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**TRAINING THE FEDERAL ACQUISITION WORKFORCE: A CORRELATIONAL
STUDY OF PERCEIVED LEARNER-CENTRIC INTERACTION EFFECTIVENESS
AND DISTANCE LEARNING ENVIRONMENTAL PREFERENCES**

A dissertation submitted to
the Graduate College of
Marshall University
In partial fulfillment of
the requirements for the degree of
Doctor of Education
In
Leadership Studies
by
Daniel Dwayne Davis

Approved by
Dr. Dennis M. Anderson, Committee Chairperson
Dr. Charles Bethel
Dr. Robert Morelan

Marshall University
December 2022

APPROVAL OF DISSERTATION

We, the faculty supervising the work of **Daniel Davis**, affirm that the dissertation, **Training the Federal Acquisition Workforce: A Correlation Study of Perceived Learner-Centric Interaction Effectiveness and Distance Learning Environmental Preferences** meets the high academic standards for original scholarship and creative work established by the EdD Program in **Leadership Studies** and the College of Education and Professional Development. This work also conforms to the editorial standards of our discipline and the Graduate College of Marshall University. With our signatures, we approve the manuscript for publication.

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DEDICATION

I dedicate this dissertation to my father, the late Reverend George Thomas Davis Jr., to my wife, Jordan Nicole Davis, to my daughter, Adelaide June Davis, and to my Lord and Savior, Jesus Christ.

ACKNOWLEDGMENTS

I want to thank my dissertation committee chairperson, Dr. Dennis M. Anderson, and my dissertation committee members, Dr. Charles Bethel and Dr. Robert Morelan, for their patience, guidance, and helpful suggestions. I also want to thank the many Veterans who have sacrificed so much to protect and preserve the freedoms that we enjoy.

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ABSTRACT

Public procurement, the purchase of goods and services by governments from external sources, is a strategic tool commonly used by governments to fulfill their mandates. To manage public procurement inside the United States federal government, the Acquisition Workforce (AWF) was established. Training to support the development and maintenance of necessary competencies in the AWF occurs in both face-to-face and distance learning environments. The trend, in general, has been towards a greater dependency on the use of distance learning. The purpose of this quantitative study was to examine AWF perceptions of learner-centric interaction effectiveness and learning environment preferences, along with the correlation, if any, between these factors inside the federal acquisition distance learning environment. The study's findings indicate a preference by the AWF for training consisting of learner-centric interaction diversity delivered in a bichronous distance learning environment.

CHAPTER 1: INTRODUCTION

Distance learning interactions and environments continue to evolve to best meet the changing needs of the adult learner. New information and communication technologies (ICT) continue to become available to distance learning interaction and environment developers, enhancing learning opportunities (Rahman, 2014). Members of the acquisition workforce, as adult learners, need learner-centric interactions delivered through distance learning environments that best meet their changing needs and preferences. By meeting the changing training needs and preferences of the acquisition workforce, acknowledged deficiencies in the technical and professional competencies necessary to promote quality and effectiveness inside the federal acquisition process have the best opportunity to be addressed.

Background

Public procurement, the purchase of goods and services by governments from sources outside of government, is a strategic tool commonly used by governments to fulfill their mandates. Public procurement through the use of contracts can help to reduce costs, increase organizational agility, and increase levels of performance without the need to increase the number of employees (Dogerlioglu, 2012). The size of public procurement is massive, making up almost 30% of general government expenditures (Organisation for Economic Co-operation and Development [OECD], 2019). Public procurement must be properly managed to serve the needs and interests of the taxpayer effectively and efficiently.

To manage public procurement inside the United States federal government, the Acquisition Workforce (AWF) was established. The AWF can be described as a group of individuals created to procure best-value products and services for use by federal agencies in service to the U.S. taxpayer (Office of Federal Procurement Policy [OFPP], 2011). Major career

fields in the AWF include contracting officers, program and project managers, and contracting officer's representatives.

Although the Department of Defense and each civilian federal agency have been purposed to create and manage their own acquisition workforce, the Office for Federal Procurement Policy issues policies to promote acquisition workforce uniformity among the various federal agencies (OFPP, 2011). The Office of Federal Procurement Policy was established for this purpose in 1974 (Office of Management and Budget [OMB], 2022). Through the Office of Federal Procurement Policy, certification requirements for contracting officers, program and project managers, and contracting officer's representatives are established (OFPP, 2011, 2013, 2014). These certification requirements for each major acquisition workforce career field consist of experience, education, and training elements (Federal Acquisition Institute [FAI], 2022b). Development of the technical and professional competencies and their supporting certification requirements are considered necessary elements of a capable and competent acquisition workforce (OFPP, 2005).

In 1976, under the guidance of the Office of Federal Procurement Policy, the Federal Acquisition Institute was established to promote the development of the AWF (FAI, 2022a). Title 41 of the United States Code provides the FAI with twelve statutory responsibilities pertaining to the acquisition workforce (FAI, 2022c). Included in these responsibilities is the requirement to assist in the creation and evaluation of training materials to support the development of the acquisition workforce (FAI, 2022c).

Training to support the development and maintenance of necessary competencies in the AWF occurs in both face-to-face and distance learning environments. The trend, in general, has been towards a greater dependency on the use of distance learning. This is in line with higher

education, as more than 70% of higher education institutions report that distance learning has become an important part of their long-term strategy (Seaman et al., 2018). The same focus on the growing use of distance learning is occurring in corporate training environments (Esterhuyse et al., 2016). The COVID-19 pandemic has only acted to accelerate this trend toward the increased use of distance learning (Pulsipher, 2020).

Distance learning environments can be classified into several categories, including asynchronous, synchronous, and bichronous (Martin & Oyarzun, 2018). The asynchronous category consists of an environment where content is delivered online and learners can participate from anywhere at any time. There are no real-time learner-centric interactions (Choi, 2016). The synchronous category consists of an environment where, although the content is delivered online and learners can participate in courses from anywhere, there are real-time learner-centric interactions (Martin & Oyarzun, 2018). Learners can access the learning environment from anywhere, but learners must access the interactions inside the environment at the same time as the instructor and other learners to participate (Martin & Oyarzun, 2018). The bichronous category is a blending of both asynchronous and synchronous environments (Martin & Oyarzun, 2018).

Historically, the AWF has only had the opportunity to receive distance learning through asynchronous and synchronous environments. Recently training using a bichronous distance learning environment has been made available to the AWF. An example of a training course that has been developed for the bichronous learning environment is the FCR404 FACCOR Refresher training course.

Distance learning has the potential to improve the quality of learning (Chang, 2016). This potential is enhanced by choosing the appropriate learning interactions and distance learning

environments that best achieve high-quality learning outcomes (Pihlajamaa et al., 2016).

Measuring perceived learner satisfaction with and learning in distance learning interactions can be used to select learning interactions that support the needs of the learner (Arbaugh, 2000; Hiltz, 1994). This learner-centric approach can improve learner engagement and learning outcomes (Chen et al., 2010).

A key characteristic of the current generation of distance learning is the recognition of the importance of transactional distance. Transactional distance is defined as understandings and perceptions that might lead to a communication gap or a psychological space of potential misunderstandings between the learner and content, the instructor, and other learners in the learning environment (Mbwesa, 2014, p. 177). To overcome the transaction distance inherent in distance learning, the implementation of learner-centric interactions is essential (Chou et al., 2010; Moore, 1989).

Research in the development and implementation of learner-centric interactions in the current generation of distance learning has been significant (Benson & Samarawickrema, 2009; Gavrillir et al., 2020; Mbwesa, 2014; Moore, 1989; Saba & Shearer, 2017; Weidlich & Bastiaens, 2018). The proper design, choice, and implementation of learner-centric interactions are some of the most important ingredients to learners' success in distance learning (Mutalib et al., 2016). It is insufficient for instructional designers to attempt to use existing face-to-face interactions in distance learning environments (Woldeab et al., 2020). The development and application of learning interactions to create equivalent learning outcomes for learners in all learning environments have been a guiding principle in distance learning (Moore, 1989, 1993; Simonson et al., 1999; Simonson, 1999, 2021).

Moore originally noted three types of learner-centric interactions that are important in overcoming transactional distance: learner-content, learner-instructor, and learner-learner (1989). Building on Moore's work, Chou, Peng, and Chang proposed a more comprehensive taxonomy of learner-centric interactions that can be used to bridge the transactional distance (2010). Their taxonomy consists of five types of learner-centric interactions: learner-content, learner-instructor, learner-content, learner-interface, and learner-self (Chou et al., 2010).

Distance learning transactional distance can best be overcome by the appropriate selection and application of the various types of learner-centric interactions (Moore, 1989, 1993). Simonson argued that by the appropriate application of the various types of learner-centric interactions, distance learning could produce equivalent learner outcomes to face-to-face learning environments (Simonson et al., 1999; 1999, 2021). Although the environments of face-to-face learning and distance learning are fundamentally different, it is the responsibility of the instructional designer to provide learning interactions designed specifically for the learner's environment to produce an equivalent value or learning outcome for the learner, regardless of the learning environment (Simonson et al., 1999; Simonson, 1999, 2021).

In a follow-up to research on equivalency, transactional distance, and interaction in distance learning, Anderson proposed the Interaction Equivalency Theorem (IEQT) (2003). Anderson argued that in distance learning, deep and meaningful formal learning was supported as long as one form of interaction existed at a high level in the learning environment (2003). Other categories of interaction could be minimized or completely eliminated without degrading the quality of the learning experience (Anderson, 2003). Anderson continued his argument by stating that, although an increase in the quantity of learner-centric interactions of the various

types may make for a more satisfying educational experience for the learner, the increase comes at a cost in both time and sustainability (Miyazoe & Anderson, 2010b).

The IEQT supports placing a priority on the creation of distance learning single modality learning environments that include a high level of only one learner-centric interaction type. For example, IEQT supports the creation of asynchronous environments that include a high level of learner-content interaction while removing or severely diminishing learner-instructor and learner-learner interactions. In synchronous environments, IEQT supports the use of a high level of learner-instructor interaction while removing or severely diminishing learner-content and learner-learner interactions. According to IEQT, such examples can provide deep and meaningful learning without the unnecessary complexity, cost, and sustainable challenges of learning environments that provide the learner with a variety of interaction types (Miyazoe & Anderson, 2010b).

The influence of IEQT can be seen inside the AWF training environment. Until recently, the majority of distance learning opportunities available to adult learners in the AWF consisted of asynchronous, self-paced e-learning and synchronous, instructor-led training, which have high levels of one type of interaction with the removal or diminishing of other types of interactions. Learner perceptions regarding the effectiveness of the five types of learner-centric interactions and learner preferences regarding distance learning environments have not been studied inside the AWF.

Research has explored learner perceptions inside asynchronous environments in the higher education learning environment (Rhode, 2009). Other research has focused on the validity of IEQT in the corporate training environment (Rodriguez, 2014; Rodriguez & Armellini, 2015). A gap in the literature is the appropriateness of the application of IEQT to AWF training.

Research is required if current AWF perceptions of learner-centric interaction effectiveness and preferences for distance learning environments provide support for the validity of dependence on IEQT inside the AWF training environment.

Statement of the Problem

A weakness in the AWF, acknowledged by the workers themselves, is a deficiency in the technical and professional competencies necessary to promote quality and effectiveness inside the federal acquisition process (FAI, 2018). Many see themselves as being poorly equipped to meet the current and future demands of the acquisition environment (Murphy & Bouffard, 2017). The AWF perception of competency deficiency has been supported by several government studies (Government Accountability Office [GAO], 2010, 2013). The acquisition workforce's resulting poor performance is considered a high-risk area (GAO, 2019).

An additional challenge facing the AWF is its changing demographics. Approximately one-third of the workforce is approaching or has already reached retirement eligibility (FAI, 2018). Although millennials currently account for only a small percentage of the current acquisition workforce, the workforce is becoming increasingly digitally focused. The current use of only asynchronous and synchronous distance learning environments may no longer be meeting the needs of an increasingly digitally focused workforce. A potential inability of current training to best meet the changing needs of the acquisition workforce may be an attributing factor to a lack of technical and professional competencies proficiency perceived by many acquisition workforce members.

These challenges support the need for research to better understand current AWF perceptions of learner-centric interaction effectiveness and preferences for distance learning environments. As the workforce moves toward more digital-centric learning preferences, a

growing understanding of these areas may be beneficial. As adult learner needs change, it is important to research those changes to better design curriculum to meet those changing needs (Diep et al., 2019).

Purpose of the Study

The purpose of this study is to examine the relationship, if any, between AWF perceptions of learner-centric interaction effectiveness and their distance learning environment preferences. The study adds to the body of research that focuses on the adult learners' perceived effectiveness of learner-centric interactions and their preferences concerning distance learning environments. Attention is placed on adult learner perceptions of the bichronous learning environment in contrast to synchronous and asynchronous distance learning environments, as research concerning learner perceptions of bichronous learning environments is sparse.

Research Questions

The following research questions guide this study:

1. Are there significant differences in how learners perceive the effectiveness of the learner-centric interactions (learner-interface, learner-content, learner-instructor, learner-learner, learner-self)?
2. Are there significant differences in how learners rate their preferences of distance learning environments (asynchronous, synchronous, bichronous)?
3. Is there a significant correlation between learner-perceived effectiveness of learner-content interactions and distance learning environment preferences?
4. Is there a significant correlation between learner-perceived effectiveness of learner-instructor interactions and distance learning environment preferences?

5. Is there a significant correlation between learner-perceived effectiveness of learner-learner interactions and distance learning environment preferences?
6. Is there a significant correlation between learner-perceived effectiveness of learner-interface interactions and distance learning environment preferences?
7. Is there a significant correlation between learner-perceived effectiveness of learner-self interactions and distance learning environment preferences?

Significance of the Study

This study addresses a gap in the area of AWF competency training pertaining to adult learners' perceptions of the effectiveness of learner-centric interactions and learning environment preferences, along with the correlation, if any, between these factors. Findings from this study may help stakeholders, such as federal acquisition leadership, training specialists, instructional designers, and online instructors, better understand how the training needs and desires of the acquisition workforce may be changing amid the world's massive digital transformation (OECD, 2017). Such understanding should help stakeholders identify best practices in the design of new training materials, the modification of existing training materials, and the delivery of said materials. These best practices should help improve the efficiency and effectiveness of AWF competency training, helping to address the noted workforce deficiencies in the technical and professional competencies necessary to promote quality and effectiveness inside the federal acquisition process (FAI, 2018). Other areas of federal, state, and local government training may also benefit from these findings as their use of distance training continues to grow. Public procurement of goods and services may be more properly managed to serve the needs and interests of the taxpayer.

Definition of Terms

For this study, the following definitions are provided:

Adult Learner. An adult learner is someone considered an adult by social definition and who is taking part in the learning process (Knowles et al., 2015).

Andragogy. Andragogy is the study of adult learning. In contrast to pedagogy which focuses on the teaching of children, andragogy focuses on helping adults learn. Andragogy is based on six assumptions of how adults learn: self-concept, experience, readiness to learn, orientation to learn, motivation to learn, and the need to know (Knowles et al., 2015).

Asynchronous Distance Learning. Asynchronous distance learning is a distance learning environment where the content is delivered online and students can participate in the course from anywhere at any time. There are no real-time online or face-to-face meetings (Martin & Oyarzun, 2018).

Bichronous Distance Learning. Bichronous distance learning is created through the blending of both asynchronous and synchronous distance learning environments, where students can participate in any time, anywhere learning during the asynchronous parts of the course but then participate in real-time activities for the synchronous sessions. The amount of the distance learning blend varies by the course and the interactions included in the course (Martin et al., 2020).

Acquisition Workforce. The Acquisition Workforce (AWF) is defined as the group of individuals established to procure best-value products and services for use by federal agencies in service to the U.S. taxpayer (OFPP, 2005).

Interaction Equivalency Theory. Interaction equivalency theory (IEQT) proposes that deep and meaningful learning can take place as long as one form of learning interaction (student-instructor, student-student, student-content) exists at a high level. The other two types of

interactions may be offered at a minimum level or even eliminated without degrading the effectiveness of the learning experience (Miyazoe & Anderson, 2010a, 2010b, 2010c; Anderson, 2003).

Learner-Centric Interaction. To overcome distance learning transactional distance, interactions are created and appropriately applied in the learning process (Moore, 2019; Moore & Kearsley, 1996; Wallace, 2003). Interaction is defined by Moore as a pedagogical concept that focuses on “the interplay among the environment, the individuals, and the patterns of behaviors in a situation” (2019, p. 33).

Synchronous Distance Learning. Synchronous distance learning is a distance learning environment where content is delivered online, and students can participate in courses from anywhere. There are real-time online meetings, and students log in from anywhere but at the same time to participate in the course (Martin & Oyarzun, 2018).

Transactional Distance. Transaction distance includes understandings and perceptions that might lead to a communication gap or potential misunderstandings between people in the distance learning environment (Mbwesa, 2014).

Limitations of the Study

This study has several limitations. First, the study will investigate members of the AWF who have experienced five categories of learner-centric interactions as part of the completion of a bichronous distance learning course developed by the Departments of Veterans Affairs Acquisition Workforce Curriculum and Development Team, the FCR404 Contracting Officer’s Representative (COR) Refresher Course. This course makes use of learner-centric interactions that may not currently exist in other federal acquisition training courses. Each federal agency uses its own internal design teams and external contractors to develop training activities. As

such, learners completing the courses developed by other designers may experience dissimilar perceptions of effectiveness with learning interactions included in those training activities because of developmental differences.

