarding Ely's (1990) conditions. Identifying all technologies used before considering perceptions of Ely's conditions was done to remove the temptation for respondents to answer no to usage to complete the survey in less time. Further, it made the survey easier for the respondent to complete, provided data in an easier to use format, and only collected data relevant to the research questions.

Reliability. After the distribution of the survey and collection of data, an internal measure of reliability was conducted by testing the Cronbach Alpha value of the Likert scale responses for each technology. Sixteen of the 17 technologies rated on the influence of Ely's (1990) conditions rated a Cronbach Alpha value above .820 showing a high level of internal consistency of responses. The lowest response, Blackboard Learn, had a Cronbach Alpha of .613 showing a level of internal consistency not as high as the other technologies but acceptable for this study.

Table 2. Reliability Ratings per Technology

Technology	Cronbach Alpha value
Learning Management System	.613
Presentation Station	.831
Document Camera	.852
Sound Amplification	.896
Lecture Capture	.821
Clickers	.915
Presentation Software	.836
Word Processing Software	.850
Google Docs	.854
DVD / Blueray Player	.852
Instructional Content	.833
Streaming Video	.836
Online Virtual Collaboration	.830
Synchronous Video	.911
Laptop	.843
iPad	.863
Online Technology Training	.847

Data Collection

The data were collected in the form of a survey administered by the Virginia Tech Qualtrics online survey tool. Before any data collection began, the researcher contacted each of the VCCS colleges' Institutional Research coordinators to receive permission to send the survey to both their fulltime and adjunct faculty. Upon receiving permission, the invitation to individual participants of the study was sent out in an email, explaining the purpose of the study. The Institutional Research coordinator at each college assisted with the distribution of the survey by forwarding the invitation to participate to all faculty at their college. The invitation also contained an explanation of how the data would be handled as well as a notice that personally identifiable information would not be collected. A time estimate for completing the questionnaire was also provided to potential participants and was included on the introduction screen of the questionnaire.

Data Analysis

Once the survey data were collected and descriptive statistics compiled and analyzed, the responses were also analyzed using appropriate statistical software tools. The study employed the use of statistical treatments of the data in order to answer the research questions.

Research question 1 analysis. For research question 1, "What are the user perceptions of community college faculty regarding the influence of Ely's (1990) conditions for specific technology implementation among various technologies?" the independent variables were each of Ely's eight conditions and the dependent variable was the ratings provided by respondents who answered yes to using a technology. Data regarding Ely's conditions for implementation was not collected for the technologies the respondent reported as not using.

Individual response ratings of the perception of the influence of implementation conditions were placed first in a table (see *Table 3*) with Ely's (1990) conditions in the columns and the respondent's ratings in the rows. Data in this table could be compared visually against each other and incomplete responses could be identified easily. This process was performed, and a similar table created, for each of the 17 technologies in the survey.

Table 3. Example Data Collected for Research Question 1

Condition	Status Quo	Knowledge	Resources	Time	Reward	Participation	Commitment	Leadership
Respondent 1	4	4	2	1	1	4	3	2
Respondent 2	3	4	4	3	2	4	3	3
Respondent 3	4	3	4	2	1	3	4	2

After incomplete surveys were removed, statistical analyses were performed for each of the technologies in the survey. In these analyses, the data obtained by the rating scale in the survey tool was treated as ordinal data. The Friedman non-parametric one-way analysis of variance test was used to show whether any of the rating scores per condition were significantly different. The Friedman test is appropriate to analyze this type of data as the dependent variable is ordinal and faculty members are responding to multiple technology ratings. If the Friedman test showed there were significant differences within the rating of the perception of influence of Ely's (1990) conditions for a particular technology, a step-wise stepdown *post hoc* analysis was conducted to identify which of Ely's conditions were significantly different as compared to the other conditions. During the step-wise stepdown *post hoc* testing, the alpha value was adjusted to control the error rate. This method of statistical analysis was performed per each technology.

Research question 2 analysis. Research question 2, "What are the user perceptions of community college faculty regarding the influence of Ely's (1990) conditions for technology implementation between and within various demographics?" was treated similar to research question 1 but instead of comparing the perceptions of the influence of Ely's conditions to the technology, the perceptions were compared among the respective sub-groups for each demographic included in the survey: age, gender, highest degree obtained, employment status, course format, and years of teaching experience. Data were examined in two different ways as part of answering the research question; an analysis of conditions per demographic and an analysis of demographic subgroups per condition. The analysis of conditions per demographic would answer questions such as “Which of Ely’s conditions are most influential to the 25-34 age group?” while the analysis of demographic subgroups per condition would answer questions such as “If I have the condition rewards and incentives in place, which age groups would be most influenced by this condition?”.

The data obtained per technology by the rating scale in the online tool was analyzed as one large dataset because this research question did not involve analysis per technology. To conduct an analysis of Ely’s (1990) conditions per demographic, the same Friedman test conducted for Research Question 1 was performed on the large dataset for only those records matching the demographic subgroup to be tested. This test was repeated for each demographic subgroup until all subgroups were analyzed. The Friedman test is appropriate for this analysis as the dependent variable is ordinal and faculty members are responding to multiple technology ratings. If the Friedman test showed there were significant differences within the rating of the perception of influence of Ely’s conditions for a particular demographic subgroup, a step-wise stepdown *post hoc* analysis was conducted to identify which of Ely’s conditions were significantly different as compared to the other conditions. During the step-wise stepdown *post hoc* testing, the alpha value was adjusted to control the error rate. This method of statistical analysis was performed per each demographic subgroup.

In order to conduct an analysis of demographic subgroups for each of Ely's (1990) conditions, the Kruskal-Wallis test was used to find any significant differences between the ratings of the sub-groups within their respective demographic. The Kruskal-Wallis test is appropriate for this type of data analysis as the dependent variable (respondent rating) is ordinal, the independent variables (demographics) are categorical, and respondents can only be in one demographic subgroup. The Kruskal-Wallis test identified any significant differences in the ratings of the influence of Ely's conditions among demographic sub-groups. For those demographics that contained more than two sub-groups, a step-wise stepdown *post hoc* analysis was conducted to identify which sub-groups were significantly different as compared to other sub-groups. During this *post hoc* analysis, alpha values were adjusted to control the error rate. The demographics of age, highest degree obtained, course format, and years of teaching experience all contained more than two sub-groups and required *post hoc* analysis if significant differences were found. This entire process was repeated for each of Ely's conditions.

Chapter 4 - Results

Introduction

The purpose of this study was to extend the literature related to the implementation of educational technologies within community college settings. Perceptions of Ely's (1990) conditions that facilitate the implementation of educational technology by community college faculty were measured via online survey. In an effort to answer the research questions, the survey was designed to measure the perceptions of Ely's conditions in relation to specific technologies implemented as well as the faculty demographics of age, gender, highest degree obtained, employment status, course format, and years of teaching experience. This chapter provides information related to data collected and the research questions. The research questions investigated were:

1. What are the user perceptions of community college faculty regarding the influence of Ely's conditions for specific technology implementation among various technologies?
2. What are the user perceptions of community college faculty regarding the influence of Ely's conditions for technology implementation between and within various demographics?

Data Analysis

The researcher contacted all 23 of Virginia's Community Colleges in an effort to obtain an appropriate sample for this study. While a large number of the local college Institutional Review Boards responded positively and distributed the survey to their faculty, not all colleges responded or granted permission. Of the 23 colleges solicited, only five did not participate leaving the remaining 18 colleges across Virginia participating in the survey. The 18 participating colleges were made up of a mixture of rural, suburban, and urban settings. In all, 772 began the survey with 634 completing the survey, representing a completion rate of 82% and a dropout rate of 18%.

Research Question 1

The first research question was stated as "What are the user perceptions of community college faculty regarding the influence of Ely's (1990) conditions for specific technology implementation among various technologies?" For this question, user perceptions of the influence of Ely's eight conditions were measured for each of 17 separate technologies commonly found in Virginia community colleges. For each of the 17 technologies, a statistical treatment for non-parametric data, specifically the Friedman non-parametric analysis of variance test, was used to identify any significant differences in user perceptions of Ely's conditions. User responses regarding the influence of Ely's conditions obtained from the data collection instrument ranged on a Likert scale of one (no influence) to five (extreme influence). The appropriate measure of multiple ordinal Likert scale data is the mean rank. The mean rank represents the mean location on a scale of one to eight (because there are eight conditions) of how that particular condition was rated as compared to the other conditions. If a condition was rated the highest by all respondents, it would have a mean rank of eight. Conversely, if a condition was rated lowest by all respondents, it would have a mean rank of one. When interpreting the results, a higher mean rank value corresponds to a higher influence while a lower mean rank value represents a lower influence of that condition. The Friedman test identifies significant differences between mean ranks. If a significant difference (p<.05) was determined from the Friedman test among any of the eight conditions, a stepwise stepdown *post hoc* test was conducted with control for Type I errors across conditions to identify where significant differences exist. Stepwise step-down is an appropriate *post hoc* test as it compares multiple non-parametric data variables while adjusting significance levels based on the number of comparisons. The results of this *post hoc* analysis produce a table of homogenous subsets, grouping conditions with no significant differences into subsets, indicating those conditions in different subsets have a significant difference between them.

All 17 non-parametric Friedman tests produced Chi-Square values which were significant ($p < .05$). Subsequently, stepwise step-down *post hoc* tests were conducted for each of the 17 technologies and these tests produced homogenous groupings of conditions with similar rankings. The following table shows these homogenous groupings indicating where significant differences exist per each technology. A detailed specific analysis of each technology can be found in Appendix E.

Table 4. Summary of Technology Homogenous Subsets

	RS	KS	SQ	TM	CM	LD	PT	RI
LMS	1	2	3	2,3	3	2,3	4	5
Presentation Station	1	1,2	2	3	3	3	4	4
Document Camera	1	1	2	3	3	3	4	4
Sound Amp	1	1,2	1,2,3	3	1,2,3	2,3	4	4
Lecture Capture	1	1	1	2	2	2,3	4	3,4
Clickers	1	1	1	1,2	2	2	2	2
Presentation Software	1	1	2	3	3	3	4	4
Word Processor	1	1	2	3	3	3	4	4
Google Docs	1	1,2	2	3	4	4	5	5
DVD/BlueRay	1	1,2	2	3	3	3	4	4
Instructional Content	1	1	1	3	2	2	4	3
Streaming Video	1	1	1	2	2	2	3	3
Online Collaboration	1	1	1	2	2	2	3	3
Sync Video	1,2,3	1,2	1	1,2,3,4	1,2,3,4	2,3,4	3,4	4
Laptop	1	1	1	2	2	2	3	3
iPad	1	1	1	2	2	2	3	3
Online Tech Training	1	1	1	2	2	2	3	3

RS = Resources; KS=Knowledge/Skills; SQ=Status Quo; TM=Time
CM=Commitment; LD=Leadership; PT=Participation; RI=Rewards/Incentives
Values correspond to subsets of conditions. Conditions with the same subset value are not significantly different. The lower the subset value, the more influential the condition.

Table 4 represents a summary of all technologies and the homogenous subgroups of Ely's (1990) conditions for each technology. Per technology, those conditions in the same subset are not significantly different. Unlike the mean ranks discussed earlier, the lower the value of a subset, the more influential the condition was perceived for that technology. Those conditions in subset 1 per technology were rated as the most influential condition, as compared among all conditions. As the statistical treatment was to identify the perceptions of conditions per technology, the table should only be interpreted per row (perception of conditions per technology); this statistical treatment was not designed for comparisons between technologies. The subgroups indicate which conditions do not have significant differences, meaning conditions with different subgroups values are significantly different. Conditions with a subgroup value of 1 indicate that condition is in the subgroup that was perceived as most influential by respondents. As the subgroup values increase in number, the level of perceived influence of that condition reduces. A detailed explanation of each technology is as follows. Detailed statistical analyses per condition can be found in Appendix E.

Learning Management System. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=524)=749.44$, $p<.001$. *Post hoc* testing showed that Resources (Mean rank=5.57) was perceived to have the most influence and its mean rank was significantly different from all other conditions. *Post hoc* analysis also showed that the mean ranks of Participation (Mean rank=3.29) and Rewards/Incentives (Mean rank=2.79) were also significantly different from all other conditions and these two conditions were perceived to have the least amount of influence.

Presentation Station. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=500)=1821.37$, $p<.001$. *Post hoc* testing showed that Resources (Mean rank=6.37) and Knowledge/Skills (Mean rank=6.17) were perceived to have the most influence and their mean ranks were significantly different from all other conditions except when compared to each other. *Post hoc* analysis also showed that the mean ranks Participation (Mean rank=2.66) and Rewards/Incentives (Mean rank=2.57) were also significantly different from all other conditions except themselves and these two conditions were perceived to have the least amount of influence.

Document Camera. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=284)=1108.84$, $p<.001$. *Post hoc* testing showed that Resources (Mean rank=6.60) and Knowledge/Skills (Mean rank=6.29) were perceived to have the most influence and their mean ranks were significantly different from all other conditions except when compared to each other. *Post hoc* analysis also showed that the mean ranks of Participation (Mean rank=2.75) and Rewards/Incentives (Mean rank=2.72) were also significantly different from all other conditions except themselves and were perceived to have the least amount of influence.

Sound Amplification System. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=85)=177.39$, $p<.001$. *Post hoc* testing showed that several conditions including Resources (Mean rank=5.65), Knowledge/Skills (Mean rank=5.48), Status Quo (Mean rank=5.25), and Commitment (Mean rank=4.49) were perceived to have the most influence while Participation (Mean rank=3.35) and Rewards/Incentives (Mean rank=2.96) were perceived to have the least amount of influence. The mean rank of Resources (Mean rank=5.65) was significantly different from the mean ranks of four other conditions: Leadership (Mean rank=4.46), Time (Mean rank=4.36), Participation (Mean rank=3.35), and Reward/Incentives (Mean rank=2.96). The mean rank of Knowledge/Skills (Mean rank=5.48) differed from the mean ranks of three conditions: Time (Mean rank=4.36), Participation (Mean rank=3.35), and Rewards/Incentives (Mean rank=2.96). The mean rank of Status Quo (Mean rank=5.25) differed from the mean ranks of only two conditions, Participation (Mean rank=3.35) and Rewards/Incentives (Mean rank=2.96), while the mean ranks of Participation (Mean rank=3.35) and Rewards/Incentives (Mean rank=2.96) were significantly different from the mean rank of all other conditions except themselves.

Lecture Capture. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=96)=250.95$, $p<.001$. *Post hoc* testing showed that Resources (Mean rank=5.81), Status Quo (Mean rank=5.80), and Knowledge/Skills (Mean rank=5.70) were perceived to have the most influence and their mean ranks were significantly different from all other conditions except when compared to each other. *Post hoc* analysis also showed that the mean rank of Rewards/Incentives (Mean rank=3.02) was significantly different from the mean ranks of all other conditions except Leadership (Mean rank=3.90) and Participation (Mean rank=2.79). Rewards/Incentives (Mean rank=3.02) and Participation (Mean rank=2.79) were perceived to have the least amount of influence.

