An Experimental Study to Test the Relationship Between Learner Control and Locus of Control on e-Learning in a Corporate Context

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ABSTRACT

Research has identified a relationship between instructional design and learner control, principally in face to face educational settings, where the selection of control types will have an impact on the learner. However, as Miltiadou and Savenye (2003) note, more research is required that will "shed light on which motivational constructs can be identified as predictors of success in an online environment." (p. 21). In both the corporate and academic arenas, there is a growing interest in online courses; however, there is a lack of sufficient studies on the effects of design criterion that can potentially heighten learner motivation and reduce attrition rates in online courses. Abdul-Rahman (1994) identified a similar concern with respect to dropout rates and suggested that "identifying factors that interact to affect students' completion or non-completion of a distance education course" (p. 9) would go a long way to arming administrators and distance educators with information and tools that will help reduce learner attrition in distance education.

This experimental study will test the relationship between learner control and locus of control as measured by scores on an assessment administered to selected employees of the Automobile Associate of America (AAA) Mid-Atlantic. The independent variables will be learner control and locus of control. Locus of control will be defined by each learner's score on the Adult Nowicki-Strickland Locus of Control Scale. Three dependent variables will be measured including assessment score, number of minutes spent in the learning program and amount of content viewed in an online, asynchronous course.

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Chapter 1: Introduction

The purpose of this research was to focus on the relationship between the design of online learning environments and learner characteristics, specifically locus of control, to determine those design strategies that may influence learner achievement when completing online learning. The costs for employee training in business in the United States grew from approximately $63 billion in 1999 to over $125 billion in 2009 (Patel, 2009). This increasing cost of training signals the importance of designing efficient and effective training that minimizes time spent learning. According to prior research (Chen & Macredie, 2002; El-Tigi & Branch, 1997; Gerjets & Scheiter, 2003; Schmidt & Ford, 2003), selecting a learner-controlled instructional design program can have a positive influence on worker assessment through higher scores. If both time spent in a course and amount of content viewed can be paired with learner locus of control through the selection of a particular instructional design methodology, then using this methodology to design and develop online learning programs will presumably have a positive effect on employee course assessment scores and, ultimately, an employee's level of skill development.

In today's tough economic condition, both training professionals and the organizations they work for are being asked to do more with less. Unfortunately, at a time when training budgets have decreased, the need for highly trained workers has increased. Both the increased responsibilities for training current and future workers coupled with decreased training budgets have pushed many learning organizations to adapt online learning to maximize their training efficiency. While the impact of this transition is often seen and measured in the learning organization's training budget, much less is known regarding the impact of online learning on a learner's progress in professional skill development and ultimately their career growth. Outside

the formal structure of higher education, adult learners are often tasked with the need to self-direct their own learning path. Literature in the field of adult learning supports this phenomenon and demonstrates that learning is now viewed as a personal event. As described by Bouchard (2009), some literature demonstrates that the learning process is more often activated as a result of the learner's intentional acts rather than a mandated curriculum. Studies in the literature also suggest that learners are seen as active participants in control of the learning process (Park, 2008). In each of these definitions, the learner is portrayed as voluntarily self-electing to pursue information.

As instructional designers increasingly incorporate advanced technology in learning environments, they must also become more aware of any potential barriers that prohibit learners from utilizing these newly designed and advanced educational vehicles. While instructional designers can control many of the external learner barriers to learning such as access to technology and physical ability to utilize technology it is equally important that they also understand the impact of internal barriers to learner acceptance of instructional technologies. Learning no longer requires group activity or instructor facilitation; rather, learning can be seen as both a personal event that can occur at any time by a single individual. Gaining the understanding of a learner's ability to voluntarily seek information may also lead instructional designers to a better identification of design styles during the instructional design process.

Three decades ago it was estimated that 70 percent of adult learning was self-directed (Cross, 1981). Furthermore, about 90 percent of all adults conduct at least one self-directed learning project per year and typical learners engage in five, spending an average of 100 hours on each project (Tough, 1978). This trend was documented among corporate learning

organizations when The American Society for Training and Development's Benchmarking Forum (2009) identified that 34% of all training was delivered via technology (see Table 1).

Table 1

2008 Percentage of Learning Hours (Available) via Different Delivery Methods, Averaged Across Organizations

	Live Instructor-Led			Self-Paced							Other Contributions		
				Computer			Print						
	(a) Instructor-Led Real	(b) Instructor Led Online	(c) Instructor Led Remote	(d) Self-paced Online (networked)	(e) Self-paced non-networked (CD-ROM, etc.)	(f) Mobile Technology (PDAs, MP3s, Cell)	(h) Self-paced Print	(g) Non-computer technology (audio/video)	(I) Other		All Instructor-Led	All Technology Based	All Online
2008	**61.16**	**5.16**	**1.74**	**26.89**	**0.53**	**0.23**	**1.76**	**0.48**	**2.05**		**68.06**	**35.03**	**32.05**
Minimum	10.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		28.90	1.00	1.00
Maximum	93.00	20.00	15.00	71.10	3.50	1.00	21.38	2.00	10.00		94.00	89.80	89.80
n	15	15	15	15	15	15	15	15	15		15	15	15
2007 (n=22)	54.48	4.19	1.32	30.56	1.84	0.34	1.69	0.48	5.10		59.99	38.74	34.75
2006 (n=21)	52.31	4.66	4.92	29.31	2.26	0.90	3.55	1.52	0.55		61.89	43.57	33.97
2005 (n=21)	63.75	3.08	1.20	23.02	2.44	0.20	2.71	0.53	3.07		68.04	30.46	26.10
2004 (n=26)	61.82	5.71	2.48	22.04	3.95	0.12	2.97	0.90	0.02		70.01	35.08	27.74

Note. From "*ASTD 2009 State of the Industry Report*" by J. Lemke, 2009, Alexandria, VA: American Society for Training and Development. Copyright 2009 by the American Society for Training & Development. Reprinted with permission

The same ASTD (2009) workplace survey of 37 public and private organizations also identified that for the first time since the organization began collecting data, a significant relationship between the percentage of content delivered via technology and the cost per learning hours used ($r=-.66$, $p<.05$) was noted. The interpretation of this relationship shows a higher percentage of technology usage corresponding to a lower learning consumption cost.

In 2011, ASTD released their State of the Industry Report which, among other respondents, examined the implementation of various course delivery methods for many Fortune

500 corporations. These companies reported the highest usage of technology-based delivery methods, delivering more than 40 percent of content via some form of technology. ASTD identifies economic uncertainty and employment instability as factors in the increase for technology based delivery methods.

These two trends are an indication that adults are continuing to play an active role in their personal and professional education and they are doing so with the aid and benefit of current instructional technology adopted by the organizations that employ them. Despite these findings, this trend, like many other trends, does not guarantee that online training programs will be utilized by those workplace professionals for which they are intended. Although widely available and easy to access, workplace professionals seldom utilize the breadth of online training programs that are designed to promote professional development and career growth within their organization. ASTD (2011) has recently found that use of technology-based learning decreased from 37% in 2009 to 34% in 2010, among the lowest level in 6 years. During this same 6 year period the use of instructor lead (classroom) training increased.

By having a better understanding of the barriers towards adult's pursuits of skill development via online learning, learning organizations and instructional designers will be able to design courses with elements that may enroll more learners, retain their participation for a longer period of time, improve the rate of knowledge retention and promote their career development via online learning.

Theory of Adult Learning

Andragogy represents a body of research used in this study and is defined by Knowles (1984b) as a theory of adult learning that emphasizes that adults are self-directed and expected to take responsibility for their decisions. Knowles' theory on adult learners makes the following

assumptions about instructional design: (1) adults should be informed why they need to learn something, (2) adults need to learn through experiencing, (3) adults approach learning as problem-solving, and (4) adults are more likely to learn when the information has immediate value. As self-directed learners, adults have unique learning needs and expectations that set them apart from early aged learners who, unlike adults, are typically placed in non-self-directed learning environments.

Based on these non-traditional, theoretical understandings, e-learning programs must be designed to fulfill these specific needs to ensure learner motivation if they are to be successful. Knowles's (1980) androgogy model which stresses need-to-know, immediacy of application, sharing of life experiences as a source of knowledge, independence and self-direction is presented as the predominate theoretical support for adult learner characteristics that are thoroughly identified by the literature.

Locus of Control

A second factor related to adults as learners is the locus of control characteristic. Julian Rotter (1966) first introduced the term "Locus of Control" as a result of work conducted with the United States Air Force. Locus of control is an individual characteristic that reflects the extent to which an individual views their actions as affecting outcomes in their life. Individuals who exhibit a strong internal locus of control believe that their success is directly related to their own efforts and abilities. Those with a strong external locus of control perceive events and factors affecting their lives as originating more out of luck or circumstances beyond their control than something they affect personally (Miltiadou & Savenye, 2003). As Abdul-Rahman (1994) notes the following:

> Locus of control is an attitudinal or belief variable that represents the individual's perception of the amount of personal or external control over life outcomes: it refers to an individual's inclination to attribute success or failure to himself or herself or to the external forces outside his or her control. (p. 31).

The importance of locus of control in regards to increasing motivation through instructional design is found in the amount of control over the learning process the designer is prepared to provide to the learner. The degree of learner influence and reinforcement while engaged in the activity are additional elements that must be considered by the instructional designer as they to have an effect on the learning outcome depending on the learner's perceived locus of control (Keller, 1983).

Learner Control

The third theoretical variable examined is the issue of learner control. Learner control in computer-supported learning represents the choice and sequencing of topics or exercises by the learner. The learner control paradigm is primarily concerned with specifying the nature of the tools that should be provided within the learning environment. These tools must be provided to enable the student to select and control: what is learned; the pace of learning; the direction learning should take; and the styles and strategies of learning that are to be adopted. The implementation of learner control depends heavily upon the provision of adaptable end-user interfaces, storage structures that are based on the use of hypermedia and suitably designed multimedia human-computer interaction methodologies (Barker, 1990).

The growth and development in learning technologies has provided both instructional designers and learners with new educational opportunities that were heretofore unavailable. These opportunities have opened a new arena in which adults can now pursue learning

experiences for personal satisfaction and growth as well as professional development for career advancement. In speaking to the current emergence of mobile learning utilization as identify by industry research, Tony Bingham, ASTD President and CEO, (ASTD, 2011) noted, "We intuitively understand that with each new technology, the way that people connect with the world and obtain information and skills evolves." (p. 42). This study will seek to examine the question of how mediated learning environments support, or hinder, learning performance while examining the relationship between course design and a learner's locus of control in a corporate context.

Chapter 2: Review of Literature

As organizations strive to find a competitive edge in a constantly changing and technology savvy environment, companies are investing more money in training than ever before (Salas & Cannon-Bowers, 2001). The focus on training programs has also evolved as businesses understand the importance of creating an employee base that is not only skilled but also able to adapt to changing environments. As technology advances and provides a more efficient means to traditional classroom training, businesses are looking to e-Learning as a means to meet their training needs (Brown & Ford, 2002; Kosarzycki, Salas, DeRouin & Fiore, 2003). As described by Kaplan-Leiserson (2002), e-Learning refers to "a wide set of applications and processes such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via internet, intranet/extranet (LAN/WAN), audio and videotape, satellite broadcast, interactive TV, and CD-ROM." E-Learning can take the form of a very structured or very flexible medium. When designed to be flexible, e-Learning allows the employee to accept control over the learning process.

At first glance, e-Learning appears to be an appropriate choice for adult learners based on the medium's ability to put the learner in control of addressing skill needs. By providing learners with the ability to control their learning selections, it would be logical to assume that they will accept more responsibility for learning. E-Learning would also assume to give learners the advantage of adjusting the training to their specific learning styles resulting in an increase of learner motivation, satisfaction with training, and transfer of know. Contrary to these assumptions, research indicates that e-Learning is not always the desirable environment for learners.

Non-Completion in e-Learning

Despite the recognized benefits for the use of e-Learning in learning environments, there are known issues that call into question the effectiveness of this delivery medium on various learner characteristics. Past research has demonstrated that there are aspects of e-Learning as a delivery mechanism that may not always justify the immediate savings and efficiency of delivery that have become the marketed benefits in the corporate sector. One known problem associated with e-Learning is the potential for increased levels of non-completion.

At various institutional levels, the term non-completion is often defined in different ways. One example from Moore (1995) demonstrates how even within a single university, different staff use different terms for different purposes, "The category of withdrawal is a large and complex one and includes a variety of different behaviors such as failure and in-voluntary withdrawal, voluntary withdrawal and transfer, occurring at different times in students' careers." (p.7). Moore (1995) also states that:

> The university Core Information report distinguishes between non-completion and withdrawal. Non-completion is a wider category, including internal transfers between courses, whereas withdrawal refers only to those students who permanently leave the university. However, withdrawal figures from Finance include temporary withdrawal, internal transfers (where money shifts between schools but is not lost to the institution) and cancellations where the place has subsequently been filled by another student… (p. 43).

Making the research even more difficult to compare, many mature students that do not complete courses do so for reasons that are not even related to the course. The diversity of adult learners in terms of age, economic, social and personal circumstance, and educational attainment results

in patterns of learning engagement that are very different from those of their younger, full-time learner, counterparts. Adult learners who engage in a learning program such as corporate training tend to be intermittent and more varied than younger students that are often required to complete education. While many adults do embark on a linear learning pathway in further or higher education, their ability to complete longer qualification programs can be affected by factors that are not shared by younger students who have stayed on in full-time education.

For example, adult learners are more likely to have a range of external constraints arising from their work, domestic obligations and financial commitments. As a result, many have to learn on a part-time basis, which means that it takes longer to achieve their learning goals. Lamdin (1997) attempted to explain how life events experienced at advanced ages impact a person's desire to engage in the learning process. In these cases, it was identified that transitions in life stages (i.e. loss of one's acquaintances, loss of health, loss of job) often became the impetus for self-directed learning. Second, mature learners are more likely than younger learners to be living at home and attending an education institution near to their home (or work). This proximity may not necessarily provide the best or most appropriate course to meet their purposes. Third, depending on the learner's age, an adult's qualifications may be out of date and some may lack confidence in their ability to successfully complete a training program if there has been a lengthy interval since they last engaged in formal learning.

The Learning and Skills Council (2002) which has responsibility for further education defines withdrawal from a training program as follows:

> A learner should be considered to have withdrawn from a program of study where he/she is known to have made a decision to withdraw from the program of study, or transfer from a full-time to a part-time program, or from a part-time to a full-time program. In

addition learners should be considered to have withdrawn where they have not attended classes for at least four continuous weeks, excluding holidays (unless there is auditable evidence of an intention to return). (p. 20)

While this is only one interpretation of non-complete it is important to note the statistics collected. According to this definition, the non-completion rates of learners aged over 19 on full-time, full-year program in 1999–2001 were approximately 3–4% higher than the rates for those under 19 years old (Learning and Skills Council, 2002). This data therefore suggest that older learners are overall less likely than younger ones to complete longer qualification-bearing programs of study.

Non-Completion: Contributing Factors

The literature in this field concedes that non-completion is a complex issue. Typically, it is found that there is a combination of reasons that lead learners to withdraw early from a training program. Some explanations for withdrawal do not express the real reasons so as to not threaten the learner's self-esteem or perceived acceptability. In other cases, the reasons given for withdrawal are due to a "last straw" or the least threatening to reveal (Cullen, 1994).