Second, this study includes learner-instructor interaction that involves only one AWF instructor. Learner perceptions of the effectiveness of learner-instructor interactions can be influenced by the skills of the instructor, in addition to learner perceptions of the learning environment itself. Many instructors experience challenges developing the technological skills necessary to be effective and engaging in a distance learning environment (Pihlajamaa et al., 2016). These challenges may lessen instructor effectiveness in distance learner-instructor interactions, impacting learner perceptions of the effectiveness of such interactions. Because of the potential role that the instructor plays in influencing learner perceptions of the effectiveness of learner-instructor interactions, learners experiencing learner-instructor interactions facilitated by other instructors may experience dissimilar levels of perceived effectiveness in those interactions.

Third, for purposes of data collection, this study assumes that learners will be able to discriminate between the various types of interactions provided inside the course. Although such discrimination is attainable by those knowledgeable in the development of distance training activities, learners may not see the differences as obvious. This difficulty in viewing the various types of interactions as separate activities may lessen learners' ability to form, hold, and then report perceptions of the effectiveness of the various learner-centric interactions studied. To address this limitation, the terminology used in the course to describe the various types of interactions, along with the use of the terminology used inside the data-capturing instrument, has been kept consistent and non-technical.

A final limitation to this study is the role the COVID-19 epidemic is playing in reshaping the current federal training environment. Before the COVID-19 epidemic, learners often had the opportunity to choose between face-to-face and distance training environments. This pre-COVID-19 freedom in learning environment selection was removed when most federal face-to-face training opportunities were replaced with distance learning-only options. The learner now enrolls in distance learning training not out of preference but out of necessity, as most face-to-face training options are no longer available.

Learners bring with them to the classroom their preconceptions, biases, and ideas (Magdalene Delighta Angeline et al., 2020). The incoming perceptions of learners for this study come from those taking distance training out of necessity because of the COVID-19 epidemic. If or when the freedom to choose between face-to-face and distance training environments returns, the incoming perceptions may change along with the population.

Methods

The primary purpose of this study was to provide a correlational view of current AWF perceptions of learner-centric interaction effectiveness and preferences for distance learning environments. To support this purpose, a correlational, non-experimental, quantitative research design was selected. The sample group for this study consisted of graduates of the VA Acquisition Academy FCR404 FACCOR Refresher Course. This training course allows learners who are members of the AWF to experience five categories of learner-centric interactions (learner-interface, learner-content, learner-instructor, learner-learner, and learner-self) in a bichronous distance learning environment. Before taking this bichronous course, members of the sample group will have previously experienced other AWF training in both distance learning synchronous and asynchronous formats.

A survey design method was used for this study. The survey design method provides for the capture of perceptions and opinions of a population, supports the questioning of relationships between variables, and answers descriptive questions (Creswell & Creswell, 2020). The survey design method was also used because of other benefits, including the economy of the design, rapid turnaround in data collection, and the ability to collect data immediately after the completion of the adult learners' experiences. The survey was cross-sectional, collecting data at one point in time (Creswell, 2012). Data was stored inside a local hard drive accessible only by the researcher.

Summary

The purpose of this correlational, non-experimental, quantitative study is to add to the body of research that focuses on the causes of perceived competency deficiencies in the AWF, specifically regarding how those perceptions relate to changing workforce demographics, adult learner needs, perceptions of learner-centric interaction effectiveness, and distance learning environment preferences. This study explores perceptions of learner-centric interaction effectiveness and their distance learning environment preferences in a federal acquisition training course. Findings from this study may help stakeholders, such as federal acquisition leadership, training specialists, instructional designers, and online instructors, better understand how the training needs and desires of the AWF may be changing with the workforce's changing demographics and the world's massive digital transformation. This study will guide future training design, development, and delivery, helping to address perceived workforce competency deficiencies more efficiently and effectively.

CHAPTER 2: LITERATURE REVIEW

The use of distance learning by adult learners continues to grow in higher education, business, and the federal government. Thirty-six percent, over 7 million adults, take at least one higher education distance learning course each year (De Brey et al., 2021). Twenty-nine percent of corporate employee training is delivered via distance learning (Training Magazine, 2020). In the federal government, the use of distance learning is heavily promoted. It is a long-standing policy of the federal government to make use of technology to deliver training to the user's desktop to make training as accessible and cost-effective as possible (GAO, 2004).

To understand how the AWF perceives the effectiveness of the various types of distance learning interactions along with the preferred types of distance learning environments, it is important to first understand the learning theories and theoretical frameworks that are foundational to distance learning and a brief history of distance learning. This chapter provides an overview of those theories and frameworks and an explanation of the types of interactions that are part of this study. In addition to that overview, a review of the history of distance learning, along with the distance learning environments used in AWF training, is discussed.

Learning Theories Applicable to Distance Learning

Constructivism

Constructivism is “an approach to learning that holds that people actively construct or make their own knowledge and that reality is determined by the experiences of the learner” (Elliott et al., 2000, p. 256). Vygotsky expanded on those views by stating that community and environment play a central role in the construction of knowledge (1978). Learning is a collaborative process, with knowledge being created through interactions with others (Vygotsky, 1978). According to Vygotsky, “Every function in the child's cultural development appears

twice: first, on the social level and, later on, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological)” (1978, p. 57). Vygotsky’s views are in line with Dewey, who viewed learning as a social activity (1938). He believed that learning originates from interactions that take place with others (Dewey, 1938).

A prevailing theory behind many distance learning course designs, especially those that include learner-learner interactions, is social constructivism. Research supports the value of designing distance learning courses from a social constructivist perspective. For asynchronous distance learning courses, the addition of discussion boards has been found to contribute to learning (Ringler et al., 2015). Online threaded discussion boards improve learner success and engagement by providing the opportunity for learners to respond to instructor posts and assignments, in addition to posts from other learners (Mooney et al., 2014).

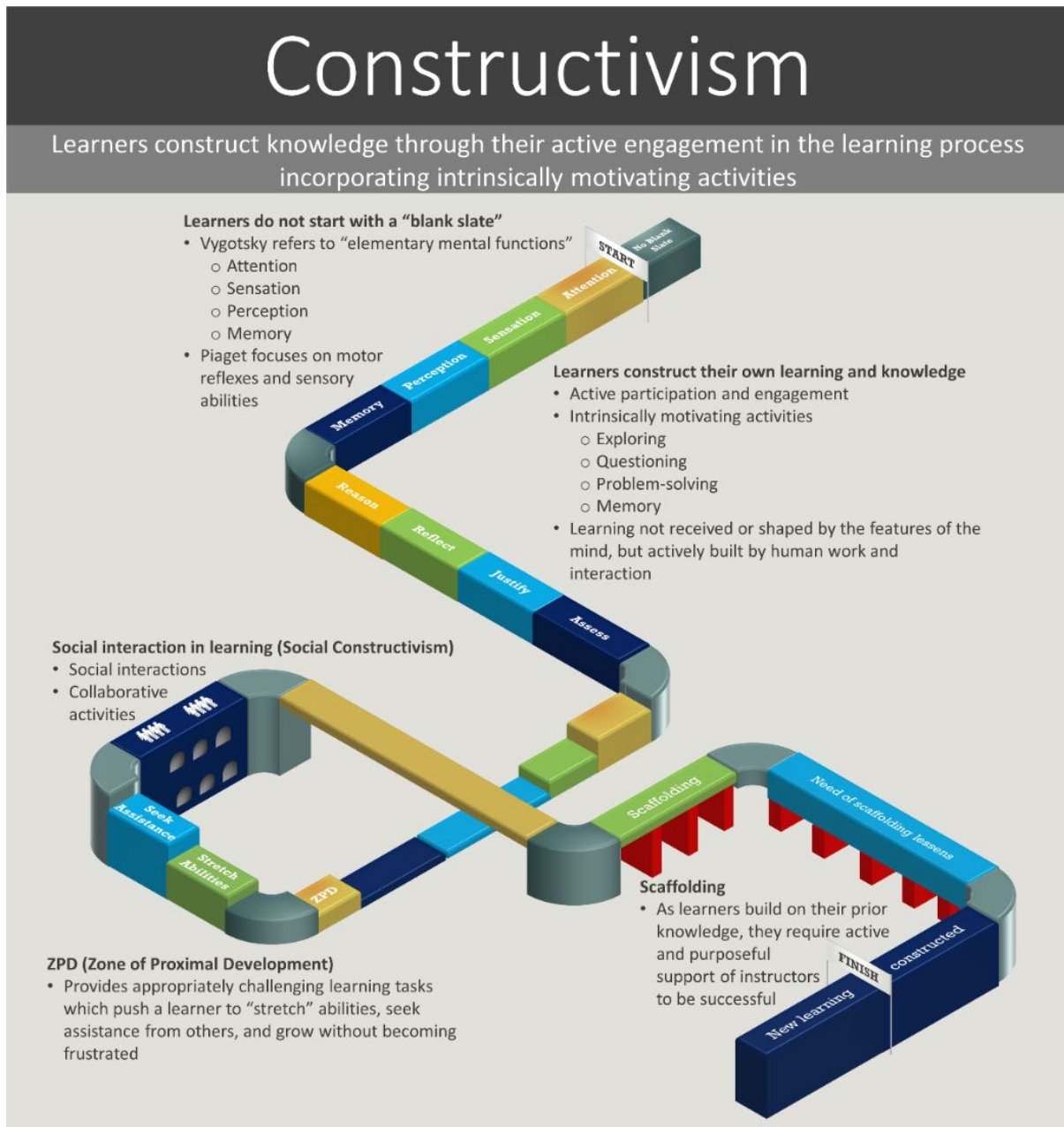
In synchronous distance learning courses, the use of live breakout groups promotes the creation of knowledge. Virtual classrooms and communication tools such as Blackboard Collaborate, Adobe Connect, and Zoom are effective tools to increase learner engagement and learning in distance education (Chinaza, 2020). Social constructivism has been demonstrated to be an “explanatory theory for the effectiveness of online learning claims interactive learning, as achieved by the process of communicating electronically, enables the learners to actively construct their own perspectives which they can communicate to a small group” (Wilson & Stacey, 2004).

As a major shift from pedagogical approaches based on behaviorism, social constructivism stresses the role of interpersonal, learner-centric interactions in the creation of knowledge. The focus of the learning environment is no longer the instructor but the learner (Sthapornnanon et al., 2009). Social constructivism creates a learner-centric learning

environment where interpersonal interactions with others inside learning environments are central to the creation of knowledge. Figure 1 presents key elements of constructivism in the form of an infographic.

Figure 1

Constructivism Infographic



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Cognitivism

Cognitivism, as a learning theory, developed during the second half of the twentieth century as a shift away from the dominant view of behaviorism in explaining the psychology behind the learning process (Gagné, 1985; Piaget, 1964; Tolman, 1948). In cognitivism, learning is viewed as an internal process that includes the use of memory, thinking, reflection, abstraction, and motivation (Ally, 2004). The information that is part of the learning process is often chunked to reduce the cognitive load for the learner (Thalman et al., 2019). Gagne's Nine Events of Instruction provide distance learning course designers an outline for developing and delivering learning interactions:

1. Gaining attention (reception).
2. Informing learners of the objective (expectancy).
3. Stimulating recall of prior learning (retrieval).
4. Presenting the stimulus (selective perception).
5. Providing learning guidance (semantic encoding).
6. Eliciting performance (responding).
7. Providing feedback (reinforcement).
8. Assessing performance (retrieval).
9. Enhancing retention and transfer (generalization). (Gagné et al., 1992)

Social Learning Theory

Bandura argues that observing others and modeling their direct experiences play a primary role in the learning process. Although some learning takes place through direct experience and by trial and error, learning also takes place vicariously. Bandura describes the learning process through modeling, which can be intentional or unintentional, as follows:

Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do. Fortunately, most human behavior is learned observationally through modeling: from observing others one forms an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action. Because people can learn from example what to do, at least in approximate form, before performing any behavior, they are spared needless errors. (1977, p. 25)

Research provides evidence of the use of modeling to create knowledge in distance education (Hill et al., 2009). The modeling can occur through a high teacher presence in learning interactions (Hill et al., 2009).

There are good reasons why social constructivism and social learning theory have become foundational to many modern distance learning designs. Learner interactions that support social learning and modeling can improve learner outcomes and perceptions of satisfaction (Kurucay & Inan, 2017; Rovai & Barnum, 2003; Yücel & Usluel, 2016). Creating a course where interpersonal interaction is lacking or nonexistent may not be a best practice in distance learning course design, given the research that supports their importance.

Connectivism

Of all the learning theories that support distance learning, connectivism is the newest. It has been called the learning theory for the 21st century (Kropf, 2013). With the emergence of the internet and other information and communication technologies (ICT), it is considered by some as the predominant learning theory for the digital age (Duke et al., 2013).

In 2005, George Siemens published an article entitled ‘Connectivism: a learning theory for the digital age’ (Siemens, 2005). Siemens argued that existing theories of learning were

developed before the digital age, and thus do not take into account the technologies that are available to today's learners (Siemens, 2005). He proposed connectivism as a theory that takes into account the learning that takes place in environments outside of the individual (Siemens, 2005). The principles of connectivism as presented by Siemens include:

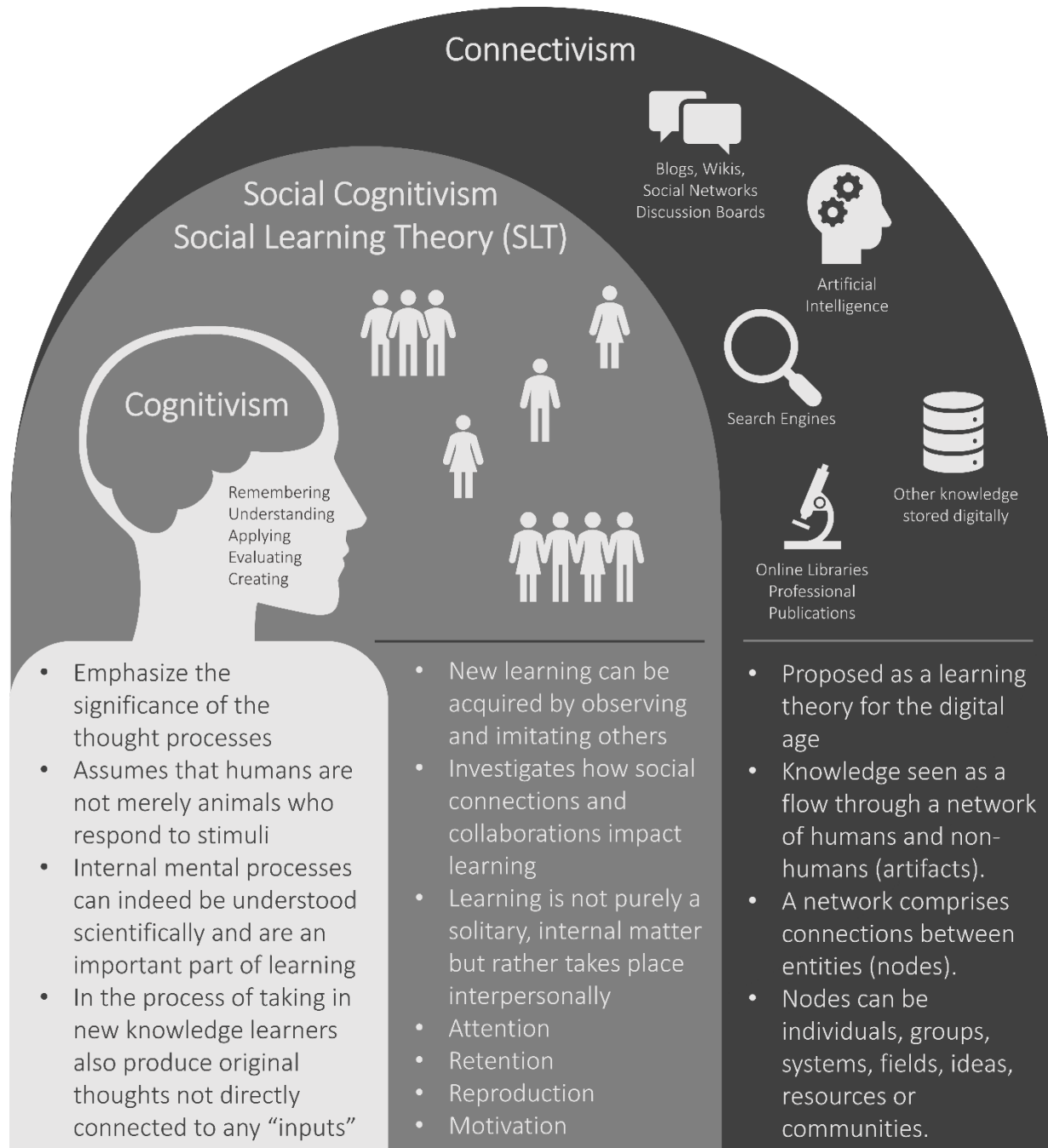
1. Learning and knowledge rest in diversity of opinions.
2. Learning is a process of connecting specialized nodes or information sources.
3. Learning may reside in non-human appliances.
4. Capacity to know more is more critical than what is currently known.
5. Nurturing and maintaining connections is needed to facilitate continual learning.
6. Ability to see connections between fields, ideas, and concepts is a core skill.
7. Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
8. Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision (2005).

Siemens argues that new developments in ICT and social software have changed how learners access information and how learners communicate with other learners and instructors (2008). In the past, access to both information and interaction with peers and instructors was largely under the control of the instructor (Siemens, 2008). In today's digital age, classroom walls are increasingly permeable (Siemens, 2008). Especially in distance education, learners have access to internet search engines, instant messaging software, online blogs, and other sources of

information. It is important for distance learning to take connectivism into account when designing and delivering distance learning interactions. Figure 2 provides a graphical overview of Cognitivism, Social Learning Theory, and Connectivism.