Clickers. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=48)=105.20$, $p<.001$. *Post hoc* testing showed only two homogenous groups, with Time (Mean rank=4.59) appearing in both groups. Status Quo (Mean rank=5.72), Knowledge/Skills (Mean rank=5.65), and Resources (Mean rank=5.48) were perceived to have the most influence and their mean ranks were significantly different from all other conditions except when compared to each other and Time (Mean rank=4.59). *Post hoc* analysis also showed that the mean ranks of Commitment (Mean rank=4.04), Leadership (Mean rank=3.57), Rewards/Incentives (Mean rank=3.56), and

Participation (Mean rank=3.39) were also significantly different from all other conditions except themselves and Time (Mean rank=4.59). These conditions were perceived to have the least amount of influence.

Presentation Software. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=500)=2042.88$, $p<.001$. *Post hoc* test showed that Resources (Mean rank=6.49) and Knowledge/Skills (Mean rank=6.39) were perceived to have the most influence and their mean ranks were significantly different from all other conditions except when compared to each other. *Post hoc* analysis also showed that the mean ranks of Participation (Mean rank=2.76) and Rewards/Incentives (Mean rank=2.62) were also significantly different from all other conditions except themselves and were perceived to have the least amount of influence.

Word Processing Software. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=490)=2032.99$, $p<.001$. *Post hoc* testing showed that Resources (Mean rank=6.45) and Knowledge/Skills (Mean rank=6.40) were perceived to have the most influence and were significantly different from all other conditions except when compared to each other. *Post hoc* analysis also showed that Participation (Mean rank=2.78) and Rewards/Incentives (Mean rank=2.70) were also significantly different from all other conditions except themselves and were perceived to have the least amount of influence.

Google Docs. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=238)=793.51$, $p<.001$. *Post hoc* testing showed that Resources (Mean rank=6.28) and Knowledge/Skills (Mean rank=5.94) were perceived to have the most influence. Resources and Knowledge/Skills were not significantly different from one another but Resources was significantly different from Status Quo (Mean rank=5.88) while Knowledge/Skills was not significantly different from Status Quo. *Post hoc* analysis also showed that Participation (Mean rank=2.96) and Rewards/Incentives (Mean rank=2.86) were also significantly different from all other conditions except themselves and were perceived to have the least amount of influence.

DVD / BlueRay Player. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=209)=846.15$, $p<.001$. *Post hoc* testing showed that Resources (Mean rank=6.44) and Knowledge/Skills (Mean rank=6.37) were perceived to have the most influence. Resources was significantly different from all other conditions except Knowledge/Skills and Knowledge/Skills was significantly different from all conditions except Resources and Status Quo (Mean rank=5.97). *Post hoc* analysis also showed that Participation (Mean rank=2.95) and Rewards/Incentives (Mean rank=2.90) were also significantly different from all other conditions except themselves and were perceived to have the least amount of influence.

Instructional Content from Textbook Publisher. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=415)=1456.57$, $p<.001$. *Post hoc* testing showed that Status Quo (Mean rank=6.22), Knowledge/Skills (Mean rank=6.15), and Resources (Mean rank=6.10) were perceived to have the most influence and were significantly different from all other conditions except when compared to each other. *Post hoc* analysis also showed that Participation (Mean rank=2.70) was also significantly different from all other conditions and was perceived to have the least amount of influence.

Steaming Video. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=218)=852.17$, $p<.001$. *Post hoc* testing showed that Knowledge/Skills (Mean rank=6.35), Resources (Mean rank=6.29), and Status Quo (Mean rank=6.22) were perceived to have the most influence and were significantly different from all other conditions except when compared to each other. *Post hoc* analysis also showed that Participation (Mean rank=2.83) and Rewards/Incentives (Mean rank=3.07) were also significantly different from all other conditions except themselves and were perceived to have the least amount of influence.

Online Virtual Collaboration. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=164)=439.25$, $p<.001$. *Post hoc* testing showed that Resources (Mean rank=5.71), Knowledge/Skills (Mean rank=5.57), and Status Quo (Mean rank=5.54) were perceived to have the most influence and were significantly different from all other conditions except when compared to each other. *Post hoc* analysis also showed that Participation (Mean rank=2.80) and Rewards/Incentives (Mean rank=2.72) were also significantly different from all other conditions except themselves and were perceived to have the least amount of influence.

Synchronous Video Equipment. Friedman testing showed a significant difference among the ratings of conditions, $\chi 2(7, N=48)=86.23$, $p<.001$. *Post hoc* testing showed that Status Quo (Mean rank=5.70) was in a group that was perceived to have the most influence but was significantly different from only Leadership (Mean rank=4.19), Participation (Mean rank=3.56), and Rewards/Incentives (Mean rank=3.25). *Post hoc* analysis also showed that Rewards/Incentives was in a group that was perceived to have the least influence but was significantly different from only Status Quo, Knowledge/Skills (Mean rank=5.44), and Resources (Mean rank=4.99). While there were some significant differences of conditions within this technology, there were many conditions that did not have significant differences between them.

Laptop. Friedman testing showed a significant difference among the ratings of conditions, $\chi2(7, N=322)=1182.72, p<.001$. *Post hoc* testing showed that Resources (Mean rank=6.24), Knowledge/Skills (Mean rank=6.23), and Status Quo (Mean rank=5.96) were perceived to have the most influence and were significantly different from all other conditions except when compared to each other. *Post hoc* analysis also showed that Participation (Mean rank=2.75) and Rewards/Incentives (Mean rank=2.98) were also significantly different from all other conditions except themselves and were perceived to have the least amount of influence.

iPad. Friedman testing showed a significant difference among the ratings of conditions, $\chi2(7, N=175)=446.93, p<.001$. *Post hoc* testing showed that Knowledge/Skills (Mean rank=5.86), Resources (Mean rank=5.83), and Status Quo (Mean rank=5.75) were perceived to have the most influence and were significantly different from all other conditions except when compared to each other. *Post hoc* analysis also showed that Participation (Mean rank=3.30) and Rewards/Incentives (Mean rank=2.99) were also significantly different from all other conditions except themselves and were perceived to have the least amount of influence.

Online Technology Training. Friedman testing showed a significant difference among the ratings of conditions, $\chi2(7, N=87)=229.95, p<.001$. *Post hoc* testing showed that Resources (Mean rank=5.93), Knowledge/Skills (Mean rank=5.60), and Status Quo (Mean rank=5.59) were perceived to have the most influence and were significantly different from all other conditions except when compared to each other. *Post hoc* analysis also showed that Participation (Mean rank=2.92) and Rewards/Incentives (Mean rank=2.98) were also significantly different from all other conditions except themselves and were perceived to have the least amount of influence.

Research Question 2

The second and final research question was stated as “What are the user perceptions of community college faculty regarding the influence of Ely’s (1990) conditions for technology implementation between and within various demographics?” Two methods were used to answer this question. In the first statistical treatment, an analysis of conditions per demographic, the same Friedman test process used in the first research question was used to identify the perception of the relative influence of all of Ely’s eight conditions for each subgroup within a demographic group. The second statistical treatment, a comparison of perceptions between the various subgroups of a demographic group for each condition, used the Kruskal-Wallis test to identify the perceptions of each demographic subgroup for each of Ely’s conditions. The first method answers questions such as “Which of Ely’s eight conditions are most influential to the 25-34 age group?” while the second method answers questions such as “If I have the condition rewards and incentives in place, which age groups would be most influenced by this condition?”.

The six demographic categories of age, gender, highest degree obtained, employment, course format, and years of teaching experience were analyzed for this research question. A summary of each statistical analysis follows below. Specific statistical details of the analysis of conditions per demographic are found in *Appendix F* while details of the analyses of demographic subgroups per condition are found in *Appendix G.* Within the details of the statistical analysis are mean ranks, similar to the results from Research Question 1. Succeeding the summary tables are analyses of each demographic and of each of Ely's conditions. Relevant data appear in the rows of tables 5-11.

Table 5. Analysis of Conditions per Demographic Subgroup

Demographic	Sub-group	RS	KS	SQ	TM	CM	LD	PT	RI
Age	< 25	*sample size too small*							
	25-34	1	1,2	2	3	3	3	4	4
	35-44	1	1	2	3	4	4	5	5
	45-54	1	2	3	4	4	4	5	5
	55-64	1	1	2	3	3	3	4	4
	65+	1	1	2	3	3	3	4	4
Gender	Male	1	1	2	3	3	3	4	4
	Female	1	2	3	4	4	4	5	5
Employment	Fulltime	1	2	3	4	4	4	5	5
	Adjunct	1	1	2	3	3	3	4	4
Years of Teaching Experience	0-5	1	1	2	3	3	3	4	4
	6-10	1	1	2	3	3	3	4	4
	11-20	1	1	2	3	3	3	4	4
	21-30	1	1	2	3	3	3	4	4
	> 30	1	1, 2	2	3	3	3	4	4
Course Format	Face-to-Face	1	1	2	3	3	3	4	4
	Online	1	1	2	3	3	3	4	4
	Mix	1	2	3	4	4	4	5	5

RS = Resources; KS=Knowledge/Skills; SQ=Status Quo; TM=Time
CM=Commitment; LD=Leadership; PT=Participation; RI=Rewards/Incentives
Values correspond to subsets of conditions. Conditions with the same subset value are not significantly different. The lower the subset value, the more influential the condition.

Analysis of conditions per demographic subgroups. The following analyses identify the perception of Ely's (1990) conditions for each demographic subgroup. In these analyses, the perceptions of all eight of Ely's conditions for each subgroup within a demographic group are compared among each other. For the analysis of conditions per demographic, the same approach and methodology as Research Question 1 holds true with eight conditions and a mean rank on a scale of one to eight.

Age demographic. For the age demographics, shown in *Appendix F, Tables F1-F5,* the under 25 subgroup was too small for statistical analysis. The remaining age subgroups 25-34, 35-44, 45-54, 55-64, and 65+ all perceived Resources as the most influential with Knowledge/Skills also perceived highly among the age groups. For these same age subgroups, Participation and Rewards/Incentives were perceived as the least influential.

Gender demographic. For the gender demographics, shown in *Appendix F, Tables F6-F7*, males and females both perceived Resources as most influential with males also perceiving Knowledge/Skills as most influential. Both genders perceived Participation and Rewards/Incentives as the least influential of the conditions.

Employment demographic. Within the employment demographics, shown in *Appendix F, Tables F8-F9*, both full-time and adjunct faculty perceived Resources as most influential with adjuncts also perceiving Knowledge/Skills as most influential. Both employment groups perceived Participation and Rewards/Incentives as the least influential conditions.

Years of experience demographic. Years of teaching experience subgroups, shown in *Appendix F, Tables F10-F14,* of all levels, 0-5, 6-10, 11-20, 21-30, and more than 30 years of experience all perceived Resources and Knowledge/Skills as the most influential conditions. All the subgroups of years of teaching experience rated Participation and Rewards/Incentives as the least influential of Ely's conditions.

Course format demographic. For the course format subgroups, shown in *Appendix F, Tables F15-F17*, face-to-face, online, and mix of courses respondents rated Resources as the most influential condition with face-to-face and online respondents also perceiving Knowledge/Skills as most influential. All three subgroups rated Participation and Rewards/Incentives as the least influential conditions.

Analysis of demographic subgroups per condition. The prior analyses of conditions per demographic subgroup provided information related to the perception of conditions per subgroup. That is, all eight of Ely's (1990) conditions were analyzed for significant differences and this analysis was done per each subgroup within a demographic group. This information allows one to state which conditions are more or less influential for each particular subgroup. For the analysis of demographic subgroups per condition, as the samples were not paired, all technologies were combined into one large dataset and there were a total of 4,410 responses for each condition. Consequently, the mean rank was based on a set of 4,410 places, meaning a condition rated the highest by all respondents would have a mean rank of 4,410 and a condition rated the lowest by all respondents would have a mean rank of 1. While the mean rank provided a scale of 1 through 4,410, the resultant subsets of differences showed significant differences and allowed for conclusions to be drawn.

The following analysis of demographic subgroups per condition examines the differences between demographic subgroups (males versus females for example) for each of Ely's conditions. When drawing conclusions, one must exercise caution if using only one analytical method. A specific condition may be more influential to males as compared to females, but that particular condition when compared against the other seven conditions may have the least amount of overall influence. While a statement that a condition is more influential to males than females may be accurate, that condition may not be very influential as compared to the remaining seven of Ely's conditions.

Gender subgroup analysis. As can be seen in the rows of *Table 6* and detailed in *Appendix H, Table H1* as well as throughout *Appendix G,* for the conditions Status Quo, Knowledge/Skills, and Resources, females perceived each of these conditions as more influential than did males. Among the two gender groups in *Table 6,* for Participation, Rewards/Incentives, Commitment, and Leadership, males perceived each of these conditions as more influential than did females. The perception of the influence of Time did not have a significant difference between males and females.

Table 6. Analysis of Gender Subgroups per Condition

	Male	Female
Status Quo	2	1
Knowledge/Skills	2	1
Resources	2	1
Time	No Significant Difference	
Participation	1	2
Rewards/Incentives	1	2
Commitment	1	2
Leadership	1	2

Values correspond to subsets of conditions. Conditions with the same subset value are not significantly different. The lower the subset value, the more influential the condition.

Age subgroup analysis. For the analysis of all of Ely's (1990) conditions, the size of the under 25 age group was too small to include in a statistical analysis among the other age groups. As can be seen in the rows of *Table 7* and detailed in *Appendix H, Table H2* as well as throughout *Appendix G*, the perceptions of the influence of Ely's conditions varied per each age group. Resources, Knowledge/Skills, and Status Quo were perceived to have more influence by the 35-44 age group than for any other age group. Among the various age groups, Time and Leadership were perceived the most influential by the 55-64 and 65+ age groups when compared to the other remaining age groups. When the perceived influence of the Commitment condition was compared among age groups, Commitment was perceived to be more influential by the 65+ age group than for any of the remaining age groups. Rewards/Incentives did not have any significant differences in regards to perception among the various age subgroups.

Table 7. Analysis of Age Subgroups per Condition

	< 25	25-34	35-44	45-54	55-64	65+
Resources	*	2	1	2	2	3
Knowledge / Skills	*	2	1	2	2	2
Status Quo	*	2	1	3	2	3
Time	*	2	2	2	1	1
Commitment	*	3	3	3	2	1
Leadership	*	2,3	3	2	1	1
Participation	*	1	1	2	1	1
Rewards / Incentives	*	No Significant Differences				

Values correspond to subsets of conditions. Conditions with the same subset value are not significantly different. The lower the subset value, the more influential the condition.
** indicates sample size too small for analysis*

Degree subgroup analysis. Among the four degree subgroups, the conditions Resources, Knowledge/Skills, and Status Quo were perceived to be the most influential conditions by those respondents with masters and doctoral degrees over those with bachelors and associates degrees. Conversely, Time, Commitment, Leadership, Participation, and Rewards/Incentives were perceived as the most influential conditions by those respondents with associates degrees compared to those with higher level degrees. As seen in the rows of *Table 8* and detailed in *Appendix H*, *Table H3* as well as throughout *Appendix G*, the degree of influence of these conditions decreases with higher educational levels.