Inadequate pre-course information and guidance has also been as a significant factor in early withdrawal from educational programs. Research investigation into the factors influencing learning progression through higher education institutions identified that selection of the correct courses was fundamental to learners at all levels (Comfort et al., 2002). Unfortunately, the research has also indicated that adults often have a difficult time obtaining details and guidance on content, timetables, and workload prior to their enrollment in these educational programs (Dinsdale, 2001). Given a lack of information, these adults will also, incorrectly, turn to the guidance of peers, friends or family for educational guidance rather than instructional authorities

(Sims, 1997). Whether due to a lack of support from the educational institution or poor judgment in counseling options, adult learners sometimes put themselves in situations where they will not be prepared for the training program which ultimately leads to non-completions. In a review of the literature on the reasons for non-completions, McInnes, Hartley, Polesel and Teese (2000) proposed that the significant factors behind non-completions in vocational education and training and higher education were the wrong choice of subject, poor preparation and a lack of readiness and commitment.

Another cause of non-completion is a lack of learner participation. Crouch and Montecino (1997) state that the major reason for disappearance in virtual learner teams has to do with the students' feelings of not being connected. A simple solution to avoid this occurrence is to email reminders to the students to keep the learning process forefront in their thoughts. Studies comparing some adaptive variants of the learner control (LC) strategy with the traditional program control (PC) type of strategy have reported the superiority of the former over the latter (e.g., Gray, 1987; Park & Tennyson, 1984; Ross et al., 1980; Tennyson & Rothen, 1977). However, some studies reported that although LC tends to induce sustained learning activities, it sometimes causes early termination of the activities due to of inappropriate choices of practice problems, such as those that are too easy or too difficult (e.g., Atkinson, 1972; Fischer, Blackwell, Garcia, & Greene, 1975; Park & Tennyson, 1984; Ross & Rakow, 1981a). Thus, the LC strategy has resulted in poor academic achievement.

Workforce Applications

The corporate sector has identified value in online learning as a way of increasing competitiveness through ensuring that the workforce is continually learning and improving. Specifically, online learning is seen as an essential element of knowledge management, allowing

companies to become “learning organizations” (Senge, 1990; Rosenberg, 2001). Since training is costly, efforts are being made to find more cost-effective ways to train employees. As a result, online learning has been applied to fulfill the needs of large scale corporate training initiatives. Some large organizations have demonstrated significant financial and operating benefits as a result of switching to online training (Strother, 2002).

Recent rapid advancements in information technologies are changing the lives of workers and students. The number of educational courses and training programs moving to the World-Wide Web, the Internet, and corporate intranets is astounding (Bassi, Benson, & Cheney, 1996). Expansion of systems like internal networks to provide communication and training are useful in the workplace because they allow workers to share information throughout the course of work. These systems also facilitate communication and training across an organization that is geographically dispersed. Unfortunately, these tools have created problems for technology users. Specifically, employees have problems related to an accelerated pace of work and increased expectations for workers. Research has demonstrated that information technology has measurably contributed to rising levels of concern about the rise in required computer usage for many workers and students (Goldsmith, 2000).

Another concern regarding the use of technology mediated training deals with some incorrect assumptions about how learners construct information in these learning environments. First, the concept of knowledge control is described as an understanding that grows out of interacting with information and ideas so that the learner can actively construct knowledge by formulating ideas into works, and these ideas are built upon through reactions to the formulation (Harasim, Hilt, Tele, & Turoff, 1995). The literature on this topic implies that just the mere creation of an online environment will somehow facilitate the creation of these skills. However,

research has very clearly identified that without careful course design and moderation, learners are sometimes not able to construct their own meanings. If moderation guidelines for online discussion and sharing of ideas are not implemented, discussion can easily deteriorate into unsubstantiated opinions among students (Paloff & Pratt, 2001; Salmon, 2000).

A second misconception of technology mediated training focuses on the development of critical thinking skills. Organizations that use video, recorded webinars or other asynchronous training delivery methods cite the benefits of reflective, critical thinking among learners. The opportunity for students to challenge course materials, other student's viewpoints and to find and compare multiple sources of information should all assist with the development of critical thinking skills. With only a few exceptions (MacKnight, 2001; Bereiter, 2002), research in the field finds little evidence relating specific design features of online training programs to the development of empirically validated critical thinking skills.

The third assumption looks at the advantages of online learning as an opportunity to allow groups of learners that are geographically dispersed to work together on a common learning goal. Despite the practical advantages of distance learning (i.e. travel savings, time away from work, etc.) there is evidence that organizations with an international learning audience may place some learners at a disadvantage. Bates (2000) cited several cultural issues in teaching at a distance that arise from differing approaches in teaching and learning among different races. Without local cultural adoption of courses, it suggested by this research that "minority" learners may withdrawal from the training program.

Research-Based Strategies

In corporate settings, some instructors are found implementing delivery mediums that they are more comfortable using without pursuing empirical evidence that supports those tools.

One example is the ubiquitous use of PowerPoint in the contemporary work world (Hanft, 2003). Rather than use traditional tools without understanding their impact on the learner, it would be helpful for corporate training programs to investigate and implement research-based strategies when designing training programs. When integrating and applying training techniques that have been subjected to many empirical tests over the last several decades, instructors will be better positioned to present course information to learners in a way that enhances understanding. This is certainly true in the field of technology-mediated training where course non-completion is a serious drawback.

The literature specifically finds that some of the main outcomes of research based design relating to non-completion in distance education is that attrition can be significantly reduced by better course design (Tait & Mills, 2002). One example of this is found in the research on mature adult learners. Edwards (1993) found that the literature suggests that mature student experience is typically ignored and hardly ever incorporated into course work. Cullen (1994) further identifies that if learning content, delivery and teaching styles do not take into account the psychological impact of past experience, adults will continue to leave courses. The need identified here is for instructional designers to account for the ways in which adults learn. Lee (1991) argues that instructional designers should be more sensitive to the models of adult learning and design instruction that meets adult learners needs for tangible results:

> For those of us working in the arena of higher education, teaching methods and pedagogic philosophy were based upon the experiences of delivering courses to the typical A-level entrant. Our mature students shared a very different set of expectations, which most academics are not very well rehearsed in addressing… a pragmatic 'common sense' ideology of education born of the harsh realities of the modern workplace and

> which undoubtedly owed much of it character to a decade and more of "free-market" rhetoric. This led students to regard the course that we were offering primarily in terms of a commercial exchange and fostered in some students the expectation that unless they came away from each evening's study with a quantifiable number of communication skills or a set of 'facts' about communication which could be applied directly and immediately to their daily lives, then somehow they were not getting full value for their investment. (p. 370).

In a corporate setting where the single purpose of training programs is to support an organization's business goals, learners come to their learning environment seeking clear direction of how the material will help them do their job. Managers and supervisors, likewise, will be less likely to allow their employees to complete a course if it is discovered that there will be no tangible or immediate impact on work performance. This leads to another factor that impacts completion which is the creation of clear learning objectives. The literature shows that unpunctuality and absenteeism are often connected with dissatisfaction with the course content. The Further Education Development Agency of London (1998) found that students were far more likely to succeed in a course if their original expectations were matched or exceeded. Likewise, a significant number of students found their course different to their expectations and felt that they had been given little specific information about the program prior to enrollment. Instructional designers and facilitators can avoid these problems by developing clear course learning objectives and accurate course descriptions.

Understanding the challenges identified with e-Learning, training organizations must next look at the unique characteristics of learners and identify delivery systems that will meet these unique needs.

Adults as Self-Directed Learners

Learning is no longer seen as an event that requires group activity or instructor facilitation. Unlike the required learning that takes place in public schools and most undergraduate educational institutions, much of the knowledge that we acquire is collected via self-direction. Literature in the field of adult learning demonstrates that learning is now viewed as both a personal event. As described by Hake (1999), some literature demonstrates that the learning process is more often activated as a result of the learner's intentional acts rather than a mandated curriculum. Studies in the literature also identify that learners are seen as active participants in control of the learning process (Carre, 2000). In each of these definitions, the learner is portrayed as self-electing to pursue information.

The concept of learner as a participant in the learning process is frequently described in the literature as self-directed learning. Self-directed learning is a specific line of inquiry within the field of adult education. Knowles (1975) defined self-directed learning as:

> Self directed learning is a process in which individuals take the initiative, with or without the help of other, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes. (p.18)

In his research, Knowles (1975) identified the baseline definitions and assumptions that guided much of the research that exists today on self-directed learning: (a) an adult's natural orientation is task or problem-centered learning, (b) self-directed learning assumes that individuals grow in capacity and need to be self-directing, (c) individuals choose to learn what is required to perform their daily life tasks, (d) learners use their own experiences as resources for learning, (e) self-directed learners are motivated by many internal incentives, such as need for

self-esteem, curiosity, desire to achieve, and satisfaction of accomplishment. For the purposes of this literature review, special attention to studies carrying these attributes will be investigated although there are many other concepts that are often used interchangeably. Alternative terms for self-directed learning include self-planned learning, learning projects, self-education, self-teaching, autonomous learning, autodidaxy, independent study, and open learning. Although worthy of research, these terms typically offer varied, though sometimes subtly different, emphases.

More specifically this concept is often attributed to adult learners. An estimated 70 percent of adult learning is self-directed learning (Cross, 1981). About 90 percent of all adults conduct at least one self-directed learning project per year, and typical learners engage in five, spending an average of 100 hours on each project (Tough, 1978). The adult learner is distinctive in a number of ways, but among the most obvious is that he or she is a self-directed learner, rather than somebody who has been forced to attend school by legal and/or parental pressure; a free-willed consumer of education and training. Research in the field finds that adults are self-directed learners that plan, control and evaluate their own learning (Hatcher, 1997). Adults have needs for independence and autonomy that drive their pursuit of education. Garrison (1997) describes how self-directed learning is a natural part of the psychological and social development that defines adulthood.

Another description of self-directed, learning is that learning is actually a response to one's situation in life and that the particular stage in that life generates the context for learning. One specific part of the population where this phenomenon has recently been cited in the literature is in the lives of older Americans. As the Baby Boomer generation ages and advances in the field of medicine continue to allow older adults to live longer, society must further

investigate the learning needs of this part of the population. While much research has focused on the adult as a learner, Lamdin (1997) attempted to explain how life events experienced at advanced ages impact a person's desire to engage in the learning process. In these cases, it was identified that transitions in life stages (i.e. loss of one's acquaintances, loss of health, loss of job) often became the impetus for self-directed learning.

Some research attempts to define self-directed learning in terms of both the formality and length of the learning process. Self-directed learning can be displayed in short-term projects lasting hours such as hobbies and games (Tough, 1971), or much longer continuous and life-long efforts leading to knowledge experts (Garrison, 1997). For many self-directed learners the self-attainment of knowledge can lead to the achievement of new professions.

Finally, a definition of self-directed learning would not be complete without a discussion on the different proposed models for how learning takes place. The first set of models are described as a linear process which closely align with the view of learning as an intentional process with the learner always in control. Tough (1971) and Knowles (1984a) have both outlined this process of self-directed learning as a detailed, step by step process. While both models consist of decisions made by the learner, Knowles (1984a) describes self-directed learning in six consecutive steps including climate setting, diagnosing learning needs, choosing, and implementing appropriate learning strategies, and evaluating learning outcomes.

Cavaliere's (1992) interactive model of self-directed learning used a case study to demonstrate how the random experiences of one's life helped the Wright brothers learn how to fly, again portraying a complex series of events and decisions that lead self-directed learners to the attainment of information and achievement of learning goals. While the linear models appear to present a logical, cognitive order to self-directed learning; the larger body of literature

supports an interactive model with turbulent and sometimes chaotic events that transpire in life that lead to self-directed learning.

Self Directed Learning: Underlying Characteristics

The mass of literature in the field of self-directed learning has provided many definitions of self-directed, learners. Beyond the definition of the term, there is additional debate which examines the impetus for self-directed learning. To provide a better view on the initiation of this type of learning the literature suggests several different views. In order to fully understand how the literature breaks down the investigation of self-directed learning, Table 2 summarizes the literature's leading perspectives.

Table 2

Self-Directed Learning: Underlying characteristics

	Self-Directed Learning As…		
Author	Personality Construct	Learner Control	Instructional Design
Knowles et al., 1998	Social maturity, life roles and locus of control		
Keller, 1983	Perceived LOC and Learner Control		
Pratt, 1988	LOC impact on facilitator collaboration		
Martinez, 2003	LOC and persistence with online learning		
Barker, 1990		Human-computer interaction methodologies	
Morrow, Sharkey, & Firestone, 1993		Learner Independence in goal setting	
Atchoarena, 1995			Goal-Setting and Self-Esteem
Boyer, 2004			Scaffolds, resources, feedback, and expertise
Tough, 1978; Merriam & Cafarella, 1999			Real-life learning, autonomy and self-direction

Self Directed Learning: Locus of Control

The first area of discussion covered in the literature on self-directed learners addresses the need to investigate the characteristic of learner locus of control. As Abdul-Rahman (1994) notes:

> Locus of control is an attitudinal or belief variable that represents the individual's perception of the amount of personal or external control over life outcomes: it refers to an individual's inclination to attribute success or failure to himself or herself or to the external forces outside his or her control. (p. 31)

The importance of locus of control in regards to increasing motivation through instructional design is found in the amount of control over the learning process the designer is prepared to provide to the learner. There are also elements of influence and reinforcement of the learner's activities at play in instructional design that can be affected depending on the learner's perceived locus of control (Keller, 1983).

Research in the field of adult learning has demonstrated the use of locus of control to explain self-directedness. For example, literature indicates that self-directed learning is a pillar of adult learning, but the level of self-direction is impacted based on the adult learner's social maturity, life roles and locus of control (Knowles et al., 1998). This type of research allows the researchers to incorporate both learning skills and motivation as factors that contribute to self-directed learning. Pratt (1988) sees locus of control as an important characteristic of adult learners that influences their ability and/or desire to collaborate with a facilitator. Martinez (2003) suggests that learners with a strong internal locus of control show greater motivation and persistence in their e-learning endeavors and similar research has already identified areas where

instructional design can positively impact self-directed learner LOC, principally in face to face educational settings.

While the research on locus of control is comprehensive this construct's correlation to self-directed learning has been called into question by some researchers. Caffarella and O'Donnell (1987) have presented findings on several studies where they attempted to identify the relationship between locus of control beliefs and self-directedness. From their findings, they concluded that there are too many inconsistencies to represent a clear relationship.

Self Directed Learning: Learner Control

A second view of the underlying characteristics of self-directed learners under investigation in the literature is learner control. Learner control in computer-supported learning represents the choice and sequencing of topics or exercises by the learner. The learner control paradigm is primarily concerned with specifying the nature of the tools that should be provided within the learning environment. These tools must be provided to enable the student to select and control: what is learned; the pace of learning; the direction learning should take; and the styles and strategies of learning that are to be adopted. The implementation of learner control depends heavily upon the provision of: adaptable end-user interfaces, storage structures that are based on the use of hypermedia and suitably designed multimedia human-computer interaction methodologies (Barker, 1990).

As presented earlier in this paper, the literature finds that adults are self-directed learners that plan, control and evaluate their own learning (Hatcher, 1997). This literature is often used to demonstrate how adult learner participants vary in their level of desire to voluntarily control the circumstance surrounding the learning process to ensure practical relevance to their life experiences. In educational and work learning environments fully self-directed learning is rare

because of the pedagogical authorities and responsibilities of teachers and managers; however, there is self-directed learning in these environments because opportunities for self-regulation do present themselves. Self-regulation is the ability of the learner to control interest, attitude, and effort to the completion of a learning task. The key to self-regulation is the ability of the learner to understand the requirements of the learning goal, and then monitor effort without reminders, deadlines or other guidance from teachers, peers, or programmed guidance. This is a key tenant of self-directed learning where control gradually shifts from teachers to learners. Learners exercise a great deal of independence in setting learning goals and deciding what is worthwhile as well as how to approach the learning task within a given framework (Morrow, Sharkey, & Firestone, 1993).