Figure 2

Cognitivism, Social Cognitivism, Social Learning Theory, Connectivism Infographic



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Frameworks and Models Applicable to Distance Learning

In addition to the learning theories discussed above, learning frameworks and models play an important role in distance learning. Some have existed before the emergence of computer-mediated distance learning but have been applied to distance learning. Others have been developed because of the emergence of computer-mediated distance learning.

Andragogy

Learning can be defined as a change in behavior resulting from practice or performance (Driscoll, 2013). The art and science behind adult learning are commonly called andragogy. Andragogy can be differentiated from pedagogy, the art and the science of teaching children (Knowles et al., 2015). Whereas pedagogy historically has had a focus on instructing, andragogy shifts the focus from the instructor to the learner (Knowles et al., 2015). The instructor is seen in andragogy as more of a facilitator of learning than the instructor of learning (Knowles et al., 2015).

The term andragogy was first used by Alexander Kapp in 1833 to differentiate between educating adults and children (Howard, 1993). Today, the key difference between andragogy and pedagogy is not the age group of the learner but the locus of control of the learning. Control in andragogy moves from the instructor to the learner, as learners are seen to function as more self-directed in the learning process (Knowles et al., 2015). Mezirow defines andragogy by focusing on the importance of self-direction in the learning process, stating that andragogy, “as a professional perspective of adult educators, must be defined as an organized and sustained effort to assist adults to learn in a way that enhances their capability to function as self-directed learners” (Mezirow, 1981, p. 21).

Malcolm Knowles is acknowledged as the modern-day father of andragogy (Cooke, 1994). Knowles' andragogy is posited on the following six assumptions:

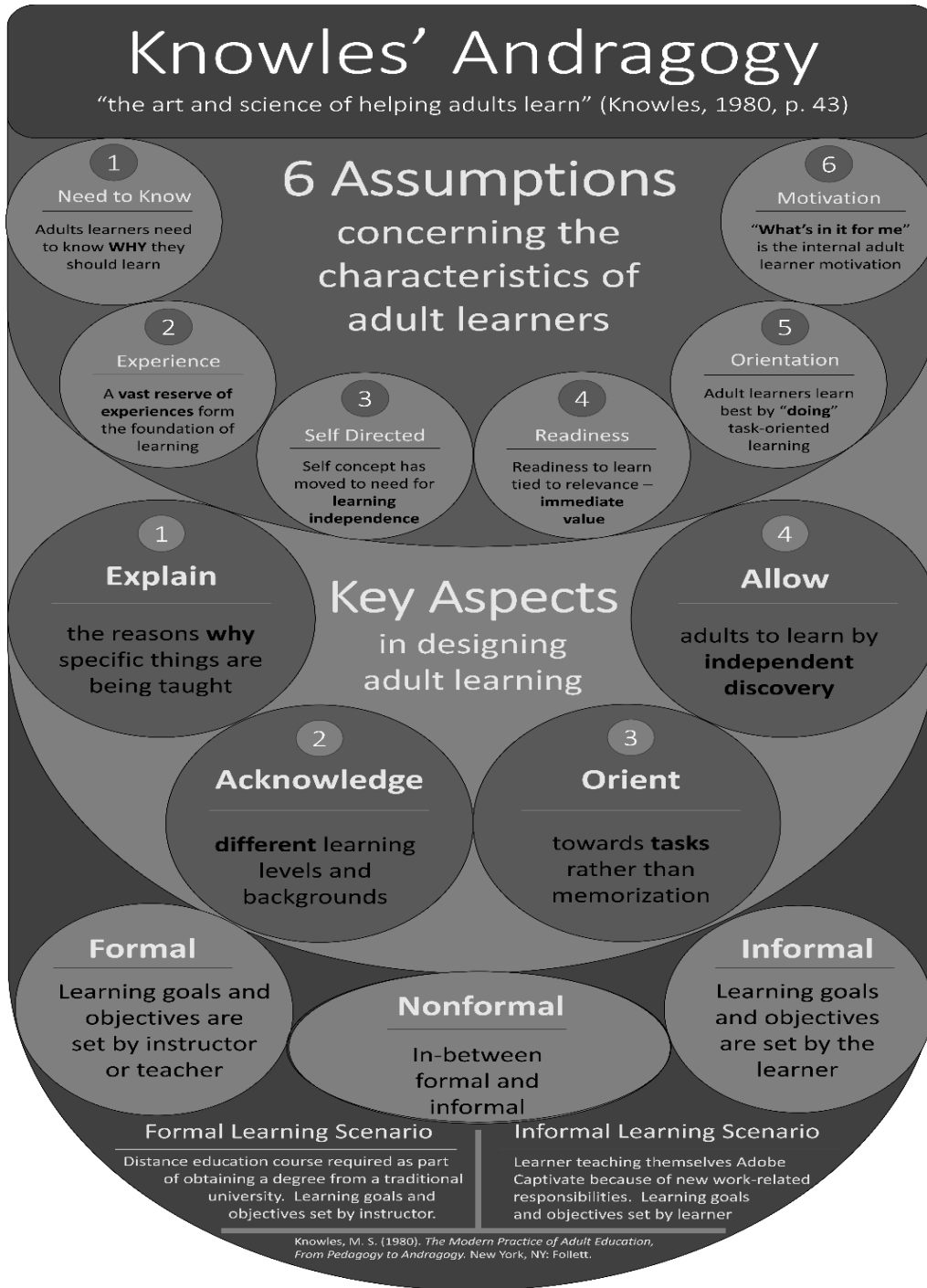
1. Self-Concept: Adult learners are self-directed, autonomous, and independent.
2. Role of Experience: Repository of an adult's experience is a rich resource for learning. Adults tend to learn by drawing from their previous experiences.
3. Readiness to Learn: Adults tend to be ready to learn what they believe they need to know.
4. Orientation to Learning: Adults learn for immediate applications rather than for future uses. Their learning orientation is problem-centered, task-oriented, and life-focused.
5. Internal Motivation: Adults are more internally motivated than externally.
6. Need to Know: Adults need to know the value of learning and why they need to learn.

(Forrest & Peterson, 2006)

Andragogy and its assumptions have become a foundational framework for the design of learner-centric interactions and computer-mediated distance learning aimed at adult learners. Figure 3 presents the key elements of andragogy in the form of an infographic.

Figure 3

Andragogy Infographic



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Seven Principles for Good Practice in Undergraduate Education

In the mid-1980s, Chickering and Gamson led a task force consisting of higher education instructors, administrators, support staff, and students to study the issue of quality in undergraduate higher education. The result was the development of what was called the Seven Principles for Good Practice in Undergraduate Education (Chickering & Gamson, 1987). The Seven Principles were originally developed for face-to-face learning (Chickering & Gamson, 1987). The seven principles are:

1. Encourage contact between students and faculty,
2. Develop reciprocity and cooperation among students,
3. Encourage active learning,
4. Give prompt feedback,
5. Emphasize time on task,
6. Communicate high expectations,
7. Respect diverse talents and ways of learning. (Chickering & Gamson, 1987)

Twelve years after the original release of the seven principles, coinciding with the growth in distance learning, Chickering and Ehrmann demonstrated how each principle was equally valid in distance learning by leveraging educational technologies (1996). They went as far as to argue that if the potential of technologies used as part of distance learning were to be fully realized, they should be employed in ways that are consistent with the Seven Principles (Chickering & Ehrmann, 1996).

Although not originally designed specifically for distance education, many researchers have found the seven principles relevant to distance learning. Graham used the seven principles to evaluate four distance learning courses (Graham et al., 2000). Based on the findings, the

researchers developed a list of best practices for distance learning that correspond to each of the seven principles (Graham et al., 2000). Additional research applying the seven principles to distance learning has been completed that provides additional support for their use in evaluating and improving the different types of learning interactions that take place in distance learning (Batts et al., 2006; Sowan & Jenkins, 2013).

Simonson's Equivalency Theory

Simonson introduced equivalency theory in the 1990s as distance learning was transitioning from being correspondence and broadcast-based to being primarily computer-mediated. Equivalency theory builds on the definition of distance education being “formal, institutionally based educational activities where the learner and teacher are separated, and where interactive telecommunication systems are used to connect learners, resources, and instructors” (Simonson et al., 2015). It is important not to confuse equivalency theory with the interaction equivalency theorem (IEQT) (Anderson, 2003; Simonson, 1999).

As interactive telecommunication technologies began to become more commonly used in the learning process, there was a tendency toward considering the technologies as only new methods of delivering existing content. Simonson argued that the emergence of new telecommunications technologies forced a redefinition of the theory and practice behind distance learning (Simonson, 2019). Equivalency theory is an attempt to redefine distance learning, taking into account the use of interactive telecommunication technologies as distance learning transitioned into the digital age.

Equivalency theory consists of several key elements. Those elements are the concepts of equivalency, learning experiences, appropriate application, students, and outcomes.

Equivalency

The concept of equivalency, as the name suggests, is central to this theory. In distance learning, learners have fundamentally different environments from which they learn. The environment will differ from that in face-to-face learning. The environment will also differ from distance learner to distance learner. Because of the variation in learning environments, it is the responsibility of the course designer to provide learning experiences designed for the learner's environment that produce an equivalent value for the learner in varying environments.

The analogy commonly used by Simonson is the comparison of a triangle and a square (Simonson, 1999, 2021; Simonson et al., 1999). It is possible to create a triangle and a square that have equivalent areas, all the while they remain different geometric shapes. Similarly, while learners in face-to-face and distance learning have different learning environments, it is important to provide the learner with the appropriate learning experiences through interactions that will provide an equivalent value, regardless of the actual learning environment.

Learning Experience

Simonson defines the concept of the learning experience as “anything that happens to the student to promote learning, including what is observed, felt, heard, or done” (2021). Learners, depending on their environment, may need a different mix of learning experiences to reach an overall equivalency (2021). In course design, it is important to create a mix of the various learning experiences that take environmental differences into account but result in an equivalent value for the learner.

Moore's use of the term interaction is very similar to how Simonson uses the concept of the learning experience (Moore, 1989). Although Simonson describes the learning experience in a learner-centric manner – “what is observed, felt, heard, or done” – Moore's description of

interaction focuses on the interaction that takes place between the learner and the content, the instructor, and also other learners (Moore, 1989; Simonson, 1999). It can be argued that Simonson and Moore are looking at the same concept through different lenses.

Appropriate Application

The third key element to equivalency theory is appropriate application. Learning experiences that are made available to the distance or face-to-face learner should be appropriate to the learner and the environment of the learner. Also, Simonson states that those experiences should be both proper and timely (Simonson et al., 1999). Observed and measured learning outcomes can be used to gauge the appropriateness of the selected mix of learning experiences for each learner in their specific learning environment.

Students

Students are those involved in the learning activity. The defining characteristic of a student is not their physical location but their enrollment status in a course (Simonson, 1999). This understanding allows students to have varying locations and learning environments while experiencing the same collection of learning experiences.

Outcomes

The final element, outcomes, are the observable, significant, and measurable changes that take place cognitively in the student as a result of the appropriate application of learning experiences (Simonson, 1999, 2021). Outcomes can be divided into two categories: instructor-determined and learner-determined. Instructor-determined outcomes are often the knowledge, skills, and abilities the instructor or course designer wishes the student to be able to acquire or build through the application of appropriate learning experiences. These are normally the goals

and objectives of the course. Learner-determined objectives are learner-specific and are connected to the reasons and motivations of the learner in taking the course.

As demand for distance education has grown, many traditional face-to-face courses are being moved to or duplicated in distance learning environments. To save time and money, it is not uncommon for a course that was originally designed for the face-to-face environment to be moved to the distance learning environment essentially intact in terms of learning experiences (Woldeab et al., 2020). Instead of lecturing in front of a physical class, the instructor may now be placed in front of a camera to do the same in a distance learning environment (Woldeab et al., 2020). According to Simonson's equivalency theory, taking such an approach without altering the learner experience based on the new learning environment may result in an unsuccessful course with unequivocal learner outcomes (2021). The equivalency of outcomes, created through the appropriate application of available learning experiences, is an important goal of distance learning (Simonson, 2021).

Transactional Distance Theory

A defining characteristic of distance learning is that the learner and instructor are geographically separated during the learning process (Cohen et al., 2007). Moore's theory of transactional distance posits that the distance between learner and instructor is more than just geographic (Moore, 1989, 1993). As Saba and Shearer state:

It is better thought of as a distance of understanding, a gap between a teacher's perception of what he or she wants to communicate and the perception of that message that is received by a learner. Bridging such gaps in understanding features in every interpersonal relationship is the specific focus of the teacher who engages a technology to

cross the bridge and is what all educators must study, understand, and manipulate. (Saba & Shearer, 2017, p. xvii)

Transactional distance is best thought of in terms of pedagogy (Mbwesa, 2014). Moore's theory of transactional distance focuses on the "understandings and perceptions that might lead to a communication gap or a psychological space of potential misunderstandings between people more so between the student and teacher in the learning environment" (Mbwesa, 2014, p. 177).

All forms of learning have some transactional distance (Moore, 1993). In face-to-face learning, although there may be no geographic distance, there is still a distance between understanding and perceptions. In distance learning, those transactional distances are even more apparent as the use of technology to bridge geographic distance can introduce an additional transactional distance between the learner and content, the learner and instructor, and the learner and other learners. Recognizing transactional distance and taking appropriate steps to bridge the transactional distance in all three major types of interactions (learner-content, learner-instructor, learner-learner) has been shown to improve learner satisfaction (Mbwesa, 2014). No matter the type of learning environment (e.g., distance or face-to-face), a major determinant of the success of the learning is the appropriate design and delivery of learning interactions that recognize the existence of transactional distance and are designed in such a way to overcome that transactional distance (Moore, 1993).

Learner-Centric Interactions

The concept of interaction has long been both a defining element and a critical part of the distance learning process (Anderson, 2003). Yet, as Anderson states, although the concept of interaction is one of the most documented aspects of distance learning, it is also one of the most disputed (2003). A meta-analysis of 35 years of the journal *Distance Education* places research

in interaction as a major theme in the 515 articles published between 1980 and 2014 (Zawacki-Richter & Naidu, 2016). But with its importance, there is a lack of clarity as to what constitutes the concept of interaction. Bannan-Ritland completed a meta-analysis of 132 studies that were conducted from 1995 to 2000. In that analysis, 20 different definitions of interaction were found to have been used in the studies (2002). Even with the lack of definition clarity, interaction is a major catalyst in the shift from an instructor-centric to a learner-centric approach in distance learning (Hirumi, 2006; Mayes, 2006).

Interaction is a key concept in Moore's theory of transactional distance (Moore, 1989, 1993). To overcome distance learning transactional distance, interactions are created and appropriately applied in the learning process (Moore, 2019; Moore & Kearsley, 1996; Wallace, 2003). Interaction is defined by Moore as a pedagogical concept that focuses on "the interplay among the environment, the individuals, and the patterns of behaviors in a situation" (2019, p. 33). Moore originally proposed a taxonomy that consists of three distinct types of learner-centric interactions in distance learning: learner-content, learner-instructor, and learner-learner (Moore, 1993).

Hillman, Willis, and Gunawardena argue that Moore's original three interaction taxonomy does not account for interactions that take place between the learner and the technologies used in distance learning (1994). They present a fourth type of interaction, learner-interface, to account for those interactions (Hillman et al., 1994). Without this fourth type of interaction, learner-interface, Moore's three types of interactions could not take place in distance learning as it is interactions with the interface that allow for interaction between learner and content, instructor, and other learners (Hillman et al., 1994). The success of learner interaction with content, instructor, and other learners is highly dependent on the learner's success and

comfort level with the interface through which other interaction types are delivered (Hillman et al., 1994). As such, adding learner-interface as a fourth type of interaction is essential for properly understanding learner-centric interactions that take place in technology-embedded distance learning.

In 2010, an additional type of learner-centric interaction, learner-self, was suggested (Chou et al., 2010). Northrup found distance learning interactions designed to support learner self-directedness to be important to learners (Northrup, 2002). Learners want to be able to monitor their progress, be given structured assignments that are due at specific times, and have access to other interactions that allow the learner to self-regulate their learning (Northrup, 2002). Note-taking technologies embedded in distance learning can encourage self-reflection on the learning sourced from content, instructor, and other learner interactions (Watkins et al., 2015). Learner-self interactions, although largely internal to the learner, can be encouraged through the use of task lists, calendars/reminders, diaries/reflective journals, progress reports, and other features built into the distance learning environment (Peng et al., 2008).