Table 8. Analysis of Degree Subgroups per Condition

	Associates	Bachelors	Masters	Doctorate
Resources	2	2	1	1
Knowledge / Skills	2	2	1	1
Status Quo	1, 2	2	1	1
Time	1	1	2	3
Commitment	1	2	3	3
Leadership	1	2	3	3
Participation	1	2	3	3
Rewards / Incentives	1	2	3	3

Values correspond to subsets of conditions. Conditions with the same subset value are not significantly different. The lower the subset value, the more influential the condition.

Employment subgroup analysis. Among the two employment groups in *Table 9* and detailed in *Appendix H, Table H4* as well as throughout *Appendix G*, the conditions Status Quo, Knowledge/Skills, Resources, Time, and Rewards/Incentives were perceived to be more influential by those respondents that were full-time faculty compared to adjunct faculty. The perception of the conditions Participation, Commitment, and Leadership did not have any significant differences between the two employment subgroups.

Table 9. Analysis of Employment Subgroups per Condition

	Full-time	Adjunct
Status Quo	1	2
Knowledge/Skills	1	2
Resources	1	2
Time	1	2
Participation	No Significant Difference	
Rewards/Incentives	1	2
Commitment	No Significant Difference	
Leadership	No Significant Difference	

Values correspond to subsets of conditions. Conditions with the same subset value are not significantly different. The lower the subset value, the more influential the condition.

Experience subgroup analysis. Among the five experience subgroups in *Table 10* and detailed in *Appendix H, Table H5,* as well as throughout *Appendix G,* the condition of Resources was perceived to be most influential by the respondents having between six and 30 years of experience when compared to the other groups of years of experience. The conditions of Time, Commitment, Leadership, Participation, and Rewards/Incentives were perceived as most influential by respondents with more than 30 years of experience and less influential with those having less experience. Participation was perceived as most influential by the 0-5 years of experience group when compared to groups with more years of experience. The perception of the conditions Knowledge/Skills and Status Quo did not have any significant differences among the groups of varying years of experience.

Table 10. Analysis of Experience Subgroups per Condition

	0-5	6-10	11-20	21-30	> 30
Resources	2	1	1, 2	1, 2	2
Knowledge / Skills	No Significant Differences				
Status Quo	No Significant Differences				
Time	2	2	2	2	1
Commitment	2	2	2	2	1
Leadership	2	3	2, 3	2	1
Participation	1	2	2	2	1
Rewards / Incentives	2	4	3	2, 3	1

Values correspond to subsets of conditions. Conditions with the same subset value are not significantly different. The lower the subset value, the more influential the condition.

Course format subgroup analysis. Among the three course format groups in *Table 11* and detailed in *Appendix H, Table H6,* as well as throughout *Appendix G,* the conditions of Resources, Knowledge/Skills, Status Quo, Time, Commitment, and Leadership were perceived as most influential to respondents who taught only online courses as compared to those who taught in other course formats. Participation and Rewards/Incentives were perceived as the most influential by those teaching a mix of course formats as compared to those who taught in the other formats.

Table 11. Analysis of Course Format Subgroups per Condition

	Face-to-Face	Online	Mix
Resources	3	1	2
Knowledge / Skills	3	1	2
Status Quo	3	1	2
Time	2	1	1
Commitment	2	1	2
Leadership	1, 2	1	2
Participation	2	2	1
Rewards / Incentives	2	2	1

Values correspond to subsets of conditions. Conditions with the same subset value are not significantly different. The lower the subset value, the more influential the condition.

Summary

The research questions aimed to identify the perceptions of Ely's (1990) conditions among individual technologies and among demographic groups. The differences and similarities to these findings as compared to previous studies will be examined further in Chapter 5. For the benefit of interpretation of the findings, each technology and demographic is summarized below. The first analysis is based on Research Question 1, identifying the perception of the influence of Ely's conditions among the implementation of specific individual technologies.

Table 12. Ely's Conditions - Highest and Lowest Statistically Significant Ratings

Technology	Highest Rated	Lowest Rated
LMS	Resources	Rewards/Incentives
Presentation Station	Resources	Rewards/Incentives, Participation
Document Camera	Resources, Knowledge/Skills	Rewards/Incentives, Participation
Sound Amplification	Resources	Rewards/Incentives, Participation
Lecture Capture	Resources, Status Quo, Knowledge/Skills	Participation
Clickers	Status Quo, Knowledge/Skills, Resources	Participation, Rewards/Incentives, Leadership, Commitment
Presentation Software	Resources, Knowledge/Skills	Rewards/Incentives, Participation
Word Processor	Resources, Knowledge/Skills	Rewards/Incentives, Participation
Google Docs	Resources	Rewards/Incentives, Participation
DVD / BlueRay Player	Resources	Rewards/Incentives, Participation
Instructional Content	Status Quo, Knowledge/Skills, Resources	Participation
Streaming Video	Knowledge/Skills, Resources, Status Quo	Participation, Rewards/Incentives
Online Collaboration	Resources, Knowledge/Skills, Status Quo	Rewards/Incentives, Participation
Synchronous Video	Status Quo	Rewards/Incentives
Laptop	Resources, Knowledge/Skills, Status Quo	Participation, Rewards/Incentives
iPad	Knowledge/Skills, Resources, Status Quo	Rewards/Incentives, Participation
Online Tech Training	Resources, Knowledge/Skills, Status Quo	Participation, Rewards/Incentives

Table 13. Tallies of Highest Statistically Significant Ratings

Condition	Tally
Resources	16
Knowledge/Skills	11
Status Quo	9

Table 14. Tallies of Lowest Statistically Significant Ratings

Condition	Tally
Rewards/Incentives	15
Participation	15
Commitment	1
Leadership	1

Based on the tallies of the ratings of conditions per technology, members of the entire sample population are most influenced by Ely's (1990) conditions of Resources, Knowledge/Skills, and Dissatisfaction with the Status Quo when implementing technologies. As shown in *Table 12* and summarized in *Table 13*, Resources were rated the highest subset of conditions for 16 of 17 technologies, Knowledge/Skills were rated in the highest subset for 11 technologies and Status Quo rated in the highest subset for nine technologies. Conversely, members of the entire sample population are least influenced by Ely's conditions of Rewards/Incentives and Participation when implementing technologies. *Table 12,* summarized by *Table 14* show that Rewards/Incentives and Participation were rated in the lowest subset for 15 of 17 technologies.

The final analysis of research question 2, identifying the perception of the influence of Ely's (1990) conditions within demographic groups can best be summarized through the findings of *Table 5* in collaboration with the findings presented in *Tables 6-11* which provide greater detail within the demographic subgroups. The analysis of subgroup comparisons per condition found in *Tables 6-11* should only be interpreted after an examination of the comparison of conditions found in *Table 5.* For example it was found that males perceive Rewards/Incentives as more influential than females. However, both the male and female subgroups perceived Rewards/Incentives as the least influential of Ely's conditions.

Within *Table 5* is a summary of the perception of Ely's conditions with a breakdown per demographic subgroup. This table shows an analysis of Ely's condition for a particular demographic subgroup. It is from this table where conclusions regarding which conditions are perceived to be more or less influential can be derived. A review of *Table 5* clearly shows Resources and Knowledge/Skills consistently were rated the most influential of Ely's conditions for all demographic subgroups. Status Quo frequently appeared as the next most influential condition after Resources and Knowledge/Skills. Conversely, Participation and Rewards/Incentives were rated the least influential of Ely's conditions for all demographic subgroups. The findings of Research Question 1 are similar to the findings of research question 2 in regards to which of Ely's conditions are perceived as most and least influential.

Chapter 5 - Conclusions

This study examined the perceptions of the conditions that facilitate the implementation of educational technology within community college settings. The conditions used within this study were from Ely's (1990) research on the conditions that facilitate the implementation of educational technology innovations. The eight conditions identified by Ely (1990) were a derivative from Rogers' (1962) diffusion of innovation research. This research aimed to serve two purposes: to extend the literature related to the perceptions of the influence of the conditions that facilitate implementation of educational technologies by community college faculty and to provide information that may lead to deeper understandings of the diffusion of innovation theories based on Ely's conditions.

Overview of Research Questions and Findings

In an effort to identify the perceptions of the influence of Ely's (1990) conditions that facilitate the implementation of educational technology by community college faculty, the following research questions were examined.

1. What are the user perceptions of community college faculty regarding the influence of Ely's conditions for specific technology implementation among various technologies?
2. What are the user perceptions of community college faculty regarding the influence of Ely's conditions for technology implementation between and within various demographics?

Data were collected via an online survey tool designed by the researcher that posed statements aligned to Ely's (1990) conditions. For the first research question, the ratings of Ely's eight conditions were examined for statistically significant differences among the 17 technologies used within the survey. All of the 17 technologies showed to have significant differences among the ratings of Ely's conditions which led to further *post hoc* analyses to identify where those significant differences existed with respect to Ely's conditions. *Post hoc* examinations identified statistically significant differences among conditions, as well as those conditions that had the highest and lowest statistically significant ratings.

The top three conditions rated the highest consistently among the 17 technologies were resources are available, knowledge and skills exist, and dissatisfaction with the status quo. Resources are available scored in the statistically significant highest group for 16 of 17 technologies while knowledge and skills exist scored in the statistically significant highest group for 11 of 17 technologies. Dissatisfaction with the status quo scored in the statistically significant highest group for nine of the 17 technologies. Those nine technologies that included dissatisfaction with the status quo were lecture capture software, clickers, instructional content from textbook, streaming video, Blackboard Collaborate, synchronous video conferencing, laptop, iPad, and Atomic Learning. It could be argued that these particular technologies have a more specific purpose for how they are used when compared to the other technologies in the survey. The technologies that did not have dissatisfaction with the status quo scored in the highest groups are more common technologies meant for more general purpose use such as presentation stations, Microsoft PowerPoint, Microsoft Word, and Google Docs. The high ratings of these conditions indicate that community college faculty are strongly influenced by having technology resources readily available, having the knowledge to use the technologies appropriately, and having the ability to acquire a better tool for the job as it relates to the implementation of educational technologies.

The two conditions rated the lowest consistently among the 17 technologies were rewards or incentives exist for participants and participation is expected and encouraged. In 15 of the 17 technologies, Participation and Rewards/Incentives were in the subset that statistically rated the lowest of user perceptions. These persistent low ratings indicate that community college faculty are not strongly influenced by having rewards or incentives in place or being part of the decision making process as it relates to the implementation of educational technologies.

Prior to answering the second research question, the ratings of Ely's (1990) conditions per technology were all compiled together, essentially removing specific technologies from the data analysis. Using the combined dataset, the demographics of gender, age, highest degree obtained, employment status, years of teaching experience, and course format were analyzed per condition to identify any statistically significant differences between and within demographic subgroups. This research question was examined through two procedures: an analysis of conditions per demographic subgroups and an analysis of demographic subgroups per condition. The analysis of conditions per demographic answers questions such as "Which of Ely's conditions are most influential to the 25-34 age group?" while the analysis of demographic subgroups per condition answers questions such as "If I have the condition rewards and incentives in place, which age groups would be most influenced by this condition?". If significant differences were identified in either statistical procedure, *post hoc* analyses were performed to identify where those differences existed within the demographic category groups.

Through the analysis of conditions per demographics, apparent similarities in regards to the perception of Ely's (1990) conditions emerged. The conditions Resources and Knowledge/Skills were consistently perceived as the most influential of Ely's conditions across all demographic subgroups. The condition Status Quo frequently appeared as the next most influential of Ely's conditions after Resources and Knowledge/Skills. On the other end of the influence spectrum, Participation and Rewards/Incentives were consistently perceived as the last influential of Ely's conditions across all demographic subgroups. These findings correspond to the majority of findings of the perception of Ely's conditions when viewed within specific technologies as studied in research question 1.

Further details on the perceived influence of Ely's (1990) conditions within demographic subgroups were identified through the analysis of demographic subgroups per condition. Statistically significant differences were found within gender for seven of the eight conditions with Time is available being the only condition not significantly different between the two genders. Males perceived the influence of Participation, Rewards/Incentives, Commitment, and Leadership significantly higher than females and conversely females perceived the influence of Status Quo, Knowledge/Skills, and Resources significantly higher than males.

Age was examined with the subgroups of under 25, 25-34, 35-44, 45-54, 55-64, and 65 and older. The under 25 subgroup (n=28) had too small of a sample size to undergo statistical analysis. All eight of Ely's (1990) conditions had significant differences among the other five age subgroups. Many of the other results varied across age groups providing very little generalizable information. It was noted however that the

65 and older group perceived the influence of Status Quo, Knowledge/Skills, Resources, and Participation the lowest of the age groups. Using this analysis of age groups as an example, it is important to note that one cannot just assume the subgroups within a demographic will have similar perceptions of the influence of Ely's conditions. An analysis of the specific subgroups will reveal more specific information regarding the perception of the influence of conditions.

Groups of those holding the highest level of degree among associates, bachelors, masters, and doctoral degrees were examined for differences in their perceptions of the influence of Ely's (1990) conditions. Similar to the comparison of age groups, all eight of Ely's conditions had significant differences among groups of educational degrees. Those holding masters and doctoral degrees tended to perceive the influence of Status Quo, Knowledge/Skills, and Resources higher than those holding bachelors and associates degrees. Those holding associates and bachelors degrees perceived the influence of Time, Participation, Rewards/Incentives, Commitment, and Leadership higher than their peers holding higher level degrees. Based on these findings, one could interpret that those with higher level degrees (masters and above) most value the right technology for the job (Status Quo), the ability to use the technology (Knowledge/Skills), and access to the technology (Resources) the most, while those with lower level degrees (bachelors and below) most value time to learn the technology (Time), input on selecting the technology (Participation), Rewards/Incentives to use the technology, support from their immediate supervisor in using the technology (Commitment), and institutional support for using the technology from a vice president or higher level (Leadership).

Employment status, full-time versus adjunct faculty, was also examined for differences of perceptions of the influence of Ely's (1990) conditions. Statistically significant differences in perceptions of influence were found within Status Quo, Knowledge/Skills, Resources, Time, and Rewards/Incentives. Full-time faculty rated all five of these conditions significantly higher than their adjunct counterparts.

Years of teaching experience was grouped similar to the age subgroups with groupings of 0-5, 6-10, 11-20, 21-30, and more than 30 years of teaching experience. Ely's (1990) conditions of Resources, Time, Participation, Rewards/Incentives, Commitment, and Leadership were shown to have statistically significant differences. Those with more than 30 years of teaching experience perceived the influence of Commitment, Participation, and Rewards/Incentives significantly higher than other groups. Those with 0-5 years of teaching experience perceived the influence of Participation significantly higher than other groups as well. Beyond the interpretation that those with tremendous amounts of teaching experience (more than 30 years) value support from their immediate supervisor for technology implementation (Commitment), input on the selection of a technology (Participation), and receiving a reward or incentive for implementing a technology and that those with very little teaching experience (0-5 years) value having input on the selection of a technology (Participation), the remaining subgroups produced results that were spread across the spectrum of conditions.