In addition to the wealth of research on learner control there are also studies that bring to light the many questions remaining to be answered in this field. Relan (1991) claims that the concept of user control is one of the most important unresolved issues in the field of computer based instruction with questions such as "who should be given what kind of control for which types of instructional tasks?" being asked. Citing the work of Hannafin (1984), Snow (1980), Ross and Rakow (1982), Tennyson and Park (1984) he states that:

> Empirical studies which have examined an assortment of cognitive and affective variables, such as attitudes, prior knowledge, anxiety, personality variables, and inquisitiveness, in conjunction with a variety of micro and macro level control strategies, have revealed that not all learners make effective choices when actually allowed to do so. (p. 12)

This question signifies the need for future research on relationships of self-directed learner characteristics such as learner control on course design.

Learner Control

In addition to the various definitions for self-directed learning as it is referred to in this review, the literature takes several different perspectives on the characteristics that may eventually define this group of learners. Student motivation is a complex characteristic that comprises the various situational reasons why learners decide whether or not to engage in learning activities (Lumsden, 1994). This is a challenging concept to tie down as researchers must take into account many factors including attitudes towards education, individualism versus collectivism, and the role of the teacher. Perhaps a narrower concept is goal orientation. Caraway, Tucker, Reinke, and Hall (2003) define this learner characteristic as the learner's ability to make plans and set goals. Goal-oriented learners set challenging goals for themselves and maintain a commitment to achieving those learning goals.

The concepts of student motivation, metacognition, self-efficacy, self-regulation, locus of control, and goal orientation provide the foundation for a learner seeking to become a self-directed learner. While it is possible that a student can become a self-directed learner without instruction and development of these characteristics, it is more likely to occur when instructors foster them at the classroom level (Lumsden, 1994). Further research is needed to provide a greater breadth of empirically data that supports one of the perspectives presented in the paper.

The concept of learner control, synonymous with the terms self-guided and self-managed, is defined as allowing learners to make decisions among instructional events during a lesson (Schnackenbery & Sullivan, 1997) and has researched learners of all ages and covering a wide range of content. The term has seen variations over time, one broad view shared by, Shyu and Brown (1992) describes learner control as the degree to which a learner can direct his own learning experience. More specifically Hannafin (1984) lists the actual components of learning

that a learner can control to include path, pace and contingencies. As technologies have advanced and new learning paradigms created so too has the literature's definition of learner control. Today advanced technology enabled learning environments make it possible to allow learners to control depth of study, range of content and time spent on learning. For these reasons, Ross and Morrison (1989) explain that learner control is not a singular construct, but instead a collection of strategies than function in different ways depending on what is being controlled and by whom. Based on these various interpretations, perhaps the best way to view learner control is on a continuum of instructional strategies in which the learner is provided with options for controlling more than one aspect of the learning environment (Parsons, 1991).

One assumption about learner-controlled environments is that learning designed under learner control will be less aversive than if administered under program control. A study by Perlmuter and Monty (1997) stated that the "mere illusion of control" significantly improves motivation and performance due to a heightened sense of freedom for the learner. Despite the fact that this concept seems relatively intuitive, results from research have been essentially inconclusive with only general ability as the best predictor of performance (Cronbach & Snow, 1977). Atkinson (1972) proposed that there "is a place for the learner's judgments in making instructional decision…however, using the learner's judgment as one of several items of information in making an instructional decision is quite different from proposing that the learner should have complete control" (p. 930). Due in larger part to a lack of empirical research to make a blanket statement on the effectiveness of learner control, research in the field has focused on which specific elements of instruction a learner should have control over.

One contribution to the investigation of learner control in programmed instruction was performed by Frank Wydra in 1980. In his research, Wydra (1980) defined learner-controlled

instruction (LCI) as an instructional strategy that allows important learning decisions to be made by the learner, rather than by the instructor. More importantly, he envisioned a learning environment in which the effort put forth towards instruction is invested in design rather than delivery (Wydra, 1980). The result of this process is a computer-based environment in which instructional decisions are placed on the learner, while the instructional design provides desired learning outcomes that can be achieved. This vision of LCI was framed by the following three parameters: (1) learning occurs in a controlled environment, (2) the instructional designer controls the environment and not the actual instruction, and (3) the learner controls movements within the environment, including decisions to stay and leave. Wydra states (1980):

> ...it is necessary to emphasize the point that LCI is not learner anarchy. There *is* control. But it is on the environmental level. There *is* direction. But it is a function of the design of the environment. There *is* learner freedom. But it is within the consequences and resources that have been built into the environment. (p.21)

Wydra indicates that the LCI model does not delegate decisions about learning objectives, measurements or standards. These decisions are specified by the designer or, in a technology-mediated asynchronous learning environment, the instructor.

Even in today's changing landscape of learning technologies the benefits promised by giving learners control over their instructional decisions are appealing to instructional designers. Researchers have theorized that giving a learner control over their learning experience may lead to improved student achievement (Swaak & de Jong., 2001; Triantafillou et al., 2003; Corbalan et al., 2006; van Gog et al., 2005).

While the concept of learner control continues to remain an intuitively accepted design method for instructional designers and educational researchers, its apparent potential for

improving learning has never been experimentally established (Goforth, 1994). According to Parsons (1991), empirical research of learner control strategies have delivered "a montage of inconsistencies, contradictions, and caveats". Reeves (1993) also stated concern that much of the learner control research was simply pseudoscience. He concluded that learner control research has been plagued with definitional problems, theoretical problems, methodological problems, and analytical problems.

Not dissimilarly, Jacobson, Maouri, Mishra, and Kolar (1996) identified that the provisional nature of learner control research within a hypermedia environment has resulted from displaced attention on technology, methodological problems, and a lack of attention to relevant cognitive research. It is for this reason that instructional design emerges as an important element in the successful implementation of learner-controlled instruction. Kinzie, Sullivan, and Berdel (1988) commented that differences in research results may well have been due to variations in the instructional design of the computer assisted instruction (CAI) across studies, specifically in the types of learner control offered.

Program Control

Program control refers to a learning environment in which the selection and order of instructional events are made without input from the learner, while learner control refers to one where the learner is actively participating on the learning strategy. The condition in which there is complete learner control of everything (i.e.., learner control) has been described by Snow (1980) as the 'Adult Scholar Model'; and one where the learner has virtually no control (i.e. program control) as 'Child Robot Model'. In the former the learner dictates complete independence and self-direction while in the latter the learner is presented with fixed tasks, a fixed pace, and no ability to alter the learning path.

In a standard achievement/treatment study focusing on the benefits of program control, instructional variations are selected for learners and incorporated into their lessons. Ross et al. (1980), for example, prearranged self-study manuals in a way that each one contained a certain number of practice problems selected for the learner. Tennyson and Rothen (1977) programmed a computer to alter instructional online support based on probability estimation of the learner's needs. Although these studies yielded results that show achievement as seemingly less favorable to learner control than to program control, the evidence is equivocal. In fact, later research by Tennyson and Rothen (1979) suggested that program control seems to be less effective on tasks requiring minimal prerequisite knowledge and having simple content structure.

Other proponents of program control have found that various types of program control are superior to learner control when evaluating post-test achievement (Tennyson, Tennyson, & Rothen, 1980). This research demonstrates that learners do not know how to use the learning strategies to formulate, or manage, their learning environment. In some cases, learners develop more negative attitudes in the learner control environments due to a frustration formed from the complexity of the instructional decisions they are required to make (Gray, 1989). Another advantage identified for program-controlled instruction reported in the literature is an improvement in learning when the pace of learning (i.e. the length of time which information is presented on a screen) is controlled by the computer (Tennyson, Christensen, & Park, 1984).

One of the fundamental questions in the design of programmed learning environments is determining the nature of instructional control which will facilitate optimal learning outcomes. Early research exploring the topic of learner versus instructor control of instruction began in 1957. In his research, Newman studied outcomes of student vs. instructor design. In his work the student design method resulted in a significant advantage for learner control, leading the

author to summarize that the design method of allowing the learner to make decisions on the techniques employed during the study of a task had positive outcomes (Newman, 1957). In 1961, the concept of "learner-controlled instruction" or LCI emerged as a serious topic of educational research, appearing as the topic of a book written by Mayer and McCann and the subject of an experimental study by Robert Mager. Mager's study also resulted in a significant gain for the learner control group (Parsons, 1991).

In the 1970s, computer-assisted/computer-based instruction (CAI/CBI) had broadened the call for research investigating the impact of learner control design in programmed instruction. With the advent of CBI, proponents noted its ability to enhance learning through learner control (Young, 1996). One researcher noted that "one of the most powerful features of the computer is the virtually unlimited range of instructional control options available to designers of computer-assisted instruction" (Hannafin, 1984). Computers were utilized as the vehicle of instruction and variations made available to the learner ranged from control of a single topic of instruction, to control over multiple aspects, to complete learner control.

Throughout 1980, research in learner control was performed almost exclusively using CAI (Hicken, Sullivan, & Klein, 1992). Empirical research typically compared learner control and computer control, a research approach that was criticized for its inconsistencies and generally regarded as not valid (Reeves, 1993). Media comparisons altered the research focus to the vehicle itself, resulting in a technology centric research focus in which the medium, not the instructional design, was regarded as the vehicle that impacted learning and cognition directly (Ross & Morrison, 1989).

During this era, justification for developing self-guided instruction grew out of efforts to customize instruction based on the assumption that the learner knew what was best.

Customization in course design usually referred to instruction which allowed learners to navigate through instruction at their own pace and comfort level. This approach was based on an earlier, but still popular, model of instruction called the "Personalized System of Instruction (Keller, 1974) which contained five distinguishing features: a mastery requirement; self-pacing; student proctors; a reliance on written instruction; and a de-emphasis on lectures.

In the 1990s, research focused on the application of hypertext and hypermedia in programmed instruction. Almost a decade after Wydra claimed that the learner's control to decide when a tool will be accessed is a fundamental assumption of LCI, hypertext systems extended the reach of learner control by providing learners the means to access information in a sequence selected by themselves (Large, 1996). Leonard (1996) noted that the inherent hypermedia design characteristics of the World Wide Web highlighted the associative thinking patterns of an active learner and supports the concept of discovery learning. In essence, programmed instruction that incorporates hypermedia empowers individual learners by embedding control over the learning experience, enabling learners to make their own choices and to construct their own knowledge.

Research in hypermedia also lead to the identification of asynchronous learning networks (ALN). ALNs are described as learning environments that facilitate connections between learners, and learners and faculty (Mayadas, 1994). Consisting of computers, networks, telecommunications and the World Wide Web, this learning environment provides learners with the opportunity to pursue learning goals asynchronously. One of the most overt references to the connection between learner control and asynchronous learning environments has been made by Odin (1997). He acknowledged learner control as one of the "advantages" of a successful ALN environment, together with collaborative learning and active learning. Odin subsequently

commented that "with interactive technologies, it is easy to design learner-centered environments where the learner can take full control of their learning" (p.10). While commentary on the ease of design of these environments is subjective, ALNs do have the potential to fulfill Wydra's vision for learner-controlled instruction.

Learner Control vs. Program Control

Research studies have reported several advantages for allowing learners to have control in programmed instruction. Providing learner control over instructional strategy of a CBI has positively impacted retention of information and heightened learner interest (Newkirk, 1973). Learner control over review options in a CBI lesson has significantly increased test performance (Kinzie et al., 1998). Hansen (1974) found that learner control over feedback in a CBI decreased learner anxiety and increased performance and attitude.

Another perspective on a review of the literature demonstrates the existence of a broad range of learner and program control application. Rather than implementing a single control design method, prior research presents an arrangement of learning environments with varying degrees of learner and program control. The degree to which how much instructional control is implemented in programmed instruction is probably better stated as representing a continuum ranging from maximum program control to maximum learner control. Between these two ends there is a wide range of control variations.

The choice of the degree of control in instruction is the combined result of a variety of factors pertaining to the learner, the learning environment, and the subject matter being learned. As learners, learning environments and subject matter become more complex, the design and arrangement of learning environments have become equally complex. Appendix A provides a summary of different research on instructional control in learning environments. This data will

show how various researchers have defined instructional control, and when that type of control was identified as successful.

As newer instructional technologies, both hardware and software, become available to designers and proliferate into instructional environments, the possibilities for including learner and program-controlled design models will likewise multiply.

Another body of research that demonstrates the inconclusive findings regarding learner vs. program control is focused on the effects of instructional programs that are varied in length (Hannafin & Sullivan, 1996). In each study, the long (or full) version of instruction included the same amount of instruction as the learner-controlled short (or lean) version where the learner was given the option to select all of the optional element. Conversely, the lean version was also the same length as a learner-controlled full version in which allowed the learner to skip all of the optional instruction. The lean vs. full comparison allows researchers to examine learners in a lean program where they have the control to add instruction, or a full program in which they have control to skip instruction. Freitag and Sullivan (1995) found that subjects achieved significantly more in the full version of the instructional program even when they identified a preference for less instruction. On the other hand, Gray (1987) demonstrated that learners have a preference for instruction that is quicker to complete instead of one that helps them achieve more.

Despite a clear lack of consistent empirical evidence to support one design model over another there are several arguments for the use of learner control over program control. First, the philosophical approach of program control to establish a linear path of learning that eliminates a learner's ability to deviate from anything outside of the established learning goals runs counter to the educational practices sought by teachers in the arts and humanities which promote

exploration. Hansen (1983) suggests that allowing learners more control will increase the chances that teachers in these areas would want to include programmed instruction in their classes. So even if learner control cannot be proven to consistently influence student achievement there is strong evidence that this concept runs counter to general perceptions of instruction.

In more than a few cases, researchers have been relegated to an "all things being equal" philosophy when asked to justify the use of learner control over program control in instructional design. Steinberg (1984) provides a practical argument for the use of learner control over program control. He states that if there is no significant difference in learner performance between the two methods of instruction, then a learner-controlled method should be implemented due to savings in design costs and time spent learning and an increase in learner attitudes and motivation. From this viewpoint, if all methods are equal, the instructional designer should simply select the most efficient method.

From a psychological standpoint, a basic theory of learning supports an implementation of program control. Salomon (1984) identifies a process known as "invested mental effort" which would account for the effort a learner puts into thinking about the instructional choices they have to make. By freeing the learner to become an active participant in the learning process, the programmed instruction opens the door for more elaborate mental processing. This same mental processing results in a deeper, more meaningful learner as opposed to learners that may not be as cognitively taxed when following a program control design methodology.

From their program control viewpoint, there are also several propositions for the use of this instructional design methodology in programmed instruction. First, Lee and Wong (1989) found that students were unable to predict their own learning of both general and specific types

of knowledge. This finding supports the argument that students are typically ineffective at defining their current state of knowledge and would, therefore, not be successful in a learning environment where they are asked to make decisions regarding their learning progression. Carrying this point further, Fredericks (1976) found that in learner control CBI studies, high performers were more able than low performers to estimate their performance capabilities prior to completing assessments. If this is the case, research points to a learner's level of knowledge as the deciding factor for type of control with program control being better suited for a learner with lower knowledge levels.

Second, research has shown that degree of prior knowledge can be a screening tool for the type of control implemented into programmed instruction (Tobias, 1987). Students with no prior knowledge about the information being presented are not as effective at evaluating instructional decisions regarding what they do and don't know. In these situations, the learner is better suited for program control instruction which removes the consequences associated with poor use of learner control. Reisslein, Sullivan, and Reisslein (2007) found that engineering students with high prior knowledge of course information performed better on retention tasks under a fast rate of transitioning, and those with low prior knowledge performed better under a slow rate of transitioning. This finding is consistent with literature that finds that learner control would be a greater benefit to those learners with higher levels of prior knowledge (Corbalan & Snow, 2006; Merrill, 2002). Based on these findings it would appear that learners with lower prior knowledge would have a difficult time trying to learn new information while making choices about the instruction.