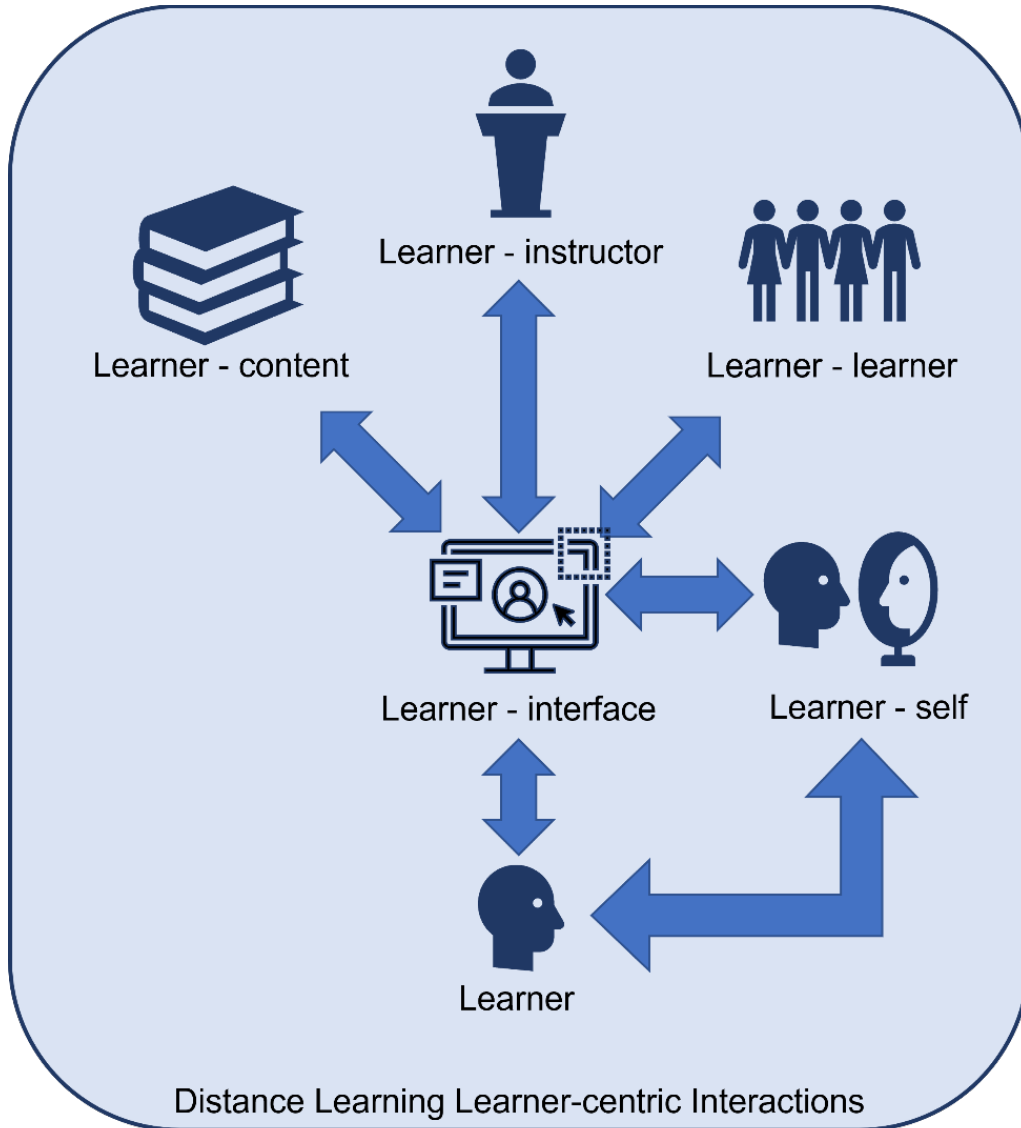
In addition to these five learner-centric interaction types, there are other interaction types of interactions that have been presented (e.g., instructor-content, instructor-instructor, content-content) (Miyazoe et al., 2012). Much research has been completed on these non-learner-centric types (Anderson, 2003; Miyazoe & Anderson, 2010b). As the current research focuses on learner perceptions related to learner-centric interactions, those additional types are not reviewed in this chapter.

Building on Moore's initial efforts, Chou, Peng, and Chang proposed a comprehensive taxonomy of learner-centric interactions (2010). Their taxonomy consists of learner-content, learner-instructor, learner-content, learner-interface, and learner-self interactions (Chou et al.,

2010). As Chou, Peng, and Chang's taxonomy was adopted for this study, each interaction type included in the taxonomy will be covered in more detail below. Figure 4 presents a graphical representation of the five distance learning learner-centric interaction types.

Figure 4

Distance Learning Learner-Centric Interactions



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Learner-Interface

With the increased use of information and communication technologies (ICT) inside distance learning, Hillman, Willis, and Gunawardena proposed a new interaction type that notes the importance of the technological interface used by learners as the bridge to interactions with content, the instructor, and other learners (1994). This new type of interaction, called learner-interface, is defined as the “process of manipulating tools to accomplish a task” (Hillman et al., 1994, p. 34). Learner-interface interaction is a necessary interaction type in distance learning that makes use of ICT. Although it is possible for distance learning to minimize or remove other interaction types, learner-interface is a necessary interaction type in all technology-embedded distance learning.

The use of technology inside the distance learning environment by the learner will either aid or hinder other types of interactions. Learners may utilize the interface to send and receive communication from both the instructor and other learners in terms of email, wikis, and blogs. The interface is also used to access self-paced training sessions and virtual instructor-led classrooms. The learner’s degree of proficiency with the interface correlates positively with the success the learner experiences with other types of interactions that are part of the distance learning environment (Hillman et al., 1994). A poorly designed interface will increase the cognitive demands on the learner, taking the focus off of the other interaction types that are being delivered through the interface (Cheon & Grant, 2009; Van Nuland & Rogers, 2016).

Several empirical studies have examined learner-interface interactions in technology-embedded distance learning. Cho conducted one of the first that focused on learner-interface interaction (2011). Students enrolled in 24 online courses that were part of a Master of Science degree program were asked to complete a learner satisfaction survey after completion of the

online degree program. The results indicated significant positive relationships between learner-content (.739), learner-instructor (.540), and learner-learner (.770) interactions and learner satisfaction. However, the relationship between learner-interface interaction and learner satisfaction was found to not be statistically significant (Cho, 2011). Cho attributed the lack of a statistically significant relationship between learner-interface interaction and learner satisfaction to methodological flaws in the study, including questionnaire flaws and the use of a single quantitative research method that prevented the gathering of more detailed data (2011).

An earlier study that was similar to Cho, Jung, Choi, Lim, and Leem investigated the effects of three types of interaction on learning achievement, satisfaction, and participation in a web-based distance learning environment (2002). Learner-interface interaction was not directly studied as a separate variable in the study but was captured as academic interaction, referring to the learner's ability to access and use the course content (Jung et al., 2002). The study concluded that academic interaction produced through web-based instruction learner experiences resulted in an increased positive view of distance learning (Jung et al., 2002).

In a more recent study on learner-interface interaction, Song, Rice, and Oh investigated learner participation in online courses that included the ability of the learner to interact with a synchronous conversational virtual agent (2019). Participants in the study were required to complete 13 weeks of asynchronous discussion activities and also seven sessions with a conversational virtual agent. Participant motivation was found to increase in relationship with meaningful interactions that were had between the learner, course materials, and the virtual agent (Song et al., 2019). As the findings of this study are related to learner-interface interactions sourced in part with a virtual agent independent online application that was not used in the

current study, the findings, though interesting, may not be as relevant as the previous studies listed.

Learner-Content

Learner-content interaction is considered the defining characteristic of education (Moore, 1989). Moore goes as far as to argue that learning is not possible without learner-content interaction (1989). Anderson supports Moore's view saying, "I too will argue, interaction between students and content has long been recognized as a critical component of both campus-based and distance education" (2003, p. 2).

Moore defines learner-content interaction as "the process of intellectually interacting with content that results in changes in the learner's understanding, the learner's perspective, or the cognitive structures of the learner's mind" (1989, p. 1). This type of interaction focuses on the learner interacting with various content sources, including books, text, multimedia, and others. In distance learning, all content and instructional materials are delivered digitally via the interface.

Learner-content interaction is important in distance learning. Hirumi found that low-quality content in distance learning may require increased dependence on learner-instructor and learner-learner interactions to clarify and contextualize inferior content (2005). Learner-content interaction is positively correlated to online learner satisfaction (Miyazoe & Anderson, 2010c).

To better understand how online learner-content interactions impact learner engagement and learning, Murray, Perez, Geist, and Hedrick investigated learner patterns of access to instructional content in an asynchronous online course offered at a regional university in the United States (2012). Frequency counts and access rates were collected to better understand learner patterns of retrieval of online content in four areas: core materials, direct support, indirect support, and ancillary materials (Murray et al., 2012). Results of this research indicate that

learners select appropriate learner-content interactions that they perceive will positively influence their performance on course assignments and assessments (Murray et al., 2012).

Learner-content interaction has also been shown to be positively associated with academic success in distance education (Zimmerman, 2012). Zimmerman studied the relationship between learner-content interaction and course grades to determine if this type of interaction was a contributing factor to learner success (2012). The findings of this study indicated that there was a statistically significant relationship between the amount of time learners invested interacting with course content and weekly grades (Zimmerman, 2012). The study concludes that learners who invest more time in learner-content interactions achieve higher grades than those who spend less time with this interaction type (Zimmerman, 2012).

Learner-Instructor

Learner-instructor interactions can be defined as learner or instructor-initiated interactions that occur before, during, or immediately after the distance learning experience. Learner-instructor is one of the original types of distance learning interactions noted by Moore (1989). Instructors seek to increase learner engagement in the content, motivate the learner to learn, increase or maintain the learner's interest in the learning process, and support the learner's self-direction and self-motivation (Moore, 1989). Presentations can also be made by instructors in the form of instruction, demonstrations of skills, or the modeling of content-related attitudes and values (Moore, 1989). This type of interaction is also used to evaluate learner progress, to provide counsel, support, and encouragement to the learner, and to support other learning objectives by employing the instructor's personality, teaching methods, and philosophy (Moore, 1989).

Learner-instructor interaction is considered by many an essential element for distance learning to be successful (Andersen et al., 2013; Restauri, 2006; Rovai, 2002). This view may or may not be influenced by the observation that many face-to-face learning interactions are of this type. As face-to-face has migrated into the distance learning environment, it has been common to continue the predominance of this type of interaction through the use of synchronous, instructor-led interactions using such tools as Skype, Adobe Connect, and Blackboard Collaborate Ultra. In asynchronous distance learning environments, where learner-instructor interaction cannot occur in real-time, course announcements, recorded instructor presentations, assignment feedback, instructor email, and comments can be placed on discussion boards or in other various forms to replace synchronous learner-instructor interactions. Regardless of the method used, learner-instructor interaction has been found useful in overcoming the transactional distance between the learner and the instructor in distance learning environments (Bouhnik & Marcus, 2006).

One of the influences of learner satisfaction in distance learning is the quantity, quality, and timeliness of learner-instructor interactions. Kang and Im investigated learner-instructor interactions in an online undergraduate environment (2013). Over 650 undergraduate students were surveyed regarding their perceptions of learner-instructor interactions and their perceived performance. Their research showed that learner-instructor interactions had a greater predictive effect on learner-perceived performance than other types of learner-centric interactions (Kang & Im, 2013). Their findings support the belief that learner-instructor interactions have a more significant effect on learner performance than other types of interactions (Kang & Im, 2013).

In asynchronous forms of distance learning, Espasa and Menses found a statistically significant relationship between learner-instructor interactions (in the form of instructor feedback on submitted learner assignments) and student satisfaction and learning results (2010). Their

quantitative study of 186 distance learning graduate students measured the relationship between these items. The findings of this study support the importance of learner-instructor interactions in promoting student success and satisfaction in distance learning environments (Espasa & Meneses, 2010).

A more recent study was carried out involving 106 students working on computer-supported collaborative learning (CSCL) projects (Muzammil et al., 2020). At the end of the project, a questionnaire was used to measure learner-learner interaction in workgroups, intra-group emotional support, learner-instructor interaction, and the use of online collaboration tools. The results of the study found a significant positive relationship between learner-instructor interaction and learner-learner interaction processes developed inside their CSCL projects. The findings support the need for learner-instructor interaction even in distance learning environments that are predominantly focused on learner-learner collaboration experiences (Muzammil et al., 2020).

In contrast to these studies, a study consisting of 221 higher education graduate and undergraduate online learners found the effects of learner-instructor interaction on learner satisfaction to be relatively weak, especially when compared to the strong effect learner-content interaction had on learner satisfaction (Kuo et al., 2014). The researchers acknowledged that even with this finding, learner-instructor interaction remains a basic and necessary component of distance learning (Kuo et al., 2014). The researchers also acknowledged that since learner-instructor interaction may include criticism, evaluations of learner papers, and discussions of grades that may not always be pleasing to the learner, student satisfaction may be a secondary target for such interaction behind learner success (Kuo et al., 2014).

Learner-Learner

Learner-learner interactions are those “between one learner and another learner, alone or in group settings, with or without the real-time presence of an instructor” (Moore, 1989, p. 4). Such interactions are often collaborative and provide the learner opportunities to work with other learners to analyze and interpret content, share experiences, opinions, and insights related to the content, and solve problems. Following the theories of social cognitivism and social learning theory, learner-learner interactions help learners construct knowledge through interaction with and the modeling of others in the learning group.

Learner-Learner Interaction Challenges. As with traditional face-to-face learning environments, careful attention needs to be made to the design and application of learner-learner interactions. The group size, the group goals, the time dedicated to the interaction, if individual roles and responsibilities should be assigned, and how to best allow for group independence while still keeping group and individual accountability are all design elements to be considered when designing and delivering learner-learner interactions. Improper design and/or delivery can greatly impact knowledge construction, learner engagement, and perceptions of satisfaction.

As an example, breakout groups are a commonly used learner-learner interaction type. In breakout groups, learners are often provided time and private virtual learning space to discuss an issue related to the content or to apply the content to solve a problem. Depending on the amount of time pre-allocated to the breakout, learners can feel they had too much time or not enough time to accomplish the task at hand. Also, breakout groups often provide privacy through the lack of instructor presence. This can create gaps in accountability for individual learners in the breakout or the group as a whole.

Phirangee noted the high dropout rates experienced in distance learning when compared to the dropout rates in traditional face-to-face learning (2016). Research attributes this high dropout rate to feelings of isolation, alienation, and disconnect in the online learner (Phirangee, 2016). To better understand how learner-learner interactions might be connected with those feelings, six students who had completed multiple online courses were interviewed (Phirangee, 2016). Student insights revealed seven harmful themes in learner-learner interactions that negatively impacted their overall online learning experiences: the keener, lack of meaningful dialogue, selective listening, lack of attribution, going off on tangents, editions notes, and cultural exclusion.

The Keener. The keener theme refers to learners who tend to dominate group discourse, muting others as a result. Learners become frustrated and annoyed when one or a few learners attempt to control the learner-learner interaction discourse. Such “keener” actions create frustration for the learners in the group by preventing others in the group from developing deeper discussions (Phirangee, 2016).

Lack of Meaningful Dialogue. Learners noted the overuse of friendly and positive language during learner-learner interactions in the attempt to avoid offending others in the group. Such comments, although often from good motives, demonstrate a lack of genuineness from some during interactions. Learners acknowledge the importance of being polite during learner-learner interactions but became annoyed when the attempt by some to be overly nice results in a lack of meaningful dialogue and connection (Phirangee, 2016).

Selective Listening. Learners express discouragement when they perceive that their or other learner dialogue, either in synchronous breakout groups or asynchronous discussion boards, is being ignored by other learners. To use Facebook as a comparison, people may post

with the expectation of receiving positive responses in return, either through the actual posting of comments of others or the posting of “like” emojis. When no or little response is received, learners perceive that others are being selective in their listening and that their comments are not receiving equal attention (Phirangee, 2016).

Lack of Attribution. Learners can become frustrated when other learners express previously presented ideas without giving credit to other learners being the source of the comments. When learners repeat ideas rather than build on a previously presented idea, a deeper understanding of the content may be lessened. It is important to give credit to other learners for their previously provided ideas and inputs. Without such attribution, it becomes more difficult for learner-learner interactions to go deeper in the discussions (Phirangee, 2016).

Going off on Tangents. Although learners ordinarily look forward to a dialogue with fellow learners during learner-learner interactions, frustration is expressed when some use the opportunity for interaction as an opportunity to go off on a tangent on a topic that they are emotional about. These tangents can involve frustration with the course, the instructor, the course materials, grading, or anything else a learner may be frustrated with. Such expressions can be found distracting and take away from the learner-learner interaction (Phirangee, 2016).

Editing Notes. In asynchronous learner-learner interactions, learners prefer the ability to go back and edit notes and posts for grammatical errors. When post-editing options are made available, some learners will go back and edit notes not only for grammatical errors but also to change content based on the replies of other learners that challenged the original post or comment. Some learners have expressed frustration and loss of interest in such synchronous learner-learner interactions when such post-editing takes place, viewing such editing as weakening the online community by disrupting the natural learning process (Phirangee, 2016).

Cultural Exclusion. In learner-learner interactions, learners enjoy the opportunity to share personal experiences that are related to the content being discussed in the interaction. Some learners, though, can feel reluctant to share their experiences if they feel they are unique from others in the group. If a learner feels they do not share the same experiences as others in the group, cultural differences may become a hindrance to interaction (Phirangee, 2016).

Learner-Self

Learner-self interactions can be internal to the learner, consisting of the mental processes that take place as the learner constructs knowledge (Gagné, 1985). They also can include the internal metacognitive processes that help learners monitor and also self-regulate their learning (Hirumi, 2013). The learning theories discussed earlier in this chapter provide the foundation for these internal, learner-self interactions that take place in learners in both distance and face-to-face learning environments.

In addition to the learner-self interactions that can take place in all learning environments, Chou, Peng, and Chang state that learner-self interactions can take place as a result of the purposeful design of the distance learning environment (2010). These design elements encourage the interpersonal and meta-cognitive skills needed for learners to be self-directed learners in distance learning environments (Northrup, 2002). Soo and Bonk define these interactions as “learner’s reflections on the content, learning process, and his new understanding” (1998, p. 3).

Interaction functions designed into the distance learning environment can provide the opportunity for learners to monitor their learning process (Chou et al., 2010). They can also provide learner reflection and application opportunities through interactive functions built into the distance learning environment (Chou et al., 2010). Interactive functions that can enable learner-self interaction include diary and reflective journals, note-taking tools, electronic

portfolios, calendar and schedule reminders, task lists, check your knowledge quizzes designed for self-evaluation, grade-status tracking, and others (Chou et al., 2010).