The final demographic examined involved the formats of courses that faculty teach which included face-to-face only, online only, and a combination of face-to-face and online courses. All eight of Ely's (1990) conditions showed statistically significant differences among these three groups. Those that teach online only courses perceived the influence of Commitment, Knowledge/Skills, Leadership, Resources, Status Quo, and Time significantly higher than the other groups that taught in different course formats. Those that taught a mix of online and face-to-face courses perceived the influence of Participation and Rewards/Incentives higher than the other groups. Those that taught face-to-face courses only did not perceived the influence of any category significantly higher than those that taught other formats. These results reflect that those that teach online courses are influenced most by support from a supervisor to implement technologies (Commitment), the ability to use the technology appropriately (Knowledge/Skills), support from a vice president or higher to implement a technology (Leadership), ready access to technologies (Resources), the technology is the best tool for the objective (Status Quo), and that time is made available to learn how to implement the technology.

Comparisons to Existing Literature

The sample group of this study involved community college faculty members across the Virginia Community College System while past studies involving the perception of the influence of Ely's (1990) conditions (Brown 2008; Ensminger et al. 2004; Surry & Ensminger 2003) used samples from different groups including businesses, K-12, and higher education. The perceptions of the influence of Ely's conditions varied within these different contexts. The addition of the results found in this study focusing on the perception of the influence of Ely's conditions in a community college setting extends the body of available literature.

In previous studies, the data collection tool was different from the one used in this study and the data analysis also differed from this study through either descriptive rankings (Brown, 2008) or the use of the mean value of the number of times a condition was selected followed by an analysis of variance to determine statistically significant differences within groups (Ensminger, 2005). The data collection tool used in previous studies was the Implementation Profile Inventory (IPI) developed by Surry and Ensminger (2004). The IPI tool was identified to have weak reliability scores and the tool involved a "forced choice" format, requiring the participant to rate one condition over a different condition. The forced choice format of the IPI tool produces ipsative data, which are data that are interrelated to each other. In this study, Likert scales were used to measure the perception of the influence of Ely's (1990) condition with each of the eight conditions as represented by a statement that aligns to that condition. By using Likert scales, participants did not have to rate one condition over another condition and conditions could be rated the same value. Likert scales also produce ordinal data, which can be analyzed statistically beyond descriptive statistics.

Based on the differences in procedures used to compare data between this study and previous studies, caution should be used when comparing results and findings. While the methodology between studies varies, multiple studies produced findings that indicate which of Ely's (1990) conditions have the most and least influence within comparison groups. *Table 15* draws comparisons of this study to previous studies while *Table 16* highlights the overall mean ranks of Ely's conditions from this study.

Table 15. Ely's Conditions Ratings from Previous Studies

Test Group (Study)	SQ	KS	RS	TM	PT	RI	CM	LD
K-12 (Ensminger, 2005)	4	2	1	3	5	6	8	7
Higher Education (Ensminger, 2005)	3	4	1	6	2	5	8	7
Business (Ensminger, 2005)	2	3	4	6	1	5	8	7
Business (Brown, 2008)	7	5	3	4	8	6	1	2
Community College – This Study	3	2	1	4	7	8	5	6

Table 16. Ely's Conditions Mean Ranks for All Data Collected

Condition	Mean Rank
Resources	6.21
Knowledge/Skills	6.09
Status Quo	5.80
Time	4.15
Commitment	4.10
Leadership	4.04
Participation	2.81
Rewards/Incentives	2.80

Based on the results of this study, there appears to be alignment of those conditions that were rated the highest in the community college setting with those conditions rated the highest in the K-12 and higher education settings identified by Ensminger (2005). In Ensminger's (2005) study, Resources, Knowledge and Skills, Time, and Dissatisfaction of the Status Quo rated as the top conditions for K-12. Within higher education, Ensminger (2005) found Resources, Participation, Status Quo, and Knowledge/Skills rated as the top within higher education. In this study Resources, Knowledge/Skills, and Status Quo rated the highest among community college faculty perceptions. Among the similarities include resources being the top rated condition, knowledge and skills were rated second within this study along with K-12 with higher education rating this condition fourth, and dissatisfaction of the status quo rating third among this study and higher education and fourth in the K-12 study. The major difference of the higher education study and this study of community college faculty was that higher education faculty rated Participation second most influential while community college faculty rated participation as one of the lowest rated conditions.

While specific technologies were examined in regards to the perception of the influence of Ely's (1990) conditions, the aggregate of those technology specific ratings of conditions were also examined and compared within demographic groups. Surry, Jackson, Porter, and Ensminger (2006) also reviewed the relative importance of Ely's implementation conditions in multiple settings and compared them across demographic categories. Surry et al. (2006) found that within various age groups, dissatisfaction with the status quo and resources were significantly different and concluded that resources were valued more for older age groups. However, it was noted that further research is needed to determine any further patterns. The results of this study did not show resources were valued any more by older age groups but rather were valued more by the younger age groups.

Surry et al. (2006) also examined gender differences and showed no statistically significant differences between the two groups. This study however found that significant differences between genders existed within all of Ely's (1990) conditions with the exception of time.

Surry et al. (2006) examined differences among educational levels and found that with higher levels of degrees the importance of dissatisfaction with the status quo and availability of resources rise. Conversely, the importance of knowledge and skills decreases as educational level increases leading the researchers to conclude those with higher levels of education feel they are able to learn any skills they may need to use a given technology or innovation. The results of this study agree with the findings of Surry et al. (2006) in that the influence of status quo and availability of resources rises with educational level. However, this study showed that the importance of knowledge and skills also rises with educational level. The findings of this study also show that the importance of time, participation, rewards or incentives, commitment, and leadership falls as educational level rises. The remaining demographics used in this study including employment status, years of teaching experience, and teaching format do not have previous studies from which comparisons can be drawn.

Applications to Instructional Design and Technology

In order to have successful implementations of innovations, it is crucial to identify which conditions are most influential to the population that is implementing the innovation. This study used Ely's (1990) eight conditions of implementation as a framework for identifying which conditions are most influential to community college faculty for specific technologies. By identifying the influence of the conditions that lead to faculty members implementing a technology, practitioners can then ensure the most influential conditions are addressed prior to future implementations to help ensure successful implementations of technology. The identification of the influence of these conditions also adds to the overall knowledgebase of implementation conditions, an area directly relevant to the field of Instructional Design and Technology.

Application to Community College Decision Makers

The findings of this study consistently showed that community college faculty as a whole, regardless of demographic or specific technology implemented, perceived the conditions of Resources, Knowledge/Skills, and Status Quo as most influential. Community college leaders should focus on having these conditions in place prior to future technology implementations for a better chance of success. This means community colleges should ensure funds, hardware, software, support, and supplemental materials are available (Resources). Community colleges should also ensure professional development and training sessions are available for faculty to learn how to use technologies (Knowledge/Skills). And finally, faculty must feel that the new technology to be implemented is an improvement from the previous technology or methods (Status Quo). By having these three conditions in place prior to future technology implementations, community colleges have a better chance for successful technology implementations.

Conclusions

As the field of instructional design and technology continues to grow and develop, a strong emphasis has been placed on the implementation phase of instructional design models. Ely's (1990) work provides a solid foundation for past and future studies that identify the conditions necessary for change, in particular the implementation of educational technologies. As demonstrated by the works of past researchers, the conditions that facilitate implementation vary per context. This study is an analysis of the implementation of educational technologies within just one context, the community college setting. Change agents should be aware that context impacts the ability to change and implement and therefore needs assessments similar to this study may be required in order to successfully implement educational technologies.

The results of this study provide guidance as to which conditions of implementation are more influential to faculty of community colleges. Using this information, plans and strategies for educational technology implementation can be developed to match the perceptions of the factors that lead to implementation by community college faculty. By identifying the factors that have the most influence prior to an implementation, those conditions can be addressed prior to implementing new technologies for a greater chance of successful implementations.

Recommendations for Future Research

Quantitative data were collected in this study via an online survey tool. To develop a deeper understanding of faculty perceptions in regards to the influence of Ely's (1990) conditions, more qualitative data collection including interviews and focus groups could be possible in future research. Cross referencing qualitative data along with data collected from surveys will provide a more complete picture as to how faculty are influenced by Ely's conditions as it relates to technology implementation.

The focus of this study was identifying which of Ely's (1990) conditions were perceived by community college faculty as most influential to their decision to implement a specific technology. The data collected and examined focused on specific technologies or demographic groups. While this study answers the "what" regarding Ely's conditions, it does not answer the "why" of why these perceptions are present. Identifying why the perceptions of Ely's conditions among specific demographics or technologies are as they were reported will further the existing knowledgebase. Understanding why some individuals or groups perceive certain conditions as more influential than other groups will assist practitioners in more successful implementations of technologies. Further research in this area, likely in a qualitative manner, may lead to the understanding of why perceptions of Ely's conditions are as they are reported.

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Appendix A – Survey Instrument

Demographics

- Age (Less than 25, 25-34, 35-44, 45-54, 55-64, 65+)
- Gender (Male, Female)
- Highest Degree Obtained (Associate's, Bachelor's, Master's, Doctorate)
- Faculty Employment Status (Full time faculty, Adjunct faculty)
- Years teaching experience (0-5, 6-10, 11-20, 21-30, 31+)
- Course format (face-to-face, online, mix of face-to-face and online)

Instructional Technologies

Do you use the following technologies in your classroom instruction?

	Yes	No
Blackboard Learn	○	○
Classroom presentation stations (podium) with LCD projector or display	○	○
Document camera	○	○
Microphone (sound amplification in classroom)	○	○
Panopto (lecture capture software)	○	○
Clickers (student response devices)	○	○
Microsoft PowerPoint	○	○
Microsoft Word	○	○
Google Docs	○	○
DVD / BlueRay player	○	○
Instructional content from textbook publisher (including website and CDs)	○	○
Films on Demand (streaming video services)	○	○
Blackboard Collaborate	○	○
Synchronous video conferencing equipment (Tandberg, Polycom, Cisco)	○	○
Laptop	○	○
iPad	○	○
Atomic Learning (technology training website)	○	○

Technology Implementation Statements

For each technology the respondent answers "Yes" to using, the following statements are asked.

For each statement, select the level of influence as to why you use **Blackboard Learn**

	No Influence 1	Little Influence 2	Some Influence 3	Major Influence 4	Extreme Influence 5
My instructional methods and strategies benefit more from the use of this technology than they did from prior technologies	○	○	○	○	○
I have the skills and knowledge necessary to use this technology	○	○	○	○	○
This technology is readily available whenever I need to use it	○	○	○	○	○
My college provides times to learn how to use this technology	○	○	○	○	○
My college provides rewards and incentives to use this technology	○	○	○	○	○
I had an opportunity to participate and be heard during the decision making process to select this technology	○	○	○	○	○
My academic dean or department head actively supports the use of this technology	○	○	○	○	○
College leadership (VPs and higher) are committed to the use of this technology	○	○	○	○	○

Appendix B – IRB Approval

VirginiaTech

Office of Research Compliance
Institutional Review Board
North End Center, Suite 4120, Virginia Tech
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-4606 Fax 540/231-0959
email irb@vt.edu
website http://www.irb.vt.edu

MEMORANDUM

DATE: March 23, 2015

TO: Ken Potter, Michael Todd Murphy

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires April 25, 2018)

PROTOCOL TITLE: Perceptions of the Influence of Ely’s Conditions: A Comparison Between Full-time and Adjunct Faculty within Community College Settings

IRB NUMBER: 15-255

Effective March 23, 2015, the Virginia Tech Institution Review Board (IRB) Chair, David M Moore, approved the Amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

http://www.irb.vt.edu/pages/responsibilities.htm

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As:	**Exempt, under 45 CFR 46.110 category(ies) 2**
Protocol Approval Date:	**March 16, 2015**
Protocol Expiration Date:	**N/A**
Continuing Review Due Date*:	**N/A**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Invent the Future

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Appendix C – Community College Faculty Demographics

Table C1. Community College Faculty by Employment Status

Demographics	Part-Time %	Full-Time %
Age:		
Under 30	3.63	1.31
30-44	33.78	26.57
45-54	37.88	40.35
55-59	11.38	19.26
60-64	6.87	8.99
65+	6.47	3.51
Gender:		
Male	54.85	52.54
Female	45.15	47.46
Marital Status:		
Single, never married	11.13	9.47
Married	72.21	73.66
Living with someone	1.48	2.13
Separated, divorced, or widowed	15.18	14.73
Race:		
American Indian / Alaska Native	0.33	0.52
Asian / Pacific Islander	1.68	2.77
Black (Non-Hispanic)	5.21	5.46
Hispanic (White or Black)	3.73	4.51
White	88.06	86.00
More than one race	0.99	0.73

(Wallin, 2005, p. 23)

Table C2. Community College Faculty Academic Qualifications by Employment

Academics	Part-Time %	Full-Time %
Highest Degree Held:		
Doctorate	8.99	18.32
First Professional	2.92	2.02
Master's	60.99	61.00
Bachelor's	17.76	13.12
Associate's	5.37	3.11
Less than an associate's degree	1.77	0.88
No postsecondary degree or award	2.21	1.53
Working Toward a Degree		
Yes	17.33	13.75
No	82.67	86.25
Type of Degree Pursuing		
First Professional	1.69	1.27
Doctorate	43.98	39.04
MFA, MSW	4.19	7.64
Others master's	35.55	33.36
Bachelor's	10.41	12.98
Associate's	4.02	4.46
Certificate or diploma	0.17	1.26

(Wallin, 2005, p. 25)

Table C3. Community College Faculty Employment Circumstance by Status

Employment Circumstance Current Position is Primary Employment	Part-Time %	Full-Time %
Yes	28.06	97.71
No	71.94	2.29
Retired from Another Position		
Yes	13.65	4.04
No	86.35	95.96
Union Membership		
Yes	21.13	52.54
No	16.13	14.86
Not eligible or not available	62.74	32.60
Salary – total income from institution		
$5,000 or less	43.18	0.97
$5,001 - $15,000	41.60	1.07
$15,001 - $38,000	11.81	26.32
$38,001 - $51,350	1.92	36.45
$51,351 or more	1.49	35.18

(Wallin, 2005, p. 26)

Table C4. Community College Faculty Positions by Employment Status

Faculty Positions	Part-Time %	Full-Time %
Faculty Status		
Yes	81.94	99.13
No	18.06	2.71
Appointment Type		
Regular	38.14	91.98
Temporary	61.86	8.02
Tenure Status		
Tenured	1.87	52.29
Tenure track, not tenured	1.81	15.96
Not on tenure track, institution has tenure	71.55	4.89
No tenure system at institution	24.77	25.86
Faculty Rank		
Full professor	5.47	23.21
Associate professor	1.83	12.37
Assistant professor	1.41	11.38
Instructor	67.64	41.43
Lecturer	4.15	0.51
Other rank	14.04	1.85
No rank	5.46	9.24
Chair of Department		
Yes	1.79	12.08
No	98.21	87.92
Teaching Discipline		
Occupational education	18.71	28.08
General education	81.29	71.92