Learner control research has had a highly dynamic and frequently changing history. The term "learner control" has varied in definition, degree and type of control measured. Its

association with multiple theoretical perspectives has heightened the need for a singular theoretical framework. Its complexity as a research domain has produced more questions than answers. Its role as an essential element of programmed instruction has not yet been fully investigated, and its future as a primary tenet of learner-centered education is only implied.

Chung and Davies (1995) noted that learner control in programmed instruction has been one of the most important issues in the field of instructional technology yet. Others have expressed concern regarding the lack of a theoretical basis for learner control research and development (Reeves, 1993; Jacobson & Levin, 1993; Milheim & Martin, 1991). A technology based learning environment must be designed using a framework of learning theory. The successful application of self-directed learning in dynamic, interactive learning environments requires a design that fosters learner control.

Another challenge presented to researchers in the field of programmed instruction is the need for future research in the area of learner control to keep current with rapidly changing technology. The findings that state higher-ability learners perform better under learner control designed computer based instruction may need to be revisited in light of recent enhancements in technology. Changes in computers, mobile devices, software authoring tools and the breadth of internet information sharing that were not available during earlier learner control studies may impact new research.

The advent of rapid technology enhancements over the past several years has also created a common acceptance of programmed instruction, thereby eliminating many of the fears of CBI that may have impacted learner control studies. New forms of media have made learner control and free-access navigation common among a new generation of learners of all ability levels thereby raising the overall competence in the appropriate use of learner control (Schanckenbery

& Hillard 1998). Still many designers of CBI are concerned about how such control should be placed in the hands of learners without confusing them or otherwise interfering with their learning (Alomyan, 2004).

It appears that the debate between program control and learner control will continue until clear guidelines can be provided as to when it is appropriate to use each method. As stated by Lepper and Chabay (1985), the process of providing control to learners cannot be relegated to a "one size fits all" statement. Instructional design methods for the creation of programmed instruction will need to adapt to the many different types of learners, learning environments and learning topics.

Learner Control and Instructional Design

The concept of learner control is defined as allowing learners to make decisions among instructional events during a lesson (Schnackenbery & Sullivan, 1997). The benefits identified by come learner control studies have moved instructional designers to incorporate the issue of learner control while designing online instruction (Gergets & Scheiter, 2003; Schmidt & Ford, 2003). Van Gog et al. (2005) suggested that giving learners more control over the learning process as their skills increased would improve their performance during training and help foster the learner's ability to diagnose and correct problems they encounter in the future.

The primary assumption in support of applying learner control in instructional design is that learners know their own instructional needs and are uniquely positioned to identify the necessary instruction (Mager, 1964; Merrill, 1975). There are several arguments for why the topic of learner control should be factored into the instructional design process. To understand these arguments a review of the research demonstrates how the inclusion of learner control influences learner attributes such as motivation, locus of control and self-efficacy.

First, the act of designing instruction that maximizes the learner's ability to control the learning process has been shown to impact learner motivation. Militadou and Savenye (2003) found that allowing the learner to control learning positively affects motivation by raising the learner's expectancy of success through the belief that their effort to learn will yield successful outcomes. Similarly, when a learner is given the ability to control learning, their perception of the value of learning improves resulting in the student taking more interest in the content and process.

Another consideration is the correlation between control type and a learner's locus of control. According to Rotter (1966) locus of control (LOC) is an individual characteristic that reflects the extent to which an individual views their actions as affecting outcomes in their life. Individuals who exhibit a strong internal locus of control believe that their success is directly related to their own efforts and abilities. Learners with an internal locus of control; therefore, would be more likely to be motivated to learn than their external LOC counterparts, and would easily accept a high degree of control over the learning environment. Unfortunately, in real learning environments it is rare to find a group of learners that all possess the same LOC. For this reason Keller (2005) calls for instructional designers to accommodate this diversity by including control within the content that is relatively easy to use and gives learners a sense of direction from the learning experience.

A third learner attribute studied to be influenced by learner control is self-efficacy. Bandura (1997) describes self-efficacy as an "individuals' confidence in their ability to control their thoughts, feelings, and actions, and therefore influence an outcome" (p.6). Those learners with higher levels of self-efficacy will have a greater confidence in their ability to succeed in their learning environment and will be able to manage greater levels of learner control. From

an instructional design perspective, Ryan and Deci (2000) have identified that course instructors that are "autonomy supportive (in contrast to controlling)" create a greater sense of intrinsic motivation and desire for a challenge. The instructional designer can use degrees of control (learner or program) to situate learning so that it has a positive impact on the learner's efficacy. To do this, the designer must anticipate or identify the learning audiences potential efficacy so that a decision can be made to determine the level of confidence building that must be designed into the learning environment.

Despite the significant amount of effort that has been placed into the study of learner control, the results across the field remain inconsistent. While some research (Mager, 1964; Campanizzi, 1978) on learner control indicates that learners can successfully control their own learning other research has shown that learner control results in ineffective instructional choices (Steinberg, 1984). Several other researchers (Farrell & Moore, 2000; Swaak & de Jong, 2001) have found that the act of designing instruction using learner control properties results in little or no improvement in achievement.

Following a discussion on learner control, the literature also addresses the challenges of designing e-learning environments for self-directed learners. Various disciplines within education have long promoted self-directed learning as desirable. Research within the fields of adult education (Garrison, 1997), gifted education (Schillereff, 2001), and web-based instruction (Scheidet, 2003) has provided the effectiveness of this strategy. Unlike the classroom where learners, once they attend, tend to complete the course, e-learning relies more on self-directed learning where procrastination will prevent action. This reliance on the learner must be addressed by instructional designers.

It is not clear in the literature that even a positive learning culture in an organization will be enough to encourage participation in e-learning (Atchoarena, 1995). Rather, the first effort should be targeted at self-confidence or self-esteem. This means encouraging people to learn and to see themselves as having the potential to learn. Positive encouragement on as many occasions as possible, especially in appraisals, should promote a sense of self-belief, and even of a different self in the future. Part of this is the process of self-examination where the learner is encouraged to look at their skills, dispositions, interests and possible goals. Goal setting may be the most effective practical tool in getting over that first hurdle. To satisfy the needs of a learner in an e-learning environment, instructional designers must focus on design techniques that allow choice on entry, followed by choice and control over duration and pace, extended to control over the structure and content of the learning experience. This is precisely what e-learning offers (Atchoarena, 1995).

The development of computer-based instruction (CBI) has progressed from linear programming, which is described as presenting the same instruction to all students, to multifaceted, adaptive programs, which give the student a variety of options and ways to influence and select their course of study. The extent to which a learner can utilize learning options and constructively influence the learning environment and course of study has been a subject of considerable debate.

Despite the fact that research results have supported the advantages of branching over fixed sequence learning (e.g. Hurlock, 1972), the intuitive practicality of learner control has not been thoroughly proven. At best, some research may suggest that learner control of lesson sequence may only have a positive influence on learner motivation (McCann, Lahey, & Hurlock, 1973).

One of the more persuasive pieces of literature on the topic of learner control is provided by Merrill (1975). In his study, Merrill provides that given the opportunity to attempt a number of learning strategies through their own devices, learners will arrive at an individually optimum strategy of their own learning process. From the other side, there is research that suggests that instructional designers should use some method other than the learner's subjective assessment of his own understanding to control the learning environment. Ausubel (1963) and Bruner (1966) each have different suggestions for the mechanics of program control, but all made strong arguments for instructional designers to develop lesson materials in a hierarchical arrangement. These theories call for a lessening of student choice, even if the course of study must be adaptive to student needs.

Other proponents of program control have found that various types of program control are superior to learner control when evaluating post-test achievement (Tennyson, Tennyson, & Rothen, 1980). This research demonstrates that learners do not know how to use the learning strategies to formulate or manage their learning environment. In some cases, learners develop more negative attitudes in the learner control environments due to a frustration formed from the complexity of the instructional decisions they are required to make (Gray, 1989).

Between the positions of rigorous program control and learner control lie a variety of available alternatives for instructional designers. If one of the potential negative outcomes of learner control is the occurrence of non-productive responses, then a mixture of learner control and instructor guidance would seem to be appropriate. Both instructors and CBT, through the development of an experienced instructional designer who has labored over a lesson can, at the very least, point to a "normative" path that has been useful to other learners while allowing the learner to determine whether or not to follow the path. Based on the economics of lesson

development suggested by Hurlock and Slough (1976) and the benefits of learner control described by Merrill (1975) and others, an instructional design where the learner can be influenced to use an optimum strategy creates another instructional design possibility.

In his research on learner control, Snow (1980) presents the question of whether or not learner control alone can overcome all of the other individual characteristics not under the control of the leaner, but does play a significant role in how much the learner will gain. Because individual characteristics, like cognitive styles, do vary greatly across learners, it becomes challenging for instructional designers to create instructional systems that generate standard levels of learning.

Early developments of technology mediated learning were based solely on behavioral models which did not take into account individual learner differences such as aptitude or cognitive styles (Eysneck, 1993). The inception of cognitive learning theory shifted research towards the pursuit of cognitive-oriented methods of instructional design. If cognitive styles do constitute the significant traits of individual differences among learners, then they have important implications for instructional design. Cross (1976) stated:

> Individuals see and make sense of the world in a different way. They give their attention to difference aspects of the environment; tackle problems with different methods; construct relationships in distinctive patterns; process information in different but personally consistent modes; and acquire knowledge based on their knowledge structures. Style has a broad influence on many aspects of personality and behaviors; manifesting itself in perception, memorial tasks, cognition and metamemory, interests, social behaviors, and self-concept.(pp. 115-116).

Wallace and Gregory (1985) have identified that there have been literally thousands of research studies conducted on cognitive styles through which a large number of cognitive styles have been identified. The resolution to this problem is to extend research that matches instructional strategies with unique learner characteristics. For example, Driscoll (1987) calls for further Aptitude-Treatment Interaction (ATI) research to identify well designed and executed studies that assist instructional designers with the creation of targeted learning environments.

Research in the field of computer-aided learning (CAL) seems to indicate that learners are the best judges of their learning needs and strategies. In this work learner control is defined as allowing learners to make choices on learning examples, sequence of learning, pacing and practice. Program control in CAL is identified as letting the learning environment (i.e. computer program) make similar decisions for each learner. Literature on CAL compares variants of learner control strategy with traditional program control strategy and reports of the superiority of learner control (Gray, 1987; Ross, Rakow, & Bush, 1980). However, in this batch of literature criticisms can also be found. Research reports that although learner control tends to promote learning, it can also cause early learning termination because of inappropriate choices of practice problems, such as those that are too easy or too difficult (Atkinson, 1972; Park & Tennyson, 1980).

Given the inability of researchers in the field to come to a clear conclusion on the appropriateness of learner control in instructional design, future research may require closer looks at the individual characteristics of learners. Through an application of a learner characteristic, such as cognitive styles, to the instructional design process, perhaps researchers can get closer to a formula for using a mixture of learner and program control in learning environments.

Summary of Literature Review

Improvements in content authoring tools and network technologies in corporations have had important implications for lifelong learning including on the job training. For example, recent reports indicate that over $100 billion were spent on job training for the U.S. workforce (Clark & Mayer, 2008). Despite this investment in employee training there is much to be learned about ways to enhance the learning environment. As Miltiadou and Savenye (2003) note, more research is required that will "shed light on which motivational constructs can be identified as predictors of success in an online environment" (p. 21). As they point out, there is a growing interest by learners in online courses; however, there is a lack of sufficient studies on the effects of design criterion that can potentially heighten learner motivation and concomitantly reduce attrition rates in online courses. Abdul-Rahman (1994) identified a similar concern with respect to dropout rates and suggested that "identifying factors that interact to affect students' completion or non-completion of a distance education course" (p. 9) would go a long way to arming administrators and distance educators with information and tools that will help reduce learner attrition in distance education.

While some research provides blanket statements regarding all adults as self-directed learners, it has been demonstrated that not all adults are fully responsible, self-directing learners. As a result, it is important to consider how the characteristics identified in the literature thus far do not actually apply to non-self-directed learners. Merriam (2001) has replaced the notion that all adults should be self-directed with an image of individuals occupying different positions on a continuum of self-direction under different life and learning circumstances. This explanation describes that there are levels of self-direction that dictate a learner’s motivation to voluntarily pursue learning.

Other research identifies variables that influence a learner's level of self-direction. Ellsworth (1992) claims that adults with more formal schooling tend to be more self-directing than adults who lack this educational background. Adult educators have also found that some adults are incapable of engaging in self-directed learning because they lack independence, confidence or resources. Not all adults prefer the self-directed option and even the adults who practice self-directed learning also engage in more formal educational experiences such as teacher-directed courses (Brookfield, 1985).

Additional literature demonstrates how adult learner participants vary in their level of desire to actively control the circumstance surrounding the learning process to ensure practical relevance to their life experiences. For example, literature existing in the field today indicates that self-directed learning is a pillar of adult learning, but the level of self-direction is impacted based on the adult learner's social maturity, life roles and locus of control (Knowles et al., 1998).

The literature has demonstrated that there are various views on the impact of design control and locus of control on learner achievement. At the very least this body of research has identified that one of the most powerful features of technology mediated instruction is the virtually unlimited scope of instructional control options available to e-Learning designers. While much research has been conducted related to instructional control, little has been adopted by the instructional design and development profession. As a result, researchers must continue to seek evidence that helps to define how much, and what type of instructional control is desirable and productive for learners with different characteristics. Research the examines the influence of program versus learner control designs on learners with differing locus of control types could inform the development of more effective e-Learning programs for the corporate sector.

Chapter 3: Methodology

This chapter identifies and discusses the research design and methodology used to study the impact of course design (learner control vs. program control) and a learner's locus of control orientation (internal vs. external) on three outcomes of workplace online learning. First, information will be provided regarding why this study investigated the relationship between e-Learning course design and locus of control. Next, the research questions will be presented in order to clearly identify the study's specific areas of interest. This section will also identify how the research questions examined the impact of the independent variables on course assessment scores, the amount of time that a learner spent completing a course, and the amount of content viewed in a course.

Following the discussion of the study's importance and the research questions, the research design and those variables investigated will be addressed. This section will identify the experimental steps that were selected to properly analyze the data obtained on each of the selected variables. Finally, the author will focus on the research process utilized in conducting this study including 1) A discussion of participant demographics 2) An explanation of material development and its subsequent validation 3) A presentation of procedural stages implemented in partnership with the sponsoring company and 4) A discussion of the methods used for data collection and analysis.

Research Questions

To promote research in the field of online professional development, this study sought to answer the following five research questions.

1. Does a learner-controlled design (as opposed to a program-controlled design) affect course assessment scores in an online learning environment?

2. Does a learner's locus of control affect course assessment scores in an online learning environment?
3. Do learners differing in locus of control orientation perform differently on course assessments of online courses when they are given varying degrees of learner control?
4. Do learners differing in locus of control orientation view different amounts of content in online courses when they are given varying degrees of learner control?
5. Do learners differing in locus of control orientation spend different amounts of time in online courses when they are given varying degrees of learner control?

Research Design

A 2 x 2 factorial experimental study (Pedhazur & Schmelkin, 1991) was utilized to examine the effect of two categorical independent variables, learner's locus of control (internal or external) and type of instructional control (learner-control or program-controlled) on three dependent variables (assessment score, number of pages viewed and minutes in the course). A two-way ANOVA was used to examine the ways in which the locus of control variable and the control variable interacted to impact the outcome of the three dependent variables: assessment score, time spent in the course, and amount of content viewed. This factorial design approach resulted in four experimental groups, classified as follows:

1. Internal locus of control / Learner-Controlled.
2. Internal locus of control / Program-Controlled.
3. External locus of control / Learner-Controlled.
4. External locus of control / Program-Controlled.