Learner-self interaction was the subject of research completed by Chou, Peng, and Chang (2010). In that study, the researchers focused on exploring the interactivity of six commonly used distance learning environments in Taiwan higher education: Blackboard, e-Campus III, iCAN XP, Moodle, TopLearn, and Wisdom Master (Chou et al., 2010). Three hundred ninety-one online learners were surveyed as to their perceptions of the various interactive functions available in distance learning environments (Chou et al., 2010). Although the researchers concluded that the six distance learning environments studied included opportunities in support of learner-self interactions, only 50% of the opportunities were adopted by learners regularly (Chou et al., 2010). The researchers indicated that the results show there exists substantial room for improvement in the application of interactive functions inside distance learning environments to improve the availability of learner-self interactions (Chou et al., 2010).

Summary Discussion

Interaction is a fundamental aspect of all types of learning. The development and proper application of learner-centric interactions are fundamental to learner success and satisfaction in distance learning. Katsarou and Chatzipangiotou completed a critical review of research studies focusing on learner-centric interactions published between 2010 and 2019 (2021). Their review followed the Webster and Watson method, which makes use of both keyword searching and a review of relevant journals (2002). The search yielded 22 studies that were considered suitable for inclusion in their critical review (Katsarou & Chatzipanagiotou, 2021). Their critical review is summarized in the following five key findings on recent learner-centric research:

- Learner-instructor interactions significantly correlate with learner academic performance and satisfaction (Kang & Im, 2013; Kuo et al., 2014).
- Although learner-learner interactions have been shown to have a significant effect on the development of learner connectedness (Diep et al., 2019) and knowledge building (Yücel & Usluel, 2016), no significant effect on perceived learning and satisfaction has been found (Kurucay & Inan, 2017; Rovai & Barnum, 2003).
- Learner-content interactions are noted by learners as among the most valued and have been statistically correlated with perceptions of both learner satisfaction and success (Ekwunife-Orakwue & Teng, 2014; Kuo et al., 2009; Rhode, 2009; Zimmerman, 2012).
- Learner-interface interaction does not statistically correlate with learner perceptions of satisfaction (Cho, 2011), although it was found that instructor digital literacy of the interface is a critical factor in facilitating online learning (Danesh, 2015).
- There is limited recent research on learner-self interactions. Although one study completed by Chou, Peng, and Chang does assess learner perceptions and use of different types of learner-self interactions inside distance learning environments, more research is needed to better understand the role of learner-self interactions and their connection, if any, with perceptions of learner satisfaction and success (Chou et al., 2010).

Anderson's Interaction Equivalency Theorem (IEQT)

In a follow-up to Moore's Theory of Interaction, Anderson proposed the Interaction Equivalency Theorem (2003). Cost and sustainability, it is argued, are important considerations in choosing interactions during distance learning course design (Miyazoe & Anderson, 2010a).

As such, the theorem is designed to help educators choose the most effective and efficient types of interactions for each specific distance learning environment without prejudicing one specific type of learner-centric interaction over another (Anderson, 2003; Miyazoe & Anderson, 2010a, 2010c).

Thesis One

The first thesis states:

Deep and meaningful formal learning is supported as long as one of the three forms of interaction (student–teacher; student-student; student-content) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the educational experience. (Anderson, 2003, p. 4)

The focus of the first thesis is on the quality of the interaction (Miyazoe & Anderson, 2010b).

Based on this first thesis, if a distance learning environment provides a high-quality level of learner-content interaction (which is common in self-paced, asynchronous distance learning environments), then the two other categories of interaction (learner-instructor and learner-learner) can be minimalized or eliminated without degrading the quality of the learning experience. According to this thesis, a distance learning course can substitute one type of interaction for another at the same high level without a loss in perceived learning effectiveness (Anderson, 2003).

A study completed by Miyazoe and Anderson provides support for this thesis (2010a). In that study, distance and face-to-face learners ranked their perceived importance of learner-content, learner-instructor, and learner-learner interactions. Learners in face-to-face learning environments ranked learner-instructor interactions highest, while students in distance learning environments ranked learner-content interactions as their highest preference. (Miyazoe &

Anderson, 2010a). As this study compared perceptions of distance learners to face-to-face learners, the results may have been influenced by the expectations of learners in the two environments and also the choice of interactions used. For example, a learner in a face-to-face environment may expect the predominance of learner-instructor interactions, whereas a learner in a distance learning environment may expect greater use of learner-content interactions because of past experiences.

Rhode found that learners in a self-paced distance learning environment did not value all types of interactions equally (2009). Participants in the study believed learner-content interactions to be indispensable in a self-paced distance learning environment (Rhode, 2009). They also noted that learner-instructor interaction could be diminished and replaced through increased quality learner-content interactions (Rhode, 2009). Learner-learner interaction was ranked as least desirable in the self-paced distance learning environment studied, noting that the very design of the environment made such interactions challenging (Rhode, 2009).

A study by Kuo, Walker, Belland, and Schroder focused on the relationship between student satisfaction and the learner-content, learner-instructor, and learner-learner interactions in distance learning (2013). All three types of interactions were found to be significantly correlated with learner satisfaction (Kuo et al., 2013). Learner-content interaction was found to be the strongest predictor of student satisfaction, followed by learner-instructor interactions (Kuo et al., 2013). Learner-learner interaction was found to be a poor predictor of learner satisfaction (Kuo et al., 2013). This study supports thesis one of interaction equivalency theorem as the findings support the claim that learner-learner interaction could be substituted for or eliminated without adverse effects on learner satisfaction.

The first thesis has also been tested outside the higher education distance learning environment. A study by Rodriguez and Armellini tested its applicability to the corporate distance learning environment (2015). A large Mexican corporation agreed to take part in the research, with the group of participants consisting of 146 learners, 30 instructors, and three academic assistants. Three versions of a distance learning course were designed, each focusing on one of three types of learner-centric interactions (learner-content, learner-instructor, learner-learner). Data collected from the participants include surveys, exams, observations, activity logs, and sales records. The researchers found that data collected on all three versions of the course displayed high levels of course effectiveness in terms of learner satisfaction, learning, and return on learner expectations. Based on their findings, the researchers suggested that thesis one could be reformulated as follows:

In corporate settings, an online course can be effective in terms of satisfaction, learning, knowledge transfer, business results and return on expectations, as long as (a) at least one of three types of interaction (learner-content, learner-teacher or learner-learner) features prominently in the design of the course, and (b) course delivery is consistent with the chosen type of interaction. (Rodriguez & Armellini, 2015, p. 313)

The researchers also found that when designing and delivering a course that only focuses on one type of interaction, there is a high risk of confusion on the part of the learner (Rodriguez & Armellini, 2015). A single modality approach can encourage learner disengagement and missed learning opportunities (Rodriguez & Armellini, 2015). By the introduction of other types of learner interactions, these risk factors can be mitigated (Rodriguez & Armellini, 2015).

In support of thesis one of Anderson's Interaction Equivalency Theorem, Rodriguez and Armellini found that 96% of learners responded that they were either very satisfied or satisfied

with the versions of the course, even though each version focused primarily on only one type of learning interaction (2015). It should be noted that 25% of all participants in the study recommended that versions of the course be improved by increasing the quality and quantity of each interaction type (Rodriguez & Armellini, 2015). This discrepancy between high learner satisfaction along with the reported dissatisfaction with the lack of diversity available may help to explain another interesting finding from this study.

In the data that was collected, learners sometimes referenced interactions that were not formally designed into the course. An example can be seen in data collected from a learner who took a version of a course that focused on learner-content interactions. Even though that specific course did not include any tools to allow formal learner-learner interaction, the learner stated that interaction with other learners was a valuable part of the course (Rodriguez & Armellini, 2015). Evidence of learners making use of interactions not designed into a course was also seen in the Empowering Beliefs course, one that focused specifically on student-instructor interaction (Rodriguez, 2014). Although no formal tools were provided in this course to allow for learner-learner interaction, the student credited learner-learner interaction as being a valuable part of the course (Rodriguez, 2014).

The use of unplanned external interactions outside of those designed inside the course demonstrates the growing importance of connectivism in distance learning. Even when specific interactions are not formally designed into a course, a learner may independently find interactions that best support their learning when not directly provided for in the course. Learners may use learner-learner interaction (reaching out to a classmate informally) or learner-content interaction (searching the web for content related to the course materials.) Rodriguez and Armellini point out that these learner interactions that are not designed into the course but used

by learners may have a significant impact on the learning experience (2015). They believe opportunities should be built into the course to encourage the use of external informal interactions (Rodriguez & Armellini, 2015).

The use of unplanned external interactions by learners raises validity questions concerning research that has been thought to provide support for thesis one. If learners commonly make use of interactions outside of the purposeful interactions designed into a course, it should not be assumed that learner expressions of satisfaction with the course are based solely on those interactions. External interactions could have been used by the learner. The existence of external interactions and their use by learners should be accounted for when attempting to determine the validity of thesis one.

Thesis Two

The second thesis of the theorem states, “High levels of more than one of these three modes will likely provide a more satisfying educational experience, though these experiences may not be as cost or time effective as less interactive learning sequences” (Anderson, 2003, p. 4). As the first thesis focuses on the quality of the interaction, the second focuses on the quantity of the interaction (Miyazoe & Anderson, 2010b). The second thesis argues that a distance learning course that includes a great quantity of learner-content, learner-instructor, and learner-learner interactions will likely provide increased learner satisfaction, but the cost of creating and delivering the content along with the time commitment required by the learner may make the course both costly and unsustainable (Miyazoe & Anderson, 2010b).

In comparing the two theses, Miyazoe and Anderson state that the first is “associated with closed systems in which interaction is limited by the design to ensure effective and efficient learning, such as in the case of a predesigned course in distance education” (2010b, p. 95). The

second thesis is said to be associated with an educational delivery context of an open system. Miyazone and Anderson state that such an open system is “where positively accidental surplus of interaction could occur; an example is an unexpected guest lecturer in a course, although it is possible for a distance course to be planned, providing a high level in all three interaction elements in exchange for cost or time” (2010b, p. 95). Also, whereas the first thesis is concerned with the effectiveness of learning (as measured by its quality aspect), the second thesis is said to be concerned with learner satisfaction and cost/time efficiency (Miyazoe & Anderson, 2013). In simple terms, the second thesis argues that more interactions are not always better. Increases in the types and quantity of interactions will increase time and financial costs that may not be justified considering the return in learner satisfaction.

Summary Discussion

IEQT can guide designers of distance learning courses as to how best to design and deliver courses to provide the greatest quality in terms of learning outcomes at the lowest cost and complexity of learner interactions. Thesis one supports the creation of single modality distance learning environments, such as asynchronous, self-paced courses consisting of only learner-content interactions and synchronous, virtual instructor-led courses consisting predominately of learner-instructor interactions. As thesis one argues, a high level of quality in one type of interaction allows for a lower level or even removal of the other types of interactions. Thesis two supports the contention that more is not always better in terms of the quantity and types of learning interactions inside distance learning. Extraneous interactions are best avoided to control costs, development time, and to increase course sustainability. IEQT argues for the use of single-modality distance learning environments over more complex environments (e.g., bichronous).

Although some studies do seem to provide support for the validity of IEQT, other research may not. Also, commonly accepted best practices in distance learning course design, based on the foundational theories of distance learning discussed earlier in this chapter, often seem to be at odds with at least the first thesis of IEQT. In the Rodriguez and Armellini study of learners in the corporate environment, although 96% of learners responded that they were satisfied or very satisfied with courses that only had one type of interaction, 25% of all learners stated that they recommended improving the single modality courses by increasing the quantity and quality of other types of interactions (2015).

This study also found that learners reach outside of courses to make use of interaction types that are not designed into the course when those internal interactions designed into the course are deemed inadequate for their learning needs:

In this study, learners were resourceful when they faced the disadvantages of the interactions designed into their courses. They engaged in informal, unplanned learning activities beyond course requirements, on and offline. If interactions embedded in their courses did not provide answers to their questions, they looked for alternatives, such as reviewing their own notes, communicating privately with others via Moodle messages or talking face to face with colleagues. These activities relate to all three types of interactions and have a potential impact on course effectiveness. (Rodriguez & Armellini, 2015, p. 314)

Another challenge to the validity of IEQT is the assumed equivalency of all three types of learning interactions in terms of their potential to create a quality learning experience without the need for any other interaction type. Based on this assumed equivalency, an online course consisting of only learner-learner interaction could create a quality learning experience equal to

one consisting only of learner-content interaction (e.g., a self-paced online training (SPOT) or learner-instructor interaction (e.g., a virtual instructor-led training (VILT)). Miyazone and Anderson argue for this very point when they state, “a student could achieve a high-quality learning experience via intense interactions with other course members (e.g., collaborative or cooperative learning) even if the teacher is unavailable, and the course content is inappropriate (2010c, p. 2).

This potential distance learning scenario seems to contradict Moore’s contention that learner-content interaction is an essential component of all distance learning (1989). Moore considers learner-content interaction to be “a defining characteristic of education” (1989, p. 1). It is through interaction with content that changes in a learner’s understanding or perspective take place (Moore, 1989). Although Miyazone and Anderson’s learner-learner interaction single modality example may be a possible course construct, in such a course completely void of learner-content and learner-instructor interactions, the question can be raised if the learner experiences shared via learner-learner interaction would be sufficient to create a quality learning experience absence of content and instructor scaffolding efforts.

Distance Learning Definition

Over the years, several definitions have been provided by researchers for distance learning. Trying to define distance learning is akin to trying to hit a moving target. As the defining characteristic of distance learning has changed over the years from correspondence to broadcast and now to computer-mediated, the definition of distance learning has needed to also change.

Keegan first acknowledged the need for a clear definition of distance learning (1980). After reviewing four definitions for distance learning (Holmberg, French Law, Moore, and Peters), Keegan provided a comprehensive definition that included the following elements:

- The separation of teacher and learner distinguishes it from face-to-face (F2F) lecturing.
- The influence of an educational organization distinguishes it from private study.
- The use of technical media, usually print, to unite teacher and learner and carry the educational content of the course.
- The provision of two-way communication so that the student may benefit from or even initiate dialogue.
- The possibility of occasional meetings for both didactic and socialization purposes.
- The participation in an industrialized form of education. (1980, p. 10)

Keegan's definition acknowledges several key characteristics of distance learning that existed at this time: separation of teacher and learner, use of print media to provide course content, and an ability for communication between the learner and the instructor (1980).

As distance learning continued to evolve, so did its definition. In 1989, a new definition was offered by Holmberg that focused on some of those changes. Holmberg focused especially on the asynchronous nature of some distance learning, stating that a defining characteristic was "non-contiguous communication... carried out anywhere and anytime" (1989, p. 168). Another defining element of distance learning, according to Holmberg's definition, is that it consists solely of learning-teaching activities between the learner and the organization originating the activities (1989). Two important potential challenges to this definition are the mischaracterization of distance learning as only being asynchronous and the lack of

acknowledgment of the existence and importance of interactions that take place between the learner and other learners.

A third definition of distance learning was offered by Gunawardena and McIsaac, which combined several key elements included in previous distance learning definitions (2004). Those key elements include the physical distance between the learner and the instructor, the use of planned and guided learning experiences, and the acknowledgment that participation takes place in a two-way structured form which is distinct from the traditional form of classroom instruction (Gunawardena & McIsaac, 2004). Missing from this definition is the concept of interaction, which has become a foundational concept of distance learning (Moore, 1989).

The last definition of distance learning to be reviewed, and the one adopted for this research, takes into account more recent developments in social and digital technologies. Saykili defines distance education as:

A form of education which brings together the physically-distant learner(s) and the facilitator(s) of the learning activity around planned and structured learning experiences via various two or multi-way mediated media channels that allow interactions between/among learners, facilitators as well as between learners and educational resources. (2018, p. 5)

This definition overcomes several concerns related to earlier suggested definitions. Through the use of the term facilitator, this definition recognizes that today's distance learning environments are most often viewed from a learner-centric perspective. The learner is seen as the center of the learning experience and takes more responsibility for their self-directed learning. Another key point is the recognition of the role of interaction between learners and content, facilitators, and

other learners. This has become a defining element of current understandings of distance learning (Anderson, 2003; Miyazoe & Anderson, 2010c; Moore, 1989, 1993).

Distance Learning History

Researchers have found it helpful to view the history of distance learning through a generational framework. Nipper was the first to do so in 1989 (Anderson & Simpson, 2012). Three generations of distance learning were suggested, linked to their focus on production, distribution, and computer conferencing (Nipper, 1989). Those three generations have often been called correspondence, broadcast, and computer-mediated (Anderson & Simpson, 2012).

The first two generations noted by Nipper, correspondence and broadcast, have been fairly universally accepted by other researchers in the field of distance learning. Starting with the third generation, researchers building on Nipper's work have often disagreed as to how to best divide and describe subsequent generations. Moore and Kearsley approach a description of the third generation using a systems approach (1996). Taylor, on the other hand, suggests that the third generation of distance learning is best understood by its dependence on telelearning (2001). Taylor goes on to argue for a fourth and fifth generation of generation (2001). The fourth is characterized by flexible learning, and the fifth is characterized by the introduction of intelligent, flexible learning (Taylor, 2001). Although the various generational characterizations that have built on Nipper's original three-generation framework can be beneficial, for the current research, Nipper's original three-generational framework is sufficient to serve as a basic generational framework for distance learning as each generational description highlights a key development for each generation: correspondence, broadcast, and computer-mediated.