(Wallin, 2005, p. 27)

Table C5. VCCS Class Sections Taught by Full-Time and Adjunct Faculty (2012-13)

College	Full-Time	Adjunct	% FT
Blue Ridge	1,266	778	62%
Central Virginia	1,090	915	54%
Dabney S. Lancaster	515	439	54%
Danville	826	1,354	38%
Eastern Shore	233	260	47%
Germanna	1,104	2,376	32%
J. Sargeant Reynolds	2,510	3,283	43%
John Tyler	1,262	1,871	40%
Lord Fairfax	1,375	2,420	36%
Mountain Empire	1,129	738	60%
New River	819	775	51%
Northern Virginia	9,131	9,419	49%
Patrick Henry	1,156	785	60%
Paul D. Camp	356	530	40%
Piedmont Virginia	932	1,059	47%
Rappahannock	401	1,014	28%
Southside Virginia	1,283	1,427	47%
Southwest Virginia	1,031	703	59%
Thomas Nelson	1,608	2,197	42%
Tidewater	5,174	8,373	38%
Virginia Highlands	1,056	597	64%
Virginia Western	1,579	1,806	47%
Wytheville	1,031	735	58%
All	36,867	43,854	46%

(VCCS Institutional Review, 2014)

Table C6. VCCS Full-time and Adjunct Faculty (Fall 2013)

College	Full-Time	Adjunct	Total
Blue Ridge	75	188	263
Central Virginia	62	240	302
Dabney S. Lancaster	24	62	86
Danville	67	173	240
Eastern Shore	17	50	67
Germanna	87	242	329
J. Sargeant Reynolds	150	626	776
John Tyler	114	347	461
Lord Fairfax	75	388	463
Mountain Empire	45	92	137
New River	56	166	222
Northern Virginia	719	1,938	2657
Patrick Henry	57	190	247
Paul D. Camp	22	116	138
Piedmont Virginia	78	258	336
Rappahannock	29	171	200
Southside Virginia	79	193	272
Southwest Virginia	40	89	129
Thomas Nelson	114	497	611
Tidewater	368	1,363	1731
Virginia Highlands	44	123	167
Virginia Western	96	345	441
Wytheville	48	118	166
All	2,466	7,975	10,441

(VCCS Institutional Review, 2014)

Appendix D – Pilot Survey Feedback

- Participant 1 – why do you need to give answers to technologies you answered "no" for using?
- Participant 2 – if someone changes their minds, will the survey record both the yes and no answers? Add a percentage complete. Inform participant of the average time for completion
- Participant 3 – Are Blackboard and "Blackboard Learn" the same thing? Classroom presentation station the same as a podium? Odd question related to using a microphone. Slow to notice the possible choices changed between the Yes and No answers. Hard copy of instructor's manual the same as publisher website?
- Participant 4 – prefer "other" technologies rather than "prior". Unsure if survey makes sense for online only faculty.
- Participant 5 – Why the need to answer questions if technology not used? Statement of "my instructional methods…" unclear. How can you tell if dean or VP supports this technology?
- Participant 6 – instead of zero, little, moderate, extreme influence, use traditional Likert "strongly agree" to "strongly disagree" scale. Maintain a neutral wording of the terms – they should not change positively / negatively based on your 'yes' or 'no' answer. Require answers to all questions, no skipping.

Appendix E – Analysis Per Technology

Table E1. Blackboard Learn Detailed Analysis

Blackboard Learn – Ely's Conditions Rankings

Condition	Mean Rank
Resources	5.57
Knowledge/Skills	5.23
Time	4.97
Leadership	4.85
Commitment	4.70
Status Quo	4.60
Participation	3.29
Rewards/Incentives	2.79

Blackboard Learn – Friedman Test

N	524
Chi-Square	749.439
df	7
Asymp. Sig.	.000

Blackboard Learn - Homogeneous Subsets

Condition	Subset				
	1	2	3	4	5
Resources	5.57				
Knowledge/Skills		5.23			
Time		4.97	4.97		
Leadership		4.85	4.85		
Commitment			4.70		
Status Quo			4.60		
Participation				3.29	
Rewards/Incentives					2.79
Test Statistic	-	4.09	7.68	-	-
Sig. (2-sided test)	-	0.13	0.05	-	-
Adj. Sig (2-sided test)	-	0.31	0.10	-	-

Table E2. Presentation Station Detailed Analysis

Presentation Station – Ely's Conditions

Condition	Mean Rank
Resources	6.37
Knowledge / Skills	6.17
Status Quo	5.93
Time	4.22
Leadership	4.07
Commitment	4.02
Participation	2.66
Rewards / Incentives	2.57

Presentation Station – Friedman Test

N	500
Chi-Square	1821.37
df	7
Asymp. Sig.	0

Presentation Station - Homogeneous Subsets

Condition	Subset 1	2	3	4
Resources	6.37			
Knowledge / Skills	6.17	6.17		
Status Quo		5.93		
Time			4.22	
Leadership			4.07	
Comittment			4.02	
Participation				2.66
Rewards / Incentives				2.57
Test Statistic	5.41	3.20	3.17	1.46
Sig. (2-sided test)	.020	.074	.205	.227
Adjusted Sig. (2-sided test)	.078	.264	.457	.643

Table E3. Document Camera Detailed Analysis

Document Camera – Ely's Conditions

Condition	Mean Rank
Resources	6.60
Knowledge / Skills	6.29
Status Quo	5.76
Commitment	4.01
Leadership	3.95
Time	3.92
Participation	2.75
Rewards / Incentives	2.72

Document Camera – Friedman Test

N	284
Chi-Square	1108.84
df	7
Asymp. Sig.	.000

Document Camera - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.60			
Knowledge / Skills	6.29			
Status Quo		5.76		
Commitment			4.01	
Leadership			3.95	
Time			3.92	
Participation				2.75
Rewards / Incentives				2.72
Test Statistic	5.36	-	.171	.225
Sig. (2-sided test)	.021	-	.918	.635
Adjusted Sig. (2-sided test)	.080	-	.999	.982

Table E4. Sound Amplification System Detailed Analysis

Sound Amplification System – Ely's Conditions

Condition	Mean Rank
Resources	5.65
Knowledge / Skills	5.48
Status Quo	5.25
Commitment	4.49
Leadership	4.46
Time	4.36
Participation	3.35
Rewards / Incentives	2.96

Sound Amplification System – Friedman Test

N	85
Chi-Square	177.39
df	7
Asymp. Sig.	.000

Sound Amplification System - Homogeneous Subsets

Condition	Subset 1	2	3	4
Resources	5.65			
Knowledge / Skills	5.48	5.48		
Status Quo	5.25	5.25	5.25	
Commitment	4.49	4.49	4.49	
Leadership		4.46	4.46	
Time			4.36	
Participation				3.35
Rewards / Incentives				2.96
Test Statistic	9.21	9.22	7.49	1.42
Sig. (2-sided test)	.027	.026	.058	.233
Adjusted Sig. (2-sided test)	.053	.052	.112	.654

Table E5. Lecture Capture Detailed Analysis

Lecture Capture – Ely's Conditions

Condition	Mean Rank
Resources	5.81
Status Quo	5.80
Knowledge / Skills	5.70
Time	4.77
Commitment	4.22
Leadership	3.90
Rewards / Incentives	3.02
Participation	2.79

Lecture Capture – Friedman Test

N	96
Chi-Square	250.95
df	7
Asymp. Sig.	.000

Lecture Capture - Homogeneous Subsets

Condition	Subset 1	2	3	4
Resources	5.81			
Status Quo	5.80			
Knowledge / Skills	5.70			
Time		4.77		
Commitment		4.22		
Leadership		3.90	3.90	
Rewards / Incentives			3.02	3.02
Participation				2.79
Test Statistic	.203	7.77	5.04	.167
Sig. (2-sided test)	.903	.021	.025	.683
Adjusted Sig. (2-sided test)	.998	.054	.095	.990

Table E6. Clickers Detailed Analysis

Clickers – Ely's Conditions

Condition	Mean Rank
Status Quo	5.72
Knowledge / Skills	5.65
Resources	5.48
Time	4.59
Commitment	4.04
Leadership	3.57
Rewards / Incentives	3.56
Participation	3.39

Clickers – Friedman Test

N	48
Chi-Square	105.20
df	7
Asymp. Sig.	.000

Clickers - Homogeneous Subsets

Condition	Subset	
	1	2
Status Quo	5.72	
Knowledge / Skills	5.65	
Resources	5.48	
Time	4.59	4.59
Commitment		4.04
Leadership		3.57
Rewards / Incentives		3.56
Participation		3.39
Test Statistic	8.84	10.11
Sig. (2-sided test)	.032	.039
Adjusted Sig. (2-sided test)	.062	.061

Table E7. PowerPoint Detailed Analysis

PowerPoint – Ely's Conditions

Condition	Mean Rank
Resources	6.49
Knowledge / Skill	6.39
Status Quo	5.97
Time	3.98
Commitment	3.96
Leadership	3.84
Participation	2.76
Rewards / Incentives	2.62

PowerPoint – Friedman Test

N	500
Chi-Square	2042.88
df	7
Asymp. Sig.	.000

PowerPoint - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.49			
Knowledge / Skills	6.39			
Status Quo		5.97		
Time			3.98	
Commitment			3.96	
Leadership			3.84	
Participation				2.76
Rewards / Incentives				2.62
Test Statistic	1.06	-	1.28	2.18
Sig. (2-sided test)	.304	-	.527	.140
Adjusted Sig. (2-sided test)	.765	-	.864	.453

Table E8. Word Detailed Analysis

Word – Ely's Conditions

Condition	Mean Rank
Resources	6.45
Knowledge / Skill	6.40
Status Quo	5.99
Time	3.98
Commitment	3.88
Leadership	3.82
Participation	2.78
Rewards / Incentives	2.70

Word – Friedman Test

N	490
Chi-Square	2032.99
df	7
Asymp. Sig.	.000

Word - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.45			
Knowledge / Skills	6.40			
Status Quo		5.99		
Time			3.98	
Commitment			3.88	
Leadership			3.82	
Participation				2.78
Rewards / Incentives				2.70
Test Statistic	.400	-	1.37	.988
Sig. (2-sided test)	.527	-	.504	.320
Adjusted Sig. (2-sided test)	.950	-	.864	.787

Table E9. Google Docs Detailed Analysis

Google Docs – Ely's Conditions

Condition	Mean Rank
Resources	6.28
Knowledge / Skill	5.94
Status Quo	5.88
Time	4.42
Leadership	3.84
Commitment	3.83
Participation	2.96
Rewards / Incentives	2.86

Google Docs – Friedman Test

N	238
Chi-Square	793.51
df	7
Asymp. Sig.	.000

Google Docs - Homogeneous Subsets

Condition	Subset 1	2	3	4	5
Resources	6.28				
Knowledge / Skills	5.94	5.94			
Status Quo		5.88			
Time			4.42		
Leadership				3.84	
Commitment				3.83	
Participation					2.96
Rewards / Incentives					2.86
Test Statistic	5.15	.206	-	.067	.420
Sig. (2-sided test)	.023	.650	-	.795	.517
Adjusted Sig. (2-sided test)	.090	.985	-	.998	.946

Table E10. DVD/BlueRay Detailed Analysis

DVD – Ely's Conditions

Condition	Mean Rank
Resources	6.44
Knowledge / Skill	6.37
Status Quo	5.97
Leadership	3.87
Commitment	3.85
Time	3.65
Participation	2.95
Rewards / Incentives	2.90

DVD – Friedman Test

N	209
Chi-Square	846.15
df	7
Asymp. Sig.	.000

DVD - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.44			
Knowledge / Skills	6.37	6.37		
Status Quo		5.97		
Leadership			3.87	
Commitment			3.85	
Time			3.65	
Participation				2.95
Rewards / Incentives				2.90
Test Statistic	.306	5.53	1.62	.120
Sig. (2-sided test)	.580	.019	.444	.729
Adjusted Sig. (2-sided test)	.969	.073	.791	.995

Table E11. Instructional Content from Textbook Detailed Analysis

Instructional Content – Ely's Conditions

Condition	Mean Rank
Status Quo	6.22
Knowledge / Skill	6.15
Resources	6.10
Commitment	4.20
Leadership	3.87
Time	3.46
Rewards / Incentives	3.30
Participation	2.70

Instructional Content – Friedman Test

N	415
Chi-Square	1456.57
df	7
Asymp. Sig.	.000

Instructional Content - Homogeneous Subsets

Condition	Subset 1	2	3	4
Status Quo	6.22			
Knowledge / Skills	6.15			
Resources	6.10			
Commitment		4.20		
Leadership		3.87		
Time			3.46	
Rewards / Incentives			3.30	
Participation				2.70
Test Statistic	.467	4.45	2.12	-
Sig. (2-sided test)	.792	.035	.128	-
Adjusted Sig. (2-sided test)	.985	.132	.422	-

Table E12. Streaming Video Detailed Analysis

Streaming Video – Ely's Conditions

Condition	Mean Rank
Knowledge / Skills	6.35
Resources	6.29
Status Quo	6.22
Time	3.83
Commitment	3.75
Leadership	3.65
Rewards / Incentives	3.07
Participation	2.83

Streaming Video – Friedman Test

N	218
Chi-Square	852.17
df	7
Asymp. Sig.	.000

Streaming Video - Homogeneous Subsets

Condition	Subset 1	Subset 2	Subset 3
Knowledge / Skills	6.35		
Resources	6.29		
Status Quo	6.22		
Time		3.83	
Commitment		3.75	
Leadership		3.65	
Rewards / Incentives			3.07
Participation			2.83
Test Statistic	.743	1.61	.775
Sig. (2-sided test)	.690	.447	.379
Adjusted Sig. (2-sided test)	.956	.794	.851

Table E13. Blackboard Collaborate Detailed Analysis

Blackboard Collaborate – Ely's Conditions

Condition	Mean Rank
Resources	5.71
Knowledge / Skills	5.57
Status Quo	5.54
Time	4.88
Commitment	4.41
Leadership	4.35
Participation	2.80
Rewards / Incentives	2.72

Blackboard Collaborate – Friedman Test

N	164
Chi-Square	439.25
df	7
Asymp. Sig.	.000

Blackboard Collaborate - Homogeneous Subsets

Condition	Subset		
	1	2	3
Resources	5.71		
Knowledge / Skills	5.57		
Status Quo	5.54		
Time		4.88	
Commitment		4.41	
Leadership		4.35	
Participation			2.80
Rewards / Incentives			2.72
Test Statistic	.723	4.76	.152
Sig. (2-sided test)	.697	.093	.696
Adjusted Sig. (2-sided test)	.959	.228	.991

Table E14. Synchronous Video Detailed Analysis

Synchronous Video – Ely's Conditions

Condition	Mean Rank
Status Quo	5.70
Knowledge / Skills	5.44
Resources	4.99
Commitment	4.68
Time	4.20
Leadership	4.19
Participation	3.56
Rewards / Incentives	3.25