The fours experimental groups (see Figure 1) were distributed into four quadrants of participants covering course design type and locus of control orientation.

		Locus of Control	
		Internal	External
Learner Control	Learner-Controlled	N=13	N=14
	Program-Controlled	N=28	N=15

Figure 1. 2 X 2 Two-Way ANOVA Design

Research Variables

Variable 1: Locus of Control

By identifying each learner's locus of control and examining individual scores on a course assessment this study sought to identify any relationship between the learner's locus of control characteristic and their level of success in online learning programs.

Variable 2: Learner Control

As technology advances, e-learning programs offer the ability to pass control of learning from the program designer to the individual learner (El-Tigi & Branch, 1997). The degree of control over instruction can range from complete external control by the instructor, or computer, to total internal control possessed by the learner. These many degrees of control can be placed along a continuum to include pacing the speed by which material is accessed by the learner, sequencing of instruction, degree of difficulty of the material being presented, and amount of practice the learner has to master the learning process/technique. In this study, learner control is placed in two categories and will be defined through (a) course design that allows a learner to make decisions about sequencing of learning content, and amount of time spent in a session and (b) amount of content viewed.

Program control, on the other hand, was defined through course design that does not allow for control of sequencing, practice time or amount of content viewed. In this study, the program-controlled treatment organized content in a specific, linear order where participants were able to access the content only in the path specified by the course menu. In this condition participants only had control over the pacing of instruction.

Participants

The participants represented a portion of the total workforce employed at AAA Mid-Atlantic. AAA Mid-Atlantic employs more than 2,600 individuals working in over 70 locations throughout five states and the District of Columbia. They provide services to members in the areas of automotive, homeowner and financial services, travel, insurance, and public and government affairs. Since AAA Mid-Atlantic employees are geographically dispersed, online training programs have been used since 2001. Today's struggling economic environment has forced AAA Mid-Atlantic to place an increased emphasis on online learning. In 2009, every employee was required to complete at least one online learning program. This effort resulted in over 14,000 course completions being recorded via the organization's learning management system.

The population was defined as full-time employees covering all levels of position throughout the company and ranging in age from 18 through 65 years of age. As this study was conducted during normal working hours, the organization's Human Resources department required that all participants would have the opportunity to determine whether or not they wanted to complete the locus of control assessment and have their scores used as experimental data. Volunteers received no financial compensation for participation; however, because the course

used in this study contained actual content required of participants to complete their job, completion of the course did count on the organization's learning transcript.

There were 300 participants who were instructed to complete the required coursework and all other components of the study within a one calendar month time period. Participants were informed that they would receive credit for the completion of the course in the organization's learning management system. All employees who volunteered to allow their assessment scores used in this study were currently participating in an online curriculum designed to educate employees on the organization's new primary membership system at the time of data collection. Successful completion of the course required participants to achieve a passing score on a computer based course assessment at the end of the specified course. These employees were notified via email of the opportunity to voluntarily participate in the study by completing a short locus of control assessment and then allowing their scores on the course assessment to be collected for data analysis. Participants that volunteered to allow their assessment scores used for this study were ensured their data would remain confidential and would not have an impact on either their jobs or position performance evaluations.

Prior to the initiation of this research, all instruments used in this study were sent to the IRB at Virginia Tech for review and final approval. In addition, Human Resources representatives from AAA Mid-Atlantic also reviewed these materials and provided written permission that these tools could be implemented within their organization. The letter specifying support of research data collection and the ability to publish research findings as part of a dissertation was also sent to the Virginia Tech IRB and approved (see Appendix D).

Materials

Item 1: Locus of Control Measurement

Prior to being granted access to the online course used in this study, participants completed the Adult Nowicki-Strickland Locus of Control Assessment (ANSIE) (1974) which was used to classify all participants as either internal or external in their locus of control. The ANSIE scale was developed in an effort to overcome some of the short-comings of existing locus of control scales and was specifically selected by the researcher for this purpose. One example found that while the Rotter (1966) scale continues to be one of the most popular measures for locus of control in adults, this scale has also been criticized for its relationship to social desirability, confounding of different types of locus of control, and difficulty in reading (Nowicki & Duke, 1983; Phares, 1976).

According to Nowicki and Duke (1974), the ANSIE instrument was designed to measure a student's perception of causality and correlates highly with instruments specifically designed to measure academic motivation. The 40 ANSIE questions were derived from the Children's Nowicki-Strickland I-E Scale (1974) and were modified for adults by changing the tenses of some statements and substituting the word "people" for the word "children" in others. The forty items are designed at the fifth grade reading level. Scores on the instrument can range from zero (i.e., a high internal locus of control) to 40 (i.e., a high external locus of control).

Reliability. Nowicki and Duke (1974) identified split-half reliabilities in the .60s for college (n = 156) and community samples (n = 33). They reported that the test retest reliability for college participants over a six week period to be r = .83 (n = 48). The relation of ANSIE scores to scholastic aptitude was also investigated. Nowicki and Duke (1974) found the relation between ANSIE and Scholastic Aptitude Test scores was not significant (r =. 11, n = 48). These

results are critical for research in the field of instructional design because it eliminates the potential for aptitude to account for any difference found between internal locus of control and external locus of control participants.

Validity. To ensure that a true measure of locus of control could be performed at each learner, several locus of control scales were considered. Ultimately, the ANSIE (1974) scale selected was found by Nowicki & Duke (1974) to have significant correlations with other locus of control scales including Rotter's (1966) original scale. Additionally, the validity of the ANSIE scale has been proven as an accurate indicator through its relationship to different individual learner characteristics (Nowicki & Duke, 1983).

Assignment of participants. The predominant method of participant assignment in locus of control studies is through the use of a median split to categorize participants into internal and external locus of control groups (Dolan & Arsenault, 1984; Wallston & Smith, 1994). While all data can efficiently be analyzed using this method, a problem arises when there are participants near the median that could jump into either category on any given day simply as a result of answering a single question differently. Cronbach and Snow (1981) discuss the median split as a method that removes statistical power. To minimize the effect that removing statistical power creates, they recommended an additional step of creating high and low blocks of participants from both ends of the distribution. By using the top and bottom third of scores of participants in their study, Cronbach and Snow (1981) found that by dropping the middle of the distribution, researchers can create a design that is more powerful than a study with the same *N* distribution over the full range of scores.

Based on the method outlined by Cronbach and Snow (1981) and implemented by other researchers (Halpin, 2005; Jones, Slate, & Marini, 1995; Pigge & Marso, 1994), this study

utilized the method of creating high and low blocks of participants to create internal and external locus of control groups. The external locus of control group, or high block, consisted of the top 45% of the distribution (29 participants), while the internal locus of control group, or low block, was comprised of the bottom 45% of the distribution (41 participants). The middle ten percent of the distribution, comprised of seven participants, were categorized as the neutral group and were removed from statistical analysis.

Item 2: Web Based Tutorial

Two versions of a single online course were created for the sponsoring organization. This course was developed to support the release of the organization's new membership data system. Course content focused on training employees how to use the new system to perform their current day-to-day responsibilities. The courses were focused on the new technology and did not cover processes and product knowledge. It was also assumed that learners completing these courses would have prior knowledge of the subject matter and would only be new to the system's user interface.

Both versions of the course contained identical content distributed across 25 pages and were only different in their course design (i.e. learner control versus program control). The learner-controlled version was self-paced and included topic selection, content selection (i.e. hyperlinks), feedback, and interactivity. The learner-controlled design was demonstrated by giving individuals the ability to control the path, pace and/or contingencies of the instruction, typically by specifying choices among a range of designer-embedded options. As the learner made decisions about which topics to be viewed, the course action scripting tracked those topics the learner accessed. Tracking was performed on each page within a topic so the data could

demonstrate the number of pages viewed in very specific terms. This data was not made visible to the participant as it was not relevant to the student's achievement in the course.

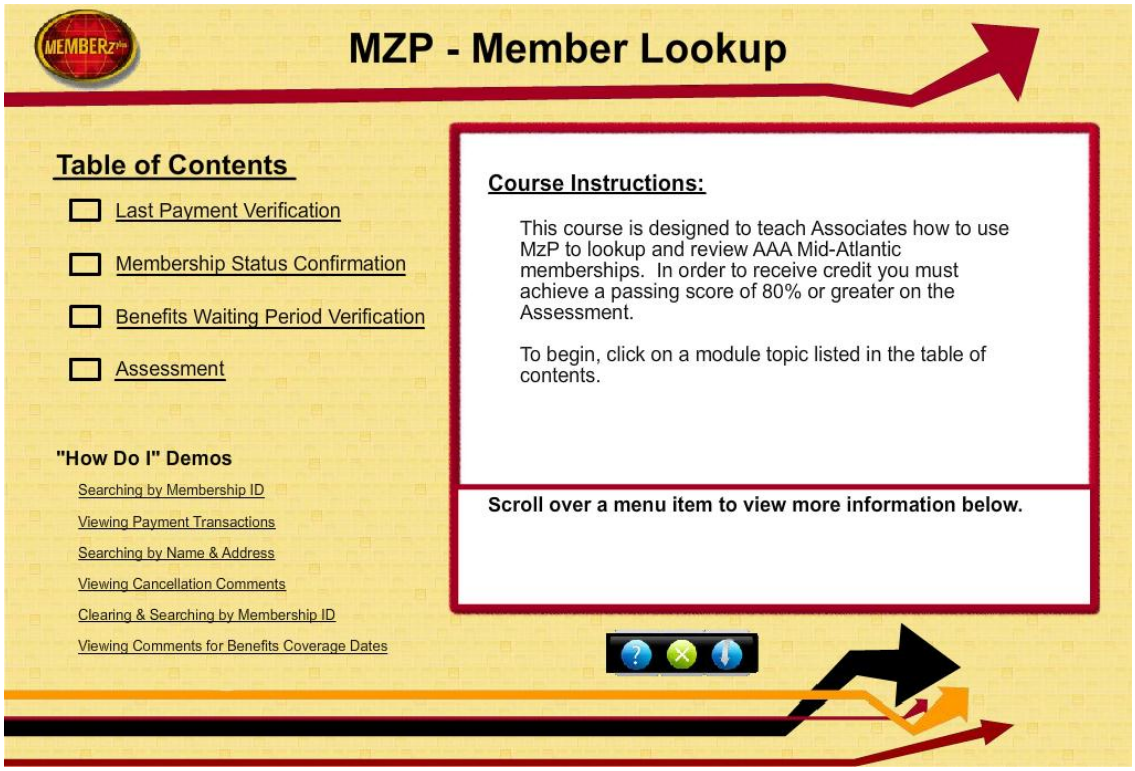

Figure 2. Learner Control Design User Interface

Referencing literature on program control from Hannafin (1984), this study defined program control as instruction in which all learners follow a predetermined path established by the designer without exercising individual judgment as to the appropriateness of the path. The program control designed version of the course dictated the path of instructional content and presented information in a linear order. Defined sequencing of data and was also implemented in the program control designed version. This programming feature ensured that the learner would view all data prior to completing the course. Finally, this version implemented little interactivity between the course and the learner to ensure that all course content was displayed. Both courses

had built in mechanisms to track the number of minutes a learner logged while completing the course.

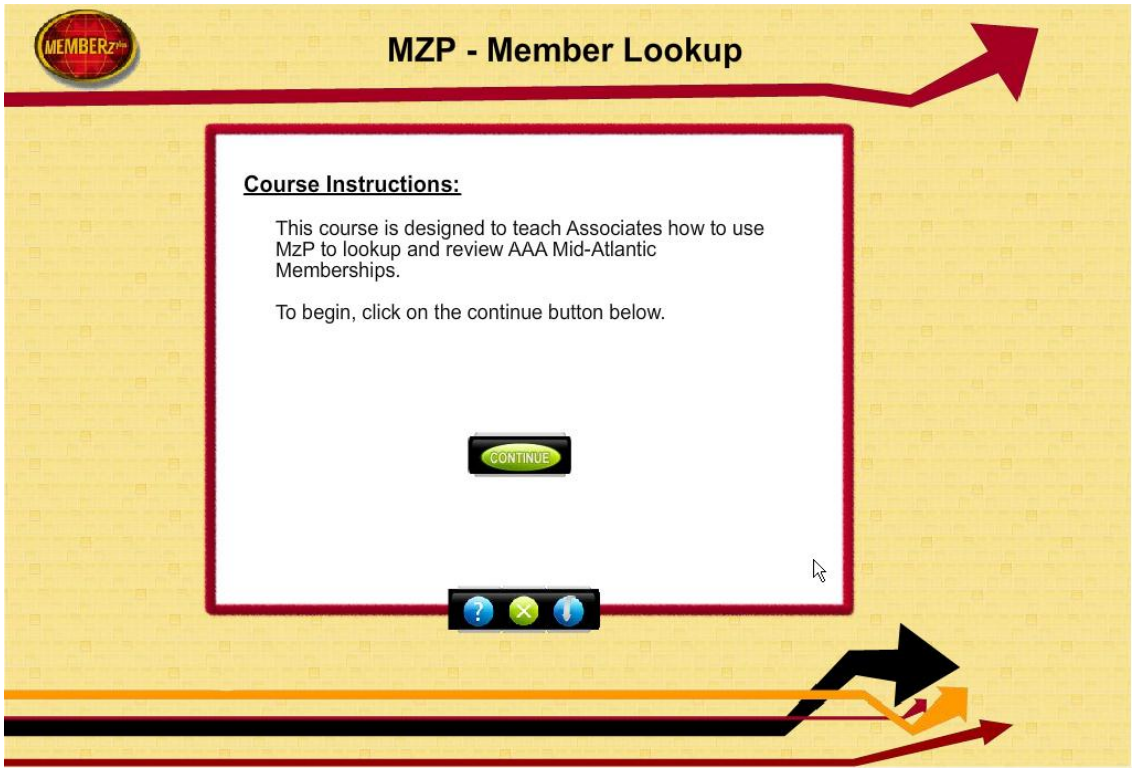

Figure 3. Program Control Design User Interface

Item 3: Course Assessment

Upon review of the course content, participants were asked to complete a 12 question multiple choice assessment. Questions contained in this assessment were presented in randomized order to prohibit sharing and memorization of questions for future tries. They were developed and validated by company assigned subject matter experts (SME) and directly reflected the content in the course. Six subject matter experts were appointed to the development of assessment content by the AAA Training and Development management team. These six individuals were acknowledged by the management team as being the most knowledgeable company resources available to validate content. Subject matter experts (SME) included: 1).

Member Services Trainer, 2) Travel Services Trainer, 3) Instructional Designer, 4) Supervisor of Membership Administration, 5) Manager of Membership Technical Support, and 6) Director of Membership Systems and Administration.

To ensure the 12 assessment questions reflected the skills learned in the assessment, the validation process included two steps. First, the Instructional Designer and Member Services Trainer reviewed course content to ensure that the correct answer for each question was reviewed at a prior point in the course content. Once this assurance was confirmed, the remaining members of the project team reviewed both correct and incorrect answers to validate that the incorrect answers could not be misinterpreted for correct answers and that correct answers accurately reflected the documented business rules that were used to develop the system.

In the event that the participants did not receive a passing score, a preview was provided with instructions on how to perform a specific skill. Participants were given unlimited opportunities to retry the course until they could successfully demonstrate knowledge of the skills being taught. In order to complete data collection in a timely manner, only data from the participant's first attempt to complete the course was used for data analysis. For the long term benefit of the company, participants were permitted to complete the course as many times as they needed until they had mastered the skills required to perform their job.