Generation One – Correspondence

The roots of the first generation of distance learning can be traced back to the primitive Christian church, and in particular, the Apostle Paul’s teachings in the Letter to the Romans (Keegan, 1994). Although the Apostle Paul taught the message of the Gospel using face-to-face learning as he traveled throughout the Roman Empire, he followed up on these teachings using distance learning in a correspondence format (Forrest & Lamport, 2013). After the Apostle Paul planted a church, he would then move on to another area to plant another. He did not feel that his responsibilities to the new believers ended once he moved on. He continued his pastoral responsibilities through follow-up visits and distance learning based on the letters he would send and receive (Forrest & Lamport, 2013).

More recently, the first generation of distance learning found its roots in the combination of printing press technology and the growing reach and convenience of postal services (Anderson & Simpson, 2012). In 1833, a Swedish newspaper advertised the opportunity to study “Composition through the medium of the Post” (Simonson et al., 2015, p. 36). From 1883 to 1991, academic degrees were authorized by the New York State for students who completed the necessary correspondence courses and summer institutes at the Chautauqua College of Liberal Arts (Simonson et al., 2015). William Rainey Harper, a Yale professor who headed up the correspondence program, was so adamant concerning both the quality and continued success of the program, he asserted that “the student who has prepared a certain number of lessons in the correspondence school knows more of the subject treated in those lessons and knows it better than the student who has covered the same ground in the classroom (Simonson et al., 2015, p. 36,37). In areas of religious training, the Moody Bible Institute, founded in 1886, began religious training through correspondence in 1901 (Simonson et al., 2015). It continues offering

correspondence-based religious training with over one million enrollments from around the world (Simonson et al., 2015).

The first generation of distance learning also played a large role in corporate and government training. In 1890, as part of the Mining Safety Act, workers were required to take and pass a correspondence course created by the International Correspondence School to work in any mine (Watkinson, 1996). Within eight years, over 190,000 students enrolled in the correspondence courses (Watkinson, 1996). By 1926, an estimated 350 correspondence schools were operating in the United States (Watkinson, 1996). The International Correspondence School, which by that time offered correspondence courses in many different areas, had an enrollment of over 2.5 million students (Watkinson, 1996).

The first generation of distance learning was often aimed at those who were without easy access to face-to-face formal education institutions (Anderson & Simpson, 2012). These groups included women and working-class people (Anderson & Simpson, 2012). When land grant universities were formed, part of their mission was to use correspondence education to reach out to people from all backgrounds (Moore & Kearsley, 1996).

Research in distance learning was limited during this first generation. There were no published journals that focused on distance learning (Anderson & Simpson, 2012). Most research that occurred during this first generation was completed by teachers involved in correspondence teaching and who wanted to reflect and learn from their own experiences (Moore & Kearsley, 1996).

Generation Two – Broadcast

The development and spread of radio and television broadcast technologies characterize the second generation of distance learning (Nipper, 1989). The ability to leverage broadcast

technologies greatly enhanced the potential of distance learning (Evans & Nations, 2007). Still limited during this time were opportunities for interaction between learners and teachers and other learners (Anderson & Simpson, 2012). Creating asynchronous access to learner-content interaction was seen as the strongest driver during this time (Anderson & Simpson, 2012).

An example of the leveraging of television broadcast technology to enhance distance learning can be seen in the efforts of the U.K. Open University (Anderson & Simpson, 2012). In the 1960s, the Prime Minister of England considered broadcast technologies to be too valuable to only be used for entertainment (Jeong, 2018). To leverage television broadcast technology for educational purposes, the U.K. Open University was established in 1969 (Jeong, 2018). Although local support offices were established for support and proctoring purposes, the content was delivered using television broadcast technology.

An example of using radio broadcast technology during this generation can be seen in the Australian School of the Air (Anderson & Simpson, 2012). Founded in 1950, the school uses radio broadcasts to deliver distance learning. The school continues today, using HF radio to reach students who live in remote areas who otherwise would not be able to attend school.

Providing access to learners who otherwise would not have access to face-to-face learning was still a driver to distance learning in this second generation (Saykılı, 2018). A disadvantage found in using broadcast technology for distance learning is that the broadcast time was fixed. This required distance learning students to take courses at predetermined times. So although the technology has helped to overcome spatial limitations, the temporal limitations for most distance learners remain (Jeong, 2018).

Generation Three – Computer-Mediated

There are several different understandings of the third and potential subsequent generations of distance learning. This is understandable, seeing how quickly and broadly distance education has been growing since the introduction of information and communication technologies (ICT) to the field of education (Rahman, 2014). Nipper was the first to recognize that distance learning was moving into a third generation (1989). In contrast to the first two generations, which had little to no student-student and student-instructor interaction, the third generation is characterized by the use of various types of interaction made available through the use of information and communication technology (ICT) (Rahman, 2014). The introduction of ICT allowed distance education to move from a focus on independent study seen in the first two generations to one focused on learner computer-mediated interaction (Rahman, 2014).

It was in response to the move in distance learning towards computer-mediated interactions that theories such as Simonson's Equivalency Theory, Moore's Distance Education Types of Interaction and Transactional Distance, and Anderson's Interaction Equivalency Theorem were developed (Anderson, 2003; Miyazoe & Anderson, 2010b; Moore, 1989, 1993; Simonson, 1999). An important element of this generation is a focus on better understanding the roles that transactional distance and interaction play in distance learning (Moore, 1989, 1993). From an instructional designer's perspective, how best to create and then deliver learner-content, learner-instructor, learner-learner, learner-interface, and learner-self interactions inside of asynchronous, synchronous, and bichronous distance learning environments are important considerations that differentiate the current generation of distance learning from the previous two generations (Martin & Oyarzun, 2018).

Asynchronous Distance Learning

In the current generation, the asynchronous classification of distance learning involves learner-content interactions that are made available without geographic or temporal constraints. Asynchronous distance learning provides learners content not only from anywhere but also at any time (Southard et al., 2015). The ability of asynchronous learning to offer the learner unlimited access to content anytime and from anywhere is recognized as one of its greatest advantages over other types of distance learning (Magdalene Delighta Angeline et al., 2020).

In its purest form, there are no real-time online or face-to-face interactions with the facilitator or other learners (Martin & Oyarzun, 2018). Asynchronous distance learning is self-paced, meaning that it is the learner that controls the individual pace of the learning, not an instructor or facilitator (Rhode, 2009). The learner is placed at the center of the learning process, allowing them to take responsibility for and ownership of their learning (Bidin & Ziden, 2013). Asynchronous distance learning is commonly utilized by corporations and governments because of the convenience it offers employees (Chauhan, 2017). The self-paced nature of the learning allows training courses to be completed when and where it is convenient for the learner.

Interaction equivalency theorem argues that the asynchronous form of distance learning, consisting of a high level of learner-content interaction with little or no learner-instructor or learner-learner interaction, can produce a high-quality learning experience (Anderson, 2003; Miyazoe & Anderson, 2010a, 2010c, 2010b). Rhode's research provides support for this contention in the higher education distance learning environment (2009). Research conducted by Rodriquez and Armellini found this also to be supported in the corporate learning environment, although, as noted earlier in this chapter, learners in this study went outside of the asynchronous

learning interaction when they felt it necessary to provide the level of experience necessary for their success.(Rodriguez, 2014; Rodriguez & Armellini, 2015).

Synchronous Distance Learning

The synchronous classification of distance learning most commonly involves learner-instructor interactions that are made available without geographic constraints. Temporal constraints do continue as the interaction inside synchronous distance learning is bound by time constraints (Martin & Oyarzun, 2018). Although distance learning has been moving education in general towards a learner-centric approach, it can be argued that some synchronous distance learning may still find its pedagogical roots in face-to-face, instructor-centric learning environments. In synchronous distance learning, when carrying over a face-to-face approach to learning, the instructor can still lead the learning as learners log into a virtual classroom where they listen to the instructor’s lecture (Skylar, 2009).

Recognized benefits of synchronous distance learning include access to instructors, immediate feedback from instructors and other learners, and the potential for a virtual form of a traditional face-to-face environment when webcams are used inside a virtual classroom (Magdalene Delighta Angeline et al., 2020). Skylar describes the advantages and disadvantages of synchronous distance learning as follows:

Advantages of using a synchronous learning environment include real time sharing of knowledge and learning and immediate access to the instructor to ask questions and receive answers. However, this type of environment requires a set date and time for meeting, and this contradicts the promise of “anytime, anywhere” learning that online courses have traditionally promoted.” (Skylar, 2009, p. 71)

Bichronous Distance Learning

The newest classification in the current generation is bichronous distance learning. This classification of distance learning is defined as:

The blending of both asynchronous and synchronous online learning, where students can participate in any time, anywhere learning during the asynchronous parts of the course but then participate in real-time activities for the synchronous sessions. The amount of the online learning blend varies by the course and the activities included in the course.

(Martin et al., 2020)

Although asynchronous and synchronous forms of distance learning have existed throughout this generation, the blending of the two forms to create bichronous distance learning has grown in popularity as a result of a shift to emergency remote instruction in response to the COVID-19 pandemic (Wilson, 2021). As a result of the COVID-19 pandemic, some formerly blended face-to-face courses have been migrated to distance learning by leveraging the bichronous form.

As the newest classification in the current generation, bichronous distance learning may be the least studied classification (Esparragoza, 2021). A few studies have been completed in higher education that shows support for the use of a bichronous distance learning environment over single modality environments such as asynchronous and synchronous (Martin et al., 2020). In the federal acquisition training environment, no such studies exist. Table 1 provides the definitions, advantages, and limitations of asynchronous, synchronous, and bichronous online learning.

Table 1*Fully Asynchronous, Fully Synchronous, and Bichronous Comparison*

Type of online learning	Definition	Advantages	Limitations
Fully asynchronous (100 percent asynchronous)	Anytime and anywhere online learning	<ul style="list-style-type: none"> • Learn at own pace • No scheduling conflict 	<ul style="list-style-type: none"> • Delayed time • Lacks immediate feedback • Low level of participation
Fully synchronous (100 percent synchronous)	Real-time online learning in which students can participate from anywhere	<ul style="list-style-type: none"> • Immediate feedback • Enhances interaction • Audio-visual communication • Increased accountability • Opportunity to structure time • Stay motivated and on task 	<ul style="list-style-type: none"> • Scheduling conflict • Access to internet and computer at specific times • Possibility of technical issues • Discussions being too fast
Bichronous (asynchronous + synchronous)	Blending of both online learning types, where students can participate in anytime, anywhere learning during the asynchronous parts of the course but then participate in real-time for the synchronous sessions	<ul style="list-style-type: none"> • Both learn at own pace as well as immediate feedback and interaction available • Opportunity for audio-visual communication 	<ul style="list-style-type: none"> • Scheduling conflict • Possibility of technical issues

Note: Retrieved from *Bichronous Online Learning: Blending Asynchronous and Synchronous*

Online Learning (Martin et al., 2020) © 2020 Florence Martin, Drew Polly, and Albert

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CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

The purpose of this study was to examine the relationship, if any, between AWF perceptions of learner-centric interaction effectiveness and their distance learning environment preferences. To support this purpose, a correlational, non-experimental, quantitative research design was selected. The sample group for this study consists of graduates of the VA Acquisition Academy FCR404 FACCOR Refresher Course between the dates of February 8, 2022, and June 3, 2022. This training course allows learners who are members of the AWF to experience five categories of learner-centric interactions (learner-interface, learner-content, learner-instructor, learner-learner, and learner-self) in a bichronous distance learning environment. Before taking this course, members of this sample group will have previously experienced other AWF training in both synchronous and asynchronous distance learning environments.

Research Design

This study employs three research design elements: correlational, non-experimental, and quantitative. In educational research, the three broad approaches are qualitative, quantitative, and mixed methods. Quantitative research was chosen for this study as it is a research design element that allows for examining the relationship among variables (Creswell & Creswell, 2020). The purpose of this study is to analyze the relationships among variables associated with the training of the AWF.

Quantitative research design generally consists of two types: experimental and non-experimental (McMillan, 2016). In experimental quantitative design, there is one essential characteristic: direct control of an intervention (McMillan, 2016). Non-experimental research does not directly control an intervention but instead uses survey research, historical research, observation, and analysis of existing data sets (Muijs, 2014). As there was no direct control of an

intervention and the data for this research was gathered from pre-existing data sets, a non-experimental design was selected.

In correlational studies, researchers describe and measure the relationship, if any, between two or more variables or sets of scores (Creswell, 2012). Although correlational studies do not equate to causation (Creswell & Creswell, 2020), correlational studies can be a valuable research tool in determining if there are statistically significant relationships between variables (Muijs, 2014). As this study focuses on determining if such relationships exist among variables associated with the training of the AWF, a correlational design was selected. The independent variables (predictor variables) are learner-perceived effectiveness of learner-interface, learner-content, learner-instructor, learner-learner, and learner-self interaction. The dependent variable (criterion variable) is learner preference for asynchronous, synchronous, and bichronous learning environments.

Research Questions

The following research questions guide this study:

1. Are there significant differences in how learners perceive the effectiveness of the learner-centric interactions (learner-interface, learner-content, learner-instructor, learner-learner, learner-self)?
2. Are there significant differences in how learners rate their preferences of distance learning environments (asynchronous, synchronous, bichronous)?
3. Is there a significant correlation between learner-perceived effectiveness of learner-content interactions and distance learning environment preferences?
4. Is there a significant correlation between learner-perceived effectiveness of learner-instructor interactions and distance learning environment preferences?

5. Is there a significant correlation between learner-perceived effectiveness of learner-learner interactions and distance learning environment preferences?
6. Is there a significant correlation between learner-perceived effectiveness of learner-interface interactions and distance learning environment preferences?
7. Is there a significant correlation between learner-perceived effectiveness of learner-self interactions and distance learning environment preferences?

Sample Population

The sample (n = 80) used for this study completed the FCR404 FACCOR Refresher course between February 8, 2022, and June 3, 2022. FCR404 FACCOR Refresher is a forty-hour training course offered to the AWF by the Department of Veterans Affairs Acquisition Workforce Curriculum Design and Delivery (AWFCDD) team. The course takes a bichronous approach to distance learning and includes all five learner-interaction types: learner-interface, learner-content, learner-instructor, learner-learner, and learner-self interaction.

Learner-interface interaction is provided through the hosting Blackboard Learning Management System. Blackboard Ultra Learn/Collaborate was chosen as the interface for this endeavor as its design allows for a unified user experience in both the creation of the learning environment and access to all other types of learning interactions. This decreased the need for additional learner digital literacy training. Because of the design of Blackboard Ultra Learn/Collaborate, all hosted learner interactions, designed to improve the learner experience, were available to the learner using only two browser tabs. This simple user interface was key to allowing for a more unified student experience with a decrease in user digital literacy overhead.

Learner-content interaction is provided to learners inside Blackboard Ultra Learn as self-paced online trainings (SPOTs) through the use of both SCORM packages and HTML5. The

acquisition workforce most often operates inside a VA-managed VPN secure environment. This creates additional learning delivery challenges not experienced in corporate or higher education learning environments. The design of Blackboard Ultra Learn allows for both SCORM and HTML5 versions of the SPOTs to be hosted, increasing access flexibility to the acquisition workforce learner inside the VA-managed VPN secure environment.

Learner-instructor interactions are student or instructor-initiated interactions that occur before, during, or immediately after the online learning experience. Leveraging the features of Blackboard Ultra Collaborate, live, synchronous interaction between learners and the instructor was developed. This interaction has been shown to improve learner experience, motivation, and satisfaction. Learner-instructor interaction is also used to help instructors evaluate the learner process, provide counsel, support, and encouragement to the learner, and support other learning objectives by utilizing the instructor's personality, teaching methods, and philosophy.

Learner-learner interaction is collaborative and provides the learner opportunities to work with other learners to analyze and interpret content, share experiences, opinions, and insights related to the content, and solve problems. Following the theories of social cognivism and social learning theory, learner-learner interactions help learners construct knowledge through interaction with and the modeling of others in the learning community. Learner-learner interactions are made available through the use of Blackboard Ultra Collaborate.

Learner-self interaction, although taking place internally to the learner through mental processes that allow the learner to construct knowledge, can be encouraged through the development of learner-self interactions. The interface used must include tools to support this type of interaction. The AWFCDD team leveraged the technology built into Blackboard Ultra

Learn to host and display interactive PDFs, creating learner-self interactions that encouraged learners to reflect on the content and their own previous experiences.

Recognizing the need for increased online learning flexibility that recognizes the diverse needs of the acquisition workforce, including the learner's physical location distribution across many time zones, the AWFCDD team created a bichronous learner environment inside of Blackboard Ultra that included interactions from all five categories recognized as necessary for learner success. The bichronous learning environment, consisting of 60% self-paced interactions and 40% live collaboration with the instructor and fellow learners, allowed for greater learner spatial and temporal flexibility while also providing live opportunities for collaboration deemed necessary for learner success.

Instrumentation

It is a longstanding practice of the AWFCDD team to make anonymous and voluntary surveys available to learners upon completion of training courses. All AWFCDD courses provide surveys to learners after completion of the training course. This formative evaluation allows instructional designers to obtain information from learners to make course changes to improve the course (Clark & Mayer, 2016). As with other AWFCDD courses, the FCR404 FACCOR Refresher included an anonymous and voluntary survey built into the design of the course to allow the AWFCDD team to make improvements to help future learners become more successful. This instrument and the resulting survey data, after IRB approval, were made available to the researcher. The instrument, a post-course survey, consists of 2 demographic questions, 12 Likert-type questions, and one open-ended question to allow learners to make any additional comments. The survey questions, written by the course designer and researcher, are based on Fink's rules for writing closed survey questions:

1. Each question should be meaningful to respondents.
2. Use standard language rules (Avoid specialized words).
3. Make questions concrete.
4. Avoid biased words and phrases.
5. Check your own biases.
6. Use caution when asking for personal information.
7. Each question should have just one thought. (Fink, 2017)

The course, along with the survey instrument, was piloted to a group of 23 AWF members from January 18th, 2022, to January 27th, 2022. Feedback on the course and survey instrument were used to make improvements. Those improvements included the addition of six questions to the survey to better capture the learner's perceptions of interaction effectiveness and distance learning environment preferences.