Synchronous Video – Friedman Test

N	48
Chi-Square	86.23
df	7
Asymp. Sig.	.000

Synchronous Video - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Status Quo	5.70			
Knowledge / Skills	5.44	5.44		
Resources	4.99	4.99	4.99	
Commitment	4.68	4.68	4.68	4.68
Time	4.20	4.20	4.20	4.20
Leadership		4.19	4.19	4.19
Participation			3.56	3.56
Rewards / Incentives				3.25
Test Statistic	10.48	8.32	8.06	9.52
Sig. (2-sided test)	.033	.081	.089	.049
Adjusted Sig. (2-sided test)	.052	.126	.139	.078

Table E15. Laptop Detailed Analysis

Laptop – Ely's Conditions

Condition	Mean Rank
Resources	6.24
Knowledge / Skills	6.23
Status Quo	5.96
Commitment	4.06
Leadership	4.03
Time	3.75
Rewards / Incentives	2.98
Participation	2.75

Laptop – Friedman Test

N	322
Chi-Square	1182.72
df	7
Asymp. Sig.	.000

Laptop - Homogeneous Subsets

Condition	Subset		
	1	2	3
Resources	6.24		
Knowledge / Skills	6.23		
Status Quo	5.96		
Commitment		4.06	
Leadership		4.03	
Time		3.75	
Rewards / Incentive			2.98
Participation			2.75
Test Statistic	7.49	3.06	1.12
Sig. (2-sided test)	.024	.216	.290
Adjusted Sig. (2-sided test)	.062	.478	.745

Table E16. iPad Detailed Analysis

iPad – Ely's Conditions

Condition	Mean Rank
Knowledge / Skills	5.86
Resources	5.83
Status Quo	5.75
Time	4.15
Leadership	4.10
Commitment	4.01
Participation	3.30
Rewards / Incentives	2.99

iPad – Friedman Test

N	175
Chi-Square	446.93
df	7
Asymp. Sig.	.000

iPad - Homogeneous Subsets

Condition	Subset		
	1	2	3
Knowledge / Skills	5.86		
Resources	5.83		
Status Quo	5.75		
Time		4.15	
Leadership		4.10	
Commitment		4.01	
Participation			3.30
Rewards / Incentives			2.99
Test Statistic	.869	.317	.966
Sig. (2-sided test)	.648	.853	.326
Adjusted Sig. (2-sided test)	.938	.994	.793

Table E17. Atomic Learning Detailed Analysis

Atomic Learning – Ely's Conditions

Condition	Mean Rank
Resources	5.93
Knowledge / Skills	5.60
Status Quo	5.59
Time	4.60
Commitment	4.31
Leadership	4.06
Rewards / Incentives	2.98
Participation	2.92

Atomic Learning – Friedman Test

N	87
Chi-Square	229.95
df	7
Asymp. Sig.	.000

Atomic Learning - Homogeneous Subsets

Condition	Subset 1	2	3
Resources	5.93		
Knowledge / Skills	5.60		
Status Quo	5.59		
Time		4.60	
Commitment		4.31	
Leadership		4.06	
Rewards / Incentives			2.98
Participation			2.92
Test Statistic	2.32	2.19	.184
Sig. (2-sided test)	.314	.335	.668
Adjusted Sig. (2-sided test)	.634	.663	.988

Appendix F – Analysis of Conditions per Demographic Subgroup

< 25 Age Subgroup too small for analysis

Table F1. 25-34 Age Subgroup

25-34 Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.21
Knowledge/Skills	6.14
Status Quo	5.89
Time	4.07
Leadership	3.95
Commitment	3.88
Participation	2.96
Rewards/Incentives	2.90

25-34 Subgroup – Friedman Test

N	560
Chi-Square	1759.98
df	7
Asymp. Sig.	.000

25-34 Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.21			
Knowledge/Skills	6.14	6.14		
Status Quo		5.89		
Time			4.07	
Leadership			3.95	
Commitment			3.88	
Participation				2.96
Rewards/Incentives				2.90
Test Statistic	1.21	5.60	2.22	1.12
Sig. (2-sided test)	.272	.018	.329	.291
Adj. Sig (2-sided test)	.719	.070	.656	.747

Table F2. 35-44 Age Subgroup

35-44 Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.31
Knowledge/Skills	6.21
Status Quo	5.94
Time	4.17
Commitment	3.86
Leadership	3.71
Participation	2.94
Rewards/Incentives	2.85

35-44 Subgroup – Friedman Test

N	885
Chi-Square	2884.29
df	7
Asymp. Sig.	.000

35-44 Subgroup - Homogeneous Subsets

Condition	Subset				
	1	2	3	4	5
Resources	6.31				
Knowledge/Skills	6.21				
Status Quo		5.94			
Time			4.17		
Commitment				3.86	
Leadership				3.71	
Participation					2.94
Rewards/Incentives					2.85
Test Statistic	.950	-	-	2.60	.886
Sig. (2-sided test)	.330	-	-	.107	.347
Adj. Sig (2-sided test)	.798	-	-	.363	.818

Table F3. 45-54 Age Subgroup

45-54 Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.29
Knowledge/Skills	6.14
Status Quo	5.78
Commitment	4.14
Time	4.08
Leadership	4.03
Rewards/Incentives	2.82
Participation	2.72

45-54 Subgroup – Friedman Test

N	1112
Chi-Square	3479.38
df	7
Asymp. Sig.	.000

45-54 Subgroup - Homogeneous Subsets

Condition	Subset				
	1	2	3	4	5
Resources	6.29				
Knowledge/Skills		6.14			
Status Quo			5.78		
Commitment				4.14	
Time				4.08	
Leadership				4.03	
Rewards/Incentives					2.82
Participation					2.72
Test Statistic	-	-	-	1.53	.325
Sig. (2-sided test)	-	-	-	.466	.569
Adj. Sig (2-sided test)	-	-	-	.812	.965

Table F4. 55-64 Age Subgroup

55-64 Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.16
Knowledge/Skills	6.05
Status Quo	5.85
Commitment	4.17
Time	4.16
Leadership	4.15
Participation	2.76
Rewards/Incentives	2.70

55-64 Subgroup – Friedman Test

N	1276
Chi-Square	3855.21
df	7
Asymp. Sig.	.000

55-64 Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.16			
Knowledge/Skills	6.05			
Status Quo		5.85		
Commitment			4.17	
Time			4.16	
Leadership			4.15	
Participation				2.76
Rewards/Incentives				2.70
Test Statistic	4.06	-	.377	2.04
Sig. (2-sided test)	.044	-	.828	.153
Adj. Sig (2-sided test)	.164	-	.991	.486

Table F5. 65+ Age Subgroup

65+ Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.05
Knowledge/Skills	5.93
Status Quo	5.49
Commitment	4.46
Leadership	4.37
Time	4.28
Rewards/Incentives	2.73
Participation	2.68

65+ Subgroup – Friedman Test

N	547
Chi-Square	1455.85
df	7
Asymp. Sig.	.000

65+ Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.05			
Knowledge/Skills	5.93			
Status Quo		5.49		
Commitment			4.46	
Leadership			4.37	
Time			4.28	
Rewards/Incentives				2.73
Participation				2.68
Test Statistic	1.33	-	1.68	.002
Sig. (2-sided test)	.248	-	.431	.966
Adj. Sig (2-sided test)	.681	-	.778	1.00

Table F6. Male Gender Subgroup

Male Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.06
Knowledge/Skills	5.97
Status Quo	5.69
Time	4.17
Commitment	4.16
Leadership	4.16
Rewards/Incentives	2.91
Participation	2.88

Male Subgroup – Friedman Test

N	1342
Chi-Square	3500.36
df	7
Asymp. Sig.	.000

Male Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.06			
Knowledge/Skills	5.97			
Status Quo		5.69		
Time			4.17	
Commitment			4.16	
Leadership			4.16	
Rewards/Incentives				2.91
Participation				2.88
Test Statistic	2.09	-	.329	.048
Sig. (2-sided test)	.148	-	.848	.827
Adj. Sig (2-sided test)	.473	-	.993	.999

Table F7. Female Gender Subgroup

Female Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.27
Knowledge/Skills	6.14
Status Quo	5.85
Time	4.14
Commitment	4.08
Leadership	3.99
Participation	2.78
Rewards/Incentives	2.75

Female Subgroup – Friedman Test

N	3066
Chi-Square	9790.07
df	7
Asymp. Sig.	.000

Female Subgroup - Homogeneous Subsets

Condition	Subset				
	1	2	3	4	5
Resources	6.27				
Knowledge/Skills		6.14			
Status Quo			5.85		
Time				4.14	
Commitment				4.08	
Leadership				3.99	
Participation					2.78
Rewards/Incentives					2.75
Test Statistic	-	-	-	6.74	2.04
Sig. (2-sided test)	-	-	-	.034	.154
Adj. Sig (2-sided test)	-	-	-	.089	.487

Table F8. Full-time Employment Subgroup

Full-time Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.23
Knowledge/Skills	6.07
Status Quo	5.81
Time	4.10
Commitment	4.06
Leadership	4.00
Rewards/Incentives	2.88
Participation	2.85

Full-time Subgroup – Friedman Test

N	2374
Chi-Square	7023.34
df	7
Asymp. Sig.	.000

Full-time Subgroup - Homogeneous Subsets

Condition	Subset				
	1	2	3	4	5
Resources	6.23				
Knowledge/Skills		6.07			
Status Quo			5.81		
Time				4.10	
Commitment				4.06	
Leadership				4.00	
Rewards/Incentives					2.88
Participation					2.85
Test Statistic	-	-	-	2.44	.004
Sig. (2-sided test)	-	-	-	.295	.951
Adj. Sig (2-sided test)	-	-	-	.606	1.00

Table F9. Adjunct Employment Subgroup

Adjunct Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.18
Knowledge/Skills	6.11
Status Quo	5.79
Time	4.20
Commitment	4.16
Leadership	4.08
Participation	2.77
Rewards/Incentives	2.71

Adjunct Subgroup – Friedman Test

N	2034
Chi-Square	6253.33
df	7
Asymp. Sig.	.000

Adjunct Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.18			
Knowledge/Skills	6.11			
Status Quo		5.79		
Time			4.20	
Commitment			4.16	
Leadership			4.08	
Rewards/Incentives				2.77
Participation				2.71
Test Statistic	3.55	-	3.76	3.47
Sig. (2-sided test)	.059	-	.152	.063
Adj. Sig (2-sided test)	.217	-	.356	.228

Table F10. 0-5 Years Teaching Experience Subgroup

0-5 Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.16
Knowledge/Skills	6.11
Status Quo	5.69
Time	4.17
Commitment	4.04
Leadership	4.03
Participation	2.95
Rewards/Incentives	2.86

0-5 Subgroup – Friedman Test

N	845
Chi-Square	2455.13
df	7
Asymp. Sig.	.000

0-5 Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.16			
Knowledge/Skills	6.11			
Status Quo		5.69		
Time			4.17	
Commitment			4.04	
Leadership			4.03	
Rewards/Incentives				2.95
Participation				2.86
Test Statistic	1.14	-	2.91	1.14
Sig. (2-sided test)	.286	-	.233	.286
Adj. Sig (2-sided test)	.740	-	.507	.740

Table F11. 6-10 Years Teaching Experience Subgroup

6-10 Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.24
Knowledge/Skills	6.04
Status Quo	5.88
Time	4.14
Commitment	4.09
Leadership	3.97
Participation	2.88
Rewards/Incentives	2.75

6-10 Subgroup – Friedman Test

N	985
Chi-Square	3047.11
df	7
Asymp. Sig.	.000

6-10 Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.24			
Knowledge/Skills	6.04			
Status Quo		5.88		
Time			4.14	
Commitment			4.09	
Leadership			3.97	
Rewards/Incentives				2.88
Participation				2.75
Test Statistic	5.26	-	4.90	2.44
Sig. (2-sided test)	.022	-	.086	.118
Adj. Sig (2-sided test)	.084	-	.214	.396

Table F12. 11-20 Years Teaching Experience Subgroup

11-20 Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.26
Knowledge/Skills	6.17
Status Quo	5.90
Time	4.09
Commitment	4.07
Leadership	4.00
Rewards/Incentives	2.80
Participation	2.71

11-20 Subgroup – Friedman Test

N	1287
Chi-Square	4081.09
df	7
Asymp. Sig.	.000

11-20 Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.26			
Knowledge/Skills	6.17			
Status Quo		5.90		
Time			4.09	
Commitment			4.07	
Leadership			4.00	
Rewards/Incentives				2.80
Participation				2.71
Test Statistic	2.80	-	1.43	.028
Sig. (2-sided test)	.094	-	.489	.867
Adj. Sig (2-sided test)	.328	-	.833	1.00

Table F13. 21-30 Years Teaching Experience Subgroup

21-30 Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.23
Knowledge/Skills	6.07
Status Quo	5.72
Commitment	4.19
Leadership	4.16
Time	4.07
Rewards/Incentives	2.82
Participation	2.75

21-30 Subgroup – Friedman Test

N	660
Chi-Square	1915.67
df	7
Asymp. Sig.	.000

21-30 Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.23			
Knowledge/Skills	6.07			
Status Quo		5.72		
Commitment			4.19	
Leadership			4.16	
Time			4.07	
Rewards/Incentives				2.82
Participation				2.75
Test Statistic	3.79	-	.676	.038
Sig. (2-sided test)	.052	-	.713	.846
Adj. Sig (2-sided test)	.191	-	.964	.999

Table F14. > 30 Years Teaching Experience Subgroup

> 30 Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.09
Knowledge/Skills	5.98
Status Quo	5.73
Time	4.30
Commitment	4.19
Leadership	4.12
Rewards/Incentives	2.80
Participation	2.79

> 30 Subgroup – Friedman Test

N	631
Chi-Square	1789.98
df	7
Asymp. Sig.	.000

> 30 Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.09			
Knowledge/Skills	5.98	5.98		
Status Quo		5.73		
Time			4.30	
Commitment			4.19	
Leadership			4.12	
Rewards/Incentives				2.80
Participation				2.79
Test Statistic	1.07	5.90	1.00	.101
Sig. (2-sided test)	.301	.015	.605	.750
Adj. Sig (2-sided test)	.761	.059	.916	.996

Table F15. Face-to-Face Course Format Subgroup

Face-to-Face Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.17
Knowledge/Skills	6.08
Status Quo	5.77
Time	4.19
Leadership	4.16
Commitment	4.13
Participation	2.77
Rewards/Incentives	2.72

Face-to-Face Subgroup – Friedman Test

N	1777
Chi-Square	5311.39
df	7
Asymp. Sig.	.000

Face-to-Face Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.17			
Knowledge/Skills	6.08			
Status Quo		5.77		
Time			4.19	
Leadership			4.16	
Commitment			4.13	
Participation				2.77
Rewards/Incentives				2.72
Test Statistic	4.36	-	1.03	3.00
Sig. (2-sided test)	.037	-	.596	.083
Adj. Sig (2-sided test)	.139	-	.911	.294

Table F16. Online Course Format Subgroup

Online Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.29
Knowledge/Skills	6.17
Status Quo	5.74
Commitment	4.28
Time	4.14
Leadership	4.08
Participation	2.67
Rewards/Incentives	2.62