Procedures

The design and experimental phases of this investigation took place over an eight month period and were mapped out with the sponsoring organization's training goals and timelines for delivery of the course content. Every effort was made to keep the research work on track, while also being respectful of the company's needs and awareness that course development issues can,

and did, arise. The key stages of this research study are outlined as follows and were communicated to the sponsoring organization.

Stage 1

A kick-off meeting with the sponsoring company's Managing Director of Training and Development and research was initiated to provide a complete review of the experimental process. During this time the corporate representative was provided the opportunity to ask any questions relating to the project and the impact on participants. During this meeting the researcher provided the representative with a copy of the research consent form and requested written consent of the company's support of the research.

Stage 2

During the course design and development phase, the researcher constructed two e-Learning programs designed to both measure the variables presented in this study and meet one of the learning needs of the sponsoring company. The researcher partnered with company subject matter experts (SME's) and e-Learning designers to ensure that the content met company standards and specified business rules. The composition of the five member course development team included two e-Learning Designers, one Member Services Trainer, one Instructional Designer and one Manager of Learning Technologies and Design.

Stage 3

Once developed, both courses underwent alpha and beta testing phases to ensure course functionality prior to participant completion. All five members of the course development team had to certify that the course content and functionality met expectations prior to participants having the opportunity to complete the course.

During the alpha phase portion of the design phase, the five SMEs were requested to provide a thorough review of all course content, materials, and layout. Significant revisions to the course content were made during this time. The need for these changes was based on late technology changes made by the organization's Information Technology department to create a more user friendly interface and to accommodate legacy system process flows requested by business departments. Due to the broad scope of the system and the dynamic needs of each independent business department, there were many changes made in the online training program during the six month alpha phase. One example of a content change was the method by which users were permitted to lookup their membership data. A search feature was added to allow users to search member accounts via a credit card number. This change resulted in a training program change where additional simulation data was programmed into the course requiring the learner to learn more steps. Another system change was a user interface change for the membership billing system. A new screen layout that shifted billing buttons required course designers to capture new screenshots and reconfigure the existing simulation.

During the three week beta testing phase, the SMEs identified and documented all content revisions needed and communicated these necessary changes to the e-Learning designers. The e-Learning designers reprogrammed the courses according to the approved content upon completion of the final review of the course content.

The successful launch of the research initiative relied on the assistance of the sponsoring company to deliver research-related communications to the employees participating in the study. Support for this communication need was approved by the sponsoring organization prior to the launch of the research. Key messages were created by the researcher to serve the needs of both the company and the needs of the research initiative. All communications were designed to

ensure there was no confusion between the goals of the research program and each employee's responsibility for completing their corporate training requirement. A communication plan was crafted by the researcher and was also reviewed and approved by a representative of the sponsoring company. This plan identified all target audiences, key elements for the content of each message and delivery method selected for participants (see Table 3).

Table 3.

Communication Plan

Initiative/Key Message	Objective	Vehicle	Timing	Audience	Creator	Sender
Manager Awareness	Inform all management personnel of the request for voluntary participation of their direct reports	Phone Call	Three weeks prior to go-live	Management	Researcher	Creator
Participant Thank You and Kick-off	To thank each participant for their participation in the study and explain the research process.	Email	Two weeks prior to go-live	All participants	Researcher	Creator
New Course Creation	To communicate details about the upcoming requirements, timeline and related details (i.e. content)	Email	One week prior to go-live	All participants	Researcher	Sponsor company
Course Go-Live	To communicate launch and availability of the course.	Email	First day of go-live	All participants	Researcher	Sponsor company
Course Reminder	To remind participants of the current course requirement and their participation in the research study.	Email	Two weeks after go-live	All participants	Researcher	Sponsor company

Stage 4

The ANSIE (1974) instrument was administered to each participant prior to being assigned to a specific version of the course. After being identified as either internal locus of control or external locus of control, participants were exposed to one of two different types of course design, program-controlled or learner-controlled. Participants were unaware that they were completing one of two potential course design types, eliminating any possible impact from the perception that course design would play a role on the learner's performance during the course completion.

Because course completion was part of each employee's professional responsibility, each course attempt was completed during work hours. Due to the strict time demands of employees within the sponsoring company, participants were given the option to complete the course content in multiple sittings, or at one scheduled time if so required by their manager. The course was programmed with a bookmarking tool that allowed a participant to continue where they had previously stopped so they did not have to repeat previously viewed content. Participants were able to re-enter the course at any time, with the exception of the course assessment, but would only be presented with the ANSIE (1974) questions prior to the first time they entered the course since their locus of control score was not used after the learner's initial course assignment.

The course bookmarking tool was not implemented in the assessment portion of the course based on the organization's policy to not allow learners to leave a course in the middle of an assessment and re-enter at a later time. Once a participant began the assessment they were required to complete all parts of the assessment. If the participant elected to leave the course in the middle of the assessment, they would be required to re-enter the course at the beginning of the assessment and be provided with a new set of questions.

During the month the volunteer employees participated in the study, data was sent to the company's learning management system as participants completed their coursework. Aside from course bookmarking data, no course completion data was sent until the participant had completed the entire course. The researcher identified all participants who had not completed their course work during this phase and, when necessary, sent them a reminder communication encouraging them to complete the coursework as outlined in the consent form. Ultimately, 77 participants completed all three elements of the study, including the informed consent, the ANSIE locus of control survey (1974) and completion of the assigned online training program. The data collected as a result of these methods and the contributions of the 77 participants was used for statistical analysis.

Data Analysis

The researcher initially sent "requests to participate" to 300 employees via internet corporate email. Those employees that only completed one or two of the three required components were contacted by the researcher on two occasions (the first via email, and the second by phone) reminding them of the importance of the project and also asking for their continued participation. The 223 employees that did not complete the required steps after these additional communications had their scores removed from the data collection process and were eliminated from the study.

Data for this study consisted of 1) ANSIE (1974) locus of control scores, 2) achievement scores on a post course assessment, 3) number of pages viewed in the course and 4) amount of time spent in the course.

The scores for the ANSIE scale (1974) were used as an initial screening tool to identify participants as either internal or external in their locus of control orientations. Scores collected

for the ANSIE ranged from 2 to 27 with the lower scores presenting a greater orientation to the internal locus of control direction and the higher scores towards the external. For the purposes of this study, those participants scoring 9 or below were classified as having an internal locus of control and those participants scoring 11 or above were classified as having an external locus of control. Based on the methodology described by Cronbach and Snow (1981), the neutral group, consisting of the middle 10% of the distribution, was removed from analysis. Using these predetermined cut-off scores, 41 employees were placed in the internal locus of control orientation category and 29 employees were assigned to the external locus of control orientation category.

All course related data from each of the two designed courses were sent to the sponsoring organization's learning management system (LMS). In one instance, a learner's course completion data was not sent to the LMS due to a network outage which prohibited the course from communicating with the LMS and, as a result, that participant's attempt was removed from the study. Data collected by the LMS included assessment score, number of pages viewed, and number of minutes spent in the course. To perform the statistical analysis, the data stored in the LMS was extracted by the LMS System Developer and presented to the researcher in a Microsoft Excel spreadsheet. Course data was then combined with data collected during the LOC survey and entered into the Statistical Package for the Social Sciences (SPSS).

A factorial analysis of variance (ANOVA) was used to analyze the variance produced of all groups to determine whether genuine differences existed among the means. In this analysis, assessment scores, pages viewed, and time spent completing a course were used as dependent variables in three separate two-way ANOVAs. Degree of learner control and locus of control were the two independent variables in each of the tests (see Table 4). A post-hoc test was not

required as there were fewer than three groups (Howell, 2013). In all cases, significance was determined at the .05 alpha level.

Table 4.

Research Questions and Statistical Tools

Research Question	Independent Variable(s)	Dependent Variable	Statistical Tool
1) Does a learner control design (as opposed to a program-controlled design affect assessment assessments scores in an online learning environment?	Learner Control	Assessment Score	Comparison of Means (Main Effect)
2) Does a learner's Locus of Control affect post-assessment scores in an online learning environment?	Locus of Control	Assessment Score	Comparison of Means (Main Effect)
3) Do learners differing in locus of control orientation perform differently on assessment assessments of online courses when they are given varying degrees of learner control?	Locus of Control and Learner Control	Assessment Score	Two-Way ANOVA (Interaction Effect)
4) Do learners differing in locus of control orientation view different amounts of content in online courses when they are given varying degrees of learner control?	Locus of Control and Learner Control	Number of pages viewed	Two-Way ANOVA (Interaction Effect)
5) Do learners differing in locus of control orientation spend different amounts of time in online courses when they are given varying degrees of learner control?	Locus of Control and Learner Control	Minutes in course	Two-Way ANOVA (Interaction Effect)

A two-way ANOVA was used to check certain assumptions about the total participant group. Independence of observations was the first assumption checked during data analysis. Participants for this study were selected through an open request for volunteers. Participants were located in five states and represented different departments across the entire organization (see Table 5).

Table 5.

Distribution of participants across the organization

		LOC Type	
Geographic Data		Internal	External
State	*VA*	6	1
	PA	3	5
	NJ	6	6
	DE	15	31
	Home	1	3
Region	*Southern*	6	1
	Northern	9	11
	Central	16	34
Department	*Contact Centers*	8	18
	Automotive	4	7
	Retail	5	3
	Insurance	14	18

Additionally, volunteer participants were responsible for performing different roles in the system they were being trained to use on a day to day basis. All participants were employed by the sponsoring organization and that was the sole similarity among the group. As one would expect from an online course participant employees completed their courses at different times and at different locations based on the work schedules and office locations. The most important factor in this assumption was that all participants were randomly assigned to their treatment group. Once they were assigned the appropriate group, participants completed the coursework on their own without assistance from any other participant. Based on all of these factors, it was determined that the assumption of independence of observation was satisfied.

The second assumption that was tested was normality of distribution. This assumption requires that the course assessment scores for each condition are normally distributed. After

creating a Stem-and-Leaf plot in SPSS, the findings showed that the distribution of each dependent variable was even around the mean indicating that they were normally distributed.

The final assumption tested was homogeneity of variance. This assumption requires that the groups for each dependent variable (score, pages viewed and time spent) have the same variance. Levene's statistic (Levene, 1960) was used to test this assumption. The three dependent variables of time spent, number of pages viewed and post course score were found to have no significant results indicating that the variance of scores was comparable for both groups. See Appendix F for the results of Levene's Test for each of the dependent variables.

The methods described for this study were ultimately selected to apply an experimental design to the implementation of an actual e-learning program in an industry context. This cross section of real business scenario and experimental research did create some challenges in the development of course materials and ultimately the amount of time required to complete the study. Two governing bodies, the IRB at Virginia Tech and the Human Resources department of the sponsoring company, were utilized to monitor the methods implemented and ensure that both entities standards were followed to protect the participants and the organization.

Chapter 4: Results

This study focused on the relationship between the design of online learning environments and selected learner characteristics, specifically locus of control, to determine those design strategies that may influence learner achievement when completing online learning. As the result of a comprehensive literature review, the following research questions were identified and explored in this study. This chapter will discuss the results of the study and will use the data obtained from the participants to provide answers to the five research questions.

1. Does a learner-controlled design (as opposed to a program-controlled design) affect course assessment scores in an online learning environment?
2. Does a learner's locus of control affect course assessment scores in an online learning environment?
3. Do learners differing in locus of control orientation perform differently on course assessments of online courses when they are given varying degrees of learner control?
4. Do learners differing in locus of control orientation view different amounts of content in online courses when they are given varying degrees of learner control?
5. Do learners differing in locus of control orientation spend different amounts of time in online courses when they are given varying degrees of learner control?

Research Question 1: Impact of Program Design on Assessment Outcomes

Does a learner-controlled design (as opposed to a program-controlled design) affect course assessment scores in an online learning environment?

A two-way Analysis of Variance (ANOVA) was used to answer this research question. The results of the two-way ANOVA on course assessment scores found no significant main effect for course design. The main effect of program design was not significant (F=1.858,

$p<0.05$). Furthermore these results suggest there was no support for the belief that learners completing an online learner-controlled course would perform better on a course assessment than those learners who completed the program-controlled version of the course. The findings of this research suggest learners attained the same level of performance as measured by the assessment regardless of their group assignment.

Research Question 2: Impact of Locus of Control on Assessment Outcomes

Does a learner's locus of control affect course assessment scores in an online learning environment?

Once again an analysis of variance was used to analyze the date relating to this research question. The results of a two-way ANOVA on course assessment score found a significant main effect for locus of control orientation. The main effect of locus of control is significant ($F=9.993$, $p<0.05$), which indicates that participants with an internal locus of control obtained significantly higher scores on course assessments in online training program ($M = 93.80$ percent correct) than do those with external locus of control ($M = 87.52$ percent correct). Following established protocol, a post hoc test was not performed for LOC because there were fewer than three groups examined (Howell, 2013).

These results support the idea that learners with an internal locus of control will obtain higher scores on a course assessment after completing an e-Learning program than those learners with an external locus of control. This finding is supported by Findley and Cooper's (1983) research that identified a positive relationship between learners with an internal locus of control orientation and learning achievement as verified by course assessments.

Research Question 3: Interaction Between Locus of Control and Program Design on Assessment Outcomes

Do learners differing in locus of control orientation perform differently on course assessments in online courses when they are given varying degrees of learner control?

This researcher defined course assessment scores as the participant's percentage of correct responses on the assessment. Using this definition, the highest possible score any participant could obtain was one hundred and the lowest possible score and participant could obtain was zero. In this study the participant's actual scores on both course assessments ranged from 58 percent to 100 percent. A two-way ANOVA was utilized to identify any interaction effects between course design type and locus of control orientation. The results of the two-way ANOVA (see Appendix G) showed no evidence (at the .05 level of significance) to support an interaction between course design and locus of control for course assessment scores, $F(1,66) = .01$, $p>0.05$.

Based on the results of a two-way ANOVA on course assessment scores, this research found no significant interaction effect for locus of control orientation and course design. Both internal LOC and external LOC learners recorded the same level of performance in their classification regardless of the course design method to which they were exposed. In view of this finding, the idea that learners with an internal locus of control orientation completing a course that is designed using learner control properties will perform better on a course assessment than those learners with an external locus of control orientation cannot be supported.

Research Question 4: Interaction of Locus of Control and Program Design on Number of Pages Viewed

Do learners differing in locus of control orientation view different amounts of content in online courses when they are given varying degrees of learner control?

An initial analysis of the data (see Table 6) was used to examine marginal means, standard deviations and overall totals for pages viewed. This analysis also identified changes in the number of pages viewed with different course design types. An examination of mean group pages viewed sought to determine what differences, if any, were reported between internal LOC and external LOC participants.

Table 6.

Summarized table of participant scores and mean groups scores for pages viewed

		Control Type		
LOC Type		Learner	Program	Mean Group Pages Viewed
Internal	*M*	31.15	29.04	29.71
	SD	2.230	5.117	28
	n	13	28	41
External	*M*	33.93	26.07	29.86
	SD	5.863	1.486	5.749
	n	14	15	29
Total	*M*	32.59	28.00	29.77
	SD	4.635	4.429	5.011
	n	27	43	70

The number of pages viewed by a participant while in the online course was tracked and summed regardless of the number of times the participant viewed each page. The maximum number of pages viewed was solely dependent on how frequently a participant needed to review the content on the screen to effectively retain the information and successfully pass the assessment. In the program control course, where every page in the course was required to be viewed prior to taking the assessment, participants were required to view all 25 pages. In the learner-controlled course the participant could bypass the content and attempt the assessment

without viewing any course pages; however, no participant elected to follow this path. The actual number of pages viewed through both courses ranged from 25-45.