Reliability

According to Thanasegaran, reliability is “the degree to which measures are free from error and therefore yield consistent results” (2009). Two underlying dimensions of the concept of reliability are repeatability and internal consistency (Thanasegaran, 2009). Chronbach's alpha is a method that can determine the internal consistency of the questions that make up a survey (Watzlaf, 2017). For research purposes, the coefficient alpha should be more than or equal to .70 (Johnson & Christensen, 2017). Using the JASP 0.16.1 statistical software, Cronbach's alpha for this instrument was determined to be .762.

Validity

A survey instrument is considered valid if “the information it provides is an accurate reflection of respondents' knowledge, attitudes, values, and behaviors” (Fink, 2017, p. 78). A

basic tenet of validity is the extent that the chosen instrument can measure what it is intended to measure in an effective way (Carmines & Zeller, 1979). A team of subject matter experts with a combined 35 years of experience in the fields of acquisition workforce training, distance learning, and the development of similar learner surveys and assessments was assembled to review a draft of the survey format and questions, examining for appropriateness, clarity, and relevance. Comments from the team of subject matter experts were used to produce the survey that was used inside the course to provide a level of content validity for the survey. The survey, updated based on their comments, was then tested in the pilot implementation of the course.

Data Collection

Data collection for this study began following approval from the Department of Veterans Affairs Acquisition Workforce Curriculum Design and Delivery (AWFCDD) leadership and the Marshall University Institutional Review Board. Access to the survey instrument and existing data from anonymous learners who voluntarily elected to complete the survey was made available to the researcher. There was no research data content delivery directly between the course developer/researcher and the participants.

Data Analysis

Data analysis was completed utilizing the JASP 0.16.1 statistical software. Data were analyzed to eliminate any inaccurate, incomplete, or unreasonable data. Research question 1 was analyzed using a set of statistical tests to measure learners perceived effectiveness of learner-centric interactions. Research question 2 was analyzed using a set of statistical tests to measure learner preference for distance learning environments. As Likert scale data is ordinal and not continuous, it has been argued that attempting to find significant differences through statistical tools based on generating a mean from values assigned to Likert scale questions is a statistically

flawed procedure (Boone, Jr & Boone, 2012; Jamieson, 2004; Kostoulas, 2013; Nanna & Sawilowsky, 1998). Because of that potential flaw, testing for significant differences in research questions 1 and 2 was accomplished by comparing the median and Inter-Quartile Range (IQR) for each Likert-type question. Research questions 3 through 7 were analyzed using Spearman's Correlation test for Non-Parametric Correlation of ordinal data.

Summary

This study provides a correlational view of the perceptions of learner-centric interaction effectiveness and distance learning environment preferences of the AWF. A correlational, non-experimental, quantitative research design was selected to best meet the research needs. The sample group consists of members of the acquisition workforce who have experienced all five types of learner-centric interactions through participation and completion of the FCR404 FACCOR Refresher course between February 8, 2022, and June 3, 2022.

Data analysis was completed utilizing the JASP 0.16.1 Statistical Software. Research question 1 was analyzed using a set of statistical tests to measure learners perceived effectiveness of learner-centric interactions. Research question 2 was analyzed using a set of statistical tests to measure learner preference for distance learning environments. Research questions 3 through 7 were analyzed using Spearman's Correlation test for Non-Parametric Correlation.

CHAPTER 4: RESULTS

This chapter provides a description of the participant characteristics and findings derived from the analysis of the survey results. The presentation of the findings in this chapter is organized by research question. Tables summarizing the data relevant to each research question follow a short narrative description of the analysis completed.

Data Collection

The sample (n = 80) used for this study completed the FCR404 FACCOR Refresher course between February 8, 2022, and June 3, 2022. Of those 80 learners, 69 chose to complete a voluntary and anonymous survey on completion of the course. This survey instrument and the resulting data, after IRB approval, were made available to the researcher.

Participant Characteristics

The survey instrument included a demographic section consisting of two questions to establish how long participants had been FAC-COR certified and their current level of FAC-COR certification. The largest percentage (n=27, 39.1%) of participants had been FAC-COR certified (or equivalent) for 6 to 10 years. The largest percentage (n=51, 73.9%) of participants were FAC-COR Level II (or equivalent) certified. These data are displayed in Tables 2 and 3.

Table 2

Number of Years FAC-COR Certified (or Equivalent)

Response	n	%	Valid %	Cumulative %
0 years (I am not currently FAC-COR certified).	3	4.348	4.348	4.348
1 - 2 years	7	10.145	10.145	14.493
3 - 5 years	18	26.087	26.087	40.580
6 - 10 years	27	39.130	39.130	79.710
Over 10 years	14	20.290	20.290	100.000
Missing	0	0.000		
Total	69	100.000		

Table 3*Current Level of FAC-COR Certification (or Equivalent)*

Response	n	%	Valid %	Cumulative %
FAC-COR Level I Certification (or equivalent)	5	7.246	7.246	7.246
FAC-COR Level II Certification (or equivalent)	51	73.913	73.913	81.159
FAC-COR Level III Certification (or equivalent)	12	17.391	17.391	98.551
None (I am not currently FAC-COR certified)	1	1.449	1.449	100.000
Missing	0	0.000		
Total	69	100.000		

Findings

Findings are presented using the framework of the research questions that have guided this study. Those questions explore learner-centric interaction effectiveness perceptions, distance learning environment preferences, and significant correlation, if any, between those perceptions and preferences. Tables summarizing the data relevant to each research question follow a short narrative description of the analysis completed.

Research Question One

The first research question asks: Are there significant differences in how learners perceive the effectiveness of the learner-centric interactions (learner-interface, learner-content, learner-instructor, learner-learner, learner-self)?

Participants were asked about their perceptions relating to the effectiveness of the course overall and the effectiveness of each type of learner-centric interaction that was experienced in the course. These perceptions were captured using a Likert-type scale consisting of 1 – Strongly Disagree, 2 – Disagree, 3 – Neither Agree nor Disagree, 4 – Agree, or 5 – Strongly Agree. Statistical analyses were performed on these responses.

Perceived Combined Effectiveness of All Learner-Centric Interactions

A majority (n=66, 98.5%) of participants strongly agreed or agreed that the content covered in the course and delivered through the various types of learner-centric interactions effectively supported their ability to complete their responsibilities as Contracting Officer Representatives (CORs). No (n=0, 0.00%) participants disagreed or strongly disagreed. These data are provided in Table 4.

Table 4

Course Content Delivered Through Learner-Centric Interactions Supports Performance of COR Responsibilities

Response	n	%	Valid %	Cumulative %
Strongly Agree	51	73.913	76.119	76.119
Agree	15	21.739	22.388	98.507
Neither Agree Nor Disagree	1	1.449	1.493	100.000
Disagree	0	0.000		
Strongly Disagree	0	0.000		
Missing	2	2.899		
Total	69	100.000		

Learner-Content Interaction

Learner-content interactions were provided through the delivery of self-paced online trainings (SPOTs). The SPOTs were hosted inside the Blackboard Learn Learning Management System (LMS) and made available to the learner at the beginning of each course module. All (n=69, 100.0%) participants strongly agreed or agreed that the use of learner-content interactions effectively supported their understanding of the content covered in the course modules. No (n=0, 0.00%) participants disagreed or strongly disagreed. These data are provided in Table 5.

Table 5*Learner-Content Interactions Perceived as Effective*

Response	n	%	Valid %	Cumulative %
Strongly Agree	52	75.362	75.362	75.362
Agree	17	24.638	24.638	100.000
Neither Agree Nor Disagree	0	0.000		
Disagree	0	0.000		
Strongly Disagree	0	0.000		
Missing	0	0.000		
Total	69	100.000		

Learner-Instructor Interaction

Learner-instructor interactions are learner or instructor-initiated interactions that occur before, during, or immediately after the distance learning experience. Learner-instructor interactions were provided to participants inside a live, virtual classroom hosted by Blackboard Collaborate Ultra LMS. A majority (n=66, 95.7%) of participants strongly agreed or agreed that the use of learner-instructor interactions effectively supported their understanding of the content covered in the course modules. No (n=0, 0.00%) participants disagreed or strongly disagreed. These data are provided in Table 6.

Table 6*Learner-Instructor Interactions Perceived as Effective*

Response	n	%	Valid %	Cumulative %
Strongly Agree	51	73.913	73.913	73.913
Agree	15	21.739	21.739	95.652
Neither Agree nor Disagree	3	4.348	4.348	100.000
Disagree	0	0.000		
Strongly Disagree	0	0.000		
Missing	0	0.000		
Total	69	100.000		

Learner-Learner Interaction

Learner-learner interactions consist of collaborative learning opportunities among learners without the need for the real-time presence of an instructor. This category of interaction was provided to participants using breakout collaboration sessions inside a live, virtual classroom hosted by the Blackboard Collaborate Ultra LMS. The instructor purposefully avoided any interaction inside these breakout sessions to keep the breakouts consisting of only learner-learner interaction. A majority (n=65, 94.2%) of participants strongly agreed or agreed that the use of learner-learner interactions effectively supported their understanding of the content covered in the course modules. One (n=1, 1.45%) participant disagreed. No (n=0, 0.00%) participants strongly disagreed. These data are provided in Table 7.

Table 7

Learner-Learner Interactions Perceived as Effective

Response	n	%	Valid %	Cumulative %
Strongly Agree	43	62.319	62.319	62.319
Agree	22	31.884	31.884	94.203
Neither Agree Nor Disagree	3	4.348	4.348	98.551
Disagree	1	1.449	1.449	100.000
Strongly Disagree	0	0.000		
Missing	0	0.000		
Total	69	100.000		

Learner-Interface Interaction

Learner-interface interactions are a necessary interaction type for all technology-embedded distance learning. In this study, learner-interface interactions were provided through the use of the Blackboard Learn Ultra and Blackboard Collaborate Ultra LMS. All (n=69,100.0%) participants strongly agreed or agreed that the use of learner-interface

interactions effectively supported their understanding of the content covered in the course modules. No (n=0, 0.00%) participants disagreed or strongly disagreed. These data are provided in Table 8.

Table 8

Learner-Interface Interactions Perceived as Effective

Response	n	%	Valid %	Cumulative %
Strongly Agree	51	73.913	73.913	73.913
Agree	18	26.087	26.087	100.000
Neither Agree Nor Disagree	0	0.000		
Disagree	0	0.000		
Strongly Disagree	0	0.000		
Missing	0	0.000		
Total	69	100.000		

Learner-Self Interaction

Learner-self interactions are those designed into the learning environment to encourage learner self-reflection on the content covered. Interactive activity guides were created and used to purposefully embed this type of interaction inside the course. As a survey question supporting the data collection of the effectiveness of learner-self interaction was not part of the survey until after the first course delivery on February 8th, 2022, the total respondents shown in Table 9 do not include participants from that course delivery. A majority (n=47, 92.2%) of participants strongly agreed or agreed that the use of learner-self interactions effectively supported their understanding of the content covered in the course modules. One (n=1, 1.45%) participant disagreed. No (n=0, 0.00%) participants strongly disagreed. These data are provided in Table 9.

Table 9*Learner-Self Interactions Perceived as Effective*

Response	n	%	Valid %	Cumulative %
Strongly Agree	33	47.826	64.706	64.706
Agree	14	20.290	27.451	92.157
Neither Agree Nor Disagree	3	4.348	5.882	98.039
Disagree	1	1.449	1.961	100.000
Strongly Disagree	0	0.000		
Missing	18	26.087		
Total	69	100.000		

Testing for Significant Difference

As Likert-type data is ordinal and not continuous, testing for significant difference was accomplished by calculating the median and Inter-Quartile Range (IQR) for each survey question. The median of each question was found to be the same: 5 – Strongly Agree. The IQR for learner-content and learner-instructor interaction was 0.000. The IQR for the other three types of interactions was 1.000. As the central tendency (median) for each question was found to be the same (5 – Strongly Agree) and the IQR for each question was 0.000 or 1.000, no significant differences in perceived effectiveness of individual learner-centric interactions were found. These data are provided in Table 10.

Table 10*Comparison of Learner-Centric Interactions Perceived Effectiveness*

	Combined effectiveness	Learner-content interaction effectiveness	Learner-instructor interaction effectiveness	Learner-learner interaction effectiveness	Learner-interface interaction effectiveness	Learner-self interaction effectiveness
Valid	67	69	69	69	69	51
Missing	2	0	0	0	0	18
Median	5.000	5.000	5.000	5.000	5.000	5.000
IQR	0.000	0.000	1.000	1.000	1.000	1.000
Range	2.000	1.000	2.000	3.000	1.000	3.000
Minimum	3.000	4.000	3.000	2.000	4.000	2.000
Maximum	5.000	5.000	5.000	5.000	5.000	5.000

Summary

A majority (n=66, 98.5%) of participants perceived that the content covered in the course supported their ability to perform their Contracting Officer's Representative (COR) responsibilities. In support of that perception, a majority of participants stated that each type of learner-centric interaction supported their understanding of the content covered in the course. No significant differences in how learners perceived the effectiveness of the different types of learner-centric interactions (learner-interface, learner-content, learner-instructor, learner-learner, learner-self) were found as the central tendency (median) for each was the same (5 – Strongly Agree).

Research Question Two

The second research question was: Are there significant differences in how learners rate their preference of distance learning environments (asynchronous, synchronous, bichronous)?

To capture participant preferences concerning distance learning environments, several survey questions asked participants to compare three types of distance learning environments. These responses are reviewed below.

Bichronous Versus Asynchronous and Synchronous Environments

Historically, the two types of distance learning environments available to the AWF have been asynchronous and synchronous. Bichronous, the blending of online asynchronous and synchronous learning environments, has only recently been introduced as an AWF distance learning environment. As such, it was important for this study to measure the preference, if any, for this new environment, bichronous, in comparison to the two legacy approaches, asynchronous and synchronous.

A majority (n=58, 84.1%) of respondents either strongly agreed or agreed that they preferred a bichronous learning environment over one that is synchronous. A majority (n=54, 78.3%) of respondents either strongly agreed or agreed that they preferred a bichronous learning environment over an online learning environment that is asynchronous. All (n=69, 100.0%) participants strongly agreed or agreed that the flexibility provided in the bichronous learning environment was found to be beneficial to their work schedule. These data are provided in Tables 11, 12, and 13.

Table 11*Bichronous Learning Environment Preferred Over Synchronous*

Response	n	%	Valid %	Cumulative %
Strongly Agree	48	69.565	69.565	69.565
Agree	10	14.493	14.493	84.058
Neither Agree Nor Disagree	6	8.696	8.696	92.754
Disagree	4	5.797	5.797	98.551
Strongly Disagree	1	1.449	1.449	100.000
Missing	0	0.000		
Total	69	100.000		

Table 12*Bichronous Learning Environment Preferred Over Asynchronous*

Response	n	%	Valid %	Cumulative %
Strongly Agree	40	57.971	57.971	57.971
Agree	14	20.290	20.290	78.261
Neither Agree Nor Disagree	11	15.942	15.942	94.203
Disagree	4	5.797	5.797	100.000
Strongly Disagree	0	0.000		
Missing	0	0.000		
Total	69	100.000		

Table 13*Bichronous Learning Environment Flexibility Perceived as Beneficial to Work Schedule*

Response	n	%	Valid %	Cumulative %
Strongly Agree	62	89.855	89.855	89.855
Agree	7	10.145	10.145	100.000
Neither Agree Nor Disagree	0	0.000		
Disagree	0	0.000		
Strongly Disagree	0	0.000		
Missing	0	0.000		
Total	69	100.000		

Asynchronous Verses Synchronous Learning Environments

Two survey questions asked participants about their online asynchronous and synchronous learning environment preferences if the bichronous learning environment was not available. Twenty-seven (39.1%) participants indicated a preference for online learning environments that are synchronous. Thirty-five (50.7%) participants indicated a preference for online learning environments that are asynchronous. These data are provided in Tables 14 and 15.

Table 14

Synchronous Learning Environment Preferred Over Asynchronous

Response	n	%	Valid %	Cumulative %
Strongly Agree	17	24.638	24.638	24.638
Agree	10	14.493	14.493	39.130
Neither Agree nor Disagree	21	30.435	30.435	69.565
Disagree	15	21.739	21.739	91.304
Strongly Disagree	6	8.696	8.696	100.000
Missing	0	0.000		
Total	69	100.000		

Table 15

Asynchronous Learning Environment Preferred Over Synchronous

Response	n	%	Valid %	Cumulative %
Strongly Agree	18	26.087	26.087	26.087
Agree	17	24.638	24.638	50.725
Neither Agree nor Disagree	15	21.739	21.739	72.464
Disagree	16	23.188	23.188	95.652
Strongly Disagree	3	4.348	4.348	100.000
Missing	0	0.000		
Total	69	100.000		

Testing for Significant Difference

As Likert-type data is ordinal and not continuous, testing for significant difference was accomplished by calculating the central tendency (median) and Inter-Quartile Range (IQR) for each survey question. Significant differences in how learners rate their preference for distance learning environments were found. The central tendency of bichronous learning environment preferences over both synchronous and asynchronous learning environments were found to be the same: 5 – Strongly Agree. This stands in contrast to the central tendency of asynchronous preference over synchronous (3 – Neither Agree Nor Disagree) and the central tendency of synchronous preference over asynchronous (4 – Agree). The IQR for bichronous learning environment preferences over synchronous and asynchronous environments were found to be 1.00. This stand in contrast to the IQR of asynchronous preference over synchronous (2.000) and the IQR of synchronous preference over asynchronous (3.000). These data are provided in Table 16.