Online Subgroup – Friedman Test

N	443
Chi-Square	1439.09
df	7
Asymp. Sig.	.000

Online Subgroup - Homogeneous Subsets

Condition	Subset			
	1	2	3	4
Resources	6.29			
Knowledge/Skills	6.17			
Status Quo		5.74		
Commitment			4.28	
Time			4.14	
Leadership			4.08	
Participation				2.67
Rewards/Incentives				2.62
Test Statistic	1.77	-	1.75	.020
Sig. (2-sided test)	.183	-	.417	.887
Adj. Sig (2-sided test)	.555	-	.763	1.00

Table F17. Mix Course Format Subgroup

Mix Subgroup – Ely's Conditions Rankings

Condition	Mean Rank
Resources	6.22
Knowledge/Skills	6.08
Status Quo	5.84
Time	4.11
Commitment	4.04
Leadership	3.93
Rewards/Incentives	2.90
Participation	2.87

Mix Subgroup – Friedman Test

N	2188
Chi-Square	6544.97
df	7
Asymp. Sig.	.000

Mix Subgroup - Homogeneous Subsets

Condition	Subset				
	1	2	3	4	5
Resources	6.22				
Knowledge/Skills		6.08			
Status Quo			5.84		
Time				4.11	
Commitment				4.04	
Leadership				3.93	
Rewards/Incentives					2.90
Participation					2.87
Test Statistic	-	-	-	7.27	.055
Sig. (2-sided test)	-	-	-	.026	.814
Adj. Sig (2-sided test)	-	-	-	.069	.999

Appendix G – Analysis of Demographic Subgroups per Condition

Table G1. Commitment Detailed Analysis per Demographic Group

Gender – Mean Ranks

Gender	N	Mean Rank
Male	1342	2265.70
Female	3068	2179.17
Total	4410	

Gender – Kruskal-Wallis Test

Chi-Square	4.67
df	1
Asymp. Sig.	.031

Age – Mean Ranks

Age	N	Mean Rank
< 25	28	3756.41
25-34	560	2068.01
35-44	885	2069.03
45-54	1114	2158.61
55-64	1276	2271.90
65+	547	2428.27
Total	4410	

Age – Kruskal-Wallis Test

Chi-Square	86.53
df	5
Asymp. Sig.	.000

Age – Homogenous Subsets

	Subset			
	1	2	3	4
< 25	3756.41			
65+		2428.27		
55-64			2271.90	
45-54				2158.61
35-44				2069.03
25-34				2068.01
Test Statistic	-	-	-	3.79
Sig. (2-sided test)	-	-	-	.150
Adjusted Sig. (2-sided test)	-	-	-	.278

Degree – Mean Ranks

Degree	N	Mean Rank
Associates	131	2917.29
Bachelors	275	2558.62
Masters	2903	2140.83
Doctorate	1101	2203.13
Total	4410	

Degree – Kruskal-Wallis Test

Chi-Square	75.300
df	3
Asymp. Sig.	.000

Degree – Homogenous Subsets

	Subset		
	1	2	3
Associates	2917.29		
Bachelors		2558.62	
Doctorate			2203.13
Masters			2140.83
Test Statistic	-	-	1.96
Sig. (2-sided test)	-	-	.162
Adjusted Sig. (2-sided test)	-	-	.298

Employment – Mean Ranks

Employment	N	Mean Rank
Full-time	2376	2206.63
Adjunct	2034	2204.19
Total	4410	

Employment – Kruskal-Wallis Test

Chi-Square	.004
df	1
Asymp. Sig.	.947

Experience – Mean Ranks

Experience	N	Mean Rank
0-5 years	845	2204.48
6-10 years	985	2133.12
11-20 years	1289	2155.23
21-30 years	660	2228.39
> 30 years	631	2398.61
Total	4410	

Experience – Kruskal Wallis Test

Chi-Square	21.558
df	4
Asymp. Sig.	.000

Experience – Homogenous Subsets

	Subset	
	1	2
> 30 years	2398.61	
21-30 years		2228.39
0-5 years		2204.48
11-20 years		2155.23
6-10 years		2133.12
Test Statistic	-	3.30
Sig. (2-sided test)	-	.347
Adjusted Sig. (2-sided test)	-	.347

Course Format – Mean Ranks

Classes	N	Mean Rank
Face-to-Face only	1777	2186.45
Online only	443	2406.02
Mix of formats	2190	2180.39
Total	4410	

Course Format – Krusal-Wallis Test

Chi-Square	13.241
df	2
Asymp. Sig.	.001

Course Format – Homogenous Subsets

	Subset	
	1	2
Online only	2406.02	
Face-to-Face only		2186.45
Mix of formats		2180.39
Test Statistic	-	.034
Sig. (2-sided test)	-	.854
Adjusted Sig. (2-sided test)	-	.854

Table G2. Knowledge/Skills Detailed Analysis per Demographic Group

Gender – Mean Ranks

Gender	N	Mean Rank
Male	1342	2078.96
Female	3068	2259.45
Total	4410	

Gender – Kruskal-Wallis Test

Chi-Square	21.11
df	1
Asymp. Sig.	.000

Age – Mean Ranks

Age	N	Mean Rank
< 25	28	2880.25
25-34	560	2178.66
35-44	885	2437.27
45-54	1114	2123.28
55-64	1276	2195.79
65+	547	2005.45
Total	4410	

Age – Kruskal-Wallis Test

Chi-Square	62.65
df	5
Asymp. Sig.	.000

Age – Homogenous Subsets

	Subset			
	1	2	3	4
< 25	2880.25			
35-44		2437.27		
55-64			2195.79	
24-34			2178.66	
45-54			2123.28	2123.28
65+				2005.45
Test Statistic	-	-	2.22	3.61
Sig. (2-sided test)	-	-	.330	.058
Adjusted Sig. (2-sided test)	-	-	.552	.163

Degree – Mean Ranks

Degree	N	Mean Rank
Associates	131	1993.28
Bachelors	275	1797.88
Masters	2903	2226.91
Doctorate	1101	2272.15
Total	4410	

Degree – Kruskal-Wallis Test

Chi-Square	40.14
df	3
Asymp. Sig.	.000

Degree – Homogenous Subsets

	Subset	
	1	2
Doctorate	2272.15	
Masters	2226.91	
Associates		1993.28
Bachelors		1797.88
Test Statistic	1.17	2.84
Sig. (2-sided test)	.279	.092
Adjusted Sig. (2-sided test)	.480	.176

Employment – Mean Ranks

Employment	N	Mean Rank
Full-time	2376	2256.18
Adjunct	2034	2144.12
Total	4410	

Employment – Kruskal-Wallis Test

Chi-Square	9.55
df	1
Asymp. Sig.	.002

Experience – Mean Ranks

Experience	N	Mean Rank
0-5 years	845	2136.94
6-10 years	985	2248.67
11-20 years	1289	2247.22
21-30 years	660	2207.30
> 30 years	631	2135.78
Total	4410	

Experience – Kruskal Wallis Test

Chi-Square	7.71
df	4
Asymp. Sig.	.103

Course Format – Mean Ranks

Classes	N	Mean Rank
Face-to-Face only	1777	2061.73
Online only	443	2589.46
Mix of formats	2190	2242.51
Total	4410	

Course Format – Krusal-Wallis Test

Chi-Square	72.93
df	2
Asymp. Sig.	.000

Course Format – Homogenous Subsets

	Subset		
	1	2	3
Online only	2589.46		
Mix of formats		2242.51	
Face-to-Face only			2061.73
Test Statistic	-	-	-
Sig. (2-sided test)	-	-	-
Adjusted Sig. (2-sided test)	-	-	-

Table G3. Leadership Detailed Analysis per Demographic Group

Gender – Mean Ranks

Gender	N	Mean Rank
Male	1342	2284.16
Female	3068	2170.36
Total	4410	

Gender – Kruskal-Wallis Test

Chi-Square	8.11
df	1
Asymp. Sig.	.004

Age – Mean Ranks

Age	N	Mean Rank
< 25	28	3846.43
25-34	560	2125.09
35-44	885	2003.16
45-54	1114	2163.13
55-64	1276	2292.00
65+	547	2411.60
Total	4410	

Age – Kruskal-Wallis Test

Chi-Square	100.65
df	5
Asymp. Sig.	.000

Age – Homogenous Subsets

	Subset			
	1	2	3	4
< 25	3846.43			
65+		2411.60		
55-64		2292.00		
45-54			2163.13	
25-34			2125.09	2125.09
35-44				2125.09
Test Statistic	-	3.34	.470	3.37
Sig. (2-sided test)	-	.067	.493	.066
Adjusted Sig. (2-sided test)	-	.189	.870	.186

Degree – Mean Ranks

Degree	N	Mean Rank
Associates	131	3001.00
Bachelors	275	2511.05
Masters	2903	2144.98
Doctorate	1101	2192.37
Total	4410	

Degree – Kruskal-Wallis Test

Chi-Square	80.04
df	3
Asymp. Sig.	.000

Degree – Homogenous Subsets

	Subset		
	1	2	3
Associates	3001.00		
Bachelors		2511.05	
Doctorate			2192.37
Masters			2144.98
Test Statistic	-	-	1.04
Sig. (2-sided test)	-	-	.308
Adjusted Sig. (2-sided test)	-	-	.521

Employment – Mean Ranks

Employment	N	Mean Rank
Full-time	2376	2220.58
Adjunct	2034	2186.80
Total	4410	

Employment – Kruskal-Wallis Test

Chi-Square	.839
df	1
Asymp. Sig.	.360

Experience – Mean Ranks

Experience	N	Mean Rank
0-5 years	845	2225.27
6-10 years	985	2082.59
11-20 years	1289	2154.58
21-30 years	660	2262.34
> 30 years	631	2411.87
Total	4410	

Experience – Kruskal Wallis Test

Chi-Square	31.91
df	4
Asymp. Sig.	.000

Experience – Homogenous Subsets

	Subset		
	1	2	3
> 30 years	2411.87		
21-30 years		2262.34	
0-5 years		2225.27	
11-20 years		2154.58	2154.58
6-10 years			2082.59
Test Statistic	-	3.96	2.12
Sig. (2-sided test)	-	.138	.146
Adjusted Sig. (2-sided test)	-	.219	.325

Course Format – Mean Ranks

Classes	N	Mean Rank
Face-to-Face only	1777	2226.80
Online only	443	2316.65
Mix of formats	2190	2164.74
Total	4410	

Course Format – Krusal-Wallis Test

Chi-Square	6.65
df	2
Asymp. Sig.	.036

Course Format – Homogenous Subsets

	Subset	
	1	2
Online only	2316.65	
Face-to-Face only	2226.80	2226.80
Mix of formats		2164.74
Test Statistic	2.09	2.61
Sig. (2-sided test)	.148	.106
Adjusted Sig. (2-sided test)	.148	.106

Table G4. Participation Detailed Analysis per Demographic Group

Gender – Mean Ranks

Gender	N	Mean Rank
Male	1342	2323.94
Female	3068	2152.95
Total	4410	

Gender – Kruskal-Wallis Test

Chi-Square	22.91
df	1
Asymp. Sig.	.000

Age – Mean Ranks

Age	N	Mean Rank
< 25	28	4109.77
25-34	560	2238.35
35-44	885	2211.69
45-54	1114	2093.10
55-64	1276	2243.66
65+	547	2200.27
Total	4410	

Age – Kruskal-Wallis Test

Chi-Square	99.15
df	5
Asymp. Sig.	.000

Age – Homogenous Subsets

	Subset		
	1	2	3
< 25	4109.77		
55-64		2243.66	
25-34		2238.35	
35-44		2211.69	
65+		2200.27	
45-54			2093.10
Test Statistic	-	.859	-
Sig. (2-sided test)	-	.835	-
Adjusted Sig. (2-sided test)	-	.933	-

Degree – Mean Ranks

Degree	N	Mean Rank
Associates	131	2765.17
Bachelors	275	2484.50
Masters	2903	2161.93
Doctorate	1101	2182.35
Total	4410	

Degree – Kruskal-Wallis Test

Chi-Square	57.47
df	3
Asymp. Sig.	.000

Degree – Homogenous Subsets

	Subset		
	1	2	3
Associates	2765.17		
Bachelors		2484.50	
Doctorate			2182.35
Masters			2161.93
Test Statistic	-	-	.264
Sig. (2-sided test)	-	-	.607
Adjusted Sig. (2-sided test)	-	-	.846

Employment – Mean Ranks

Employment	N	Mean Rank
Full-time	2376	2224.13
Adjunct	2034	2182.66
Total	4410	

Employment – Kruskal-Wallis Test

Chi-Square	1.58
df	1
Asymp. Sig.	.209

Experience – Mean Ranks

Experience	N	Mean Rank
0-5 years	845	2316.32
6-10 years	985	2104.22
11-20 years	1289	2144.68
21-30 years	660	2146.31
> 30 years	631	2398.04
Total	4410	

Experience – Kruskal Wallis Test

Chi-Square	42.76
df	4
Asymp. Sig.	.000

Experience – Homogenous Subsets

	Subset	
	1	2
> 30 years	2398.04	
0-5 years	2316.32	
21-30 years		2146.31
11-20 years		2144.68
6-10 years		2104.22
Test Statistic	1.49	1.12
Sig. (2-sided test)	.221	.571
Adjusted Sig. (2-sided test)	.464	.756

Course Format – Mean Ranks

Classes	N	Mean Rank
Face-to-Face only	1777	2169.08
Online only	443	2121.09
Mix of formats	2190	2251.10
Total	4410	

Course Format – Krusal-Wallis Test

Chi-Square	8.45
df	2
Asymp. Sig.	.015

Course Format – Homogenous Subsets

	Subset	
	1	2
Mix of formats	2251.10	
Face-to-Face only		2169.08
Online only		2121.09
Test Statistic	-	.817
Sig. (2-sided test)	-	.366
Adjusted Sig. (2-sided test)	-	.366

Table G5. Rewards/Incentives Detailed Analysis per Demographic Group

Gender – Mean Ranks

Gender	N	Mean Rank
Male	1342	2339.32
Female	3068	2146.29
Total	4410	

Gender – Kruskal-Wallis Test

Chi-Square	30.56
df	1
Asymp. Sig.	.000

Age – Mean Ranks

Age	N	Mean Rank
< 25	28	3881.93
25-34	560	2163.14
35-44	885	2153.66
45-54	1114	2177.00
55-64	1276	2235.05
65+	547	2232.04
Total	4410	

Age – Kruskal-Wallis Test

Chi-Square	74.26
df	5
Asymp. Sig.	.000

Age – Homogenous Subsets

	Subset	
	1	2
< 25	3881.93	
55-64		2235.05
65+		2232.04
45-54		2177.00
25-34		2163.14
35-44		2153.66
Test Statistic	-	.4.69
Sig. (2-sided test)	-	.321
Adjusted Sig. (2-sided test)	-	.321

Degree – Mean Ranks

Degree	N	Mean Rank
Associates	131	2803.95
Bachelors	275	2511.33
Masters	2903	2180.35
Doctorate	1101	2122.50
Total	4410	

Degree – Kruskal-Wallis Test

Chi-Square	72.05
df	3
Asymp. Sig.	.000

Degree – Homogenous Subsets

	Subset		
	1	2	3
Associates	2803.95		
Bachelors		2511.33	
Masters			2180.35
Doctorate			2122.50
Test Statistic	-	-	2.52
Sig. (2-sided test)	-	-	.112
Adjusted Sig. (2-sided test)	-	-	.212

Employment – Mean Ranks

Employment	N	Mean Rank
Full-time	2376	2264.19
Adjunct	2034	2135.82
Total	4410	

Employment – Kruskal-Wallis Test

Chi-Square	15.87
df	1
Asymp. Sig.	.000

Experience – Mean Ranks

Experience	N	Mean Rank
0-5 years	845	2299.48
6-10 years	985	2028.34
11-20 years	1289	2172.01
21-30 years	660	2200.16
> 30 years	631	2427.07
Total	4410	

Experience – Kruskal Wallis Test

Chi-Square	62.21
df	4
Asymp. Sig.	.000

Experience – Homogenous Subsets

	Subset			
	1	2	3	4
> 30 years	2427.07			
0-5 years		2299.48		
21-30 years		2200.16	2200.16	
11-20 years			2172.01	
6-10 years				2028.34
Test Statistic	-	3.04	.305	-
Sig. (2-sided test)	-	.081	.581	-
Adjusted Sig. (2-sided test)	-	.190	.886	-

Course Format – Mean Ranks

Classes	N	Mean Rank
Face-to-Face only	1777	2126.45
Online only	443	2127.26
Mix of formats	2190	2284.42
Total	4410	

Course Format – Krusal-Wallis Test

Chi-Square	24.13
df	2
Asymp. Sig.	.000

Course Format – Homogenous Subsets

	Subset	
	1	2
Mix of formats	2284.42	
Online only		2127.26
Face-to-face only		2126.45
Test Statistic	-	.002
Sig. (2-sided test)	-	.965
Adjusted Sig. (2-sided test)	-	.965

Table G6. Resources Detailed Analysis per Demographic Group

Gender – Mean Ranks

Gender	N	Mean Rank
Male	1342	2046.80
Female	3068	2274.92
Total	4410	

Gender – Kruskal-Wallis Test

Chi-Square	34.24
df	1
Asymp. Sig.	.000

Age – Mean Ranks

Age	N	Mean Rank
< 25	28	2672.61
25-34	560	2180.69
35-44	885	2392.87
45-54	1114	2170.25
55-64	1276	2193.55
65+	547	2003.52
Total	4410	

Age – Kruskal-Wallis Test

Chi-Square	43.28
df	5
Asymp. Sig.	.000

Age – Homogenous Subsets

	Subset		
	1	2	3
< 25	2672.61		
35-44	2392.87		
55-64		2193.55	
25-34		2180.69	
45-54		2170.25	
65+			2003.52
Test Statistic	1.75	.227	-
Sig. (2-sided test)	.186	.893	-
Adjusted Sig. (2-sided test)	.460	.989	-

Degree – Mean Ranks

Degree	N	Mean Rank
Associates	131	1946.67
Bachelors	275	1848.72
Masters	2903	2230.63
Doctorate	1101	2259.14
Total	4410	

Degree – Kruskal-Wallis Test

Chi-Square	34.39
df	3
Asymp. Sig.	.000

Degree – Homogenous Subsets

	Subset	
	1	2
Doctorate	2259.14	
Masters	2230.63	
Associates		1946.67
Bachelors		1848.72
Test Statistic	.487	1.01
Sig. (2-sided test)	.485	.314
Adjusted Sig. (2-sided test)	.735	.529

Employment – Mean Ranks

Employment	N	Mean Rank
Full-time	2376	2271.77
Adjunct	2034	2128.09
Total	4410	

Employment – Kruskal-Wallis Test

Chi-Square	15.95
df	1
Asymp. Sig.	.000

Experience – Mean Ranks

Experience	N	Mean Rank
0-5 years	845	2130.09
6-10 years	985	2288.14
11-20 years	1289	2215.23
21-30 years	660	2239.67
> 30 years	631	2121.87
Total	4410	

Experience – Kruskal Wallis Test

Chi-Square	11.87
df	4
Asymp. Sig.	.018

Experience – Homogenous Subsets

	Subset	
	1	2
6-10 years	2288.14	
21-30 years	2239.67	2239.67
11-20 years	2215.23	2215.23
0-5 years		2130.09
> 30 years		2121.87
Test Statistic	2.06	5.68
Sig. (2-sided test)	.356	.128
Adjusted Sig. (2-sided test)	.520	.128

Course Format – Mean Ranks

Classes	N	Mean Rank
Face-to-Face only	1777	2065.47
Online only	443	2584.06
Mix of formats	2190	2242.55
Total	4410	

Course Format – Krusal-Wallis Test

Chi-Square	71.43
df	2
Asymp. Sig.	.000

Course Format – Homogenous Subsets

	Subset		
	1	2	3
Online only	2584.06		
Mix of formats		2242.55	
Face-to-face only			2065.47
Test Statistic	-	-	-
Sig. (2-sided test)	-	-	-
Adjusted Sig. (2-sided test)	-	-	-

Table G7. Status Quo Detailed Analysis per Demographic Group

Gender – Mean Ranks

Gender	N	Mean Rank
Male	1342	2107.74
Female	3068	2248.26
Total	4410	

Gender – Kruskal-Wallis Test

Chi-Square	12.43
df	1
Asymp. Sig.	.000

Age – Mean Ranks

Age	N	Mean Rank
< 25	28	2980.34
25-34	560	2222.92
35-44	885	2400.51
45-54	1114	2091.41
55-64	1276	2245.32
65+	547	1971.95
Total	4410	

Age – Kruskal-Wallis Test

Chi-Square	65.38
df	5
Asymp. Sig.	.000

Age – Homogenous Subsets

	Subset			
	1	2	3	4
< 25	2980.34			
35-44		2400.51		
55-64			2245.32	
25-34			2222.92	
45-54				2091.41
65+				1971.95
Test Statistic	-	-	.137	3.52
Sig. (2-sided test)	-	-	.711	.060
Adjusted Sig. (2-sided test)	-	-	.976	.171

Degree – Mean Ranks

Degree	N	Mean Rank
Associates	131	2096.45
Bachelors	275	1983.36
Masters	2903	2208.52
Doctorate	1101	2266.00
Total	4410	

Degree – Kruskal-Wallis Test

Chi-Square	12.93
df	3
Asymp. Sig.	.005

Degree – Homogenous Subsets

	Subset	
	1	2
Doctorate	2266.00	
Masters	2208.52	
Associates	2096.45	2096.45
Bachelors		1983.36
Test Statistic	3.23	.944
Sig. (2-sided test)	.199	.331
Adjusted Sig. (2-sided test)	.199	.553

Employment – Mean Ranks

Employment	N	Mean Rank
Full-time	2376	2252.11
Adjunct	2034	2151.05
Total	4410	

Employment – Kruskal-Wallis Test

Chi-Square	7.55
df	1
Asymp. Sig.	.006

Experience – Mean Ranks

Experience	N	Mean Rank
0-5 years	845	2120.05
6-10 years	985	2265.34
11-20 years	1289	2239.22
21-30 years	660	2158.36
> 30 years	631	2206.94
Total	4410	

Experience – Kruskal Wallis Test

Chi-Square	8.51
df	4
Asymp. Sig.	.074

Course Format – Mean Ranks

Classes	N	Mean Rank
Face-to-Face only	1777	2086.04
Online only	443	2456.53
Mix of formats	2190	2251.65
Total	4410	

Course Format – Krusal-Wallis Test

Chi-Square	39.06
df	2
Asymp. Sig.	.000

Course Format – Homogenous Subsets

	Subset		
	1	2	3
Online only	2456.53		
Mix of formats		2251.65	
Face-to-face only			2086.04
Test Statistic	-	-	-
Sig. (2-sided test)	-	-	-
Adjusted Sig. (2-sided test)	-	-	-

Table G8. Time Detailed Analysis per Demographic Group

Gender – Mean Ranks

Gender	N	Mean Rank
Male	1342	2206.78
Female	3068	2203.50
Total	4410	

Gender – Kruskal-Wallis Test

Chi-Square	.007
df	1
Asymp. Sig.	.935

Age – Mean Ranks

Age	N	Mean Rank
< 25	28	3682.55
25-34	560	2040.55
35-44	885	2183.37
45-54	1114	2083.34
55-64	1276	2324.32
65+	547	2298.02
Total	4410	

Age – Kruskal-Wallis Test

Chi-Square	72.24
df	5
Asymp. Sig.	.000

Age – Homogenous Subsets

	Subset			
	1	2	3	4
< 25	3682.55			
55-64		2324.32		
65+		2298.02	2298.02	
35-44			2183.37	2183.37
45-54				2083.34
25-34				2040.55
Test Statistic	-	.326	2.61	4.12
Sig. (2-sided test)	-	.568	.106	.090
Adjusted Sig. (2-sided test)	-	.919	.285	.172

Degree – Mean Ranks

Degree	N	Mean Rank
Associates	131	2566.47
Bachelors	275	2372.65
Masters	2903	2213.41
Doctorate	1101	2095.86
Total	4410	

Degree – Kruskal-Wallis Test

Chi-Square	25.07
df	3
Asymp. Sig.	.000

Degree – Homogenous Subsets

	Subset		
	1	2	3
Associates	2566.47		
Bachelors	2372.65		
Masters		2213.41	
Doctorate			2095.86
Test Statistic	2.36	-	-
Sig. (2-sided test)	.125	-	-
Adjusted Sig. (2-sided test)	.234	-	-

Employment – Mean Ranks

Employment	N	Mean Rank
Full-time	2376	2240.91
Adjunct	2034	2161.96
Total	4410	

Employment – Kruskal-Wallis Test

Chi-Square	4.49
df	1
Asymp. Sig.	.034

Experience – Mean Ranks

Experience	N	Mean Rank
0-5 years	845	2201.09
6-10 years	985	2163.45
11-20 years	1289	2123.92
21-30 years	660	2192.10
> 30 years	631	2451.05
Total	4410	

Experience – Kruskal Wallis Test

Chi-Square	31.83
df	4
Asymp. Sig.	.000

Experience – Homogenous Subsets

	Subset	
	1	2
> 30 years	2451.05	
0-5 years		2201.09
21-30 years		2192.10
6-10 years		2163.45
11-20 years		2123.92
Test Statistic	-	2.52
Sig. (2-sided test)	-	.471
Adjusted Sig. (2-sided test)	-	.471

Course Format – Mean Ranks

Classes	N	Mean Rank
Face-to-Face only	1777	2137.57
Online only	443	2311.77
Mix of formats	2190	2237.09
Total	4410	

Course Format – Krusal-Wallis Test

Chi-Square	10.10
df	2
Asymp. Sig.	.006

Course Format – Homogenous Subsets

	Subset	
	1	2
Online only	2311.77	
Mix of formats	2237.09	
Face-to-face only		2137.57
Test Statistic	1.45	-
Sig. (2-sided test)	.229	-
Adjusted Sig. (2-sided test)	.229	-

Appendix H – Summary Analysis of Demographic Subgroups per Condition

Table H1. Gender Detailed Analysis per Condition

	Male (n=1342)	Female (n=3068)
Status Quo *	2107.74	2248.26
Knowledge/Skills *	2078.96	2259.45
Resources *	2046.80	2274.92
Time	2206.78	2203.50
Participation *	2323.94	2152.95
Rewards/Incentives *	2339.32	2146.29
Commitment *	2265.70	2179.17
Leadership *	2284.16	2170.36

** denotes significant difference*

Table H2. Age Detailed Analysis per Condition

	< 25 (n=28)	25-34 (n=560)	35-44 (n=885)	45-54 (n=1114)	55-64 (n=1276)	65+ (n=547)
Status Quo *	-	2213.73	2390.12	2083.03	2236.11	1964.23
Knowledge/Skills *	-	2161.72	2426.20	2115.54	2176.24	2024.28
Resources *	-	2169.77	2380.74	2159.44	2182.58	1993.69
Time *	-	2089.51	2160.37	2102.09	2278.57	2316.92
Participation *	-	2230.31	2209.05	2089.81	2246.36	2198.31
Rewards/Incentives	-	2161.24	2154.05	2180.56	2217.80	2239.98
Commitment *	-	2063.98	2065.26	2154.82	2267.54	2423.61
Leadership *	-	2124.05	2005.79	2148.24	2293.53	2407.03

** denotes significant difference.* *<25 group too small for statistical analysis*

Table H3. Degree Detailed Analysis per Condition

	Associates (n=131)	Bachelors (n=275)	Masters (n=2903)	Doctorate (n=1101)
Status Quo *	2096.45	1983.36	2208.52	2266.00
Knowledge/Skills *	1993.28	1797.88	2226.91	2272.15
Resources *	1946.67	1848.72	2230.63	2259.14
Time *	2566.47	2372.65	2213.41	2095.86
Participation *	2765.17	2484.50	2161.93	2182.35
Rewards/Incentives *	2803.95	2511.33	2180.35	2122.50
Commitment *	2917.29	2558.62	2140.83	2203.13
Leadership *	3001.00	2511.05	2144.98	2192.37

** denotes significant difference*

Table H4. Employment Status Detailed Analysis per Condition

	Full-time (n=2376)	Adjunct (n=2034)
Status Quo *	2252.11	2151.05
Knowledge/Skills *	2256.18	2144.12
Resources *	2271.77	2128.09
Time *	2240.91	2161.96
Participation	2224.13	2182.66
Rewards/Incentives *	2264.19	2135.82
Commitment	2206.63	2204.19
Leadership	2220.58	2186.80

** denotes significant difference*

Table H5. Years of Teaching Experience Detailed Analysis per Condition

	0-5 (n=845)	6-10 (n=985)	11-20 (n=1289)	21-30 (n=660)	> 30 (n=631)
Status Quo	2120.05	2265.34	2239.22	2158.36	2206.94
Knowledge/Skills	2136.94	2248.67	2247.22	2207.30	2135.78
Resources *	2130.09	2288.14	2215.23	2239.67	2121.87
Time *	2201.09	2163.45	2123.92	2192.10	2451.05
Participation *	2316.32	2104.22	2144.68	2146.31	2398.04
Rewards/Incentives *	2299.48	2028.34	2172.01	2200.16	2427.07
Commitment *	2204.48	2133.12	2155.23	2228.39	2398.61
Leadership *	2225.27	2082.59	2154.58	2262.34	2411.87

** denotes significant difference*

Table H6. Course Format Detailed Analysis per Condition

	Face to Face (n=1777)	Online Only (n=443)	Mix (n=2190)
Status Quo *	2086.04	2456.53	2251.65
Knowledge/Skills *	2061.73	2589.46	2242.51
Resources *	2065.47	2584.06	2242.55
Time *	2137.57	2311.77	2237.09
Participation *	2169.08	2121.09	2251.10
Rewards/Incentives *	2126.45	2127.26	2284.42
Commitment *	2186.45	2406.02	2180.39
Leadership *	2226.80	2316.65	2164.74

** denotes significant difference*