A two-way ANOVA was conducted to identify any interaction effects between course design type and locus of control orientation. The results of the two-way ANOVA (see Appendix H) showed evidence (at the .05 level of significance) that supported an interaction between course design and locus of control for pages viewed, $F(1,66) = 6.98$, $p>0.05$.

Based on the results of a two-way ANOVA using number of pages viewed, this research found a significant interaction effect for locus of control orientation and course design, $F(1,66) = 6.98$, $p<0.05$). As a result, there is support for the idea that learners with an internal locus of control orientation completing a course designed with learner control properties will view more course content, in terms of pages, than those learners with an external locus of control orientation in a similar course design.

Research Question 5: Interaction of Locus of Control and Program Design on Amount of Time Spent in a Course

Do learners differing in locus of control orientation spend different amounts of time in online courses when they are given varying degrees of learner control?

As in research question number four, an initial analysis of the raw data (see Table 7) was used to examine marginal means, standard deviation and overall totals for time spent in the course. This analysis also identified how the total minutes spent by the participant in the course changed under the different course design types. An examination of means sought to determine if there was a difference between internal locus of control participant scores and external locus of control participant scores.

Table 7.

Summarized table of participant scores and mean groups scores for time in course

LOC Type		Control Type		Mean Group Time in Course
		Learner	Program	
Internal	*M*	21.9700	19.7771	20.4724
	SD	12.37421	8.99135	10.07837
	n	13	28	41
External	*M*	22.2343	15.0973	18.5428
	SD	11.07838	6.12232	9.42850
	n	14	15	29
Total	*M*	22.1070	18.1447	19.6730
	SD	11.49150	8.34019	9.79152
	n	27	43	70

The amount of time a participant spent while actively engaged in one of two course designs was represented as the number of minutes from the moment the course was launched in the learning management system to the moment the participant exited the course. In instances where the participant exited the course prior to completion and returned at a later date, the number of minutes recorded from the second course attempt were added to the prior totals. The researcher set no limitation on the amount of time a participant was able to spend in the course; however, some employees were scheduled to complete the training within designated timeframes by their manager. The maximum number of minutes spent in both courses was solely dependent on how long a participant needed to review the content in the course (including all attempts) to effectively retain the information and successfully pass the assessment. The actual amount of time in the courses ranged from four minutes and seventeen seconds to fifty-seven minutes and two seconds.

A two-way ANOVA was conducted to identify any interaction effects between course design type and locus of control orientation. The results of the two-way ANOVA (see Appendix I) showed no evidence (at the .05 level of significance) to support an interaction between course design and locus of control for time spent in a course, $F(1,66) = 1.05$, $p>0.05$.

With no interaction between course design and locus of control for time spent, only the two main effects of locus of control and design type were examined. As a result of this examination, neither the main effect of locus of control, $F(1,66) = .84$, $p<0.05$, nor the main effect of Design type, $F(1, 66) = 3.73$, $p<0.05$, was significant.

The results of a two-way ANOVA using the amount of time the participant spent in the course, found no significant interaction effect for locus of control orientation and course design. As a result, the idea cannot be supported that learners with an internal locus of control orientation completing a course that is designed using learner control properties will spend less time in a course than those learners with an external locus of control orientation.

In summary, the findings for the five proposed research questions generated mixed results (see Table 8).

Three of the research questions presented in this study generated findings of no-significance. For research question one, course assessment score was found to have no significant main effect for course design indicating that the course design type had not impact on how learners performed on the course assessment. In research question three, no significant interaction effect was found for locus of control orientation and course design. Based on this finding, the idea that learners with an internal LOC will perform better on a course assessment when completing a course designed with higher levels of learner control cannot be supported. In this study, all participants performed the same regardless of the course design method to which

they were exposed. Finally, research question five examined the amount of time the participant spent in the course, and found that there was no significant interaction effect for locus of control orientation and course design. No further analysis can be warranted from these findings as learners with an internal LOC orientation spend the same amount of time in a course designed with high levels of learner control as those learners with an external LOC.

Table 8

Results for Five Research Questions

Research Question	F
1) Does a learner control design (as opposed to a program-controlled design affect assessment assessments scores in an online learning environment?	1.86 (Comparison of Means)
2) Does a learner's Locus of Control affect post-assessment scores in an online learning environment?	9.99* (Comparison of Means)
3) Do learners differing in locus of control orientation perform differently on assessment assessments of online courses when they are given varying degrees of learner control?	0.01 (Two-Way ANOVA)
4) Do learners differing in locus of control orientation view different amounts of content in online courses when they are given varying degrees of learner control?	6.98* (Two-Way ANOVA)
5) Do learners differing in locus of control orientation spend different amounts of time in online courses when they are given varying degrees of learner control?	0.84 (Two-Way ANOVA)

Note. * Significant at the $p < 0.05$ level.

Beyond these findings of no-significance, two research questions did result in significant findings that should be considered for further discussion. In research question two, this study found a main effect of significance where learners with an internal locus of control orientation showed better scores on course assessments as compared to those with an external locus of control. In research question four, the dependent variable of pages viewed in an online course is

the only instance where the interaction of a learner's locus of control and the course design methodology was significant. Implications and importance of these findings will be discussed in Chapter 5.

Chapter 5: Discussion

This study was designed, implemented and conducted with the goal of providing organizations with research based evidence that could be considered, and possibly utilized during the design of online learning programs. After reviewing the available literature, a research design was created to examine how differing degrees of learner control in an e-learning program would interact with a learners' locus of control orientation to affect leaner's performance. In addition to the traditional metric of course score (i.e. student achievement); the literature review identified two additional variables that were investigated in this study. The two dependent variables that were added to this study's design were the time spent completing a course and the amount of content viewed. As suggested in the current literature, these two variables were included in this study to investigate the potential impact each may have on the amount of time savings for a corporate employee.

Research Question 1

The first research question sought to research the impact of program design on assessment outcomes. Based on the findings, it is noted that the application of various course design methodologies (learner-controlled and program-controlled) have no impact on a learners ability to improve assessment scores.

This finding is consistent with a majority of past research which examined the impact of individual learner performance when given varying degrees of control over the learning process. While some previous research indicated that learners tended to experience higher levels of performance when given control of their learning process (Chou & Liu, 2005; Hannafin & Sullivan, 1995; Kopcha and Sullivan, 2008; Liu, Chiang & Huang, 2007; Shyu & Brown, 1995) other researchers reported individuals performed worse when given control over the learning

process (Coldevin et al., 1993; Paolucci, 1998). The dilemma these conflicting results create tends to continue the spirited debate over this issue. Interestingly, a meta-analysis of similar research reported that most studies found no significance related to the learning process design variable (Farrell & Moore, 2000; Quade, 1993; Schnackenberg, 1997; Swaak & de Jong, 2001).

While this study found no significance between learner performance and the learning process, there is a benefit to be gained for those learning organizations seeking to find the correct mixture of course design for individual learning needs. Most contemporary authoring tools such as Adobe Flash, Camtasia and Captivate all allow for a high degree of customization of course navigational controls. As a result of this flexibility in customization, course developers may spend additional development hours using these tools to create a dynamic interface with the goal of allowing users to create customized learning experiences. A finding of no significance for the impact of course design should, at a minimum, serve as a reminder for course developers to not invest considerable time in perfecting customized navigational controls associated with course design. Rather, course developers may make better use of their development time if they place their emphasis on just-in-time delivery of learning content.

Research Question 2

The second research question sought to research the impact of locus of control on assessment outcomes. Based on the findings, it is noted that those learners with an internal locus of control are more successful on assessments than learners with and external locus of control. This finding is consistent with much of the existing research on locus of control. Gifford, Briceno-Perriott, and Mianzo (2006), found that first-year students who entered a university with lower scores on the locus of control scale (internals) obtained significantly higher GPAs than those who scored higher (externals) on this same scale. Additionally, both Bolen and Webster

(1996) and Tella, Tella and Adeniyi (2011) have found locus of control to be a significant predictor of academic performance with higher levels of academic performance being associated with a more internal locus of control. Each of these studies add weight to the findings of this study which places significance on a learner's locus of control orientation.

The primary value of this finding from a corporate perspective is it helps to identify those training delivery methods that will address employee learning needs based on locus of control orientation. Employees whose locus of control orientation is known by their training department, or their manager, prior to training can be guided to learning environments that will better facilitate individual skill development. Employees with an internal locus of control may be better suited for participation in e-Learning programs. The practice of matching training delivery method to an employee's locus of control orientation will prove invaluable to those corporate trainers who tend to send every employee, regardless of locus of control orientation, through the same learning environments in an effort to save the company training funds. By recognizing the relationship between locus of control orientation and training delivery method the cost of spending time away from the job and not learning new skills greatly outweighs any expense absorbed in helping employees with an external locus of control orientation find resources for instructor led training.

Research Question 3

The third research question sought to examine how the interaction between locus of control and program control would impact a learner's performance on an assessment. Based on the findings, it is noted that internal LOC and external LOC learners recorded the same level of performance in their classification regardless of the course design method to which they were exposed.

In a similar study, Halpin (2005) investigated the relationship between course design with varying learner control and locus of control orientation and found that there were no significant differences in achievement based on participants' locus of control orientation or control group. Similar studies have suggested that a comparison of the two variables is warranted to better guide instructional design efforts (Chang & Ho, 2009). Chang and Ho (2009) anticipated those learners with an internal locus of control would prefer a greater degree of control and would use this freedom of control to efficiently navigate the course content and record higher levels of performance on their course assessment. The findings from this employee research group indicated this was not the case. Interestingly, internal LOC learners did not score higher on the assessment portion than their external LOC counterpoints. These findings also demonstrated that within the internal LOC group, assessment scores did not vary after completing different types of courses. Based on these findings content developers may want to demonstrate extreme caution before focusing exclusively on the needs of internal LOC learners when developing online courses.

Research Question 4

The fourth research question sought to examine how the interaction between locus of control and program control would impact how many pages of content each learner reviews in an e-learning course. Based on the findings, it is noted that internal LOC learners completing a course designed with learner control properties will view more course content, in terms of pages, than those learners with an external locus of control orientation in a similar course design.

Given this research did not find a positive correlation to student achievement and course design, this current finding can be discussed from contrasting viewpoints. One viewpoint could be, if there is no benefit to the learner in terms of greater scores on knowledge assessment then a

corporation would not want to encourage employees to spend any more time in a training course than is absolutely necessary. From this perspective, it would simply be better for the organization to have the employee view the minimum amount of content necessary for learning, demonstrate mastery of the skill and return to the job as quickly as possible. This viewpoint would be supported by studies (Farrell & Moore, 2000; Gray, 1987) that demonstrated learners often preferred a version of learning that is quicker to complete as opposed to one that helps them learn more.

A second viewpoint that could be interpreted may be that a motivational component is at work for employees. Pairing a course design with a learner's locus of control orientation appears to promote the learner's engagement in the course which results in more content being reviewed. This finding also indicated that an employee with an external locus of control orientation does not desire to view as much content in a learner-controlled design as their internal locus of control counter parts. This finding is similar to research which has studied the effects of learner control in versions of the same program that varied only in length. In these studies, learners in the longer (or full) version were able to select all optional elements from the learning program whereas those in the shorter (lean) version were able to bypass the optional elements (Freitag & Sullivan, 1995; Hannafin & Sullivan, 1996). This finding may be a key towards engaging the learner and promoting completion of online courses. Further research in this area should be conducted to assess the significance of course design and locus of control on amount of content viewed.

Research Question 5

The fifth research question sought to examine how the interaction between locus of control and program control would impact how much time each learner spends in an e-learning

course. Based on the findings, it is noted that internal LOC learners did not complete a course designed with learner control properties any faster than their external LOC counterparts.

Past research on the locus of control had demonstrated that learners with an internal locus of control orientation are more likely to be attracted to learning environments that provide them with greater freedom (Gifford, Briceno-Perriott & Mianzo, 2006; Tella, Tella & Adeniyi, 2011). Further, MacGregor (1999) suggested that internal LOC learners are more likely to make non-sequential connections when interacting with a hypermedia instructional environment suggesting that less time could be spent reviewing unneeded information. Based on this research it was expected that learners with an internal locus of control would spend less time in the course because they would recognize any missing knowledge and then directly seek that information, bypassing extraneous learning content along the way. Likewise, it was expected that those learners with an external locus of control, on the other hand, would review all content and possibly even spend more time in the learner-controlled course design as they may struggle in a learning environment that presents less structure and more options for sequencing.

Research by Halpin (2005) found that learners with an internal locus of control orientation did not make greater use of the embedded links in a Hypermedia based instructional environment. Similarly, these findings found that locus of control orientation had no impact on a learner's preference for navigating or the amount of time spent in the learning program. Based on this prior research and the current findings, it appears that neither of these two options were evident and the interaction of locus of control and course design had no impact on time spent in the course. As a result, no further conclusions should be made regarding to time efficiencies that are sought through the relationship of these two variables.

Implications for Instructional Design

The decision to add time spent completing a course and the amount of content viewed as additional variables comes from the recognition that while corporations see the value of human knowledge as a resource to the organization they often find themselves faced with the challenges allowing employees to spend time away from the job to complete training. There is an inherent conflict between daily corporate demands and the amount of time required for training. Corporate entities need for their employees to perform the daily operations of the business in order to generate a profit, but must also approve time away from the job to ensure that employees are learning the skills needed to perform their jobs successfully. It was expected that by studying the impact of locus of control and learner control, two outcomes that are at the forefront of corporate training would be identified and thus promote a more effective design for e-learning programs.

Two research questions generated findings that may impact how organizations can design training to ensure learning efficiencies. First, research question two identified the impact of the locus of control variable on learning assessment scores. Even though the course design variable was not part of this examination, knowing that certain locus of control type perform better in e-learning programs helps organizations make better use of employee's time by recommending alternative learning methods. In an effort to maximize employee training time, departments and employee managers must make recommendations that help employees learn new information and skills and reduce time away from their job based on their likelihood for success when attending training programs.

When an employee is not predisposed to find success in a particular learning environment, organizations need to know the learning barrier to ensure that time away from the

job is not wasted. Research question two found that the external locus of control participants performed more poorly in the e-Learning environment. Although program design did not have an impact on external locus of control learners, other design strategies or learner characteristics may have an impact on this lack of success. Obviously, further investigation is required and should be conducted in this area so organizations have a means to support external locus of control learners.

The research finding that most pertained to this topic was the outcome of research question number four. This research question sought to identify if learners with an internal locus of control would view fewer pages in the learner-controlled course environment then participants with an external locus of control in the program control course environment. Although no significance was found for research question five, the amount of time spent, the findings of question three indicate that a learner's locus of control did dictated their degree of amount of content viewed in a learning course.

Designed and implemented in cooperation with the sponsoring organization, this research was pursued with the intentions of adding to the current body of literature (Chang & Ho, 2009; Bouchard, 2009) that seek to answer the question of how mediated learning environments support or hinder learning performance while examining the relationship between course design and a learner's locus of control in a corporate context. The motivation for investigating this relationship in a corporate setting was based on a limitation of empirical evidence for research beyond academic settings. Despite the traditional view that most employees are resistant to change, research does show evidence that employees prefer a highly interactive and motivating computer training program over traditional, instructor led classroom learning activities (Vandewaetere & Clarebout, 2011; Kettanurak, Ramamurthy & Haseman, 2001). Research

question four similarly demonstrated how the proper pairing of a course design methodology and a locus of control orientation can facilitate a learner's desire to pursue more content.

As was mentioned in chapter four, research question four identified that those learners with an internal locus of control orientation completing a course designed with learner control properties viewed more course content, in terms of pages, than those learners with an external locus of control orientation in a similar course design. Since no positive correlation with student achievement was found, research findings from this study could not justify a strong business case for pairing LOC and course control design methods. Without the ability to report increased knowledge and performance skills, a corporation would benefit from allowing employees to spend any effort navigating through a course than is absolutely necessary. This study would seem to contradict the viewpoints by studies like Farrell & Moore (2000) and Gray (1987) which demonstrated learners often preferred a version of learning that is quicker to complete as opposed to one that helps them learn more. For a corporate entity, these prior studies would certainly present a more attractive option from an efficiency perspective.

Implications for Learner Control

The impact that course design, learner control versus program control, has on student achievement continues to remain a point of controversy among learning professionals. Some research suggests that online learning programs afford instructional designers a content delivery vehicle that allows learners a high degree of control over the learning process (Chou & Liu, 2005; Triantafillou, Pomportsis, & Demetriadis, 2003; Wang & Sutton, 2002; Zimmerman, 2002,). Furthermore, it is believed that this degree of control over the learning process allows the learner to excel beyond the levels of performance for learners in traditional learning environments

Chang and Ho (2009) suggested students with an external locus of control who learned from the learner-controlled version of an online course experienced higher levels of academic performance than students with an internal locus of control who learned from a program control online course. Their findings support the suggestion that learners with a greater subject matter expertise will perform better in a learner-controlled course, regardless of their locus of control orientation, simply because they were more capable of using their prior knowledge to assist with the process of navigating the learning resources.

In spite of these and similar findings concerning locus of control and type of course design, not all researchers see the learner-controlled design methodology as having a positive impact on all learners. Some research (Lin & Hsieh, 2001) suggests that a learner-controlled design can actually create problems for learners as learner characteristics like attitudes, needs and self-motivation can sidetrack the employee from completing the course. When the learner is in control of their own learning they can spend too much time reviewing wrong information, or possibly spending too much time on the correct information.

In this current research, the most interesting area of significance for course control was identified in research question four where learners with an internal locus of control orientation completing a course designed with learner control properties viewed more course content, in terms of pages. This finding may shed light on a motivational component is at work for employees. In similar studies (Freitag & Sullivan, 1995; Hannafin & Sullivan, 1996) researchers studied the effects of learner control in versions of the same program that varied only in length. In these studies, learners demonstrated a preference for controlling their paths of navigation through learning content. If it can be identified that there are sound methods for engaging the learner and promoting completion of online courses then there would be added value to the

corporate as few employees would elect to drop out of their learning programs. Further research in this area could be considered to assess the significance of course design and locus of control on amount of content viewed.

In conclusion, there is great certainty that given the advancements in computer technology combined with decreasing training budgets at a time when training is becoming critical to corporate survival, online learning programs will play an increasingly vital role in learning systems citation. The American Society for Training and Development (2011) reported in its State of the Industry Report that leading-edge learning organizations are incorporating technology components and processes which frequently produce efficiency gains and decreases in overall cost for learning delivery. Learning professionals are faced with the ultimate task of identifying and developing innovative delivery methods to aid the learning process. It is apparent that online, learner-centered, learning environments that provide a means for more individualized instruction can provide viable solution.

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Appendix A: Program vs. Learner Control Applications

Author	Control Continuum		
	Program Control (greater success than learner)	Combination/No Significant Difference	Learner Control (greater success than program)
Reigeluth & Schwartz, 1989			Programs that operate almost entirely under the learner's control in that complex simulations are nearly totally left to the discretion of the learner.
Bowers &Tsai, 1990			Instruction designed around hypermedia technologies granting complete learner control.
Laurillard, 1987			Control of content sequence.
Milheim & Martin, 1991			Control of pacing, content and sequence
Yeh & Lehman (2001)			Learners presented with Advanced Organizers.
Coorough,1991		Control of sequence, practice, and advisement	
Romiszowski, 1986		Four levels for which a designer needs to make decisions about the source of instructional control. Learner experiences a range of control	
McNeil & Nelson, 1991		Program control with partial guided learner control for review and practice.	
Judd, 1972		Learner control with memory support.	

		Previous stimuli and their correct classifications displayed on request.
Fredericks, 1976		Learner control over practice.
Gay, 1986		High prior knowledge combined with both program and learner control conditions.
Gray, 1989	No control over branching.	
Coldevin, Tovar, & Brauer, 1993	Identified three levels of sequence control with those given linear control performing better.	
Gray, 1987	Linear control only.	
Tennyson, 1980	No student control: examples presented in rational sets.	
Hannafin, 1984	Learners follow a predetermined path: no individual judgment as to its appropriateness.	
Ross & Rakow, 1981b	Examples adapted to subject's pretest scores. Prescriptions varied according to subjects' scores.	

Appendix B: Institutional Review Board Approval Letter

VirginiaTech

Office of Research Compliance
Institutional Review Board
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24060
540/231-4606 Fax 540/231-0959
e-mail irb@vt.edu
Website: www.irb.vt.edu

MEMORANDUM

DATE: August 12, 2010

TO: Barbara B. Lockee, Travis Eschenmann

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires June 13, 2011)

PROTOCOL TITLE: Learning Control

IRB NUMBER: 10-656

Effective August 12, 2010, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the new protocol for the above-mentioned research protocol.

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

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

All investigators (listed above) are required to comply with the researcher requirements outlined at http://www.irb.vt.edu/pages/responsibilities.htm (please review before the commencement of your research).

PROTOCOL INFORMATION:
Approved as: **Expedited, under 45 CFR 46.110 category(ies) 7**
Protocol Approval Date: **8/12/2010**
Protocol Expiration Date: **8/11/2011**
Continuing Review Due Date*: **7/28/2011**
*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

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

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

Appendix C: Institutional Review Board Organization Consent

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for the Organization
In Research Projects Involving Human Subjects

Title of Project: An Experimental Study to Test the Relationship Between Learner Control and Locus of Control on Learning in a Corporate Context

Investigator: Travis Eschenmann

I. Introduction

This consent form describes a research study that is being conducted through the Instructional Design and Technology program at Virginia Tech, and what you may expect if you decide to participate in it. You are encouraged to read this consent form carefully and to ask the person presenting it to you any further questions you may have before making a decision about whether or not to participate. This form describes the known possible risks and benefits of taking part in this study. You are completely free to choose whether or not to participate in this study.

II. Purpose of this Research

This study is being conducted as a part my dissertation research scheduled to be completed in the spring semester of 2011. The main goal is to examine the impact of learner control and locus of control on completion of workplace instruction. Specifically, this study will investigate the influence of learner control instructional conditions through program design on the time to complete an instructional program, amount of content viewed and learner performance on a course assessment. From this study, I will seek to identify a relationship between instructional design and learner locus of control to determine how varying the instructional design methodology may influence learner achievement when completing online learning. Approximately 200 AAA Mid-Atlantic Associates will volunteer to participate in the study. Each Associate will complete the Membership Lookup portion of the MzP Curriculum during this study.

III. Description of Study Procedures

Employees of AAA Mid-Atlantic will be first asked to complete Adult Nowicki-Strickland Locus of Control Scale (ANSIE) which will be used to classify all participants as internal or external in their locus of control. According to its creators, this instrument is designed to measure a person's perception of causality, and correlates highly with instruments specifically designed to measure academic

Virginia Tech Institutional Review Board: Project No. 10-656
Approved August 12, 2010 to August 11, 2011

motivation. The ANSIE questions were derived from the Children's Nowicki-Strickland I-E Scale (CNSIE) and were modified for adults by changing the tenses of some statements and substituting the word "people" for the word "children" in others. Scores on the instrument range from zero (i.e., a high internal locus of control) to 40 (i.e., a high external locus of control). Scale questions include "Do you feel that one of the best ways to handle most problems is just not to think about them?" and "Do you think it's better to be smart than to be lucky?"

Upon completion of this scale, employees will be instructed to complete one of two versions of the MzP: Membership Lookup Course. Participants will be instructed to complete the required course within a one month time period and will receive credit for the completion of the course in the organization's learning management system. All participants will have the opportunity to view the same content, and will not be limited in their learning options.

IV. Risks of Participation

There are no more than minimal risks associated with this study.

V. Benefits of Participation

All Associates participating in this study will complete the required MzP training course and thereby fulfill the training requirement set by your business line. No additional completions of this course will be required.

Lessons learned from this research will be shared with AAA Mid-Atlantic allowing the organization to modify future training programs to improve the learning experience.

VI. Confidentiality of Records

All information about you will be held in the strictest confidence within the confines of Virginia State law, and will be used only by myself. All information will be referred to by numbers only, not names, and it will be stored in a secure area. I respect your desire for privacy. If, however, concerns arise about the welfare of you, according to our responsibility under Virginia State law we would be required to discuss these concerns with you in order to make sure that any needed support could be made available.

While I will make every effort to maintain your confidentiality, it can not be absolutely guaranteed. It is possible that the Institutional Review Board (IRB) of Virginia Tech may view this study's collected data for auditing purposes. The IRB is responsible for the oversight of the protection of human participants involved in research. The results of this research may be presented at meetings or in publications; however, your identity will not be disclosed.

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VII. Freedom to Withdraw

Participation in this study is voluntary. Employees will be free to withdraw from this study at any time, for whatever reason. They are free not to answer any questions that they choose.

VIII. Participant's Responsibilities

Employees will be given the opportunity to voluntarily agree to participate in this study.

IX. Organization's Permission

I have read the Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give permission for the investigator to conduct this study:

Organizational Representative: _____ PRINT NAME

Organizational Representative: _____ SIGNATURE

_____ DATE

Should I have any pertinent questions about this research or its conduct, a researcher participant's rights, and whom to contact in the even of a research-related injury to the participant, I may contact:

Travis Eschenmann Investigator	(302) 299-4375 Telephone
Barbara Lockee Faculty Advisor	(540) 231-9193 / blockee@vt.edu Telephone / e-mail
Kim Ziolkowski AAA Mid-Atlantic Representative	(302) 299-4375 Telephone

David M. Moore
Chair, Virginia Tech Institutional Review Board for the Protection of Human Subjects
Office of Research Compliance
1880 Pratt Drive, Suite 2006 (0497)
Blacksburg, VA 24061

(540) 231-4991 / moored@vt.edu
Telephone / e-mail

Virginia Tech Institutional Review Board: Project No. 10-656
Approved August 12, 2010 to August 11, 2011

Appendix D: Institutional Review Board Individual Consent

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants
In Research Projects Involving Human Subjects

Title of Project: An Experimental Study to Test the Relationship Between Learner Control and Locus of Control on Learning in a Corporate Context

Investigator: Travis Eschenmann

I. Introduction

This consent form describes a research study that is being conducted through the Instructional Design and Technology program at Virginia Tech, and what you may expect if you decide to participate in it. You are encouraged to read this consent form carefully and to ask the person presenting it to you any further questions you may have before making a decision about whether or not to participate. This form describes the known possible risks and benefits of taking part in this study. You are completely free to choose whether or not to participate in this study.

II. Purpose of this Research

This study is being conducted as a part my dissertation research scheduled to be completed in the spring semester of 2011. The main goal of this research is to examine the influence of online training design on learning. Lessons learned from this research will be used to improve the design of future online training programs. Each Associate will be asked to complete the Membership Lookup portion of the MzP Curriculum during this study.

III. Description of Study Procedures

If you decide to participate in this study, you will be asked to complete an online assessment which will take approximately 15 minutes to complete. During the assessment you will be asked a series of questions from the Adult Nowicki-Strickland Locus of Control Scale (ANSIE) which is designed to provide information on your learning preferences. This information will not be shared with anyone at AAA Mid-Atlantic and will only be used in the context of my research at Virginia Tech. Your information will remain confidential at all times.

After completing this assessment, you will be asked to complete the "MzP – Membership Look-up" course located on AAA University. This course will take approximately 30 minutes to complete and will count towards your MzP training

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requirements. You will receive credit for this completion on your training transcript.

Of course, you always have the right yourself to say if you do or do not want to complete the user tasks or answering questionnaire. I will respect your decision about participation in the research.

IV. Risks of Participation

There are no more than minimal risks associated with this study.

V. Benefits of Participation

All Associates participating in this study will complete the required MzP training course and thereby fulfill the training requirement set by your business line. No additional completions of this course will be required.

VI. Confidentiality of Records

All information about you will be held in the strictest confidence within the confines of Virginia State law, and will be used only by myself. All information will be referred to by numbers only, not names, and it will be stored in a secure area. I respect your desire for privacy. If, however, concerns arise about the welfare of you, according to our responsibility under Virginia State law we would be required to discuss these concerns with you in order to make sure that any needed support could be made available.

While I will make every effort to maintain your confidentiality, it can not be absolutely guaranteed. It is possible that the Institutional Review Board (IRB) of Virginia Tech may view this study's collected data for auditing purposes. The IRB is responsible for the oversight of the protection of human participants involved in research. The results of this research may be presented at meetings or in publications; however, your identity will not be disclosed.

VII. Freedom to Withdraw

Participation in this study is voluntary. You are free to withdraw from this study at any time, for whatever reason. You are free not to answer any questions that you choose.

VIII. Participant's Responsibilities

I voluntarily agree to participate in this study.

Virginia Tech Institutional Review Board: Project No. 10-656
Approved August 12, 2010 to August 11, 2011

IX. Participant's Permission

I have read the Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

Study Participant: _____ PRINT NAME

Study Participant: _____ SIGNATURE

_____ DATE

Should I have any pertinent questions about this research or its conduct, a researcher participant's rights, and whom to contact in the even of a research-related injury to the participant, I may contact:

Travis Eschenmann Investigator	(302) 299-4375 Telephone
Barbara Lockee Faculty Advisor	(540) 231-9193 / blockee@vt.edu Telephone / e-mail
Kim Ziolkowski AAA Mid-Atlantic Representative	(302) 299-4375 Telephone
David M. Moore Chair, Virginia Tech Institutional Review Board for the Protection of Human Subjects Office of Research Compliance 1880 Pratt Drive, Suite 2006 (0497) Blacksburg, VA 24061	(540) 231-4991 / moored@vt.edu Telephone / e-mail

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Appendix E: Results of Levene's Test for Dependent Variables

Dependent Variables	*F*	df1	df2	Sig.
Time	*2.078*	3	66	.112
Score	*1.058*	3	66	.373
Pages Viewed	*5.837*	3	66	.276

Appendix F: Results for Two-Way ANOVA for the Dependent Variable Score

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	805.445	3	268.482	3.726	.015
Intercept	527630.139	1	527630.139	7322.409	.000
LOC	720.082	1	720.082	9.993	.002
Control	133.887	1	133.887	1.858	.177
LOC & Control	.964	1	.964	.013	.908
Error	4755.755	66	72.057		
Total	587782.000	70			
Corrected Total	5561.200	69			

Appendix G: Results for Two-Way ANOVA for the Dependent Variable Pages Viewed

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	487.824	3	162.608	8.624	.000
Intercept	57608.726	1	57608.726	3055.138	.000
LOC	.151	1	.151	.008	.929
Control	397.240	1	397.240	21.067	.000
LOC & Control	131.578	1	131.578	6.978	.010
Error	1244.518	66	18.856		
Total	63776.000	70			
Corrected Total	1732.343	69			

Appendix H: Results for Two-Way ANOVA for the Dependent Variable Time in Course

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	474.788	3	158.263	1.701	.157
Intercept	24940.716	1	24940.716	268.070	.000
LOC	77.760	1	77.760	.836	.364
Control	347.164	1	347.164	3.731	.058
LOC & Control	97.491	1	97.491	1.048	.310
Error	6140.505	66	93.038		
Total	33707.178	70			
Corrected Total	6615.292	69			