Table 16

Comparison of Distance Learning Environment Preferences

	Bichronous preferred over synchronous	Bichronous preferred over asynchronous	Asynchronous preferred over synchronous	Synchronous preferred over asynchronous
Valid	69	69	69	69
Missing	0	0	0	0
Median	5.000	5.000	3.000	4.000
IQR	1.000	1.000	2.000	3.000
Range	4.000	3.000	4.000	4.000
Minimum	1.000	2.000	1.000	1.000
Maximum	5.000	5.000	5.000	5.000

Research Question Three

The third research question was: Is there a significant correlation between learner-perceived effectiveness of learner-content interactions and distance learning environment preferences?

Analysis of survey responses reporting participant perceived effectiveness of learner-content interactions and distance learning environment preferences was completed using Spearman's correlation test for non-parametric correlation. A positive and significant correlation was found between learner-content interaction perceived effectiveness and preference for the bichronous learning environment over both synchronous and asynchronous learning environments. These data are provided in Table 17.

Table 17

Spearman's Correlation of Perceived Learner-Content Effectiveness and Bichronous Learning Environment Preference

Variable		Bichronous preferred over synchronous	Bichronous preferred over asynchronous
Learner-content interaction perceived effectiveness	Spearman's rho	0.297 *	0.266 *
	p-value	0.013	0.027

* $p < .05$, ** $p < .01$, *** $p < .001$

Research Question Four

The fourth research question was: Is there a significant correlation between learner-perceived effectiveness of learner-instructor interactions and distance learning environment preferences?

Analysis of survey responses reporting participant perceived effectiveness of learner-instructor interactions and distance learning environment preferences was completed using

Spearman’s correlation test for non-parametric correlation. A positive and significant correlation was found between learner-instructor interaction perceived effectiveness and preference for the bichronous learning environment over the synchronous learning environment. No significant correlation was found between learner-instructor interaction perceived effectiveness and preference for the bichronous learning environment over the asynchronous learning environment. These data are provided in Table 18.

Table 18

Spearman's Correlation of Perceived Learner-Instructor Effectiveness and Bichronous Learning Environment Preference

Variable		Bichronous preferred over synchronous	Bichronous preferred over asynchronous
Learner-instructor interaction perceived effectiveness	Spearman's rho	0.336 **	0.215
	p-value	0.005	0.076

* p < .05, ** p < .01, *** p < .001

Research Question Five

The fifth research question was: Is there a significant correlation between learner-perceived effectiveness of learner-learner interactions and distance learning environment preferences?

Analysis of survey responses reporting participant perceived effectiveness of learner-learner interactions and distance learning environment preferences was completed using Spearman’s correlation test for non-parametric correlation. A positive and significant correlation was found between learner-learner interaction perceived effectiveness and preference for the bichronous learning environment over both synchronous and asynchronous learning environments. These data are provided in Table 19.

Table 19

Spearman's Correlation of Perceived Learner-Learner Effectiveness and Bichronous Learning Environment Preference

Variable		Bichronous preferred over synchronous	Bichronous preferred over asynchronous
Learner-learner interaction perceived effectiveness	Spearman's rho	0.472 **	0.406 **
	p-value	< 0.001	<0.001

* $p < .05$, ** $p < .01$, *** $p < .001$

Research Question Six

The sixth research question was: Is there a significant correlation between learner-perceived effectiveness of learner-interface interactions and distance learning environment preferences?

Analysis of survey responses reporting participant perceived effectiveness of learner-interface interactions and distance learning environment preferences was completed using Spearman's correlation test for non-parametric correlation. A positive and significant correlation was found between learner-interface interaction perceived effectiveness and preference for the bichronous learning environment over both synchronous and asynchronous learning environments. These data are provided in Table 20.

Table 20

Spearman's Correlation of Perceived Learner-Interface Effectiveness and Bichronous Learning Environment Preference

Variable		Bichronous preferred over synchronous	Bichronous preferred over asynchronous
Learner-interface interaction perceived effectiveness	Spearman's rho	0.405 ***	0.308 *
	p-value	<0.001	0.010

* $p < .05$, ** $p < .01$, *** $p < .001$

Research Question Seven

The seventh research question was: Is there a significant correlation between learner-perceived effectiveness of learner-self interactions and distance learning environment preferences?

Analysis of survey responses reporting participant perceived effectiveness of learner-self interactions and distance learning environment preferences was completed using Spearman's correlation test for non-parametric correlation. A positive and significant correlation was found between learner-self interaction perceived effectiveness and preference for the bichronous learning environment over the synchronous learning environment. No correlation was found between learner-self interaction perceived effectiveness and preference for the bichronous learning environment over the asynchronous learning environment. These data are provided in Table 21.

Table 21

Spearman's Correlation of Perceived Learner-Self Effectiveness and Bichronous Learning Environment Preference

Variable		Bichronous preferred over synchronous	Bichronous preferred over asynchronous
Learner-self interaction perceived effectiveness	Spearman's rho	0.467 ***	0.175
	p-value	<0.001	0.220

* $p < .05$, ** $p < .01$, *** $p < .001$

CHAPTER 5: SUMMARY OF FINDINGS, RECOMMENDATIONS, AND CONCLUSION

The purpose of this quantitative study was to examine AWF perceptions of learner-centric interaction effectiveness and learning environment preferences, along with the correlation, if any, between these factors inside the federal acquisition distance learning environment. This chapter provides a summary of the findings derived from the analysis of the survey results. The summary of findings is followed by recommendations for future research and the chapter conclusion.

Summary of Findings

Learner-Centric Interaction Effectiveness Perceptions

In order to examine AWF perceptions of learner-centric interaction effectiveness, participants were provided with five types of learner-centric interactions inside a bichronous learning environment. A post-course survey was then used to capture the perceived effectiveness of the course in general and the perceived effectiveness of each type of interaction used in the course. Research question one asked if there was a significant difference in how learners perceived the effectiveness of the experienced learner-centric interactions.

As to the overall perceived effectiveness of the course consisting of all the various types of learner-centric interactions, 98.5% of participants (n=66) stated that the content presented in the course by means of these interactions supported their ability to perform their work duties. Every (n=69, 100%) participant strongly agreed or agreed that the learner-content interactions provided were effective in supporting the understanding of the content covered in the course. Every (n=69, 100%) participant also reported that the learner-interface interactions provided were effective in supporting the understanding of the content covered in the course. A majority

(n=66, 95.7%) of participants saw the use of learner-instructor interaction as being effective. A majority (n=65, 94.2%) of participants strongly agreed or agreed that the use of learner-learner interactions supported their understanding of the content covered in the course modules. A majority (n=47, 92.2%) of participants strongly agreed or agreed that the use of learner-self interactions was effective. As the central tendency (median) for each question pertaining to perceived interaction effectiveness was found to be the same (5 – Strongly Agree), no significant differences in perceived effectiveness of individual learner-centric interactions were found. The findings support the perceived effectiveness by the learner of the use of a diversity of types of learner-centric interactions.

The findings stand in contrast to previous studies completed in other types of distance learning environments. For example, Rhode found that learners in a self-paced distance learning environment did not value all types of interactions equally (2009). Participants in the study believed learner-content interactions to be indispensable in a self-paced distance learning environment (Rhode, 2009). They also noted that learner-instructor interaction could be diminished and replaced through increased quality learner-content interactions (Rhode, 2009). Learner-learner interaction was ranked as least desirable in the self-paced distance learning environment studied, noting that the very design of the environment made such interactions challenging (Rhode, 2009). As technological advancement continues to make possible a more diverse experience in terms of information and communication technologies (ICT) in our personal lives, the findings of this current study support the claim that learners perceive a benefit from the creation of the same type of diverse interaction experience in online learning environments.

Almost twenty years ago, Anderson's Interaction Equivalency Theorem (IEQT) was introduced (2003). The focus of the first thesis of IEQT is that only one type of learner-centric interaction, presented at a high level, is necessary to create a quality learning experience (Anderson, 2003). Over the past two decades, research has provided support for the first thesis (Kuo et al., 2013; Miyazoe & Anderson, 2010c; Rhode, 2009; Rodriguez & Armellini, 2015). As no attempt was made to limit learning interaction types, this study does not provide support for or against the first thesis of IEQT. Participants were provided with a full and diverse set of learner-centric interactions in order to determine the perceived effectiveness of the various types of learner-centric interactions.

The second thesis of IEQT focuses on the quantity of the interactions inside a learning experience (Miyazoe & Anderson, 2010b). The second thesis argues that a distance learning course that includes a greater quantity and increased diversity of learner-centric interactions will likely provide increased learner satisfaction, but the cost of creating and delivering the content along with the time commitment required by the learner may make the course both costly and unsustainable (Miyazoe & Anderson, 2010b). It is this second thesis of IEQT that the current study may provide some additional understanding.

When IEQT was introduced, the educational technology required to implement and sustain the various learner-centric interactions that were part of this study did not exist. An attempt to create equivalent interactions using the existing technology of the day would have been cost prohibitive or technologically impossible. But because of continuing advances in educational technology and the lower costs of that technology, it has become increasingly possible to develop and implement a set of more diverse learner-centric interactions in a cost-effective manner, making possible the creation of a richer and fuller experience for the learner.

The findings of this study support the claim that learners perceive the use of a diversity of learner-centric interactions to be effective in supporting understanding of the content taught in the course. Such diversity requires a distance learning environment that is able to host interaction diversity both efficiently and effectively.

Distance Learning Environment Preferences

Part of this study focused on the capture of AWF distance learning environment preferences. A preference for the bichronous learning environment over both synchronous and asynchronous learning environments was found. A majority (n=58, 84.1%) of respondents either strongly agreed or agreed that they prefer a bichronous learning environment over one that is 100% instructor-led (i.e., synchronous). A majority (n=54, 78.3%) of respondents also either strongly agreed or agreed that they prefer a bichronous learning environment over an online learning environment that is 100% self-paced (i.e., asynchronous).

These responses stand in contrast to participant preferences when comparing the two legacy learning environments (synchronous and asynchronous). In those comparisons, preferences concerning the two legacy learning environments were more evenly split. Twenty-seven (39.1%) participants indicated a preference for online courses that are 100% instructor-led (synchronous), while thirty-five (50.7%) participants indicated a preference for online courses that are 100% self-paced (asynchronous).

One possible reason for the preference for a bichronous learning environment over the two legacy environments may be the flexibility that the bichronous learning environment provides learners. All (n=69, 100%) participants stated that they found the flexibility of the bichronous learning environment to be beneficial to their work schedule. Of all the questions in the survey, the question asking if participants found the flexibility of the bichronous learning

environment to be beneficial had the most positive response. Almost 90% (n=62) of participants reported that they strongly agreed with that statement.

Another possible reason for the preference of the bichronous learning environment over the legacy environments may be the ability of the bichronous environment to support the diverse types of learner-centric interactions that participants found effective. Findings concerning the correlation between the perceived effectiveness of learner-centric interactions and learning environment preferences are summarized below.

Correlation between Interaction Effectiveness and Environment Preferences

As this study found support for the perceived effectiveness of a number of learner-centric interactions and a preference for a bichronous online learning environment, research questions 3 through 7 focused on if there were significant correlations between the learner-perceived effectiveness of the various learner-centric interactions and their bichronous learning environment preference. Analysis was completed using Spearman's correlation test for non-parametric correlation.

A positive and significant correlation was found between the perceived effectiveness of five types of learner-centric interactions and a preference for the bichronous learning environment. The strength of the correlation results, though, did vary from interaction to interaction. For example, positive and significant correlations were found with some interaction types (learner-content, learner-learner, learner-interface) and bichronous preference over both synchronous and asynchronous learning environments. But for other interaction types (learner-self and learner-instructor), a positive and significant correlation was found only with bichronous preference over synchronous learning environments, but not the same interaction types over the

asynchronous learning environments. The findings concerning correlation are inconclusive and would benefit from the following suggested future research.

Recommendations for Future Research

1. The current study is limited to FAC-COR certified members of the AWF. Future research could include other certification groups in the AWF (FAC-C certified Contract Officers and FAC-P/PM certified Program Managers).
2. The sample (n = 69) used for this study completed the FCR404 FACCOR Refresher course between February 8, 2022, and June 3, 2022. FCR404 FACCOR Refresher is a forty-hour training course offered to the AWF by the Department of Veterans Affairs Acquisition Workforce Curriculum Design and Delivery (AWFCDD) team inside a bichronous learning environment. Future studies could focus on AWF learning interaction preferences inside both asynchronous and synchronous learning environments.
3. This study employs three design elements: correlational, non-experimental, and quantitative. Data was acquired by the use of a Likert-type survey. Future research could focus on using a qualitative approach in order to gather data through participant interviews.

Conclusion

The study's findings indicate perceived effectiveness and preference by the AWF for training consisting of diversity in learner-centric interactions delivered in a bichronous learning environment. These findings do not align with current approaches to AWF distance training. While the majority of current AWF distance training is synchronous (instructor-led), only twenty-seven (39.1%) participants indicated a preference for online courses that are 100% synchronous (instructor-led), the lowest scoring preference of the AWF. The gap between what the AWF prefer (bichronous) and what they are most commonly being provided (synchronous,

instructor-led) may help to explain a weakness in the AWF: a deficiency in the technical and professional competencies necessary to promote effectiveness inside the federal acquisition process (FAI, 2018). By providing learner-centric interaction diversity in the AWF-preferred bichronous learning environment, deficiencies in the technical and professional competencies necessary to promote quality and effectiveness inside the federal acquisition process may have a better opportunity to be addressed.

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APPENDIX A: APPROVAL LETTER



w w w . m a r s h a l l . e d u

Office of Research Integrity
Institutional Review Board
One John Marshall Drive
Huntington, WV 25755

FWA 00002704

IRB1 #00002205
IRB2 #00003206

August 8, 2022

Dennis Anderson, Ed.D.
Leadership Studies, COEPD

RE: IRBNet ID# 1941451-1

At: Marshall University Institutional Review Board #2 (Social/Behavioral)

Dear Dr. Anderson:

Protocol Title: [1941451-1] Daniel Davis - Training the Federal Acquisition Workforce: A Correlational Study of Perceived Learner-centric Interaction Effectiveness and Distance Learning Environmental Preferences,

Site Location: MUGC

Submission Type: New Project APPROVED

Review Type: Exempt Review

In accordance with 45CFR46.104(d)(1), the above study was granted Exempted approval today by the Marshall University Institutional Review Board #2 (Social/Behavioral) Designee. No further submission (or closure) is required for an Exempt study unless there is an amendment to the study. All amendments must be submitted and approved by the IRB Chair/Designee.

This study is for student Daniel Davis.

If you have any questions, please contact the Marshall University Institutional Review Board #2 (Social/Behavioral) Coordinator Lindsey Taylor, at 304-696-6322 or price100@marshall.edu. Please include your study title and reference number in all correspondence with this office.

Sincerely,

A handwritten signature in blue ink that reads 'Bruce F. Day'.

Bruce F. Day, ThD, CIP
Director, Office of Research Integrity

APPENDIX B: SURVEY QUESTIONS

Part 1 Demographics

SQ1. I have been FAC-COR certified (or equivalent) for:

- 0 years (I am not currently FAC-COR certified).
- 1 – 2 years
- 3 – 5 years
- 6 – 10 years
- Over 10 years

SQ2. My current level of FAC-COR certification is:

- None (I am not currently FAC-COR certified)
- FAC-COR Level I Certification (or equivalent)
- FAC-COR Level II Certification (or equivalent)
- FAC-COR Level III Certification (or equivalent)

Part 2: Likert Scale Questions

All Likert Scale questions have the following potential responses:

5 – Strongly Agree

4 – Agree

3 – Neither Agree nor Disagree

2 – Disagree

1 – Strongly Disagree

SQ3. The content covered in the course (the FAI COR Competencies) supports my ability to perform COR responsibilities.

SQ4. The self-paced online trainings (SPOTs) supported my understanding of the content covered in the modules.

SQ5. The instructor-led reviews supported my understanding of the content covered in the modules.

SQ6. The breakout collaboration sessions with fellow learners supported my understanding of the content covered in the modules.

SQ7. The learning interface used to deliver the course online supported my understanding of the content covered in the modules.

SQ8. The activity guides I completed during the course supported my understanding of the content covered in the modules.

SQ9. I found the flexibility of the online blended learning approach (60% independent and self-paced, 40% collaborative and fixed-timed) to be beneficial to my work schedule.

SQ10. In the future, I would prefer taking an online course using the same blended approach over one that is 100% instructor-led.

SQ11. In the future, I would prefer taking an online course using the same blended approach over one that is 100% self-paced.

SQ12. In the future, if no online blended version of the course were available, I would prefer taking an online course that is 100% instructor-led over one that is 100% self-paced.

SQ13. In the future, if no online blended version of the course was available, I would prefer taking an online course that is 100% self-paced over one that is 100% instructor-led.

SQ14. I would recommend this course to other CORs.

Part 3: Essay Question (question not used as part of the research project)

SQ15: Please add any additional comments that you would like to share: