ABSTRACT

LUCAS, JAN WILLIS. Personality Type (MBTI) Relationship to Performance and Satisfaction in Web-Based Instruction (WBI). (Under the direction of Dr. Terrance P. O'Brien.)

The purpose of this study is to provide empirical data that reports the association between students' personality type preferences as understood by the Myers-Briggs Type Indicator (MBTI) personality profile and their achievement and perception of satisfaction in web-based learning environments. Data were collected from two graduate level courses offered entirely online using the WebCT learning management system during one semester. The data of interest were extracted from the course information; MBTI profile (learning style), numeric end of course grade (performance), course evaluation (used for satisfaction indicator). The demographic subject profile information such as gender, ethnicity, and age were extracted from the MBTI profile database collection. Data analysis and generation were done using SAS software. For the given sample, the data show the MBTI scale preference for Thinking-Feeling make a statistically significant difference in the satisfaction ratings of Learner-to-Learner and Learner-to-Content interactions within Web-Based instructed (WBI) courses. Students with MBTI preference for Feeling rated their satisfaction with Learner-to-Learner and Learner-to-Content interactions in the WBI courses higher than those with Thinking preference. Satisfaction with Learner-to-Instructor interaction was not related to MBTI preference, but was statistically significantly different by age range. MBTI preference, age and gender did not make a difference in achievement as measured by end of course grade in the WBI courses. These findings suggests Web-Based instruction should ensure effective methods and strategies are used to accommodate student learning preference with regard to course interactions.

Personality Type (MBTI) Relationship to Performance and Satisfaction in Web-Based Instruction (WBI)

by

Debra Jan Willis Lucas

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Approved by:

_____	_____
Brad Mehlenbacher, Ph.D.	Susan Osborne, Ph.D.
_____	_____
James R. Smith, Jr., Ed.D.	Terrance P. O'Brien, Ph.D. Chair of Advisory Committee

DEDICATION

This work is dedicated to the memory, legacy and posterity of

Vance Lenore Willis and Lucy Catherine Huss Willis.

There is a poem accredited to George A. Gladden, Sr. entitled "My Christmas Card List" that captures my dedication list. The poem describes how Gladden is a total of the many people he has met and how they each had a part in shaping things he does. Very much so this opus has been birthed from the myriad interactions, experiences and adventures I had throughout my life and my dedication is to all who have been a part of this adventure large and small; to all who have, by their presence, woven a thread into the fabric that defines me and my life. Following is my version of Gladden's poem reworked as:

"*My Dedication List*"

I have a list of folks I know, who deserve to be written in this book,
Then every time this work I see, I'll pause and take a look.
And when I do I'll realize these names are all a part,
Not of the book they're written in, but of my very heart.
For each name stands for someone who has crossed my path sometime,
And in that meeting they've become the rhythm in each rhyme.
While it may sound fantastic for me to make this claim,
I really feel that I'm composed of each remembered name.
And while most folk may not be aware of any special link,
Just meeting them has shaped my life much more than any think.
Once I have met someone, the years cannot erase,
For in my mind I hear their voice and see their pleasant face.

So never think my Dedication list is just a mere routine

Of names upon a list, forgotten in between.

For when I try to compose a Dedication list it must acknowledge all,

Because each and every person is important in my all.

For I am but a total of the many folk I've met,

And each just happens to be one I prefer not to forget.

Whether I have known someone for many years or few,

In some way they have had a part in shaping things I do.

And in this time of reflection I realize anew,

The best gift life can offer is to continue meeting folks anew.

Were I to compose a complete list it would be quite long

And some names I'm sure I'd somehow just get wrong.

For there are many who at best I could only just describe,

For the meeting was just in passing or merely an aside.

A name was never given, nor even a word exchanged,

Yet they made a subtle impression just the same.

My dedication is an acknowledgment and thanks, and yet much more,

It is advice I share that you may have heard before.

Be sure the lines you write in someone's life book is worthy of the ink,

For you are making much more of an impression than you may ever think.

It may be mere observation, one word or two, or lasting years of exchange

Regardless of the depth or length, it is eternal writing just the same.

BIOGRAPHY

Debra Jan Willis Lucas was born June 27, 1958 to Vance Lenore Willis and Lucy Catherine Huss Willis. Jan was the fourth daughter and last of six children. Interestingly, Vance raised his family on the farm on which he grew up, living on the same farm from the age of two until he died in November of 2003 at the age of eighty-nine. Initially, Vance supported his family farming cotton on the small twenty-five acre farm and raising crops and livestock. Vance and Lucy took what they called public work within the textile industry at a local hosiery mill when small-scale farming was no longer profitable enough to provide for the family needs.

Vance and Lucy were industrious and hard-working and raised their children with high standards, good morals, civic responsibility, and Christian values. The Willis family was grounded and established in faith and love. All six children completed high school with honors. Four of the six children earned their bachelor's degrees and both sons and Jan completed doctoral degree programs.

Jan earned her Bachelor of Science degree in Computer Science from North Carolina State University. Jan worked in the telecommunications industry as a Software Engineer for over twenty years before continuing her formal education. Jan returned to her alma mater, North Carolina State University, completing her Master of Education degree in Curriculum and Instruction with a concentration in Business and Marketing Education and continuing into the doctoral program.

Jan resides in Johnston County North Carolina with her husband and family.

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The College of Education extended financial opportunities to me in the form of assistantships and contract work making it economically possible for me to pursue academics full time. I humbly thank Dr. Sam Snyder and Dr. Ellen Vasu for these appointments. I am deeply grateful to Dr. Terrance P. O'Brien, Dr. James R. Smith, Jr., Ms. Cheryl P. Caddell and Ms. Janice T. Coats for requesting the financial appointments for me in the Business and Marketing Education department. Beyond financial aid, this core group of colleagues provided encouragement, friendship, laughter, challenge, faith, wisdom, guidance, alternative perspectives, questions, answers, counsel, requests, prayer, opportunity, food, fun and fellowship. I will forever treasure all the moments and memories created with them these past five years.

The statistical analysis and reporting of this doctoral dissertation work were greatly facilitated and enhanced by Dr. Roger Woodard and Joy Munk Smith, who contributed time, direction, guidance and counsel that was instrumental to the completion and scientific integrity of the study, and I am genuinely grateful for their involvement.

My doctoral committee members were outstanding and contributed greatly to my research and dissertation; Dr. Susan Osborne, Dr. Brad Mehlenbacher and Dr. James Smith. Brad inspired my creativity and fostered profound intellectualism. His invitation for collaboration on an international conference presentation and publication initiated me into professional academia. Susan inspired my confidence and provided insightfulness from a

different discipline that had a profound impact on my research and professionalism. Jimmy was both a committee member and a departmental colleague.

There are many NCSU instructors that I was privileged to study with and to learn from, who contributed to my intellectual growth and who had an impact on my research. All are worthy of mention, but for brevity I mention a distinct few who most impacted this dissertation: Dr. David Baumer, Dr. Gary Comstock, Dr. Alan Foley, Dr. Bonnie Fusarelli, Dr. Brad Mehlenbacher, Dr. Craig Newmark and Dr. Roger Woodard.

Additionally, there have been other NCSU staff, employees and classmates who have, in my estimation, assisted me in great measure during my graduate assistance work, class work, research and life during the past five years. I would like to name them all, but reason compels me to do otherwise. However, there are a distinct few that absolutely must be preserved in print: Dr. Kwaku Adu-Gyamfi, Anne Akers, Dr. Kenneth Anderson, Irene Armstrong, Twanda Baker, Dr. Connie Bossert, Meimei Davis, Kim Duckett, Elliott Fisher, David Howard, Robert Hambrick, Scott Lennon, Rosina Rubes, Daniel Underwood and Mark Williams.

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INTRODUCTION

Increasingly world-wide, social life is being digitized. The latest technological devices are affordable for all economic sectors of society allowing everyday activities to be recorded and stored on personal computers or online services. Today's conversations, business transactions and political negotiations are conducted via digitized communication channels (email, instant messaging (IM) and short message service (SMS)). As well, private thoughts, opinions and reflections on public affairs and personal interests are being instantly posted on weblogs or personal Web spaces. Because these various communications and interactions are in digital form, they can be stored, retrieved, transferred and shared via computers and the Internet making it possible for instantaneous global sharing with family, friends, and strangers. Summarily, this is reflective of Thomas Friedman's sentiment from his research of modern twenty-first century culture in his book, The World is Flat (2005).

New Century

Wallace (2005) calls this "the agora of the 21st century, a space where a diverse array of digital modes of communication intersect in cyberspace -- email, instant messaging, text messaging, multimedia messaging, weblogging, audioblogging, moblogging, mobcasting, podcasting" (¶ 6). Wallace claims this is the new cultural landscape for learning, entertainment, and communicating with each other which is incontestable in light of daily observation in our global community. This new cultural landscape "is being constructed without consultation with, or permission from, regulatory authorities or self-appointed gatekeepers" (¶ 7).

New Students

Today's students and young workers are part of a cohort that Prensky (2001) calls "Digital Natives" (¶ 5). Raised on music television (MTV), video games, e-mail, the Web and instant messaging, digital natives have developed experiential thinking patterns, and behaviors that differ from previous generations. As a result, the challenge facing educational designers and instructors is to recognize these differences and to develop educational offerings that are appropriate to their learning patterns, characteristics and behaviors (Prensky, 2001).

New Literacy

Until the latter portion of the 20th century, information and knowledge were somewhat regulated and controlled. Information managers or institutes regulated access to information about everyday life and were important in codifying and regulating what constituted competencies, which powered industrial production and commerce. This role regulated and controlled social communications, and hence the structure of cultural, political and economic life.

> This regulated space centralized power, and thus wielded a power to enforce confined definitions of reality on the world; such as scientific establishment's decree that a body of knowledge is "science", and everything else is hocus-pocus; the medical establishment's declaration that a favored corpus of practices is "medicine", and all others quackery; and the teaching profession definition that literacy is the three "Rs", and evermore shall it be. (Wallace, 2005, ¶ 13)

But these edicts concludes Wallace (2005), are losing their force and authority as people challenge the established or controlled information/knowledge and develop their own communication media to find things out for themselves and explore truths beyond conventional wisdom or the official versions. People are talking to one another in their own self-created space, without limit of space, time and speed. Some of these communication spaces have established their own new pseudo language. This is not the end of literacy as we once knew or defined it, but a groping towards a new kind of literacy capable of fulfilling the knowledge acquisition, informational and cultural needs of the new twenty-first century digital age (Wallace, 2005).

The new literacy afforded by cyberspace has created a "world of endless possibilities by refusing to be constrained by what went before" (Wallace, 2005, ¶ 28). Cyberspace's hypermedia form of composition offers flexibility in the interaction with the content and information as linearity is not required or even expected. "They [hypermedia content] can therefore be read -- and possibly understood -- in any order, so you can enter the hypermedia space at any point, and structure your reading of the story in any manner you choose " (Wallace, 2005, ¶ 22). As a result, each individual's reading experience, and the experience itself, is different, as the connections and associations made via the hyperlink immediate access reference are different based on choice. Where reading and writing have been central to people's notion of literacy for centuries, digital technology challenges the print paradigm. It does not abolish literacy, but predicts or foretells a redefinition of it (Wallace, 2005).

The print paradigm resulted in mass production of information and knowledge in print form through the end of the 19th century and became "a monolith that controlled access to information about everyday life" (Wallace, 2005, ¶ 12). The print information monopolies

were mostly based on “close and exclusive control of specialized knowledge: trade guilds, which regulated the transmission of craft skills; learned societies and associations, which regulated access to scientific information and entry into the professions” (Wallace, 2005, ¶ 12). Although the print model continues to dominate education, it is being impacted and challenged increasingly by the advent of electronic and cyber technologies.

> Now these two modes [print and secondary orality] are united in cyberspace as hypermedia combines almost all aspects of oral and literary cultures. Every minute of every day the Internet buzzes with the sound of music and of voices in many tongues; with animations and videos in glorious technicolor: with words and pictures; with the colour of magic, to paraphrase Arthur C. Clarke 7. (Wallace, 2005, ¶ 27)

New technologies continue to make it cheaper and easier for anyone, regardless of expertise or authority, to widely disperse information that may or may not be monitored or validated. Educators can either continue to dictate, monitor or to try to steer their students clear of any untrustworthy information or, instead, recognize the imperative for a new paradigm—

> one that focuses on helping students gain information literacy skills which would allow them to differentiate and make their own judgments regarding the accuracy of information. If we accept Plato's definition that knowledge is justifiable, believed truth, then our students, in order to be effective twenty-first century citizens, will have to be able to ask themselves if they believe in the truthfulness of a particular piece of information, and if they can justify that belief beyond simply saying

> "because the teacher said so."(Ferris, 2006, Wikis: Definitions and Debates, ¶ 6)

In the digital world the belief must be justified beyond simply saying, "Because I found it on the internet."

New Culture

Prensky (2001) expands the concept of the new student, new technology, and new literacy and calls it a new culture or social construct. He suggests that the new digital native generation is creating a social revolution in not just that people use the tools available to them to form ad-hoc groups and communicate. They control these tools, and can adapt them and use them in new ways – their own ways – to accomplish their own ends. The great difference in today's young people is that they are programmers of the technology of their age. Almost all of them program unconsciously to some extent. Now, for the first time in history, when large numbers of young people have a common purpose, they can harness technology, adapt it to serve their purpose and take collective action. (Prensky, 2004, p. 5)

The new digital natives quickly find ways to extend new tools to fill the particular demands of their generation. Today's young people can collectively decide something is right or needs to change or be instituted and can make it happen because the tools to make it happen are in the people's hands, and they know how to use them. If they don't exist, or need modifications, the digital natives are ready to write them (Prensky, 2004, p. 6).

New Educational Model

With the twenty-first century's new culture and environment, a new learning model unconstrained by space or time with unlimited availability and access is required. Educators

recognize and research indicates that learning is improved with a combination of teaching methods; supplementing the traditional lecture with effective oral discussion and participation, and including instructional technologies such as video clips, flash presentation and simulation programs. But, supplementation minimally challenges the centrality of the print model of education. “Instructors continue to equate authority and ownership of knowledge with the teacher who controls the text, whether print or electronic, rather than with the learners” (Ferris & Wilder, 2006, Technology and Learning Paradigms, ¶ 2).

Ferris and Wilder (2006) suggests a new model of education may be better suited to the cyber age ; one that takes advantage of secondary orality, “which relies on the affordances of print culture but also reintroduces the value of such oral characteristics as communality, group-sense, and participation” (Ong, 1982 as cited by Ferris & Wilder, 2006, Technology and Learning Paradigms, ¶ 2). Advancements in electronic technology create the conditions for a redefinition of the oral characteristics of literate cultures. “In a secondary-oral model, learners assume ownership of knowledge within learning experiences that encourage them to engage with texts electronically” (Ferris & Wilder, 2006, Technology and Learning Paradigms, ¶ 3). Cyberspace accommodates this new print combined with oral components learning paradigm seamlessly.

Additionally, the educational trend to meet increased demand for educational programs that are time and place independent has increased significantly. A report from the National Center for Education Statistics (as cited in Waits and Lewis, 2003) indicated that approximately 90 percent of public four–year institutions and about 50 percent of private institutions were offering, or planning to offer, distance education programs in 2000–2001. Among the institutions offering distance education courses, the majority (90 percent)

reported that they offered Internet courses using asynchronous computer-based instruction (NCES, 2003). To satisfy the demand, educational institutions have turned to new technologies and predominantly the Web, which has transformed learning environments significantly.

New Learning Environment

In today's digital economy and wired world, distance learning environments provide increased flexibility and opportunities for educational institutions desiring to maintain a competitive advantage in educational offerings to students. Distance learning has become an integral part of our lives as we move towards a technology-based society where continuous learning is required for everyone. The concept of value in a wired world is definitionally connected to the web. Thus, Web-Based instruction is required and expected. Web-Based instruction (WBI) continues to evolve broadening access to higher education, training, and development programs for all.

The proliferation of WBI has often raised the question of effectiveness and equivalence as related to traditional face-to-face course offerings. A research review by Berge and Mrozowski (as cited by Koch, 2006) reported that of the 1,500 or so studies reviewed more than one hundred "studies focused upon various measures of student success (such as grades, subsequent academic success, and persistence) in distance learning courses" (Koch, 2006, ¶ 5). Several of the studies sought to understand why some students do better than others, at least as measured by the grade.

Koch (2006) poses the question, "Does distance learning "work" in the sense that students experience at least as much success when they utilize distance learning modes as compared to when they pursue conventional bricks and mortar education?" (Koch, 2006 ¶ 3).

The answer to this question is important in assessing if distance learning programs are cost-effective investments, for students, for educational institutions or for governments.

Significance of all that's New

The significance of this new century, new student, new learning space, and new educational paradigm is that educational institutes dominated and led by the previous generation prior to all things electronic, the "digital immigrants"(Prensky, 2001, ¶ 5) must adapt and remodel the teaching-learning paradigms of the digital universe. This world is flat culture will not reverse, will, as all other cultural advances, have positive and negative events and outcomes, but will march forward.

Today's college-aged generation has never known life without the internet and has grown up with technology. Information technology is as common and natural to them as television was to the previous generation. Their generation is often referred to as the Net Generation or Net Gen. Oblinger and Oblinger (2005) give a terse definition of a Net Gen college student;

> Born around the time the PC was introduced, 20 percent began using computers between the ages of 5 and 8. Virtually all Net Gen students were using computers by the time they were 16 to 18 years of age. Computer usage is even higher among today's children. Among children ages 8 to 18, 96 percent have gone online. Seventy-four percent have access at home, and 61 percent use the Internet on a typical day. (Oblinger & Oblinger, 2005, Children and Teenagers, ¶ 1)

The literature is replete with research focused on the Net Generation and the new student learners and their digital vernacular, their expectations, demands and the disconnect

they experience to the traditionally modeled educational institutions. As such, new models of education and curricula design are emerging. These new models are reshaping and questioning the classical theories of learning, development and cognition. An emerging call to educational researchers is that of redefining and developing new theories and pedagogical strategies.

The literature that identifies the new generation learner and the new learning environment recommends strategies, theories and models to effectively provide active learning. Many studies conclude with the recommendation for continued research in use of technology in educational design and modeling and specifically the need to actively seek to understand the new learners. Oblinger and Oblinger (2005) suggest that colleges and universities are finding a variety of ways to meet student's expectations for service, immediacy, interactivity, social connectedness, and digital learning spaces. The many solutions may help structure a set of common pedagogical principles to guide decisions and policy.

> Educating students is the primary goal of colleges and universities. However, reaching that goal depends on understanding those learners. Only by understanding the Net Generation can colleges and universities create learning environments that optimize their strengths and minimize their weaknesses. Technology has changed the Net Generation, just as it is now changing higher education. (Oblinger & Oblinger, 2005, Asking the Right Questions, ¶ 6)

What is considered new is continually redefined with technological advances. But according to decades of research, the psychology of human mental processing and

development will remain consistent to core principles. Perhaps this concept is best understood in light of physiology; humans still see with eyes, hear with ears, and process information with the brain. The tools used for human interaction however have changed greatly. The print paradigm has modified over the centuries from papyrus to pixels, and long distance communication has advanced from documents physically transported by foot, then horse to signals on wire with the telegraph to wireless internet via a wide avenue of input devices from keyboards, to cell phones (new tools). The same internally configured human model interacts with a new and changed external environment that influences internal processing functions. Understanding the context of the environment and the tools available is important, but should not replace understanding of the unchanged human model.

Cyber Culture and the Human Model

The concept that people (the human model) learn differently was recognized as far back as Plato and Socrates (Diaz & Cartnal, 1999). Learning differently is characterized in this context, not as the neurological process or the concept of obtained knowledge, but in the preferred method of receiving, processing and using information to acquire and apply knowledge. This is characterized as a predisposition and widely referred to as personality type (and loosely as learning style). As Bransford, Collins, et al. (2000) summarizes, “How people take in information and prioritize that information to make decisions is the basic facet of how people learn” (p. 131).

Understanding how people learn is intriguing, complex, multifaceted and crucial for educators. Use of the various theories and models that exist from years of research related to human development and learning provide a stable foundation on which to build knowledge and understanding of all learners; digital immigrants, digital natives, and those to yet come.

Learning Theories

Grasha (as cited in Diaz & Cartnal, 1999) defines learning styles as "personal qualities that influence a student's ability to acquire information, to interact with peers and the teacher, and otherwise to participate in learning experiences" (¶ 1). This interaction notion is moving preferred predisposition, personality type, into a connection with learning environment and learner experience, which are significant components according to social learning theory (A. Bandura, 1977) and constructivist theory (J. Brunner, 1966).

Bandura's (1977) social learning theory explains human behavior in terms of continuous reciprocal interaction between cognitive, behavioral, and environmental influences. Constructivist theory defines learning as an active process in which learners construct new ideas or concepts based upon their current/past knowledge. The learner selects and transforms information, constructs hypotheses, and makes decisions, relying on a cognitive structure to do so. Cognitive structure (i.e., schema, mental models) provides meaning and organization to experiences and allows the individual to assimilate and synthesize beyond the given information (Brunner, 1966). The contextual theory shares the tenets of the social learning theory's model of interaction causation. The contextual theory model views the interaction between the environment and organism as equally influential; whereas the social learning model sees the environment as having a greater influence than the organism (Ford & Lerner, 1992).

The contextual model approach recognizes that learning is a complex and multifaceted process. According to contextual learning theory, learning occurs only when students (learners) process new information or knowledge in such a way that it makes sense to them in their own frames of reference (their own inner worlds of memory, experience, and response). This approach to learning and teaching assumes that the mind naturally seeks meaning in context, as in relation to the person's current environment, and the mind does so by searching for relationships that make sense and appear useful (Vacca, 2002).

The theories of learning have actually birthed the construct of learning style in which to model (used for further study of a theory's characteristics) the theoretical principles of human learning. As noted by both the social learning and constructivist theories, learning is intricately intertwined with the individual learner. Some aspects that greatly influence learning are the learner's experience, frame of reference or perspective, ability to personally associate information, and perceived value or meaning. Succinctly, these are the components of information processing; intake, organization, processing, and usage; essentially the tenets of Jungian type theory.

Type Theory

Type theory is based on the initial work of the Swiss psychiatrist C.G. Jung (1921-1971) in his attempt to define his premise that human behavior is not random but predictable and classifiable. Jung attempted to explain differences in human behavior as a result of preferences related to basic functions our personalities perform throughout life resulting in a foundational personality type. The essence of Jung's theory is "much seemingly random variation in behavior is actually quite orderly and consistent, being due to basic differences in the way individuals prefer to use their perception and judgment." (Myers, McCaulley, Quenk

& Hammer, 2003, p. 3). Jung's theory makes use of functions and attitudes to explain and predict human behavior.

From theory to model, classifying or categorizing attributes of learning and learners with a model provides a structured method to understand and define learner type and characteristics. Type knowledge allows instruction that is conducive to the learner preferences. Jung's (1971/1976) *Theory of Psychological Type* is one of the most widely used assessments of human information processing and human behavior. Extensive amounts of research went into creating and perfecting personality theory and its assessment instruments. Substantial research has also been based on the theory since its conception (Myers, McCaulley et al., 2003).

Personality Type Theory

Jung's theory makes use of functions and attitudes to explain and predict human behavior. Jung defined attitude as "a readiness to act or react in a certain way" and that people were either introvert or extravert in attitude. Jung noted after ten years of continued research that these two types did not provide a complete picture. Thus he divided his attitude types using two pair of mental functions; two opposite perceiving functions, sensing versus intuition; and two opposite judging functions, thinking versus feeling. The two attitudes paired with the four mental functions resulted in eight personality types.

Jung's work was extended by the efforts of Isabel Myers and Katharine Briggs in further refining the Jungian classifications to make them understandable and useful in people's lives. Myers and Briggs extended the three-category classification to include a fourth dichotomous pair, the judging versus perceiving attitude. This extended the eight types into sixteen defined personality types. The research and effort resulted in the creation of the

Myers-Briggs Type Indicator (MBTI) personality inventory. This instrument identifies a person's four separate preference scales with respect to the theory's attitude and function. The MBTI preference indicates the difference in people that result from the following:

- Preferred focus of attention and source of energy (Extroversion vs Introversion (E-I))
- Preferred method of receiving or gathering information (Sensing vs iNtuition (S-N))
- Preferred method of making decisions (Thinking vs Feeling (T-F))
- Preferred method of managing the outer world, using received information and decisions from that information (Judging vs Perceiving (J-P)

The result is a four-letter code that describes and predicts behavior that is preferred or most natural to an individual. For example, ESTJ indicates a person with Extraverted Thinking with Introverted Sensing that uses Judging methods to organize their daily life (Myers, et al., 2003).

The MBTI contains four separate dichotomies: E-I, S-N, T-F, and J-P. Two of these, S-N and T-F, describe functions and reflect basic preferences for use of perception and judgment; the other two, I-E and J-P, reflect attitudes or orientations. These functions and orientations influence how a person perceives a situation and decides on a course of action (Myers, et al., 2003). Each pole, of all the dichotomies, is valuable and can be used and manifest as required by the individual regardless of the identified natural or predisposed preference pole. The theory supports type indication, i.e. an observable preference or natural choice, not trait, a measurable amount of a characteristic. MBTI theory stresses the incorporation of whole type understanding, not individual dichotomy designations. All types are viewed as necessary with each type exhibiting unique gifts and strengths, and areas of vulnerability, and pathways for development.

Type theory research has yielded an appreciable amount of validated information on personality type in relation to preferred function usage. The research base has well documented profile type descriptions associated with the preference indicators. The characteristics that are most associated with each type includes such data as the form in which the person of that type likes to receive new information and how they organize and process that information for recall and usage.

Additional data over the years have been gathered, analyzed and evaluated to yield such information as; predictive success or satisfaction in various careers and educational pursuits, and predictive indicators from preference tendency for health and mental disorders. The MBTI instrument has gone through various revisions to improve internal consistency, reliability estimates, test-retest reliability, measurement precision, and validity. The ***MBTI Manual: A Guide to the Development and Use of the Myers-Briggs Type Indicator*** (3rd Edition) includes a complete history of the revisions of the MBTI forms and documents the rigorous reliability and validity measures employed to validate the assessment instrument.

Isabel B. Myers saw type theory and it's practical applications to peoples' every day lives as not only a means for human understanding but also a catalyst for the realization of human potential. Myers et al. (2003) includes a quote of Isabel;

> "Within limits, type development can substitute for intelligence, because average intelligence, fully utilized through fine type development, will give results far above expectation. However, a serious deficit of type development, especially a deficit of judgment, constitutes a disability for which no amount of intelligence can compensate (Myers with Myers, 1980/1995, p.177) (Myers, et al, 2003, p. 253).

Psychological type and the MBTI instrument provide a structure and method for understanding normal, everyday differences between people. Appreciating and making use of those differences is a major underlying part of the MBTI. The challenge is to move from recognition to appreciation and effective usage. Type understanding can be applied to relationships of all order from intimate spousal interaction, parenting skills, co-worker interface, customer service, teacher-student interaction and to self. The goal is to appreciate differing gifts and value other person's type by interacting and communicating according to their natural preferences not one's own natural bias or preference. In self-application, the goal is to more fully develop whole type such that weaknesses are improved and strengths moderated to avoid becoming liabilities.

Jung's *Theory of Psychological Type* provides a theoretical framework for this research with its focus "on the development of personality throughout the life span" (Myers, McCaulley, et al., 2003, p.27). Since learning is a lifelong process and how we learn is interwoven with our personality types and preferences, Jungian theory gives a basis to develop and discuss correlations between learning preferences and how people develop their innate types across a lifespan developing various aspects of the types to function optimally in the world. According to Jungian theory, type does not change across time or as a person matures but rather the expression of type develops and may vary depending on the life circumstances and stage of life (Myers, McCaulley, et al., 2003).

Implication of Type to Education

Examination of the MBTI instrument reveals elements that provide student (learner) understanding. The implications of personality type theory for education and training are manifold. Type theory provides a structured method to identify educational and training

goals and objectives for a desired outcome while meeting the learning needs of the individual learner. Type knowledge allows instructors to design teaching methods and activities that are conducive to the learner preferences. Personality types associated with the MBTI functions provide information on what learners by type are interested in (motivation), how they learn best, what is generally needed for optimal presentation, and what the learner needs or prefers to achieve comprehension and mastery. Each of these elements relate to the active and engaged learner paradigm.

A knowledge of the relative strengths of each MBTI type can help determine appropriate balance in instructional programs and specifically electronic or Web-Based instruction, by guiding the inclusion of; challenge versus support regarding interaction and group activities and lecture, practical involvement and application versus conceptual inspiration and theory, structured and ordered learning material versus free-form and end goal methods. MBTI results focus on how people take in information and prioritize that information to make decisions which is the basic facet of how people learn (Bransford, 2000). Improving this information and decision synthesis into practical instructional methods is crucial to meeting the needs, expectations and demands of the new century, new learner, new learning space, and new culture.

Knowledge of all the type dynamics and core needs of personality types can help to better define curriculum and instruction programs and models. In most educational situations there will be a mix of all the various types, not groups subdivided by their preference. The challenge for the instructor or designer is to provide information such that all learners are being accommodated. For instance, knowledge that participants are a mix of sensors, and intuitives, a facilitator should ensure that both an agenda with step-by-step items for the

sensors are presented and also a big picture of where the instructional unit is going is stated for the intuitive learners. These dual accommodations should be used throughout the program. Additionally, it is helpful for the instructor to be aware of their own personality type in order to optimize the presentation and methods and avoid teaching to their type only, which is a natural bias.

There are many factors that contribute to student achievement, success and satisfaction in learning and training experiences regardless of presentation platform; traditional, Web–based, blended, interactive, real-time, etc. Indications are a well-designed course that fosters interactivity through the creation of a virtual learning community is primary to student achievement, success and satisfaction. Understanding the factors that influence the learning experiences of students is needed to direct instructional design and implementation for the twenty-first century.

This study is conducted with the hope to gain understanding of how students' characteristic personality type and associated behaviors impact their learning experience with respect to academic achievement and satisfaction generally and specifically within the Web-Based instruction (WBI) models of the new century. The goal of the study is to add knowledge and understanding regarding how students utilize and interact with learning environments, and to inform and guide the design and delivery of effective instructional models, specifically models for the new cyberspace environment of the digital twenty-first century.

Statement of the Problem

Understanding course delivery technologies in a world that demands opportunities for continuous learning, flexibility, convenience, and accessibility is increasingly important to

higher education. The National Center for Education Statistics reports web-based course offerings have increased in order to meet the expectation and demand of educational opportunities (as cited in Waits & Lewis, 2003). As a result, educational institutions are expending time and capital to assess the effectiveness of web-based course offerings and researching how technology affects learning outcome. There is a need to assess different methods of teaching and creating learning spaces with respect to changes in the culture and the learner. Some of the teaching models applied to the new spaces are effectively those used in traditional settings in previous decades. However, some of the new electronic delivery models and methods are different enough to create new opportunities for evaluative assessment and research.

Consideration of this issue is based on the perspective that maximized learning effectiveness is facilitated when students are actively engaged and satisfied. As such, there is a need for continued research that examines student achievement related to engagement and satisfaction factors in the new century's models and those indigenous to the new digital world such as online learning environments. For example, how personality type influences the effectiveness of web-based learning environments, and the association between students' preferred type and their achievement and satisfaction with Web-Based instruction.

Purpose of the Study

The purpose of this study is to provide empirical data that reports the association between students' personality type preferences as understood by the MBTI personality profile and their achievement and perception of satisfaction in web-based learning environments. Age, gender, and demographic factors are important, but one cannot ignore the premise that understanding the personality type of students is essential for creating effective

instruction and learning spaces. It is hoped that the knowledge provided from this study will add to the pedagogical modeling that better fulfills education's goal and responsibility of effectively presenting information through a variety of instructional methods. The guiding premise of the study is the relationship of learner MBTI personality type related to on-line instructional achievement and learner perception of satisfaction.

The findings hopefully can be utilized in making recommendations and observations for the definition and implementation of instructional delivery models effective for the new digital global world and specifically for Web-Based instruction (WBI).

Research Question

This study examines the overarching question concerning the association between students' MBTI personality type (learning style) and performance and perceptions of satisfaction for learners enrolled in web-based learning environments. The guiding questions for this research study were:

- What is the relationship between MBTI personality type and performance in web-based program courses?
- What is the relationship between MBTI personality type and the perceptions of satisfaction with Learner-Learner, Learner-Content and Learner-Instructor interactions within Web-Based instruction (WBI) courses?

Significance of the Study

Researchers and educational experts conclude that distance learning environments are especially complex and that evaluative instruments should include measures of the effectiveness of the technology, instruction, interaction, achievement and student

perceptions. Student's perceptions are important to consider when judging the quality of instructional strategies and methods as instruction is judged by how well the students' expectations are met in a culture not limited by geographical location and other constricting criteria (asynchronous communication; anytime anywhere access; availability of experts) as exist in the new digitally global society. Effectiveness is judged by the degree to which students interact with course content and the degree to which they learn the concepts presented (achieve) throughout the instructional period. Palloff and Pratt (2001) indicate a critical component of an effective (measurable achievement) online course is incorporation of the virtual human interaction (students and instructors) into the course design. They suggest that the social connection in online courses is foundational for a successful (marked achievement, expressed satisfaction) online learning experience.

Additional research investigating students' personality types, web-based course delivery methods, and web-based teaching styles is clearly needed to facilitate maximizing the effectiveness of web-based learning. It is hoped this study will contribute information to the field of knowledge related to Web-Based instruction (WBI) learning environments. Empirical data collected about students' MBTI personality type, performance (achievement), and students' perceptions of satisfaction in web-based learning environments can be utilized to make informed decisions relative to web-based programs and course development strategies. The more knowledge about personality type, achievement, and perceptions related to web-based learning, the greater likelihood course design, and delivery of Web-Based instruction will facilitate the success of students, and also effectively meet their expectations and demands.

Limitations & Delimitations

A limitation of this study is the bias introduced by using a convenience sample. The sample of convenience was chosen to allow efficient access to information and to minimize budgetary requirements. This study is restricted to students with a Bachelor of Science degree enrolled in the Business and Marketing lateral entry initial licensure program (ILP) in select courses at North Carolina State University at Raleigh, North Carolina. Because of the design of the study, the number of participants will be small and although diverse by the nature of university enrollment will restrict generalization to the larger population. Additionally, the sample may not represent the general population of higher education students in race, age, and gender distribution. This will be evaluated during the study.

This study assumes that satisfaction with instructional presentation provides a basis for learner acceptance and motivation and has an impact on achievement. This study used a Course Evaluation Survey (CES) for assessing student perception of satisfaction. The instrument was developed for this study and thus lacks rigorous usage and analysis for evidence of sound psychometrics, which creates unknowns regarding the strengths of the instrument. However, a pilot administration of the survey was conducted and resultant data were analyzed for coefficient alpha and communality as discussed in chapter three.

This study is limited to the Jungian theory of personality type as assessed by the MBTI assessment instrument profiles used to identify learner characteristics related to learning style preferences. Jung's theory of psychological types assumes that true preferences exist and that people know themselves well enough to identify and self-report their type (Myers, McCaulley, et al., 2003). It is also assumed that a person's type is innate and consistent across time and that type preferences are dichotomous and that both poles of the

scales are equally valued (Myers, McCaulley, et al., 2003). The research recognizes the limitations of using psychological type preferences for understanding people's personal and educational orientation. Personality type refers to preference, not to ability, aptitude or intellect. Learners can learn in ways they do not prefer as well as their preferred ways of learning. Stereotyping learners based on their reported personality type preferences is avoided. MBTI type is an indicator of learners' preference for dealing with the world and type is not rank ordered with some types being superior to other type preferences.

The research is limited to a specific presentation model and design. The platform is Web-Based instruction (WBI) using the WebCT learning management system. The course presentation has a precise, consistent and well-defined design (Appendix C) and is limited to two content courses. The study restricts achievement to the measure of performance indicated by the end of course numeric grade. The study does not assess the student as teacher in classroom performance, teaching retention and disregards influence of life changes and events on in-course performance.

Other delimitations of the study are the courses used are taught by two instructors. Instructor teaching effectiveness is not analyzed or included in the study model. The sample's geographical and educational backgrounds are not part of the data collection or analysis. Prior achievement measures or indications such as grade point average and scores on standardized tests such as scholastic assessment test (SAT) or graduate record examination (GRE) are not considered. Influences of race and gender are not part of the study model.

Definitions

For the purposes of this study, the following definitions apply. All Wikipedia references are direct quotes presented in a replicated definition format.

Asynchronous -	A communication method that provides two way communications with a time delay (e.g., email, mail, threaded postings).
audioblog or audioblogging -	is a type of weblog in which the creator makes music files, normally in the MP3 format, available for download (Wikipedia, http://en.wikipedia.org/wiki/Audioblog)
cyber -	cyber is a prefix stemming from cybernetics and loosely meaning through the use of a computer. (Wikipedia, http://en.wikipedia.org/wiki/Cyber)
Cyberspace -	The electronic medium of computer networks the Internet world and its virtual reality, in which online communication takes place.
Dichotomy -	being twofold; a classification into two opposed parts or subclasses
Digital Immigrants -	All older adults pre-birth 1980 who have learned digital technology later in life, digital immigrants retain their pre-digital "accents" -- such as, thinking computers are technology (Prensky, 2001)
Digital Natives -	Persons are born into digital technology, typically identified as born after 1980 (Wikipedia, http://en.wikipedia.org/wiki/Digital_native).

Distance Learning - is a field of education that focuses on the pedagogy/andragogy, technology, and instructional systems design that is effectively incorporated in delivering education to students who are not physically "on site" to receive their education. (Wikipedia, http://en.wikipedia.org/wiki/Distance_learning)

email - electronic mail, abbreviated e-mail or email, is a method of composing, sending, storing, and receiving messages over electronic communication systems. The term e-mail applies both to the Internet e-mail system based on the Simple Mail Transfer Protocol (SMTP) and to intranet systems allowing users within one company to e-mail each other. (Wikipedia, http://en.wikipedia.org/wiki/Email)

Friedman Test - A non-parametric test (distribution-free) used to compare observations repeated on the same subjects. Similar to parametric ANOVA, it is used to detect differences in treatments across multiple test attempts. The procedure involves ranking each row (or block) together, then considering the values of ranks by columns. (Wikipedia, http://en.wikipedia.org/wiki/Friedman_test)

hypermedia - is a term created by Ted Nelson in 1970. It used to refer to content in which graphics, audio, video, plain text and hyperlinks intertwine to create a generally non-linear medium of information. (Wikipedia, http://en.wikipedia.org/wiki/Hypermedia)

Interaction -	is used to reference how participants relate to one another, the content, and the instructor.
Internet (www) -	The vast collection of inter-connected networks that provide the communication paths for networking components to route communications using a common TCP/IP language/protocol (Wikipedia, http://en.wikipedia.org/wiki/Main_Page)
instant message or IM -	is a form of real-time communication between two or more people based on typed text. The text is conveyed via computers connected over a network such as the Internet. (Wikipedia, http://en.wikipedia.org/wiki/Instant_messaging)
Kendall's Tau	In statistics, rank correlation is the study of relationships between different rankings on the same set of items. It deals with measuring correspondence between two rankings, and assessing the significance of this correspondence. The statistic described here is also known as Kendall's τ. (Wikipedia, http://en.wikipedia.org/wiki/Kendall%27s_tau)
Kruskal-Wallis Test -	A non-parametric test (distribution-free) used to compare three or more independent groups of sampled data
Learning Style -	Synonymously used in the literature and referenced in this study as MBTI personality type.

Learning Management System -	a software package that enables the management and delivery of learning content and resources to students. Most LMS systems are web-based to facilitate "anytime, anywhere" access to learning content and administration. (Wikipedia, http://en.wikipedia.org/wiki/Main_Page)
moblog or moblogging -	is a blend of the words mobile and weblog. A mobile weblog, or moblog, consists of content posted to the Internet from a mobile or portable device, such as a cellular phone or PDA. Moblogs generally involve technology which allows publishing from a mobile device. (Wikipedia, http://en.wikipedia.org/wiki/Moblogging)
mobcast or mobcasting -	is a term coined by Andy Carvin of the Digital Divide Network in January 2005 to describe groups of people using mobile phones to create podcasts on a common subject, particularly in the contexts of civic engagement or political action. (Wikipedia, http://en.wikipedia.org/wiki/Mobcasting)
multimedia -	is the use of several media (e.g. text, audio, graphics, animation, video) to convey information. (Wikipedia, http://en.wikipedia.org/wiki/Multimedia)
Performance -	generally a numerical measure of successful completion or evidence comprehension of a specified set of instructional goals and objectives. In this study context, performance is measured by the end of course numerical grade.

podcasting - is the method of distributing multimedia files, such as audio or video programs, over the Internet using syndication formats, for playback on mobile devices and personal computers. The term podcast, like 'radio', can mean both the content and the method of delivery. . (Wikipedia, http://en.wikipedia.org/wiki/Podcasting)

portmanteau - is a term in linguistics that refers to a word or morpheme that fuses two or more grammatical functions. (Wikipedia, http://en.wikipedia.org/wiki/Portmanteau)

Personality Type Preference Codes - The Jungian psychological preference dichotomous scales are:

- (E/I) Extraversion vs. Introversion;
- (S/N) Sensing Perception vs. iNtuitive Perception;
- (T/F)Thinking Judgement vs. Feeling Judgement;
- (J/P) Judgement vs. Perception.

Satisfaction - The fulfillment or gratification of a desire, need, or appetite. In this study context it is an individual's perceived comfort level and feelings regarding the effectiveness and expectations of the web-based course experience.

Spearman -Brown - A formula that estimates what the correlation would be if the number of items had not been reduced with the split-half procedure. The estimated correlation is equal to 2r/(1 +r) where r represents the correlation of the two halves.

Traditional Learning Environment -	A learning environment or classroom where the instructor and the student communicate face-to-face in real time
Web – or World Wide Web (the Web)	a hypertext system that operates over the Internet, used for serving Web pages and transferring files. (Wikipedia, http://en.wikipedia.org/wiki/Web)
Web-Based instruction (WBI) -	Courses of study that are delivered via the World Wide Web using a web-based computer-software learning management system such as WebCT, BlackBoard, etc
WebCT -	Web Course Tools for authoring, delivery and management of instructional models and curriculum.
weblog or Web log -	is usually shortened to blog, is a type of website where entries are made (such as in a journal or diary), displayed in a reverse chronological order. (Wikipedia, http://en.wikipedia.org/wiki/Weblog)
wikipedia -	is a Web-based free-content encyclopedia project. It exists as a wiki, a website that allows any visitor to edit its content. The word *Wikipedia* is a portmanteau of the words *wiki* and *encyclopedia*. Wikipedia is written collaboratively by volunteers, allowing most articles to be changed by anyone with access to the website (Wikipedia, http://en.wikipedia.org/wiki/Wikipedia)

LITERATURE REVIEW

Introduction

The literature review for this research concentrated on material with publication dates within the year range of 1995-2005, although some older publications that worthily contribute are referenced. The current psychological type and instructional method literature articles and publications were obtained from the North Carolina State University library data base, online peer-reviewed journal publications, books, academic websites, and the internet via Google search. Several relevant and associated key words related to learning style were employed, such as: personality type, MBTI, learner characteristics, learning styles. The use of advanced search techniques were used to filter and refine the amount of information using terms such as: instructional modeling, online learning, and Web-Based instruction, academic performance, learner perception, satisfaction.

This section presents a synthesis of some of the research literature on the investigation of learner personality types and type's influence on learner behaviors, attitudes, and performance in educational settings, specifically the online (Web-based) settings.

There exists a plethora of terms and concepts for styles in the research literature and terms are often used interchangeably. Cassidy in a 2004 article on learning styles suggests that the variety of models, theories, interpretations, constructs, and type and interest of research confounds a concise and clear working definition for learning style (Cassidy, 2004). The working definition used in this research and the related literature review for learning style is the preferred method of receiving, processing and using information to acquire knowledge and make decisions that defines Jungian personality type (Myers, 1998).

While the review of literature is not solely that of personality type used to classify learning style, that which is included informs and supports this research. This literature review is organized by the major categories of interest for the intended study; performance/achievement and type, learner attitudes/perception and type, and learning spaces and type. An ancillary educational design perspective category of instructional gaming research is included offering a future developmental perspective.

Performance & Type Studies

General research has linked student preferred learning styles (type) and achievement. Jones and Reichard (2003) studied four disciplines; English, math, science, and social studies, to determine if student learning style preference varied as a function of discipline using the Kolb Learning Style (LSI) Inventory. They found that the 105 (45% male and 55% female) student participant's learning style preference varied significantly across the four disciplines; each learning mode showed significant ($p<.05$) differences across subject areas. The interpretation was that when learning different subjects, students altered their preferred learning styles, indicating ability to "style-flex," (p. 336) adapting to the various learning strategies needed to be successful in the different disciplines. "This means that when learning different subjects, students altered their preferred learning styles" (p. 369). They found no significant differences by gender in type preference in the study.

Several studies using the Kolb Learning Style Inventory (LSI) investigated the relationship of style to performance. McNeal and Dwyer's (1999) study of nursing students found no significant difference in the achievement between nursing students who were matched according to Kolb learning style and method of instruction. Gary, Ellis, and Rasmussen's (2004) study of the effectiveness of using hypermedia as a learning tool found

that there was significant learning using the hypermedia module as measured by gains in pre-test and post-test content assessments. Two groups were included in the study: a control group with no hypermedia treatment and a test group which completed a hypermedia module. An in-class post-test was administered to measure performance. The pre-test and post-test used for assessment included questions from various levels of learning which spanned a continuum from concrete to abstract. The control group had no significant gains ($t = 1.63$, $p < .132$) but the hypermedia study group exhibited significant learning ($t=11.56$, $p < .0001$) (Gary, et al. (2004), Table 1). However, there was no significant difference in learning outcome according to LSI style, substantiating similar findings in other studies (Buch & Bartley, 2002; Freeman & Tijerina, 2000) that reported no difference in examination scores related to LSI style. To examine the effect of Kolb's characteristics on achievement, analyses of covariance for each of the learning styles was conducted. “In neither style were the associated p-values significant at the .05 level: active/reflective ($F = .457$, $p = .999$) and abstract/concrete ($F = 1.195$, $p = .222$); neither process nor perception dimensions of learning styles varied significantly with the hypermedia treatment” (Gary, et al. (2004), Results, ¶ 4).

Others studies reported performance differences by learning style. Ross, Drysdale, and Schulz’s (2001) four-year longitudinal study investigated the relationship of performance or learning outcomes and style and concluded that academic performance was affected by learning style. A sample of 974 students in two university-level computer applications courses were administered the Gregorc Style Delineator (Gregorc, 1982a, as cited by Ross, et al., 2001) to collect learning-style information. The Office of the Registrar at the university supplied the final grades for the courses used as the performance measure. Average course grades by learning styles were calculated, and analyzed in a series of one-way ANOVAs to

determine if significant differences between mean course grades for each learning style existed. The chi-square contingency test was used to determine significance between learning style and grade (performance). The ANOVA revealed significance, $F(3,801) = 7.30$, $p < 0.05$, between the mean course grade scores achieved by each learning-style group for the course Computer Science 203: Introduction to Computers (CPSC203) (n=804) course. ANOVA results indicate that the subjects' dominant learning-style score significantly affected learning-style outcomes, $F(3,165) = 2.84$, $p < 0.05$, as well. The chi-square analysis conducted to ascertain the relationship between course marks attained by the learning-style groups showed significance, X^2- 53.80(3), $p = .01$, indicating differences in course marks (i.e., A-F grades) obtained by each learning-style group. The Teacher Education and Supervision (EDTS) 325: Computer Applications in Education (EDTS325) (n=168) course analysis showed the subjects' dominant learning-style score affected learning-style outcomes, $F(3,165) = 2.84$, $p < 0.05$. The effect of learning style on academic performance was found to be significant in both courses. Results indicate that sequential learners performed significantly better than did random learners in both courses under investigation. The researchers site limitation of the study in other performance affecting variables such as age, gender, and academic major. The major recommendation of the study was the inclusion of a learning-style preference analysis for students early on in a course or program to increase learner awareness of their information processing preferences.

Beets and Lobinger (2001) comparing instructional method preference to performance found that students preformed better on exams when they were exposed to their preferred method of instruction. Preferred method was identified by a student questionnaire completed near the end of the semester regarding the student’s preference of the three

pedagogical methods employed in the study. A three by three treatment group arrangement ensured that every student was exposed to each of the three treatments (three different pedagogical techniques) for the same duration and that all course topics were included in the project. The class was an introductory financial accounting class taught by the same instructor in a single semester divided into one-third time increments. Using a non-parametric alternative to the one-way independent-samples ANOVA, the Kruskal-Wallis Test, there were no significant differences related to quiz grades ($p = .547$, Kruskal-Wallis) or exam grades ($p = .147$, Kruskal-Wallis) among the three study groups. Exam grades, however, were affected by preference; students earned higher exam grades when they were exposed to their preferred pedagogical technique. Student exam scores differed significantly, ($p < .001$, Friedman test), when their preferred method was used in class rather than when their less preferred method was used. As well, an analysis was done relating attendance and usage of preferred pedagogical method. Students attended class more often when their preferred pedagogical method was used in class; and the difference in attendance when their first, second, and third preferences were used was significant ($p = .036$, Friedman test). The attendance factor might well have affected the increased exam score and is not addressed in the study. Interestingly, the increased attendance might allude to an increased measure of satisfaction with the learning experience, a factor considered in the current study.

Huitt (1992) devised a model for incorporating individual differences during problem solving and decision making activities from his review of the research that indicated there was evidence that temperament (type) influenced the individual's problem solving strategies. Huitt identifies specific techniques of attending to individual differences as classified by the Myer-Briggs Type Indicator such as an extravert's preference to think out loud as a strategy

to include in decision making activities to enhance the effectiveness of instruction. A similar study by Campbell and Davis (1988) conclude a key to developing the learner's ability to think critically is found in the order of the learner's preferences for perception and judgment. They posit teaching may be improved by emphasizing learners' dominant ways of perceiving (P) and judging (J). They also suggest learners who know their own preferred and non-preferred approaches can reinforce their strengths while working to improve their less natural preferences.

A study by Gordon and Yocke (1999) produced results indicating the temperament styles of Jungian Myers-Briggs Type Indicator show a positive relationship to a number of important teaching effectiveness competencies and that certain styles have greater ease or difficulty in achieving high effectiveness scores. In the study the teaching effectiveness was measured with the Classroom Observation Keyed for Effectiveness Research (COKER) instrument and MBTI Form G for personality type. The study's 22 selected beginning industrial and health occupations education teacher participants were 50% male and female, with only 31.8% having completed a bachelor's degree or higher. The mean age of respondents was 38.68 (SD = 6.28) years, with some prior work experience in their field. Nine of the sixteen MBTI personality types were represented in this study and the dominant MBTI personality types were: ESTJ, ESFJ, and ISFJ accounting for 59.5% of the sample. Eight of the 18 teaching effectiveness competency statements had significant and positive relationships ($r = .65$, $R^2 = .4225$) with the sensing-intuition (S-N) temperament type. The sensing-intuition temperament type was the best predictor of teaching effectiveness as measured by the COKER instrument when compared with extraversion-introversion,

thinking-feeling, and judgment-perception temperament types in the overall study (Disscussion, ¶ 7).

A study by Crosby and Iding (1997) stated, "Results indicate performance differences in the program's two phases (knowledge acquisition and knowledge application) for all MBTI scales, suggesting the MBTI can provide useful information for designing intelligent tutor programs" (Introduction, p. 1). The study used an adaptive multimedia tutor to present lessons and measure student performance. The multimedia tutor recorded frequencies for number of correct answers, incorrect answers, misconceptions, and amount of time elapsed before correct answers provided. These frequencies were used to produce a related confidence factor. Lessons were categorized in two groups; knowledge acquisition and knowledge application. A repeated measures ANOVA showed statistical significance ($p \leq 0.0001$) between the two groups of lessons for all MBIT scales represented in the sample; only ISFJ was not represented, with all categorizes having higher performance measures in the acquisition lessons. With small sample size (total N=45) detailed analyses by MBTI category was not possible. The analysis of variance between confidence factors of sensing (S) and Intuitive (N) students showed a significant difference between the performance of the S and N types ($F=3.93$, $p = 0.05$) (p. 5). The interaction of the S and N dimension with the other MBTI dimensions determined the direction of performance; J/S students performed better in application phase than J/N, while P/N performed better than the P/S. Crosby and Iding conclude that MBTI profile patterns as analyzed yield data that can inform and direct design and development of adaptive tutorial programs for instruction.

A study by Borg and Shapiro (1996) compares student's learning style with professor's teaching style in principles of economic education suggesting options for

improving instruction by offering teaching and grading strategies that better accommodate student personality types and learning styles based on previous study recommendations. MBTI was used to evaluate economics students in the principles of macroeconomics course to see if personality type affected the student's grade in the course. The study sample included 119 students, enrolled in four sections of the same macroeconomics course with similar class size of 35-50 students with three different instructors. Only students who completed the course were included in the sample analysis. The study three model design used “an ordered probit analysis” (p. 17) for the estimated coefficients for modeling prediction equations to predict or estimate the probability of earning an A, B, C, D or F grade in the economics class based on personality type. The model using four categories of MBTI separately found that being an introvert (I) had a significant positive effect on earning a good grade over that of being an extrovert (E). The findings indicate “in all three models, a student whose temperament type matched the class instructor's temperament did significantly better in the class than a student whose temperament type did not match the instructor's” (p. 22). The researchers concur that the universality of the findings are limited by the study parameters, but these findings match other such studies and “the robustness of our results provides evidence that personality type does affect a student's ability to succeed in economics, and that more research needs to be done in this area” (p. 21).

Learner Perceptions & Type Studies

Several studies link student characteristics and behaviors to learning experience perceptions and attitude, such as satisfaction, frustration and anxiety. The studies investigate the impact of perception on learning outcomes and performance.

Kim and Moore conclude from a 2005 WBI study that students' interaction with classmates and their instructor may have an impact on their satisfaction with Web–based courses. The study was conducted with eighty-two graduate students enrolled in a web-based course at a Midwest university. Using principal components factor analysis on collected data related to leaner characteristics and behavior, three factors were extracted as key. The Varimax rotation analysis revealed no relations among the extracted factors. The factors identified for analysis were 1) technical experience – self-reported level of usage and proficiency; 2) learning style - Sequential/Global (S–G), Sensing/Intuitive (S–I), Active/Reflective (A–R) learning styles, and Group/Individual learning preference; 3) interaction - Interaction with instructor, and Interaction with classmates. Multivariate regression was used to analyze the relationship between the three key factors and the participants' satisfaction/preferences related to Web courses. Findings seemed to indicate that students' gender and their perceived level of course difficulty was correlated with interaction. "Regression analysis revealed that Interaction (Factor 3) can significantly predict the students' satisfaction with Web–based courses ($F = 17.984$, $p < .01$). Students who had more interaction with an instructor and other classmates tended to be more satisfied with their Web courses" (Kim & Moore, 2005, Results, ¶ 4). The study's indication of gender influence requires cautious interpretation, as the researchers' advise, in light of the high percentage of females, 78 percent, in the study sample. The study utilized the Index of Learning Styles (ILS) (Felder & Soloman, 1991) questionnaire for learning style assessment and a study developed survey questionnaire to collect web-learning experience and satisfaction. They suggest for successful learner outcomes in Web–based courses increased

engagement among all participants, with students regulating their learning and instructors becoming active facilitators are required.

Other studies (Fredericksen, Pickett, Shea, Pelz, & Swan, 2000; Hong, 2002) support the connection between student interaction and satisfaction. The Fredericksen, et al. (2000) study reports that students who reported higher levels of interaction with instructor and classmates also reported higher levels of perceived learning, which they interpret as satisfaction. The four groups were identified by interaction amount as; 1) a great deal (N=439), 2) sufficient (N=744), 3) insufficient (N=196), 4) none (N=27). The student rating for perceived learning are based on a Likert scale: 1) I learned more than I expected 2) I learned as much as expected 3) I learned less than I expected 4) I learned nothing (Results, ¶ 1). The student rating of learning by interaction with the instructor means in order for the four groups were 1.30, 1.67, 2.45, and 2.18 (SDs=.048, 0.62, 0.78, 0.83, respectively) (Results, ¶ 2). The ANOVA analysis was statistically significant, $F=168.25$, $p< .0001$. The student rating of learning by interaction with classmates for the same identified interaction level groups was higher with higher interaction level with ANOVA statistical significance, $F=50.82$, $p < .0001$(Results, ¶ 3). The study incorporated a student satisfaction survey to gauge the level of student satisfaction with online courses, perceived learning with online courses, and what factors contributed to those results. The journal article provided sparse data regarding metrics or instruments used for data collection.

Du and Simpson (2002) concluded from a study of 169 library and information sciences graduate students learning totally via internet that learning styles and class participation have an impact on students' reported enjoyment (satisfaction) level. The study assessed learning style using Kolb’s Learning-Styles Inventory via online administration,

measured participation via the course learning management system's (WebCT) tracking metrics of pages accessed and read and total postings, and student self report of enjoyment near course end. The student self report used a 5 category Likert scale from 1) very enjoyable to 5) very frustrated. Using SPSS software, multiple regression analyses of the dependent self-reported enjoyment variable and the independent participation and learning style variables resulted in a regression of R=0.354 with statistical significance ($p < 0.01$ alpha= 0.05). The effect size ($R^2 = 0.125$, adjusted R^2=0.104) reported as indicating a medium relationship between independent variable enjoyment and the dependent variables learning style and participation. The authors concluded that learning style was most significant in explaining enjoyment level (p. 10).

Student perception of sense of community or connectedness is somewhat affected by the learner's type and communicator style according to a study conducted by Rovai (2003) of 72 doctoral students in a WBI program. The study assessed learner type using MBTI; the communicator style using Norton's (1983) communicator style measure (CSM) that consisted of 10 styles: friendly, impression leaving, relaxed, contentious, attentive, precise, animated, dramatic, open, and dominant; and the sense of community using the study's defined Classroom Community Scale (CCS). Rovai reported his study's internal consistency reliability coefficients for the 51 Likert-type items of the CSM subscales using Cronbach's coefficient α as friendly, .84; impression leaving, .85; relaxed, .80; contentious, .71; attentive, .76; precise, .80; animated, .71; dramatic, .58; open, .69; and dominant, .78 (Instrumentation, ¶ 3). The 20 item self-report CCS was used to operationalize classroom community. The instrument used a five-point Likert scale from 1) strongly agree to 5) strongly disagree with the least favorable choice always assigned a value of 0 and the most favorable choice

assigned a value of 4. The higher the total score was regarded as reflecting stronger sense of classroom community (Instrumentation, ¶ 5). Rovai (2002) in a related study provided CCS validity and reliability data. The results indicate significant difference in communicator styles among the four learning styles (ST, SF, NT, NF), but did not show that learning style was related to a sense of community. Study results provided evidence that students did not differ by learning style in either connectedness or learning. "The median test was not significant for both connectedness, $\chi 2(3, N=72)=6.41, P=.09$, and learning, $\chi 2(3, N=72)=1.23, P=.75$" (Classroom community and learning styles, ¶ 3). Results suggested that friendly and open communicator styles correlated positively with sense of connectedness. Moreover, the feelings of these same students regarding their construction of understanding through online discussions and the degree to which they shared values and beliefs concerning the extent to which their educational goals and expectations were satisfied also did not vary (Discussion and conclusions, ¶ 4).

Chen and Macredie (2004) examined the relationships between cognitive styles using Witkin's Field Dependence instrument and learners' perceptions and attitudes toward Web-Based instruction of the 61 master's students in a university based information systems and computing program. The study findings indicate field independent students were significantly more positive in rating the Web-Based instruction and appreciated that the program allowed them to study topics in whatever order they prefer, allowing them to work at their own pace. The field dependent students reported negative attitudes toward the Web program stating they felt confused over the option choices when trying to acquire the content. They differed in their preference for the navigational tools and content presentation;

however, both field independent and field dependent felt confident in their understanding of the content.

Valenta, Therriault, Dieter and Mrtek (2001) concur with research that purports the students' attitudes toward distance education are as important a metric as students' achievements in determining the effectiveness of distance education. Their Q-methodology, (Methods, ¶ 1) applying a hybrid of qualitative and quantitative statistical techniques, study investigated the positive and negative attitudes of students regarding distance education classes. From their review of the published literature related specifically to student attitudes toward computer-mediated distance learning in Web-based environments, they arrived at five positive and five negative attitudes that were prominent to the application of technology to distance learning. They used these ten aspects with the Q-methodology three stages: develop a set of statements to be sorted; have participants sort those statements along a continuum of preference (agree to disagree); and analyze and interpret the data a set (Methods, ¶ 1). Through content analysis, 23 statements that represented aspects of lifestyle, workplace, and learning preference were selected for the final Q-set. Seventy-four college students from one college in Chicago participated in the study with male and female equally represented. Q-methodology factor analysis and varimax rotation identified three opinion types (called factors) among the participants representing three different views regarding the use of Web-Based instruction The three factors were titled: (1) Time and Structure in Learning; (2) Social Interaction in Learning; and (3) Convenience in Learning (Results, ¶ 1). Results prompted them to wonder about the association of opinion and learning style. A preliminary review of the data using Canfield Learning Styles Inventory showed a significant relationship ($Z = 3.00$, $p < .025$) between being an independent learner and favorably opined to the importance

of the factor 1, time and structure of technology, and education. Also indications were that individuals who had high factor loadings for social interaction in learning were more likely classified as social learners (as expected) and less favorable in their reported opinion regarding the effectiveness of distance learning. The study suggests further research to understand how learning styles contribute to the experience of online education.

Irons, Jung & Keel (2002) researched the relationship between levels of course design and level of student interactivity as it predicts student satisfaction. The level of design being defined by increasing channels of interactivity; virtual classes that required students to use the Web as a channel of interactivity (e.g. chat rooms, self-paced or knowledge-based navigational instruction) compared to those where the Web is simply used to publish course materials (i.e., content access via web). To test the hypothesis that satisfaction increases with interactivity, interactivity was operationalized as the presence of a required Web component. Independent sample t-tests were used to analyze the independent variable (i.e. required Web component) in relationship to the items of satisfaction as measured by a seventeen item subset of the twenty-three item satisfaction survey. Additional measurements using location (host local course offering verses remote offering) as an independent variable were also tested based on the proposition that "distance learning research consistently points to the importance of learning location (host/remote) to differences in student experience, making location a key independent variable to test" (p. 179). The analysis found statistical significance ($p < .05$) in relation to the independent variable of interactivity, suggesting as the level of interactivity produced by the design (as more channels of interactivity are added) of a virtual class increases there are higher student satisfaction ratings.

Additional ANOVA analysis on the interaction effects while controlling for Web requirement and location was employed to investigate unexpected data patterns. An interesting interaction was unveiled. “Students enrolled in classes that integrate the Web into the course as a required component viewed the class as more accessible ($p = .006$) than do students enrolled in classes where they are not required to use Web resources” (Irons, et al., 2002, p. 178). But, they discovered that student satisfaction decreases if access to the virtual class is restrictive as in non-urban areas where computer access was not as readily available and supported (i.e. location variable). The study proposes, “These findings point to the continuing relevance of issues of access to distance learning research, even when the focus is on interactivity” (p.180). They suggest comprehensive analysis of student satisfaction with distance learning classes must consider the digital divide of the population; where digital divide is the existing gap created by social inclusion and quality of opportunity between those with regular and effective access to digital technologies and those without. The digital divide has socio-economic components affecting equitable access to digital information. The researchers suggest that the degree of variation of access to asynchronous communication resources such as the web, e-mail, etc. between urban and non-urban students should be assessed by a focused research effort.

A similar study related to student perspectives regarding distance education by Hara and Kling (1999) investigated whether students' frustrations (viewed as dissatisfaction) with Web-based distance instruction inhibit their educational opportunities. The qualitative case study examined six master’s students in one web-based distance education course, B555 (pseudonym used in this study) offered at a major U.S. university. The researchers found the published and available literature on the effect of distance education has been focused on

student outcomes, but not on the affective aspects of distance education or on the details of students' perspectives (Research, ¶1). Sound case study data collection methods were employed by the researchers and well documented. The resultant data from observation, interview and document review were analyzed and presented in rich thick description. The study presented the results in three sectioned formats to allow varying levels of reader interpretation and involvement, providing a concluding assertions discussion as the third and last section. By way of commentary, the researchers delineate the prominent or pervading frustrations of students found in their single case study in three interrelated sources: lack of prompt feedback, ambiguous instructions on the Web, and technical problems. The authors conclude that these frustrations inhibited educational opportunities. They posit that continued research is needed that investigates not the virtues, but also the failures and frustrations of technology in education and especially more student-centered (or perspective) studies.

Storey, Phillips, Maczewski, and Wang (2002) reports similar findings of dissatisfaction with web-based learning environments. The study findings indicate the Web tools themselves can have an impact on students' perceived learning in positive or negative ways, based on usability factors. This study, although thorough, did not use reliably robust measures of assessing the impact on students' learning of the Web-Based instructional tools such as grades, exams or other evaluation of learning outcome. Rather the conclusions are arrived at solely through review of student feedback on course questionnaires.

These studies indicate that student perceptions of the learning experience are significant factors and should be a consideration in instructional design, curriculum development, and institutional policy. Specifically, indications are that learner acceptance and accessibility are baseline requirements for successful implementation and outcome

(Irons, Keel, & Bieleman, 2002). The current study continues the investigation of student perception of the learning experience with a goal to add to the existing knowledge base.

Learning Spaces & Type Studies

The SCALE-UP (Student-Centered Activities for Large Enrollment Undergraduate Programs) project study by Beichner and Saul (2003) examined the affect of highly collaborative, hands-on, computer-rich, interactive learning environment for large-enrollment courses on student performance. This was not Web-Based instruction, more blended instruction, with physical environment designed and structured to facilitate hands-on activities, simulations, and team work. Their findings indicate improved problem-solving, conceptual understandings, attitudes, and performance with decreased failure rates in follow-up classes and from the affective project environment. Their interpretation of the findings is that a positive correlation exists between student performance and collaborative, interactive learning spaces.

Northrup, Lee, and Burgess (2002) conducting a study investigating student's perceived importance of instructional strategies found that learner's in electronic formats ranked highly the use of student controlled activities and of utmost importance timely interaction with peers and instructors. The study was conducted with 52 graduate students in an online instructional technology masters program. The Online Learning Interaction Inventory (OLLI) with cited reliability coefficient of 0.95 was used to measure interaction. The OLLI focused on interaction attributes; content interaction, conversation and collaboration, intrapersonal/metacognitive skills, and need for support (p. 3). The OLLI was a 50 item instrument with four sections of the instrument using a five-point Likert scale of 1) strongly disagree to 5) strongly agree to rate interaction attributes. Data were analyzed using

frequency, means, and standard deviations to report areas of interaction perceived to be valued asset or hindrance to online success. The intrapersonal/metacognitive attribute was the most highly rated indicator (M=4.58, SD = 72) (p. 5). The support attribute also rated high with timely instructor feedback (M=4.48, SD=.64) (p. 5) rated as the number two most valued indicator. Online learners in this study reflect the importance of interaction by requesting interactive elements in the online learning experience.

In his coauthored book, *How College Affects Students (Vol.2): A Third Decade of Research,* Terenzini (2005) summarizes what 2,500 studies published since 1990 reveal about students' learning and higher-order cognitive skills and what influences student learning. He identified what the collective whole postulated as important or significant influences affecting college students' academic success and cognitive development. Terenzini discusses six characteristics of learning and effective educational settings and their implications for improving higher education teaching and learning. These six characteristics running through the research literature are reasonable recommendations as touchstones for reviewing current programs, practices, and policies, and in developing new ones. These characteristics are: 1) Entails encounters with challenging ideas and people, 2) Requires active engagement with those challenges, 3) Occurs best in a supportive environment, 4) Involves real-world activities, 5) Is a relational, social activity, 6) Is unbounded by time or place.

Diaz and Cartnal (1999) suggest success in distance learning classes may ultimately depend on understanding the learning styles of the students who enroll. They used the Grasha-Reichmann Student Learning Style Scales (GRSLSS) to assess student learning preferences in college-level distance learning settings. The GRSLSS focuses on how students

interact with the instructor, other students, and with learning in general. Thus, the scales address one of the key distinguishing features of a distance class, the relative absence of social interaction between instructor and student and among students. They found online students more independent and on-campus students more dependent, in their styles as learners as measured by the GRSLSS. A statistical test (a t test) found the variations in average scores between the two styles (independent and dependent) were found to be statistically significant ($p < .01$) (Research Outcomes, ¶ 1). "On-campus students seemed to match the profile of traditional students who are willing to work in class provided they can obtain rewards for working with others and for meeting teacher expectations. Online students appeared to be driven more by intrinsic motives and clearly not by the reward structure of the class" (Diaz, 1999, Conclusion section, ¶ 1). They recommended faculty use social learning style inventories to assist with designing their course content, use of technology, delivery methods, and structure of the learning environment.

Ellis (2003) concluded from data analysis a marked difference in attitude between introverts and extroverts in their comfortableness with the forum structure of online courses. The Ellis study's small sample size (N=19) and small MBTI scale representations limit the findings. However, the researcher used the well researched MBTI profile characteristics of the four scale categories to reflectively consider the study findings and put the data in perspective to make recommendations for improved network environments. Other learner characteristics were reviewed and the study recommended strategies for improved online environments: 1) enhancements of well structured forums; 2) clearly established online expectation and responsibility; 3) both synchronous and asynchronous communication (particularly important for feeling type); 4) activities need to allow personal and impersonal

information sharing; 5) activities need to be both factual and theoretical; 6) careful compositions of online groups. More research to add a mix of other learner characteristics and cultural information was suggested to investigate networked learning environments.

In an analysis of research in the area of technology and personality type, Dewar and Whittington (2000) found that many researchers suggest that Introverts are over-represented as compared to population norms in the online environment. Some of the research analyzed suggested a difference exists in how the introvert/extrovert types enter into the virtual community. They cited other studies suggesting that intuitives (N) are also over-represented in terms of people using the internet to learn. O'Brien (O'Brien, et al. 1998 as cited by Jones, 2003) concurs that generally studies find type significance on the thinking vs. feeling and sensing vs. intuiting scales. Dewar and Whittington (2002) conclude that researchers postulate the over-representations might exist because the internet environment seems better suited to people who learn globally (N) as opposed to sensors (S) who prefer step-by-step methods.

Instructional Gaming and Educational Design Studies

As noted in the introduction of this study, technological advances have resulted in a new culture with a global perspective and connection, and learners with new expectations, habits and attitudes. The impetus of the present research was to discover understanding of the learner as a first-step in proposing practical instructional methods to meet the needs, expectations and demands of the new century, new learner, new learning space, and new culture. An important part of understanding the learner includes studying their culture and background. As such, the following literature review section focuses on experiential norms in the new digital culture and aspects of the digital native.

Prensky (2005) concludes that learners in today's classroom are not being successfully engaged and thus not provided with the optimal educational learning experience. Often it is not the absence of the latest technology in some blended fashion, or the lack of instructor desire to teach. He posits that it is the use of the outmoded techniques carried over from previous culture and learning environments. Prensky posits that today's curriculum needs to engage as all other areas of student lives are already engaged with society's digital world. Prensky cites educational research supporting the use of gameplay models and strategies for instructional methods.

Prensky (2001) suggests electronic games require active engagement in environments, which supports discovery, observation, trial and error, problem solving, visualization, and interpretative skills; all of which are becoming increasingly important skills for the global community. These are skills which can and should be fostered in learning and education.

Dickey (2005) discusses the research literature related to educational games in his article. He concludes that most research focuses on how educational games may enhance existing curriculum, but lacks investigation of design aspects of games that might provide instructional designers with methods for engaging learners. Dickey presents an overview of the game strategies that may assist educational designers to develop problem-based, project-based, and constructivist engaged learning environments by looking at games' use of the 1) roles of narrative, 2) role playing, 3) learner positioning, and 4) interactive choice.

According Howland (2002 as cited in Dickey), hooks are used in game design to provide interactivity that promotes action, feedback, and continued engagement. Various hooks (choices) are used in game design, including action hooks, resource hooks, tactical and

strategic hooks, and time hooks. Howland suggests the centrality of choice (hooks) in gameplay personalize and affect the gameplay experience. Education has used similar methods in the use of learning simulations. But, game designs of the twenty-first century have further perfected the choice aspects requiring players to implement higher order thinking skills in order to navigate and interact. This is the heart of what educators and instructional designers hope to foster in learning environments.

Implications of new technology

Some researchers of the digital learners in the new culture speculate that the cultural exposure of technology at the current extreme level of continuously connected, wired and stimulated has modified behavior patterns, neurological processes and thinking patterns of students. Prensky (2001) summarizes research findings from neurobiology, social psychology, and from studies done on children using games to support the concept that digital natives think differently.

Citing neurobiological studies Prensky (2001) conclude that stimulation of various kinds actually changes brain structures and affects the way people think, and that these transformations go on throughout life.

> The old idea that we have a fixed number of brain cells that die off one by one has been replaced by research showing that our supply of brain cells is replenished constantly. The brain constantly reorganizes itself all our child and adult lives, a phenomenon technically known as neuroplasticity. (Prensky, 2001, p. 2)

As well, social psychologists provide strong evidence that one's thinking patterns change depending on one's experiences. The implication of this research, according to Prensky

(2001), is that training and learning activities need modification to match the new cultural brain functions.

> Digital Natives accustomed to the twitch-speed, multitasking, random-access, graphics-first, active, connected, fun, fantasy, quick-payoff world of their video games, MTV, and Internet are bored by most of today's education, well meaning as it may be. But worse, the many skills that new technologies have actually enhanced (e.g., parallel processing, graphics awareness, and random access), which have profound implications for their learning, are almost totally ignored by educators. (p. 5)

Advances in technology create problems that are really opportunistic answers to previously created problems of past generation or version devices. The growing deployment of instruction via computer mediated space created what was and is referred to as digital divide. This divide existed in the incongruent access of computer technologies for participating in the continually enriching e-learning spaces. As previous research studies noted learner perception, satisfaction, and acceptance is impacted by; the urban and non-urban locations computer accessibility, tools usability and accessibility, and lack of available technical support (Irons, Jung & Keel(2002); Hara and Kling(1999); and Storey, Phillips, Maczewski, and Wang (2002)).

An answer to the problem may be in the phenomenally advancing cell phone technologies. McNicol quotes Junko Ogawa, mobile-Internet content producer for Tokyo language-textbook publishing company, ALC Press (Japanese) saying "The only device that's really handy enough to let you study where, and when, you want is the cellular phone" (McNicol, 2004, ¶ 2). In Japan, you can dial a number on your cell for short English lessons

from ALC Press's Pocket Eijiro. But voice-only learning isn't just overseas or where cell phone market penetration exceeds 100%. In Concord, Massachusetts of the USA, you can use a cell phone for guided tours of Minute Man National Historical Park (Prensky, 2005, Voice Only, ¶ 3). Quoting Prensky (2005) cell phones are:

> hotbeds of feature innovation—the major features being voice, short messaging service (SMS), graphics, user-controlled operating systems, downloadables, browsers, camera functions (still and video), and geopositioning—with new features such as fingerprint readers, sensors, and voice recognition being added every day. In addition, optional hardware and software accessories are available as both input mechanisms (e.g., thumb keyboards and styli) and optional output systems (e.g., plug-in screens and headphones). (Feature Segmentation, ¶ 2)

This translates into unlimited potential for educational usage and delivery. A very appealing feature of cell phone technology to the digital natives is ease of modifying the tool to one's unique needs and preference with very user-friendly interface programs available on the market.

These studies reflect the wave of new partnership developments between industry and education to launch use of pod-cast, mobile device learning, instant messaging, simulations, virtual laboratories, and other new technical products to conduct learning in new learning spaces, albeit somewhat related to the current e-learning environment of the world wide Web (www), yet remarkably different. The similarity seems to cease beyond the communication technology used in various spaces. The studies seem indicate new instructional modeling is required.

The new learners, new spaces, and new expectations are similar to the old with regard to the requirement for instruction to provide meaningful experience that fosters interactivity and engagement promoting successful achievement and performance. Measures of learner satisfaction, achievement and the impact of type preference are applicable to both the digital native (new learner) and the digital immigrant (the previous generation prior to all things electronic) in either role of learner or instructor as time and circumstance dictate.

Performance, Perception, Platform & Preference Studies

Within the research literature there are several studies that investigated the relationships of the combined aspects of the previous research categories of performance, perception, learning space (platform) and type preferences influences.

A study to investigate the benefits and perceived effectiveness of instructional technology was conducted by Apperson, Laws and Scepansky (2004). The study used data from student enrollments in ten separate classes across two semesters to complete surveys on instructor assessment and presentation graphics. The 152 students in a course without PowerPoint technology and the 144 students in a course with PowerPoint completed the graphics survey and 104 and 95 respectively completed instructor assessment surveys. The MANOVA analyses of the presentation graphics survey indicate students in the PowerPoint class "were more likely to feel it was easy to stay focused on lecture material, that the instructor maintained student interest in the course material, that PowerPoint is helpful in increasing classroom learning, and that PowerPoint increases the interest level of a college class" (Apperson, et al.,2004, Results, ¶ 1) than the non- PowerPoint presentation class. The MANOVA analysis of the instructor assessment survey indicated the PowerPoint class students rated the professor much more favorably, and indicated the instructor presented

information more clearly and used technology effectively. Perception of instructor was substantially enhanced by the use of the PowerPoint technology even though the material content was the same in both classes. Analyses of impact on final grades showed no significant differences between the classes with or without the use of PowerPoint. The researchers conclude

> Rather it seems that the use of PowerPoint makes for a better experience for the students from their perspective. It is our contention that this confers an enormous benefit towards education in that students like the courses better and therefore have a more favorable attitude toward their education. (Apperson, et al.,2004, Discussion, ¶ 1)

A journal article examining the research related to the relevance of cognitive processing and cognitive constructivist paradigms for guiding development of Web-Based instruction by Miller & Miller (1999) concludes that instructional design influences the learner attitude and interaction with the instructional content. They contend that learner perception of usefulness and ease of use form the highest predictive effect on a course websites acceptance and usage which directly affects learner outcome. Similar results related to timeliness of feedback, referred to as instructor immediacy were reported by Baker (2004) who concludes that instructor immediacy was closely related to affective learning and thus significantly influences the learning process and outcome (performance).

In a similar study, Hong (2002) investigates how student characteristics (age, gender, computer knowledge, scholastic aptitude, and learning style) and instructional design (problem-based learning in Web-based conferencing, student-instructor communication, and student-to-student communication, time spent on the course, etc.) affected student

satisfaction and performance in a Web-based, graduate course. Data on 26 students in a compulsory statistics course offered online was gathered using questionnaires, academic records, faculty instructor records and student interviews. The course format was structured similar to a traditional face-to-face with weekly topics, discussions, activities, and group work, but conducted in the asynchronous internet space. Data was analyzed using Statistical Package for the Social Sciences software (SPSS) version 10.05. Questionnaire data were tabulated and relationships among the model variables measured using SPSS's Kendall's tau-c. Student gender, age, scholastic aptitude, and learning style were found not to be related to perceived satisfaction with the course. "However, students who had better initial computer skills reported higher levels of satisfaction with the Web-based course (Kendall's TAU-C=0.395, Exact test *P*<.01)" (Results, ¶ 1). Likewise these student variables, gender, etc., were not related to achievement; but the better course results were achieved by students with better scholastic aptitude (Kendall's TAU-C=0.386, *P*<.05) (Results, ¶ 2). Four of the five instructional variables did not affect satisfaction. However, the higher the instructional variable of student-instructor interactions the more satisfied the student (Kendall's TAU-C=0.367, *P*<.01) (Results, ¶ 3) and per analysis the better the grade in the course (Kendall's TAU-C=0.337, *P*<.05) (Results, ¶ 6). Also, students that viewed their group's dynamics (Kendall's TAU-C=0.368, *P*<.05) and material used in the Web-based conferences (Kendall's TAU-C=0.328, *P*<.01) favorably were more satisfied with the course (Results, ¶ 5). The study results indicated no relationship between learning style, satisfaction and achievement. Hong cautions that the mandatory requirement of the course and use of Web platform may have obscured the affect of learning styles on satisfaction and learning achievement

(Discussion, ¶ 2). Hong concluded that satisfaction with instructor-student communications relates positively with overall course satisfaction as well as higher academic performance.

Nicholson (2002) recommends that strategies to increase synchronous communications be incorporated in Web mediated instruction after finding that students using IM (instant messaging) reported more student to student interactions and an increased sense of community. The study was based on a survey of 30 students in a core course in the Masters of Library Science degree in New York. In the sample, 13 students used IM for course communication and 17 did not, by self-selection as the IM component was not a course requirement. Findings show that IM students were more likely to agree with the statement regarding feeling a sense of community with classmates than non-IM students; S.Agree 46% verses 18% and Agree 31% verses 53% (Results, ¶ 2). As well the IM students reported more communication contacts with classmates than did non-IM students. The interviews and survey comments indicate that the IM communication was typically more social than course related, even the IM interactions with the instructor. Nicholson suggests that IM in distance or web-based courses is analogous to the physical hallway in a classroom building where socializing occurs naturally, noting IM as the virtual hallway. Nicholson also noted from the interviews and comments that student appreciated having a non-monitored communication channel that connected them to classmates.

Picciano (2002) researched relationships between interaction and performance, perception of social presence and performance, actual participation and social presence and if differences exist in perceptions and actual performance and participation. Study participants were 23 students typified as mature, busy and self-directed enrolled in a single graduate course. The course was organized into thirteen weekly themes and topics using a Web site

with the syllabus, reading assignments, weekly discussion topics and questions, supplementary reading material, and related links. The study model contained multiple independent (measures of interaction and presence) and dependent (measures of performance) variables for analysis. Student participation (interaction) was collected from the course Web site. Students completed a satisfaction questionnaire addressing overall experiences as related to perceived learning and interaction with others and the technology used. Measures of performance were from scores on an examination and from a written assignment. The researcher chose to use basic descriptive analyses using means and correlations as the sample size was small for formal inferential statistical procedures. Correlation on actual student interactions and performance scores on examination and written assignment were positive at 0.1318 and 0.4577, but not significant at α 0.05 level. There was a strong positive (0.6732) and statistically significant (0.05 level) relationship between student perception of interaction and perception of learning (performance). Likewise, the correlation of interaction and perception of social presence was positive (0.8477) and significant (0.05 level) (Results, ¶ 8). The perception of social presence had a small inverse non-significant relationship to performance on examination but a positive (0.5467) and significant (0.05 level) relationship on written assignment. Looking at their analyses the authors conclude there is a strong relationship between teaching presence, perceived satisfaction and perceived levels of learning.

Richardson and Swan (2003) examined the role of social presence in online learning environments. Data was collected from 97 students in an online course using a social presence survey. The survey was a 16 item Likert six-point scale created for the study based on a social presence scale constructed by Gunawardena and Zittle (p. 71). The study

examined correlations between three variables; students' overall satisfaction with their instructor, students' overall perceived learning, and students' overall perceived social presence "which is defined as the "degree of salience of the other person in the (mediated) interaction and the consequent salience of the interpersonal relationships (p. 3)". Results show;

> …students' overall perceived learning yielded a correlation of .68 with students' overall social presence scores ($p<.05$; $r2=.46$); students' overall perceived learning yielded a correlation of .73 ($p<.05$; $r2=.53$) with students' satisfaction with the instructor; and students' perception of social presence yielded a correlation of .60 ($p<.05$; $r2=.36$) with students' satisfaction with the instructor. (p. 73)

The researchers conclude that perceived social presence predicts perceived learning and satisfaction with the instructor and that these learner perceptions should be considered in course delivery methods and strategies, especially those that confer social presence.

Summary

The present study launches from these studies with a continued focus on the interaction of the preference (personality type), performance (achievement), perception (satisfaction), and platform (WBI). As noted by each referenced study of the research review, continued research is warranted to further analyze and direct the emerging educational paradigms and platforms related to effective instruction with consideration of learner characteristics and perceptions.

In light of the research and literature review, understanding the learner in relation to the learning objective and learning environment is a complex and multifaceted model. Many

factors related to learners, such as achievement, preference of and completion of learning courses, interaction with course content, self-efficacy, perceived satisfaction, perceived quality, attrition and various measures of learning styles have been investigated and valuable information gained. To add to that knowledge base this study hopes to obtain understanding of the relationships of learner personality type with achievement and perceived satisfaction in the fully integrated Web-Based instruction platforms.

The goal is to achieve perspicuity of the attributes and factors related to the relationship of the learner to the educational experience. The study is devised using the quantitative correlational research method to uncover the essence of those relationships and provide a richer picture of the learner in a Web instructional experience.

METHODOLOGY

This chapter describes the research design of the study, the subjects, the instruments applied, the method for data collection, and the techniques used to analyze the data. This study focuses on the overarching questions:

- What is the relationship between MBTI personality type and performance (EOC) in Web-Based instruction (WBI) courses?
- What is the relationship between MBTI personality type and the perceptions of satisfaction with Learner-to-Learner, Learner-to-Content and Learner-to-Instructor interactions within Web-Based instruction (WBI) courses?

Research Design

The research design is a quasi-experimental quantitative study as the sampling was convenience sampling that was not random and there are no subject assignments for controlled treatments or interventions. Using the sample, variables of interest were measured and analyzed for significant differences. This quantitative research hoped to produce knowledge to be interpreted and generalized to a broader population than the study sample. Quantitative data collection methods of having fixed study variables identified, isolated, and precisely measured are used.

The design supports collection of sampling data with precise validated collection instruments. The data were objectively analyzed using statistical procedures provided by SAS software, Version 9.1 of the SAS System for Workstation statistical software package applications. The information was collected from existing data available from selected courses and subject information databases.

The Study Model

The relationship of the three independent variables; the learner's reported personality type (preferred learning style) measured by the MBTI four-letter code treated as four categorical variables: (categorical MB1- E/I; MB2 - S/N; MB3-T/F; MB4-J/P), age (categorical ranges) and gender (categorical M/F), to the four dependent response variables; end of course numeric grade as performance (EOC: range: 80-100), and perceived course satisfaction levels treated as three discrete data variables (LL, LC, LI) each with range of 10-50), will be investigated using MANOVA modeling.

Model Equation:

$$Y_{LL} + Y_{LC} + Y_{LI} + Y_{EOC} = \alpha + X_{MB1} + X_{MB2} + X_{MB3} + X_{MB4} + X_{AGE} + X_{G}$$

LL + LC + LI + EOC = MB1 + MB2 + MB3 + MB4 + Age + Gender

Dependent Variables (Response):

LL = Satisfaction 1 for Learner-Learner Interaction (range: 10-50)

LC = Satisfaction 2 for Learner- Content Interaction (range: 10-50)

LI = Satisfaction 3 for Learner- Instructor Interaction (range: 10-50)

EOC = End of Course Numeric Grade as Performance measure (range: 60-100)

Independent Variables (Predictor):

MB1 = Myers-Briggs Type Indicator scale E-I (Extraversion – Introversion)

MB2 = Myers-Briggs Type Indicator scale S-N(Sensing – iNtuition)

MB3 = Myers-Briggs Type Indicator scale T-F (Thinking – Feeling)

MB4 = Myers-Briggs Type Indicator scale J-P (Judging – Perceiving)

AgeRange = Categorical Age (24-30, 31-36, 37-42, 43-50, 51+)

Gender = Male or Female

Study Sample

The subjects for this study were students enrolled in the Initial Licensure Program for Business and Marketing Education taking graduate level courses. The students were in one of the two core content graduate level courses offered in the program which is offered entirely online using the WebCT learning management system (LMS). These two courses were chosen as the data of interest could conveniently be extracted from the course offering information; MBTI profile (personality type), numeric end of course grade (performance), course evaluation (satisfaction indicators). Additional subject profile information such as gender, ethnicity, and age was extracted from the MBTI profile database. The NCSU student identification code, a number NC State randomly assigns to each student within the university was used to code the participants for confidentiality. The data collection was from semester course enrollment from all sections of the two content courses, yielding a sample size of N=47. The response rate for the final sample size was approximately sixty percent. There were a total of 75 students in the courses targeted for the two separate data items; MBTI and CES. However, not all enrollees completed both instruments and thus could not be used in the data set analysis.

Both online courses use the same online instructional strategies using WebCT Learning Management System (LMS) application and departmental procedures. A full description of the course design and presentation is included in Appendix C.

The two courses have consistent presentation, presence, and management, as do all the courses within the Business and Marketing Education program. This provides continuity and unity within the program enhancing ease of use (navigation, friendliness) and minimizes interface interaction learning required of the students to participate. There were two different

instructors for sections of the courses. Instructor difference could be an influential factor within the measured end of course numeric grade and possibly the measure of satisfaction. Therefore, to control for instructor differences a t-test was used to test the aggregated mean scores of the instructors end of course grades (EOC). If a statistically significant difference in the mean EOC scores existed, the difference would be a covariant in the analysis. However, instructor difference was minimized by the consistency of the unified course presentation, management, and instructional strategies.

Instrumentation

The Myers-Briggs Type Indicator (MBTI), designed by the mother-daughter team of Kathryn Myers and Isabel Briggs-Myers, version Form M was used to identify the personality type (learning style preference) of the subjects (Appendix A). The course evaluation survey (CES) instrument was used to identify perceived satisfaction levels (Appendix B). The calculated end of course (EOC) numeric grade from the WebCT course grade book was used to identify a performance measure.

Myers-Briggs Type Indicator

Research has been done using the Myers-Briggs Type Indicator (MBTI) in a variety of disciplines including education. According to CPP, Inc. (Consulting Psychologists Press) the Myers-Briggs Type Indicator (MBTI) instrument publisher, more than 2 million assessments are administered annually in the United States. The MBTI tools are available across the globe in 30 languages and it is purported to be the most widely used personality inventory in the world (Consulting Psychology Press home page, http://www.cpp.com/).

The MBTI Form M is standardized based on a large national sample of adults. The national sample is defined as a stratified random sample collected in 1996 designed to be representative of the US population. The sample did not align with the US population census data. The sample had an under-representation of African American males and overrepresentation of Caucasian females. Ethnic categories of the US population were not available in the sample for American Indian, Asian/Pacific Islander, or Eskimo. The sample was weighted on gender and ethnicity to approximate the US census data (Myers, McCaulley, et al., 2003, 385). Form M is an updated version of the MBTI instrument enhanced for construct validation to ensure true score correlations with preference choices on each paired scale (Myers, McCaulley, et al., 2003).

Extensive research using the Myers-Briggs Type Indicator is documented in a 2001 bibliography presenting more than 7,155 reference usages of the Myers-Briggs Type Indicator (CAPT, 2005) since its inception in 1946. The MBTI research usage in all levels of education is documented with an extensive library archive maintained on CAPT website (CAPT, 2005).

Isabel Myers and Katharine Briggs extended Jung’s work by further refining the Jungian classifications to make them understandable and useful in people's lives. Myers and Briggs extended the three-category classification to include a fourth dichotomous pair, the judging versus perceiving attitude. This extended the eight types into sixteen defined personality types. The research and effort resulted in the creation of the Myers-Briggs Type Indicator (MBIT) personality inventory. This instrument identifies a person's four separate preference scales with respect to the theory's attitude and function and reports the personality type as a four letter code.

The MBTI is made up of four scales with two preferences each representing two opposite continuums. Myers, McCaulley, et al. (2003) cautions that both ends of the continuum are valuable qualities and it is assumed that people use components of all eight of the personality types but that they prefer one to the other. The scale dichotomies are (CPP, 2004; Myers, McCaulley, et al., 2003):

- Extraversion (E) or Introversion (I)
    - Where one prefers to focus their attention and get energy
- Sensing (S) or Intuition (N)
    - The way one prefers to take in information
- Thinking (T) or Feeling (F)
    - The way one prefers to make decisions
- Judging (J) and Perceiving (P)
    - How one orients to the external world – with a judging or perceiving process

The preferences can be scored either on an interval scale from 0 to 30 or treated as categorical scores. The resulting number shows how consistently choices for one preference pole of a dichotomy (pair) were made over its opposite pole. The MBTI scores are treated as interval data as a means for sorting the preference into the four scale categories. This study employs the categorical sorting of the MBTI for data collection and analysis.

MBTI Instrument Details

The MBTI Form M consists of 93 items, all scored for type. To assure the most accurate prediction of type, the instrument is scored using item response theory (IRT). This

form is intended for people 14 years old or older. It is designed at a seventh grade reading level. The MBTI Form M is easy to complete, score, and explain. It takes fifteen to twenty minutes to complete (Myers, McCaulley, et al., 2003). The MBTI instrument's ease of use, various available options for administration and scoring, the completeness and thoroughness of the MBTI manuals, and the supporting materials related to the administration, interpretation and application of the instrument are desirable features conducive to thorough research application. The online version of MBTI Form M was used in this study.

The MBTI is divided into three parts. Part I contains 26 questions in which the subject is asked to select an answer from two forced choice response options that "comes closest to telling how you usually feel or act." For example, "Do you tend to spend a lot of time ( ) by yourself, or ( ) with others?" Part II contains 47 word pairs that the respondent is "asked to select the word in each pair that appeals to you more. Think what the words mean, not how they look or how they sound. Do not think too long about any of the word pairs." An example is "scheduled" or "unplanned." Part III includes 20 word phrases where the participant is asked to "Select the answer that comes closest to telling how you usually feel or act." For example, "At parties do you ( ) sometimes get bored, or ( ) always have fun?" There is a non-web paper version of Form M that has similar questions but is arranged slightly different. (Myers, McCaulley, et al., 2003).

MBTI Scoring

For this study, the MBTI instrument was scored using SkillsOne software available for scoring yielding the categories for each pole as a four letter code, such as ENTP. In the interpretation of the instrument profile, the score is deemphasized to lessen the perception of greater or lesser proficiency, maturity, or accessibility of a trait. The focus is on the

preference clarity and direction of the preference showing how consistently a person answered the questions in the direction of the preferred pole of the category; such as how consistently one answered questions indicative of a thinking (T) preference as opposed to the feeling (F) preference (Myers, McCaulley, et. al., 2003).

MBTI Psychometrics Properties

A good psychological test is reliable, valid, has appropriate norms, and is usable (Zeisset, 2000). To determine psychometrics properties associated with the MBTI, meta analysis for more than a decade has provided information regarding the reliability and validity of the MBTI. A summary of the data regarding reliability, validity, norms and use of the MBTI psychological test follows.

Reliability of the MBTI.

Reliability refers to how consistently an instrument measures what it attempts or purports to measure. The MBTI manual (Myers, McCaulley, et al., 2003) reports internal consistency reliability estimates, discussing two methods: split-half and coefficient alpha. Continuous score reliability estimates are provided to permit comparison with other instruments. Additionally test-retest measures over time are reported to show consistency of user type remaining the same with time and change.

Logical spilt-half reliability for the MBTI Form M was performed by paring items according to item statistics using the following criterion (Myers, McCaulley, et al., 2003, p. 160):

- item format (word pair versus phrase question);
- item-to-total correlations;

- average value of the difficulty parameter defined by Item Response Theory (IRT);
- maximum amount of item information (a function of IRT parameters);
- subscale coverage;
- whether the item was an original Form G item or a new or revised item
- referred to as logical split-half

Additionally, the instrument was divided using the consecutive items procedure for comparison purposes, where the first set of consecutive items represented the first half of a two pole scale, X-Half, and the latter half of consecutive items represented the second half of the pole, Y-Half (Myers, McCaulley, et al., 2003). Table 3.1 "shows split-half reliabilities of scores for Form M using both the logical split-half and the simple consecutive items procedure for the national sample, both corrected using the Spearman-Brown formula". The Spearman-Brown prophecy formula is often used in split-half reliability studies to correct for half-size scale lower reliability coefficients than could be achieved with full-size scale coefficients. Table 3.1 is an excerpt from the MBTI Manual (Myers, McCaulley, et al., 2003, 160) slightly modified from the original publication by removing Form G data and header details.

Table 3.1 Form M - Continuous Scores Based on Split-Half Correlations

	E-I	**S-N**	**T-F**	**J-P**
Logical Split-Half				
X Half	.90	.92	.91	.92
Y Half	.91	.92	.90	.92
Consecutive Split-Half				
X Half	.91	.92	.89	.92
Y Half	.90	.92	.92	.92
Word Pairs	.91	.93	.92	.94
Phrases	.91	.91	.90	.93

N=3,036 *Form M National Sample* *Myers, McCaulley, et al., 2003, p. 160*

In Table 3.1 the national sample (n=3,036 for Form M) was identified as a stratified random sampling collected in 1996 designed to be representative of the US population. The sample did not align with the US population census data. The sample had an under-representation of African American males and overrepresentation of Caucasian females. Ethnic categories of the US population were not available in the sample for American Indian, Asian/Pacific Islander, or Eskimo. The sample was weighted on gender and ethnicity to approximate the US census data (Myers, McCaulley, et al., 2003, 385).

The four MBTI scales were also assessed for internal consistency using Cronbach's coefficient alpha on the same national sample (n=3,036). Cronbach's alpha (a.k.a., "the reliability coefficient"), is the most common estimate of internal consistency of items in a scale. Cronbach's alpha measures the extent to which item responses obtained at the same time correlate highly with each other. Myers, McCaulley, et al. (2003) research findings support the type theory that respondents who have a better understanding of the items and more accurately self-report type preferences are more likely to be consistent and have higher

reliability coefficients. Table 3.2 is a replication from the MBTI Manual (Myers, McCaulley, et al., 2003, 161) that lists the coefficient alphas or average of all of the item correlations for the four MBTI scales from the national sample and a variety of other samples. Coefficient alpha scale ranges for each MBTI pair as deduced from Table 3.2 are: E-I (.89 - .95); S-I (.86 - .95); T-F ((.86 - .93); J-P (.88 - .94). The Thinking - Feeling scale has the lowest coefficient alphas of the scale (Myers, McCaulley, et al., 2003).

Table 3.2 Form M - Continuous Scores Based Coefficient Alpha

Sample	Gender	N	E-I	S-N	T-F	J-P
National Sample	M, F	2,859	.91	.92	.91	.92
	M	1,330	.91	.93	.90	.93
	F	1,529	.90	.91	.88	.92
Iowa State University	M, F	269	.91	.91	.91	.92
CRI Sample	M, F	140	.89	.93	.91	.94
Trinity Sample	M, F	90	.90	.91	.94	.92
Fairview	M, F	247	.93	.93	.90	.92
	M	37	.93	.93	.91	.93
	F	210	.92	.93	.89	.91
Middle Tennessee State U.	M, F	175	.91	.87	.88	.91
	M	76	.91	.87	.86	.88
	F	99	.92	.86	.87	.92
Public Utilities Company	M, F	240	.95	.95	.93	.94
	M	114	.95	.95	.93	.94
	F	126	.95	.95	.93	.94

Table 3.2 continued

Ball Foundation	M, F	85	.93	.89	.92	.92
Test Samples (combined)	M, F	500	.94	.93	.92	.93
	M	200	.93	.93	.91	.93
	F	300	.94	.93	.91	.94
Retest Samples (combined)	M, F	400	.94	.95	.93	.94
	M	151	.94	.95	.93	.94
	F	259	.94	.94	.93	.94

N=3,036 *Form M National Sample* *Myers, McCaulley, et al., 2003, p. 161*

Test-retest reliability estimates to measure stability or replication over time were performed on the MBTI. The MBTI was administered to a sample group of people followed by a second administration to the same group after an adequate amount of time had lapsed to allow for decay of memory from their previous response choices. Table 3.3 is a replicated excerpt from the MBTI Manual (Myers, McCaulley, et al., 2003, 163) slightly modified from the original publication to only show the three different group's sample data for the four week test-retest product-moment correlations and display the test-retest reliabilities of continuous scores. The samples used were (Myers, McCaulley, et al., 2003, p 386):

- 50 employees of the Consulting Psychologists Press (CPP) with a mean age of 36 and gender representation of 68% females and 32% males
- 258 employees of the Public Utilities Company with a mean age of 44 and gender representation of 50% female and 50% males
- 116 college students from the Virginia Commonwealth University with a mean age of 25 and gender representation of 82% females and 18 % males

Table 3.3 Test-Retest Correlations of Form M Continuous

Sample	**Interval**	**N**	**E-I**	**S-N**	**T-F**	**J-P**
VA Commonwealth	4 weeks	116	.94	.90	.83	.90
Public Utilities Company	4 weeks	258	.93	.89	.87	.93
CPP	4 weeks	50	.95	.97	.94	.95

Myers, McCaulley, et al., 2003, p. 163

Table 3.4 replicated from the MBTI Manual (Myers, McCaulley, et al., 2003, 163) shows the test-retest percentages of agreement for the four pair dichotomies of the three test-retest sample groups. Table 3.5 replication (Myers, McCaulley, et al., 2003, 163) shows the percentages of people who reported four, three, two, one, or zero preferences the same on a four week delay interval retest.

Table 3.4 Form M Test-Retest Percentage Agreement of Dichotomies

Sample	**Interval**	**N**	**E-I**	**S-N**	**T-F**	**J-P**
VA Commonwealth	4 weeks	116	87	87	84	88
Public Utilities Company	4 weeks	258	91	92	84	89
CPP	4 weeks	50	96	96	92	96

Myers, McCaulley, et al., 2003, p. 163

Table 3.5 Percentage of People with Preferences the Same at Retest

	Number of Preferences Same at Retest						
Sample	**Interval**	**N**	**4**	**3**	**2**	**1**	**0**
VA Commonwealth	4 weeks	116	55	38	4	3	0
Public Utilities Company	4 weeks	258	66	25	8	1	0
CPP	4 weeks	50	80	20	0	0	0
Combined	4 weeks	424	65	28	6	1	0

Myers, McCaulley, et al., 2003, p. 164

There is evidence that the test-retest reliabilities of the MBTI show consistency over time. If a person changes in type, it is usually on one preference and in the scale that initially had low preference clarity (Myers, McCaulley, et al., 2003). The MBIT manual summarizes test-retest reliability of the instrument with intervals of up to 50 years between test administrations. Even with life changes, instrument changes, and instrument scoring procedures over the long time intervals, 54% changed not at all or on just one scale. On the shorter test-retest intervals about 75% did not change on individual scales and about 90% agreement was found in some samples that used the newer Form M version of the indicator (Zeisset, 2000).

Item Response Theory.

Along with the traditional test-retest and split-half internal consistency reliability traditional methods, considered classical test theory (CTT), for assessing the test's measurement precision (error free indication) the Item Response Theory (IRT) was also used in the Form M of the MBTI version development. Both IRT and CTT based methods view

measurement precision as the “relative degree to which test scores are free from undesirable, unsystematic sources of variance; tests producing higher levels of precision are viewed as being more informative regarding each examinee’s true score on the underlying psychological characteristic of interest (Myers, McCaulley, et al., 2003, 164).” The traditional reliability methods yield a single overall, aggregate estimate reliability coefficient for a given group which represents the reliability across the entire range of scale scores. Studies indicate that these correlations over-estimate precision on extreme scores and under-estimate precision on scores near the midpoint (Zeisset, 2000). IRT assumes that some points along the scale may be more precise than others and instead of a single reliability number, IRT methods provide a graphical function that shows the amount of precision expected at any given level of score across the possible range of scores (Myers, McCaulley, et al., 2003, 164).

“Item Response Theory focuses on the relationship between a person’s “true score” on the characteristic being measured and the likelihood of making a particular response to an individual test item (Zeisset, 2000, 30).” A person’s total score on the whole scale is the referent “true score.” The IRT method reflects the theoretical assumption that scales tend to be more precise for individuals who fall at some levels of true score than at other score levels. The goal to maximize precision at the midpoint of each scale in order to accurately classify people with slight preferences on each side of the midpoint was possible with the IRT method. IRT provides a means to describe and evaluate the precision or error more accurately at the midpoint (Myers, McCaulley, et al., 2003).

The IRT equivalent of the reliability coefficient is the test information function (TIF) that shows precision produced by the test at each possible value of the range of scores. The

standard error of measurement (SEM) of CTT is the test standard error (TSE) function for IRT, which shows the expected standard error that would be found when estimating true scores from the observed item responses across the full range of possible scores. Analytic results for the MBTI scales from the IRT method demonstrate the theories fundamental assumption that test precision varies as a function of the range of test scores being considered, and that "precision tends to be highest in the vicinity of the midpoint of each scale, exactly as would be desired for an instrument used to determine dichotomous preferences (Myers, McCaulley, et al., 2003, 165)."

The test-retest reliability methods show consistency over time with agreement levels that are significant beyond chance. As well, Cronbach's coefficient alpha reliabilities for the MBTI were in the range of 80 to 90% considered acceptable and recommended for research. The added use of IRT methods to assess precision and increase test information with the Form M revision added to the overall reliability indicators for the MBTI assessment.

Validity of the MBTI.

An assessment is said to be valid based on the extent or degree to which it truly measures what it claims (or intended) to measure. There are generally three categories or types of validity considered most important according to the *Standards for educational and psychological testing* (American Psychological Association (APA), the American Educational Research Association (AERA), and the National Council on Measurements Used in Education (NCME), 1999). These validity types are content, criterion, and construct.

Content validity has to do with items seeming to measure what they claim to measure. Content validity questions how well the sample items represent the domain of items (O'Brien, 2005; Garson, 2005) in appropriateness and completeness. The item selection

process for the MBTI assessment well addressed the content validity of the four scale inventory. For item selection with the revised Form M, item response theory (IRT) was used. IRT is a theory about how item responses are related to the underlying construct in the individual that is presumed to produce those responses.

Item response theory (IRT) is used to determine that the scale items are measuring what is intended to be measured for the MBTI (Myers, McCaulley, et al., 2003). The focus of IRT is on the relationship between a person's true score on the psychological characteristic in question and the likelihood of making a particular response choice to an individual test item. For instance, in a word-pair choice item for the E-I scale such as "talkative" or "quiet" how likely is a person with a true introversion preference (based on total E-I scale score) to choose the "quiet" introverted response item. To look at the effectiveness of such an item using IRT, a graph is plotted that is referred to as the item characteristic curve (ICC) (Zeisset, 2000).

In IRT the ICC graph's horizontal axis is a plot of the varying levels of the characteristic the item is designed to measure. For MBTI, scores to the left of the zero midpoint on the graph are the E, S, T, or J preference. To the right of midpoint, positive numbers, are the I, N, F, or P preferences that are referred to as the right side keyed direction. At the far left, negative end, of the scale would be clear preference for the E, S, T, or J with decreasingly clear preferences moving right to the zero midpoint, where preference shifts to increasingly clear preference for I, N, F, or P. A theta increase from left to right indicates a greater likelihood that a person will respond in the keyed direction. It is expected that a person with a clear Introversion preference would have a higher likelihood of choosing "quiet" in the word-pair item than would a person with a clear Extroversion preference.

Indicating that the item is discriminating for the desired construct of the E-I scale (Zeisset, 2000). The ICC plot vertical axis is called pkr for probability of a keyed response and goes from 0.0 at the baseline of the graph to 1.0 at the top and shows the probability that a person at a given level would respond to the item in the keyed direction. The probability of item choice in the keyed direction can go from very unlikely, 0.0 to nearly certain, 1.0 (Zeisset, 2000).

For the IRT model used with MBT, there are three parameters describing each item's characteristic or performance. "The parameters define the way in which the person's score relates to the observed likelihood of endorsing the item in the keyed direction (Zeisset, 2000, 31)." The ICC parameters are designated a, b, and c.

The a parameters describes the item's discrimination, the steepness of the curve's slope. Typically, more information or measurement precision is provided with a steeper curve. A flat ICC curve would indicate the item is not discriminating and the probability of the person responding in the keyed direction is nearly the same at any point on the scale (Zeisset, 2000).

Parameter b in the ICC is the difficulty parameter and tells how hard or easy it is to answer in the keyed direction for the item. On the ICC graph, the location of the steep part of the curve is the b parameter. If b occurs near the midpoint, the item is discriminating between even slight preferences with MBTI items. It is preferable to have the greatest slope close to the midpoint (Zeisset, 2000).

The third or c parameter is the lower asymptote and has to do with where the ICC curve flattens out for those who score at the left end (non-keyed direction) of the scale. If the item does not come down to the baseline on the scale at the lower end (non-zero asymptote),

it has a lower asymptote problem and means that even people with a clear preference on the measurement scale had a higher than zero chance of answering the item in the non-keyed direction. The c parameter helps identify over popular or socially desirable answers. The presence of nonzero lower asymptote alerts test developers to the possibility that something is present in the item that leads even clear preference scale persons to respond in the opposite non-keyed direction. For example, a clear Extravert would respond to the non-zero asymptote item in the introverted direction (Zeisset, 2000).

IRT item selection for Form M of the MBTI produced selected items that have clear levels of slope on the a parameter, have maximum discrimination near the midpoint, b parameter, and have curves that begin near the baseline, no c parameter problems. Using the three-parameter IRT model, items were selected from a pool to form a test that produces the maximum amount of test-level information which roughly corresponds with the reliability concept of classical test theories. Comparing Form M with previous forms of the MBTI, overall Form M has improved information and less error near the midpoint where precision is essential for type-sorting instruments (Zeisset, 2000).

Criterion-related validity has to do with the correlation between instrument measurement items and known and accepted standard measures or criteria and has two subcategories: predictive and concurrent. Criterion validity questions how well the assessment predicts future or estimates current performance on some valued criterion (O'Brien, 2005; Garson, 2005). Myers, McCaulley, et al. (2003) demonstrate evidence for criterion-related validity through comparisons of the MBTI with numerous other instruments. Correlations of MBTI continuous scores to other instrument scales were conducted with a wide variety of instruments and many different samples. The instruments thought to be

relevant to the MBTI preference scale included; Strong Interest Inventory, Career Factors Inventory (Chartrand, Robbins, & Morrill, 1997), Strong Skills Confidence Inventory (Betz, Borgen, & Harmon, 1996), Maslach Burnout Inventory (Maslach, Jackson, & Leiter, 1996). The correlations of the MBTI four preferences scales with the scales of these instruments support the predictions of type theory regarding meaning of and behaviors believed to be associated with the four MBTI dichotomies. Multiple tables report the product moment correlations of the MBTI continuous scores with those of other tools in the MBTI manual lending evidence for criterion-related validity of the MBTI (Myers, McCaulley, et al, 2003.

Construct validity examines the ability of the instrument to measure a particular characteristic or construct; each measure must validly measure the construct it purports to measure. Construct validity questions how well the assessment results can be interpreted as a meaningful measure of some quality or characteristic (specified construct) (O'Brien, 2005; Garson, 2005).

Evidence for construct validity of the MBTI is established in part through factor analysis. Myers, McCaulley, et al (2003) cite several exploratory factor analyses that produced results that were nearly identical to the four-factor model hypothesized by the MBTI assessment: Harvey, Murry, and Stamoulis, 1995; Thompson and Borrello, 1986; Tzeng, Outcalt, Boyer, Ware, and Landis, 1984; Tischler, 1994 (as cited by Myers, McCaulley, et al, 2003, 172). The Form M version of the MBTI was analyzed by confirmatory factor analysis using the national data sample (N=3,036) and PRELIS 2 software "to obtain polychoric correlations and asymptotic variance matrices suitable for dichotomous items. The matrices were used by LIREL 8.12 software running the diagonal weighted least squares procedure to estimate the model (Myers, McCaulley, et al, 2003,

p173).” The resultant data indicated an index of .949 for adjusted fit and the non-normed fit index was .967, indicating excellent fit for the indicator’s four-factor model as proposed (Myers, McCaulley, et al, 2003).

Evidence for the validity of an inventory or self-reporting test such as the MBTI is really a combination of all three types of validity considered in unison. The consideration for content, criterion and construct validity are all important for having a valid test.

Criticisms of MBTI

One of the criticisms of the MBIT instrument is the cost and administration restrictions which can retard educational research usage of the instrument. The MBTI instrument is available only through the CPP publishing company and their qualified certification providers. To buy and administer the instrument one must have MBTI qualification or certification provided by qualified certifying providers. The instrument usage is costly. For example, the self-scorable item booklet with answer sheet for mail in scoring is $14.50 per instrument or for a scoring template the booklet/answer sheet set is $67.50 for a set of 8. Online administration and scoring is $13.50 each for counts of 100-499 instruments, with a set-up fee of $300. Cost of the instrument and required qualification or certification limits the instrument’s widespread use especially in public education arenas.

Capraro and Capraro (2002) did a meta-analytic study of the Myers-Briggs Type Indicator across many different research articles. They report that critics of the MBTI instrument disliked the forced-choice response format and were opposed to the assessment’s assumption that all people can be divided into groups. Their meta-analytic study found some concern over gender weighting, especially on the TF scale. Many of the studies did not report reliability and validity information for their own data, but fell back on the idea that the MBTI

is generally widely accepted without reporting on their own data findings of the instrument (Capraro & Capraro 2002). Although the current study indicates that MBTI forces people into groups, neither Jung nor Myers believed that everyone was a "type." They considered that everyone has differing levels or clear preferences along the scale continuums. The goal in classifying into four letter codes was to assist in self understanding and the concept that in each of the sixteen types all have similarities, differences and uniqueness. McCaulley paraphrased the uniqueness of every person as: "An ENFP is like every other ENFP, like some other ENFPs, and like no other ENFP" (Myers, McCaulley, et al, 2003

The Mental Measurements Yearbook (MMY) 2003 review of the MBTI Form M assessment concludes with the statement that MBTI "demonstrates a comforting degree of stability of classification (Plake, Impara & Spies, 2003)." The review was very thorough citing both criticisms and confirmations of the MBTI as a valid and reliable instrument. The MMY review publication is held in high regard by most social research disciplines and is often used for instrument selection purposes and thus a reasonable recommendation for MBTI use.

The MBTI instrument is a reliable and valid indicator for personality trait identification. The instrument has been researched, evaluated, revised, and scrutinized for over seventy years and is still the leading personality profile instrument available. Continued research is evidence that the instrument is considered of value in certain applications. If used with understanding and knowledge, the instrument can be a useful source of information to combine with other measures and data to make informed decisions with supporting evidence.

The SkillsOne internet application delivery site for administration, scoring and report generation are used in the online distance education ECI courses that provide the MBTI Form M profile of learning style data for this study.

Web-based Courses Survey

The Course Evaluation Survey (CES) questionnaire was used to evaluate students' perception of satisfaction in the online course. The survey (Appendix B) was prepared and administered using WebBuilder developed by North Carolina State's College of Agriculture and Life Sciences (CALS) department for survey and quiz construction that can be confidentially and anonymously administered to students enrolled in NCSU courses.

Item generation

The existing literature of the studies investigating attributes of students' perceptions of learning, satisfaction, connectedness, interactions and barriers to educational experiences was reviewed for possible items to include in the evaluation survey for the online courses. The survey questions were generated from the review of survey instruments from several studies (Rovai, 2003; Du &Simpson, 2002; Kim & Moore, 2005; Valenta , et al., 2001; Shelton, 2000; Muir, 2001; Irons, Young & Keel, 2002; Soles & Moller, 2001; Farahani, 2003; Irzarry, 2003; Northup, 2002; Berge, 2006) of Web-Based instruction and in consultation with research committee chair. The North Carolina State University Wide Evaluation Instrument (UEI) was reviewed for item inclusion related to overall course evaluation measures related to department data collection. There were no items selected from the UEI survey for use in the satisfaction survey as it was determined that none of the UEI

survey questions were constructed to measure the desired satisfaction interaction level constructs as proposed for the study.

An initial set of items from the various instruments was developed and reviewed for adherence to the hypothesized constructs of satisfaction related to construction of understanding and the extent to which learner goals and expectations are satisfied or facilitated. An initial set of 45 items, 15 per subscale of interaction was developed. The principal research sponsor and chair of the study reviewed the items with the researcher for adherence to the proposed constructs, clarity, single direction wording and scoring, non-repetitiveness, relevance and applicability. The set was reduced to ten items per subscale and refined to ensure all items were worded in a positive direction with the higher the value the more indicative of satisfaction. A final examination of the Course Evaluation Survey items revealed that on face value they appear to measure reasonably intuitive elements of interaction satisfaction.

After reconstruction from the review process, the survey was tested with the available Microsoft Word[1] application's Flesh Java application designed to analyze a document and display the difficulty associated with comprehension. Flesh produces two scores: Flesch-Kincaid Grade Level and the Flesch Reading Ease Score. Each of the scores is calculated based on the average number of syllables per word and words per sentence contained in the document. The Flesch scores provide an estimation of how difficult a document will be to comprehend. The Flesch Reading Ease Score indicates on a scale of 0 to 100 comprehension difficulty. The higher the score the easier the document is to understand. Most standard documents aim for a score of approximately 60- 70. The Flesch-Kincaid Grade Level score is an index that gives the number of years of education based on a U.S. school grade level

required for document understanding. The recommended level for most standard documents is a score of approximately 7.0 to 8.0 grade level. The CES had a Flesch Reading Ease score of 50.3 indicating a moderate level of complexity. The Flesch-Kincaid Grade level was 9.1. These scores are slightly higher than the recommended standard. However, the survey is intended for college administration and aligns with reasonable comprehension expectations.

The CES contains the following: 30 five point Likert scale items used as satisfaction indicators, six questions related to online work behaviors, one item to determine gender and an additional narrative comments section for free text input. The Likert items asked students to indicate their agreement on a five-point scale: 1) strongly agree 2) somewhat agree 3) agree 4) somewhat disagree 5) strongly disagree.

The Business and Marketing Education Department's online Course Evaluation Survey (CES) is subdivided into four question sets. The first three question sets are categories of statements designed to measure levels of satisfaction related to interaction within the online course. These three sets contain ten questions each using the described likert scale range from strongly disagree, with a numerically assigned value of 1, to strongly agree with numerically assigned value of 5. The resultant value range from 10-50 is evaluated to be the higher the numeric value the more satisfied. All questions are presented in the positive direction. The sets are categorized by interaction constructs; Learner-Learner, Learner-Content, Learner-Instructor. The work behavior and comment sections of the CES are not part of the data collection and analysis process for this research.

Survey Content Validity.

The constructed course evaluation survey instrument was pilot tested by sending the instrument survey to ten graduate students who had previously participated in the ECI

courses. The graduate students were asked to take the survey for results review and to critique the survey. Specific comments were solicited for;

- Time to complete
- Length of survey
- Question wording and clarity
- Usefulness of items scale
- Construct validity as indicated by category
- Suggestions for improvement

The critique of the survey from the pilot study and the resultant data were reviewed with no required item modifications.

The small sample size from the initially identified course evaluations required further data collection from other courses than the two identified for study sampling. Additional CES surveys were used for the summer courses offered within the same department and taught by the same instructors to collect more data for instrument evaluations. The resultant sample size for factor analysis of the CES instrument was sixty-five.

Frequency counts of CES items were calculated to determine if each item elicited a full range of responses across the five-point Likert-type scale. Of the 30 items, 14 (46%) elicited the full range of possible responses from strongly agree to strongly disagree; LL subset 6 out of 10; LC subset 5 out 10; LI subset 2 out 10. Ten items (33%) had response range from 2 to 5 on the Likert scale; LL & LC subsets 4 out of 10; LI subset 2 out 10. The LI subset elicited the least range variance with responses of 3 to 5 on the Likert scale for 60% of the subscale items. All the items had from 70 – 75% frequency rate on the Likert scale at 4, somewhat agree, and 5, strongly agree, with the exception of Q14, 15 and 19 with

frequencies of 46%, 62% and 24% respectively. All items had from 1 to 5% frequency rate at the 1, strongly disagree, and 2, somewhat disagree scales, with the exception of Q14, 15 and 19; frequencies of 23%, 7% and 53% respectively (Appendix F, Table F.1). The data seems to indicate a high level of satisfaction with the learning experience as measured by the single administration of the CES to the sample student population. The LL, LC, LI subscale frequency count per question item rating for the N-68 sample are summarized in Table 3.6, Table 3.7 and Table 3.8. The LI, Learner to Instructor, subscale range was the most favorably reported for satisfaction as noted in the item range frequency count. The frequency count per subscale procedures duplicated the finding with the LI subscale having 40% of the sample reporting a maximum satisfaction level of 50, a strongly agree scale value of 5 on every item (Appendix F, Table F.2). The frequency counts analysis indicates survey items Q14, 15, and 19 should be reviewed.

Table 3.6 Learner-to-Learner Questions Subset Frequency Counts

Q-Item	1 *Strongly Disagree*	2 *Somewhat Agree*	3 *Agree*	4 *Somewhat Agree*	5 *Strongly Agree*
qq1	1 (1%)	2 (3%)	14 (21%)	10 (15%)	40 (60%)
qq2	-	3 (4%)	16 (24%)	11 (16%)	38 (56%)
qq3	-	1 (1%)	17 (25%)	5 (7%)	45 (66%)
qq4		4 (6%)	16 (24%)	9 (13%)	39 (57%)
qq5	2 (3%)	2 (3%)	16 (24%)	11 (16%)	37 (54%)
qq6	1 (1%)	-	16 (24%)	12 (18%)	39 (57%)
qq7	2 (3%)	4 (6%)	13 (19%)	16 (24%)	33 (48%)
qq8	2 (3%)	2 (3%)	14 (21%)	14 (21%)	35 (52%)
qq9	1 (1%)	1 (1%)	17 (25%)	12 (18%)	36 (54%)
qq10		2 (3%)	15 (22%)	13 (19%)	38 (56%)

Table 3.7 Learner-to-Content Questions Subset Frequency Counts

Q-Item	1 *Strongly Disagree*	2 *Somewhat Agree*	3 *Agree*	4 *Somewhat Agree*	5 *Strongly Agree*
qq11	1 (1%)	-	16 (24%)	8 (12%)	43 (63%)
qq12	-	2 (3%)	14 (21%)	10 (15%)	41 (61%)
qq13	1 (1%)	1 (1%)	17 (25%)	5 (7%)	43 (63%)
qq14	5 (7%)	11 (16%)	20 (29%)	13 (19%)	19 (28%)
qq15	2 (3%)	4 (6%)	19 (28%)	12 (18%)	31 (45%)
qq16	1 (1%)	-	17 (25%)	11 (16%)	38 (56%)
qq17	1 (1%)	1 (1%)	18 (28%)	2 (3%)	44 (67%)
qq18	-	3 (4%)	16 (24%)	3 (4%)	44 (67%)
qq19	2 (3%)	34 (50%)	15 (22%)	9 (13%)	8 (12%)
qq20	-	-	13 (19%)	6 (9%)	49 (72%)

Table 3.8 Learner-to-Instructor Questions Subset Frequency Counts

Q-Item	1 *Strongly Disagree*	2 *Somewhat Agree*	3 *Agree*	4 *Somewhat Agree*	5 *Strongly Agree*
qq21	1 (1%)	-	16 (24%)	1 (1%)	50 74%)
qq22	-	1 (1%)	16 (24%)	6 (9%)	45 (66%)
qq23	1 (1%)	-	22 (33%)	5 (7%)	39 (57%)
qq24	-	-	13 (19%)	8 (12%)	47 (69%)
qq25	-	-	17 (25%)	5 (7%)	46 (66%)
qq26	-	-	16 (24%)	7 (10%)	44 (67%)
qq27	-	2 (3%)	21 (31%)	7 (10%)	38 (56%)

Table 3.8 continued

qq28	-	-	19 (28%)	9 (13%)	40 (59%)
qq29	-	-	16 (24%)	6 (9%)	45 (66%)
qq30		1 (1%)	16 (24%)	8 (12%)	43 (63%)

Survey Construct Validity

An exploratory factor analysis using SAS software, Version 9.1 of the SAS System for Workstation[2] was completed on the sample questionnaires to discover simple patterns in the relationships among the question items (variables) used to measure the satisfaction level constructs. Factor analysis is a method used for analyzing relationships of measured entities such as survey items and underlying supposed or hypothesized unobserved latent variables (or factors). An assumption of factor analysis is that the correlations among observed variables (i.e. survey item responses) is accounted for by the latent factors (i.e. interaction satisfaction levels) and if the latent variables are held constant then observed variable correlations become zero. "The primary purpose of factor analysis is data reduction and summarization. Factor analysis has been widely used, especially in the behavioral sciences, to assess the construct validity of a test or a scale (University of Texas, 1995, Purposes, ¶1)." Therein was the hope that the factor analysis would provide some indications of the validity of the Course Evaluation Survey as a measure of the underlying perception of satisfaction related to course interactions.

The principal components analysis was performed on the three hypothesized satisfaction level factors to identify if the item groupings did indeed exhibit communality and if the items as a whole were correlated. Principal component analysis considers the total

variance and makes no distinction between common and unique variance. The correlation (covariance) matrix, with 1.0s (variances) down the main diagonal, is submitted to the analysis procedure.

Factor Analysis is used to:

> study the patterns of relationship among many dependent variables, with the goal of discovering something about the nature of the independent variables that affect them, even though those independent variables were not measured directly. Thus answers obtained by factor analysis are necessarily more hypothetical and tentative than is true when independent variables are observed directly. The inferred independent variables are called factors. A typical factor analysis suggests answers to four major questions:
>
> 1. How many different factors are needed to explain the pattern of relationships among these variables?
> 2. What is the nature of those factors?
> 3. How well do the hypothesized factors explain the observed data?
> 4. How much purely random or unique variance does each observed variable include? (Darlington, 1973, ¶ 9)

Darlington (1973, How Many Cases, ¶ 1) posits that for factor analysis the sample size can be small, roughly 50 cases, if there is a clear true factor structure. However, he maintains for useful interpretability of the supposed factor structure the more cases the better with preference for 100 or more cases. Various guidelines for sample size in relation to number of variables are presented in discussions of the factor analysis procedure, with the

minimum number of observations per variable ranging from 5 to 10 (UCLA Academic Technology Services). In the present study the preliminary analysis was conducted with sample size of 65. This is a less than desired number of cases, but with the advantage of having previous research survey items to review and reconstruct for survey usage, the factor structure is possibly clearer, this assumption is a bias in the research analysis. A future research study is actually suggested by the CES analysis, one in which the survey is further tested and refined as a possible research instrument for data collection on student satisfaction constructs.

Factor Extraction Option.

The a priori hypothesis of the satisfaction level subsets was used as criterion for the number of factors to extract in the analysis. The previous research reviewed suggested the satisfaction subscales used in the present study. Specifically those studies that investigated the relationships of perception, performance and preference; Apperson, et al., 2004; Hong, 2002; Nicholson, 2002; Picciano, 2002; Richardson and Swan, 2003 were consulted. The questionnaires from several studies were reviewed for construct formulation related to perceived satisfaction and interaction measures; Rovai, 2003; Du &Simpson, 2002; Kim & Moore, 2005; Valenta , et al., 2001. Common factor analysis is designed to explain correlation of specific variables and to indicate the portion of total variance shared by the variables included in the model (University of Texas, 1995).

After determining the number of factors the next step in modeling for principal components analysis is method of rotation to use.

The fundamental theorem of factor analysis is invariant within rotations. That is, the initial factor pattern matrix is not unique. We can get an infinite number of solutions, which

produce the same correlation matrix, by rotating the reference axes of the factor solution to simplify the factor structure and to achieve a more meaningful and interpretable solution. The idea of simple structure has provided the most common basis for rotation, the goal being to rotate the factors simultaneously so as to have as many zero loadings on each factor as possible. (University of Texas, 1995, The Rotation of Factors, ¶ 1)

The most commonly used orthogonal rotation procedure, the varimax method, was used to analyze the data observations once converted to a correlation matrix. The resultant analysis output is a matrix of factor loadings; an n by m matrix of correlations between the original variables and their factors, where n is the number of variables and m is the number of retained factors. The meaning of the rotated factors is inferred from the variables that are considered significantly loaded on their factors. A rule of thumb frequently used regarding what constitutes a significant loading is that factor loadings greater than 0.30 in absolute value are considered to be significant (University of Texas, 1995, The Rotation of Factors, ¶ 1).

Ideally, each item (variable) would have a single significant loading on only one factor. But it is common that items have multiple significant loadings especially on subscale levels of an overall construct. If items fail to load significantly on any factor the variable (item) should be eliminated or reconstructed. Generally, the interpretation of factor loadings is that the larger the absolute size of a factor loading for a variable the more important that variable (item) is in interpreting the factor. Factor loadings represent the correlation (linear association) between a variable (item) and latent factors that are supposed and hoped to be measured (University of Texas, 1995, Interpretation, ¶ 3).

For the CES, factor procedures were run for each of the three supposed subscales; LL, LC, and LI with 10 items (variables) and for the whole satisfaction scale of 30 items (variable). Each factor procedure was run with significant loading identified as 0.5 with a process step to print flag indications (*) of the factor loadings greater than 0.5. For the factor analyses the Kaiser-Guttman rule of eigenvalues greater than one stating the number of factors to extract is equal to factors with an eigenvalue (variance) greater than 1.0 was used. This allows for the extracted factor to have a variance as large as the single standardized original variable, in principle component this refers to the 1s retained in the main diagonal of the correlation matrix (University of Texas, 1995, Kaiser-Guttman, ¶ 1). The factor procedure was not held to one factor analysis to ascertain that only one factor existed within the subscale divisions.

Factor Procedure

The LL and LI subscales each resulted in one factor extraction as there was only one eigenvalue greater than one, this disallowed a subsequent varimax rotation of the data as a rotation is not possible with one factor (Appendix F, Table F.5). The LC subscale analysis resulted in two factors with a large first eigenvalue (6.08) and a much smaller second eigenvalue (1.25) suggesting the presence of a dominant global factor and a residual secondary factor within the subscale. The LC subscale analysis with varimax rotation matrix identified only two items, Q14 and Q19 as having a significant secondary factor loading (0.59 and 0.91 respectively). This flagged Q14 and Q19 as items for review and inspection as did the frequency count. With all other items significantly loading on only one factor; the one factor extraction for the subscale appears reasonable.

The full set factor procedure allowing for eigenvalue greater than one Kaiser-Guttman rule as an option resulted in the initial correlation matrix having five factor loadings; not the hypothesized three factor construct measure. Inspection of the eigenvalues matrix revealed that factor one had a large eigenvalue of 18.07 with a secondary factor value of 2.10, the remaining three factors were small and relatively equivalent in supposed value with eigenvalues of 1.45, 1.17 and 1.08 respectively. The Kaiser-Guttman rule factor extraction however was overruled based on a priori theory and survey item construct knowledge and the principal components and the succeeding orthogonal varimax rotation procedures were executed with a factor set option of three (Appendix F, Table F.5, p. 33-36).

Interestingly, the full survey's 30 items all had high factor loadings with the principal components analysis on factor 1. The variance explained by each of the retained three factors was 18.071, 2.105 and 1.451. The total estimate of the common variance among all items was 21.628. This initial estimate of the common variance constitutes about 72% of the total variance present among all 30 items (Appendix F, Table F.5, p. 35). The varimax rotation matrix had the same total communality estimate of 21.628, but variance explained by each factor more evenly distributed as 10.00, 9.889, and 1.737 respectively (Appendix F, Table F.5, p. 37).

The rotated factor patterned seems to indicate survey items 1 through 20 have high factor loadings on Factor 1 (0.63 to 0.77) with a few item exceptions. Q5 indicated factor loadings across three latent factors somewhat evenly; 0.45, 0.36 and 0.48. Q14 had low factor loading on Factor 1 with spilt factor loadings of 0.45 and 0.47 on Factor 2 and 3. Q19 is a lone item with high factor loading on Factor 3 of 0.85 and negative low factor loadings

on factors 1 and 2. Items 21 through 30 have high factor loadings on Factor 2 from 0.67 to 0.89 values (Appendix F, Table F.5, p. 37).

With smaller than recommended sample size, the interpretation of the factor patterns is tentative at best. However, the a priori latent construct definition is somewhat replicated by the analysis outcomes. The finding that subsets for LL and LC are correlated with strong factor loadings on a single factor is not a surprising interpretation as these levels measured learner-learner and learner-content interactions, both more in the control of the individual student than the learner-instructor interaction.. Again, a future research study is suggested by the analysis, one in which the survey is further tested and refined as an instrument for data collection on student satisfaction constructs.

Survey Reliability

An internal consistency reliability method frequently used is Cronbach's alpha for computing correlation values among the questions or items on an instrument. Cronbach's alpha splits all the questions/items on an instrument into every possible division of two parts and computes correlation values for them all. By using a computer program, output is generated quickly producing one number for Cronbach's alpha. Like a correlation coefficient, the closer it is to one, the higher the reliability estimate of the instrument (Zeisset, 2000).

A Correlation Procedure (CORR) analysis using SAS software, Version 9.1 of the SAS System for Workstation was completed on a random sampling of questionnaires to determine Cronbach coefficient alpha measures for the survey questions. The sample size used for the analyses was N=65. Of the 65 surveys, some had missing data items that were eliminated from the analysis procedure by the SAS program. Therefore, the question subsets

had varying sizes. Correlation procedures were executed for each of the three hypothesized construct subsets of satisfaction with each level having ten variables (questions) per subset. The internal consistency reliability coefficients for the subscales using Cronbach's coefficient alpha were: LL coefficient alpha= 0.94 (Appendix F, Table F.2, p. 10), N=65; LC coefficient alpha= 0.90 (Appendix F, Table F.2, p. 12) N=62; LI coefficient alpha= 0.96 (Appendix F, Table F.2, p. 14), N=65. The correlation procedure was executed for the whole set of thirty question items (variables). The resultant coefficient alpha was 0.97 with N=56 (Appendix F, Table F.3, p. 17, 18). The statistical output data tables for the correlation analysis of the CES are included for review in Appendix F.

The data presented on the Course Evaluation Survey development and validation procedures provides some tentative evidence that the 30-item CES is a reasonable instrument to assess graduate students' satisfaction level with the defined Web-Based instruction experience. There are limitations. The sample was students from a single institute of learning with WebCT learning management system presentation, in a single department and curriculum. Caution should be exercised when generalizing the satisfaction scores to any other population or educational experience. As well more analyses should be conducted with larger sample sizes or other sample groups to try and replicate the current analyses results for more robust confirmation of survey validity and reliability.

Data Collection

To comply with ethical research policy of North Carolina State University in the study of human subjects, an IRB application was submitted to the institutional review board for approval. The IRB application requested exemption as there was no direct contact with subjects, only data extraction from pre-existing database sources. The application was

submitted, corrected based on review feedback and resubmitted for final consideration. The research proposal was approved as "..received administrative review and has been approved as exempt from the policy as outlined in the Code of Federal Regulations (Exemption: 46.101.b.1)." See Appendix D for approval notice.

Data were collected from the semester data related to the two ECI561 and ECI562 graduate level courses offered entirely online using the WebCT learning management system. The data of interest were extracted from the course information; MBTI profile (learning style), numeric end of course grade (performance), course evaluation (used for satisfaction indicator). The demographic subject profile information such as gender, ethnicity, and age was extracted from the MBTI profile database collection.

The collected data were aggregated into an Excel spreadsheet for review and to run preliminary analytic reviews. The information in the study records was kept strictly confidential. The confidentiality of the collected student information was preserved at all times. Subject names or other identifying information are not disclosed or referenced in an identifiable way in written or verbal context. The data are organized by a derivative of the original student identification number to further ensure confidentiality of the information and that number was used throughout the study. Only the principal investigators had access to the code used to create the study numbers for use in checks and review for data integrity. The aggregated data, both paper and electronic versions, are secured in the privacy of the researchers' office. No reference is made in oral or written reports which could link subjects to the study.

Data Analysis

Data analysis and generation were done using SAS software, Version 9.1 of the SAS System for Workstation. Copyright 2005 SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA.

A first look at the data includes frequency tables. For example, frequency tables to show the number of males and females in the sample, the number of subjects from particular ethnic and racial backgrounds, and age ranges. Responses on reported learning style (MBTI) measurement scale are summarized via a frequency table. General descriptive data are reported including information on the number of participants, their gender and age, and information related to their end of course numeric scores (mean, median, standard deviation). Summary statistics related to the course satisfaction survey are reported (mean, median, mode, standard deviation).

A multivariate analysis of variance (MANOVA) technique was used for assessing the differences across the multiple dependent variables simultaneously, based on the set of categorical variables acting as independent variables. The MANOVA provided information on the nature and predictive power of the independent measures; MBTI categories (MB1, MB2, MB3, MB4), age, and gender, as well as the relationships and differences seen in the dependent measures; satisfaction levels (LL, LC, LI) and performance (EOC). A between-groups MANOVA was used to assess whether an overall significant difference exist between groups. Univariate tests were run to find individual differences for each dependent variable; satisfaction levels (LL, LC, LI) and performance (EOC). Post hoc analyses were conducted based on the initial data results from the MANOVA and univariate tests.

RESULTS

Purpose of the Study

The purpose of this study was to provide empirical data that reports the association between students' personality type preferences as measured by the MBTI personality profile and their achievement and perception of satisfaction in web-based learning environments. Consideration of this issue is based on the perspective that maximized learning effectiveness is facilitated when students are actively engaged and satisfied. The guiding premise of the study is the relationship of learner MBTI personality type related to on-line instructional achievement and learner perception of satisfaction. The findings may be used in making recommendations for the definition and implementation of instructional delivery models effective for Web-Based instruction (WBI).

Research Question

This study examined the overarching question concerning the association between students' MBTI personality type (learning style) and performance and perceptions of satisfaction for learners enrolled in web-based learning environments. The guiding questions for this research study as outlined in chapters one through three were:

- What is the relationship between MBTI personality type and performance in web-based program courses?
- What is the relationship between MBTI personality type and the perceptions of satisfaction with Learner-Learner, Learner-Content and Learner-Instructor interactions within Web-Based instruction (WBI) courses?

Sample Description

Descriptive statistics were computed for all variables including frequencies, ranges, means and standard deviations. All subject data are summarized and reported in aggregate form for anonymity and confidentiality. Forty-seven students enrolled in Web–based courses had complete data information available for use in the current study model.

The study sample contained nearly three times as many females as males. Overall, the sample was a relatively older group of students with forty-seven percent of the students older than 36 years. Table 4.1 summarizes the 47 subjects by age range and gender. The age information presented in alternate continuous numeric form, available from the MBTI assessment demographics revealed the sample had an average age of 37.74 years. The standard deviation was 10.23 years with a large age spread of 36 years from 23 to 59 years old.

Table 4.1 Subject Frequency of Age Range by Gender *(percentage as decimals)*

Age Range	**Gender**					
	Female		***Male***		***Total***	
	%	**(Freq)**	**%**	**(Freq)**	**%**	**(Freq)**
24-30	21.28	(10)	14.89	(7)	36.17	(17)
31-36	14.89	(7)	2.13	(1)	17.02	(8)
37-42	8.51	(4)	4.26	(2)	12.77	(6)
43-50	19.15	(9)	0	(0)	19.15	(9)
51+	8.51	(4)	6.38	(3)	14.89	(7)
Total	72.34	(34)	27.66	(13)	100	(47)

The categorical distribution of subjects by MBTI scale pairs (explanatory variables) of Extroversion-Introversion, Sensing-Intuiting, Thinking-Feeling, and Judging-Perceiving is summarized in Table 4.2. Sixty percent of the subjects reported a preference for Extroversion and forty percent reported a preference for Introversion. More subjects reported a preference for Sensing, Thinking and Judging than for the opposing MBTI direction preferences of Intuition, Feeling and Perceiving. This distribution is relatively similar to the US distribution of types as reported in the Myers-Briggs National Representative Sample (NRS); wherein 49.3% reported Extroversion preference to 50.7% reporting Introversion (Myers, et. al., 1998) The NRS had more subjects reporting Sensing and Judging as did the sample. Unlike the sample, the NRS had more Feeling (59.8%) than Thinking (40.2%) reported preference. The type distribution profile for the national representative sample is included in the Appendix H for reference and comparison.

Table 4.2 Subjects by MBTI category

	E	**I**	**S**	**N**	**T**	**F**	**J**	**P**
Frequency (n)	(28)	(19)	(30)	(17)	(29)	(18)	(29)	(18)
Percentage	60	40	64	36	62	38	62	38

Note. E = Extraversion, I = Introversion, S = Sensing, N = Intuition, T = Thinking, F= Feeling, J = Judgment, P = Perception.

Fourteen of the sixteen MBTI personality groups are represented in the sample. The most prominent reported types are ESTJ, ENFP and ISTJ; accounting for 57.46% of the sample. Not represented in the sample were types: ENTP and INTJ. Table 4.3 presents the frequencies of MBTI Type in the research study sample. The two least reported types in the NRS were INFJ (1.5%) and ENTJ (1.8%) with the sample's missing INTJ being the third

least (2.1%) in the NRS and the sample's missing ENTP (3.2%) as fourth least reported in the NRS; an indication of the similarity of the research sample to the national representative sample profiles.

Table 4.3 MBTI Personality Type Profiles of Subjects (N = 47) (*frequency in parenthesis*)

<table>
<tr><td colspan="2">TOTAL</td><td>ISTJ
(8) 17%</td><td>ISFJ
(4) 8.5%</td><td>INFJ
(1) 2%</td><td>INTJ
0%</td></tr>
<tr><td rowspan="3">E
60%

S
64%

T
62%

J
62%</td><td rowspan="3">I
40%

N
36%

F
38%

P
38%</td><td>ISTP
(1) 2%</td><td>ISFP
(1) 2%</td><td>INFP
(1) 2%</td><td>INTP
(3) 6.4%</td></tr>
<tr><td>ESTP
(2) 4.3%</td><td>ESFP
(1) 2%</td><td>ENFP
(8) 17%</td><td>ENTP
0%</td></tr>
<tr><td>ESTJ
(11) 23.4%</td><td>ESFJ
(2) 4.3%</td><td>ENFJ
(3) 6.4%</td><td>ENTJ
(1) 2%</td></tr>
</table>

Note. E = Extraversion, I = Introversion, S = Sensing, N = Intuition, T = Thinking, F= Feeling,

J = Judgment, P = Perception

Response Variables Statistical Summary

Descriptive statistics for each dependent response variable (EOC, LL, LC, and LI) were obtained. The measure for achievement was the end of course grade. The three measures of satisfaction with Web-Based instruction and learning: learner-to-learner (LL), learner-to-content (LC) and learner-to-instructor (LI) interactions were rated using ten questions for each scale in the course evaluation survey (CES). Satisfaction ratings were by Likert-scale 1 to 5 selection for statement agreement to questionnaire items. The question agreement ratings were from 1 to 5 wherein 1=strongly disagree, 2=somewhat disagree,

3=agree, 4= somewhat agree, 5=strongly agree. The Likert-scale means for the three satisfaction scales were used for model analysis. The agreement ratings are interpreted as indicative of satisfaction as the sets of questions were constructed to declare positive affirmation of satisfaction related to interactions of the learner with the instructional content or with other students or with the course instructor.

The end of course scores (EOC) were generally very high with a minimum score of 81 and average of 94. The EOC scores were tightly packed with small standard deviation and the middle fifty percent of all the scores clustered in a six-point range. The EOC data distribution is negatively skewed (mean score less than the median score) with a skew coefficient of -1.30. The lowest 25% of the scores (value between the minimum and the first quartile) is more spread out relative to the top 25% (value from third quartile to maximum). Table 4.4 presents the basic descriptive statistics data.

Table 4.4 Basic Statistical Summary for End of Course Grade (N=47)

Minimum	**Maximum**	**First Quartile**	**Third Quartile**	**Mean**	**Median**	**SD**	**Skew**
81.80	100	92.60	97.50	94.67	95.30	3.74	-1.30

The satisfaction level ratings overall were high indicating subjects were well satisfied with the course interactions as measured by the CES survey. The standard deviations indicate little variability existed among the subject ratings. The satisfaction levels data distribution are negatively skewed with the quartile and range data indicative of each satisfaction factor clustered near the high satisfaction rating with little spread in the measure for the small research sample. The descriptive statistics for satisfaction level ratings are presented in Table 4.5.

Table 4.5 Basic Statistical Summary for Satisfaction Ratings (N=47)

	Min.	**Max.**	**First Quartile**	**Third Quartile**	**Mean**	**Median**	**SD**	**Skew**
Learner-to-Learner	2.70	5.00	3.60	4.90	4.32	4.70	0.76	-0.89
Learner-to-Content	2.30	5.00	3.90	4.70	4.15	4.15	0.71	-0.96
Learner-to-Instructor	2.60	5.00	3.80	5.00	4.40	4.80	0.79	-1.04

Multivariate Analysis Test

The research question as outlined in chapters one through three:

- What is the relationship between MBTI personality type and performance (EOC) in Web-Based instruction (WBI) courses?
- What is the relationship between MBTI personality type and the perceptions of satisfaction with Learner-Learner (LL), Learner-Content (LC) and Learner-Instructor (LI) interactions within Web-Based instruction (WBI) courses?

To answer these research questions a multivariate analysis of variance (MANOVA) was used. MANOVA was conducted to determine the overall effect of the research model's three independent variables of MBTI Type four scales (four levels), age range (5 levels), and gender (2 levels) on the model's four dependent, response variables; end of course numeric grade as performance (EOC) and perceived levels of satisfaction for learner-to-learner, learner-to-content and learner-to-instructor interactions with the course and Web-Based instruction. MANOVA was used to simultaneously evaluate the mean differences among and between all the variables while controlling the intercorrelation among them.

The overall purpose for analysis of variance is to test differences in means (for groups or variables) for statistical significance. The total variance in the response is partitioned into the components that explain the difference due to true random error (i.e., within-group SS) and the components that explain the differences between means (averages). The variance components were tested for statistical significance, to determine if there are differences between the means of every combination of age range, gender and the four MBTI scale pairs in relation to student performance and perceived satisfaction levels.

The interest was whether student performance as indicated by end of course grade (EOC) and perceived satisfaction as measured by the course evaluation survey (CES) satisfaction ratings are different for the reported MBTI type preference scales. The design compared different groups of subjects categorized by the MBTI scales: Extroversion-Introversion, Sensing-iNtuiting, Thinking-Feeling, and Judging-Perceiving and referred to as a between-groups factor. The data means and standard deviations by each explanatory (independent) categorical variable to the response (dependent) variables are presented in Tables 4.6 through 4.11

Table 4.6 Means & Standard Deviations by Extroversion-Introversion

	Extroversion				***Introversion***			
	Male (n=8)		***Female (n=20)***		***Male (n=5)***		***Female (n=14)***	
Dep. Variable	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
End-of-Grade	94.02	2.85	95.57	3.11	93.27	4.55	94.25	4.71
Learner-Learner	4.21	0.75	4.26	0.84	4.26	0.80	4.50	0.67
Learner-Content	4.13	0.68	4.11	0.70	4.00	0.71	4.29	0.79
Learner-Instructor	4.19	0.74	4.48	0.75	4.12	1.08	4.51	0.81

Table 4.7 Standard Deviations by Sensing-Intuitive and Gender

	Sensing				***Intuitive***			
	Male (n=8)		***Female (n=22)***		***Male (n=5)***		***Female (n=12)***	
Dep. Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
End-of-Grade	93.80	3.99	94.31	4.19	93.61	2.75	96.34	2.81
Learner-Learner	4.01	0.85	4.29	0.84	4.58	0.37	4.48	0.65
Learner-Content	3.83	0.68	4.09	0.78	4.48	0.45	4.35	0.63
Learner-Instructor	3.91	0.92	4.43	0.83	4.58	0.52	4.61	0.64

Table 4.8 Standard Deviations by Thinking-Feeling and Gender

	Thinking				***Feeling***			
	Male (9)		***Female (20)***		***Male (4)***		***Female (14)***	
Dep. Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
End-of-Grade	93.91	3.74	95.24	4.57	93.33	3.09	94.73	2.61
Learner-Learner	4.07	0.81	4.14	0.84	4.60	0.42	4.66	0.56
Learner-Content	3.92	0.69	3.98	0.77	4.43	0.51	4.48	0.59
Learner-Instructor	4.03	0.94	4.41	0.81	4.48	0.54	4.60	0.70

Table 4.9 Means and Standard Deviations by Judging-Perceiving and Gender

	Judging				***Perceiving***			
	Male(9)		***Female (20)***		***Male (4)***		***Female (14)***	
Dep. Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Learner-Learner	38.89	13.37	38.95	9.98	28.50	2.52	37.93	9.15
Learner-Content	93.71	3.83	94.82	4.23	93.76	2.85	95.32	3.34
Learner-Instructor	4.02	0.79	4.21	0.81	4.70	0.29	4.56	0.69
End-of-Grade	3.95	0.74	4.09	0.76	4.37	0.38	4.31	0.70

Table 4.10 Means and Standard Deviations by Age Range (N=47)

	24-30 ***n=17***	***31-36*** ***n=8***	***37-42*** ***n=6***	***43-50*** ***n=9***	***51+*** ***n=7***
Dep. Variable	***M (SD)***	***M (SD)***	***M (SD)***	***M (SD)***	***M (SD)***
End-of-Grade	94.48 (3.28)	92.90 (5.03)	93.4 (4.60)	95.46 (3.45)	97.17 (1.35)
Learner-Learner	4.21 (0.83)	4.36 (0.86)	3.62 (0.58)	4.71 (0.44)	4.66 (0.54)
Learner-Content	3.97 (0.77)	4.05 (0.90)	3.78 (0.68)	4.58 (0.32)	4.50 (0.40)
Learner-Instructor	4.22 (0.83)	4.40 (1.00)	3.55 (0.53)	4.94 (0.09)	4.86 (0.22)

Table 4.11 Means & Standard Deviations by Gender (N=47)

	Female			*Male*		
Dep. Variable	***n***	***Mean***	***Std Dev***	***n***	***Mean***	***Std Dev***
End-of-Grade	34	95.03	3.84	13	93.73	3.43
Learner-Learner	34	4.35	0.77	13	4.23	0.74
Learner-Content	34	4.18	0.73	13	4.08	0.66
Learner-Instructor	34	4.49	0.76	13	4.16	0.84

Multivariate Analysis Results

The between-groups MANOVA design using the Wilks' lambda F statistic compared all possible combinations of means for each dependent variable in relation to the independent variables for all means generated by the model statement. The MANOVA for unbalanced cells was used on the model.

Presented in Table 4.7 are the MANOVA Wilk’s Lambda results testing for no overall effect (no difference in the means) of age range, gender or MBTI Type (independent variables) on student performance and perceived satisfaction levels (dependent variables). Wilks’ lambda is the most commonly used test when there are more than two groups formed by the independent variables. It is a measure of the difference between groups of the centroid (vector) of means on the independent variables. The smaller the lambda, the greater the differences (Garson, 2006)

Table 4.12 Multivariate Analysis of Variance

Independent Variable	**Wilks' Lambda**	**F-Value**	**Pr > F**
AgeRange	0.4684	1.84	0.0351 *
Gender	0.9072	0.87	0.4924
Extroversion-Introversion	0.8490	1.51	0.2210
Sensing-Intuition	0.8558	1.43	0.2446
Thinking-Feeling	0.7258	3.21	0.0244 *
Judging-Perceiving	0.8837	1.12	0.3641

Note. *p < .05

The MANOVA results indicate there are statistically significant differences among means of students for age range (F = 1.84, p =0.0351) in relationship to student's performance or satisfaction or both performance and satisfaction. There are statistically significant differences among means of students for the MBTI Thinking-Feeling scale (F = 3.21, p =0.0244) in relationship to student's performance or satisfaction or both performance and satisfaction. Obtaining significant multivariate test for main effects (or interactions), prompts examination of the univariate ANOVA test for each response variable to interpret the respective effects. The univariate tests identify the specific explanatory variables that contribute to the significant overall effect within the model. The means for the significant explanatory variables of age range and thinking-feeling scale were computed for the response variables for reference and are presented in Table 4.8.

Table 4.13 Means and Standard Deviations by AgeRange & Thinking-Feeling (N=47)

Response Variable	***24-30***	***31-36***	***37-42***	***43-50***	***51+***
	M (SD)	***M (SD)***	***M (SD)***	***M (SD)***	***M (SD)***
***EOC by* Thinking**	94.51 (3.79)	90.92 (6.54)	92.47 (4.37)	97.98 (1.91)	97.23 (1.47)
***EOC by* Feeling**	94.45 (2.85)	94.87 (2.40)	98.4 (n=1)	92.30 (1.71)	96.80 (n=1)
***LL by* Thinking**	3.93 (0.87)	3.97 (1.12)	3.54 (0.61)	4.56 (0.55)	4.60 (0.56)
***LL by* Feeling**	4.51 (0.70)	4.75 (0.24)	4.00 (n=1)	4.90 (0.14)	5.00 (n=1)
***LC by* Thinking**	3.68 (0.68)	3.57 (1.12)	3.66 (0.68)	4.52 (0.38)	4.42 (0.36)
***LC by* Feeling**	4.29 (0.78)	4.53 (0.24)	3.78 (n=1)	4.65 (0.25)	5.00 (n=1)
***LI by* Thinking**	4.14 (0.87)	3.88 (1.25)	3.53 (0.59)	4.96 (0.09)	4.87 (0.24)
***LI by* Feeling**	4.31 (0.82)	4.93 (0.15)	3.67 (n=1)	4.93 (0.10)	4.80 (n=1)

Note. No Standard Deviation for n=1 cells.

The interaction effect of age range and Thinking-Feeling scale was added into the MANOVA model to determine if the interaction of the significant explanatory variables contributed to the overall effect. The MANOVA Wilk's lamda ($\Lambda = 0.4036$) result indicated no significant differences among means related to the interaction effect of age range and thinking-feeling scale. The original model was retained and unchanged for the study analysis.

The overall model was evaluated with an additional explanatory variable, instructor, to determine if the significant statistical differences of the means among the groups in age range and Thinking-Feeling to the response variables was affected. The model with instructor added produced no different outcome. Instructor effect should be a consideration in future and other analyses with larger sample size, different course partitioning and different course content.

Analysis of Variance Results

The univariate analyses were examined for each dependent variable to determine where the difference between the means for age range and Thinking-Feeling were significant for the satisfaction ratings and performance. The Type III sum of squares results were used for analysis. Type III sum of squares for each term represents the variation among the means for the different levels of the factors. The Type III sum of squares for a particular effect (MBTI Thinking-Feeling scale) is the amount of variation in the response (satisfaction or performance) associated to that effect after correcting for all other terms in the model (SAS, 2003). The Type III sums of squares tables for each dependent variable analyzed simultaneously for all independent variables are presented and discussed.

The ANOVA comparison of means indicates which group of means is statistically significantly different from each other, but does not identify which means differ from which other means. The Tukey-Kramer post hoc test designed specifically for pair wise comparisons was used to determine the detail differences among the Age Range and Thinking-Feeling means. Tukey-Kramer is the most conservative of the post-hoc tests in that it is the most likely to accept the null hypothesis of no group differences (Garson, 2006). The post hoc test results are discussed with each response variable univariate result.

Univariate Analysis & Post Hoc Results

The univariate analysis of Learner-Learner interaction satisfaction ratings to the overall model (all variables) had a significant p-value of 0.0397 with small effect (*F-value 2.26*). Thirty-five percent (R^2 = 0.35) of the Learner-Learner interaction satisfaction ratings variance was explained by the research model explanatory variables. The Type III sum of

squares for each explanatory variable are presented in Table 4.9.The Learner-Learner interaction satisfaction ratings means were statistically significantly different (p=0.0202) for groups categorized with Thinking-Feeling preference from other groups with other MBTI preference scales, age ranges and gender with a relatively large main effect (F = 5.89). The post hoc Tukey-Kramer results showed those categorized as Feelers rated satisfaction with Learner-Learner interactions significantly higher (M = 4.74) than those categorized as Thinkers (M = 4.11). No other Learner-Learner interaction means were statistically significant between groups; although age range groups were close to significant (p=0.0618) for Learner-Learner interaction means differences.

Table 4.14 Univariate Analysis of Variance for Learner-Learner satisfaction rating

Source	**DF**	**Type III SS**	**Mean Square**	**F-Value**	**Pr > F**
AgeRange	4	4.556	1.139	2.47	0.0618
Gender	1	0.023	0.023	0.05	0.8241
Extroversion-Introversion	1	0.240	0.240	0.52	0.4757
Sensing-Intuition	1	0.524	0.524	1.13	0.2938
Thinking-Feeling	1	2.722	2.722	5.89	0.0202 *
Judging-Perceiving	1	0.601	0.601	1.30	0.2614

Note. *p < .05

Thirty-two percent (R^2 = 0.32) of the Learner-Content interaction satisfaction ratings variance was explained by the research model explanatory variables. The Type III sum of squares for each independent term is presented in Table 4.10. The Learner-Content interaction satisfaction ratings means were statistically significantly different (p=0.0279) for

groups categorized with Thinking-Feeling preference from other groups with other MBTI preference scales, age ranges and gender with a relatively large main effect (F = 5.28). The post hoc Tukey-Kramer results showed those categorized as Feelers rated satisfaction with Learner-Content interactions significantly higher (M = 4.56) than those categorized as Thinkers (M = 3.99). No other Learner-Content interaction means were statistically significant between groups. However, the Learner-Content interaction satisfaction means were very close to the .05 alpha significance level for explanatory age range groups (p=0.0710, F = 2.36).

Table 4.15 Univariate Analysis of Variance for Learner-Content satisfaction rating

Source	**DF**	**Type III SS**	**Mean Square**	**F-Value**	**Pr > F**
AgeRange	4	4.015	1.003	2.36	0.0710
Gender	1	0.022	0.022	0.05	0.8208
Extroversion-Introversion	1	0.083	0.083	0.20	0.6603
Sensing-Intuition	1	0.003	0.003	0.01	0.9299
Thinking-Feeling	1	2.226	2.226	5.24	0.0279 *
Judging-Perceiving	1	0.016	0.016	0.04	0.8464

Note. *p < .05

The dependent variable Learner-Instructor interaction satisfaction ratings univariate analysis to the overall model (all variables) had a p-value of 0.0318 with small effect (F = 2.36). Thirty-six percent (R^2 = 0.36) of the Learner-Instructor interaction satisfaction ratings variance was explained by the research model explanatory variables. The Type III sum of squares for each independent variable is presented in Table 4.11. The Learner-Instructor interaction satisfaction ratings means were statistically significantly different (p=0.0081) for

groups categorized by age range from other groups categorized by MBTI preference scales and gender with a relatively large main effect (F = 4.04). The Learner-Instructor interaction satisfaction rating means, contrastingly to the other satisfaction ratings, were not significantly different on the Thinking-Feeling scale. No other Learner-Instructor interaction means were statistically significantly different between groups.

The Tukey-Kramer results for the pair-wise multiple comparisons for Age Range showed statistically significant difference for means (p = 0.0205) between students in the age range of 37-42 and 51+ for satisfaction with Learner-Instructor interaction. The older 51+ age range students rated Learner-Instructor interaction satisfaction higher (M = 4.936) than the 37-42 students (M = 3.607). There was statistically significant difference (p=0.0326) for means between the 37-42 aged students (M = 3.607) and the 43-50 aged students (M = 4.916), again the older students having a higher satisfaction rating for the Learner-Instructor interaction.

Table 4.16 Univariate Analysis of Variance for Learner-Instructor satisfaction rating

Source	**DF**	**Type III SS**	**Mean Square**	**F-Value**	**Pr > F**
AgeRange	4	7.936	1.984	4.04	0.0081*
Gender	1	0.222	0.222	0.45	0.5059
Extroversion-Introversion	1	0.304	0.304	0.62	0.4364
Sensing-Intuition	1	0.005	0.005	0.01	0.9186
Thinking-Feeling	1	0.139	0.139	0.28	0.5969
Judging-Perceiving	1	0.099	0.099	0.20	0.6558

Note. *p < .05

The dependent variable end of course grade (EOC) univariate analysis to the overall model (all variables) did not have statistically significant p-values ($p = 0.1865$) as shown in Table 4.12. This confirms the MANOVA results of no significant mean difference for performance related to groups defined by MBTI personality type, age range and gender.

Table 4.17 Univariate Analysis of Variance for End of Course grade (performance)

Source	**DF**	**Type III SS**	**Mean Square**	**F-Value**	**Pr > F**
AgeRange	4	87.305	21.826	1.71	0.1687
Gender	1	27.652	27.652	2.17	0.1496
Extroversion-Introversion	1	33.961	33.961	2.66	0.1114
Sensing-Intuition	1	17.117	17.117	1.34	0.2544
Thinking-Feeling	1	20.334	20.334	1.59	0.2149
Judging-Perceiving	1	0.040	0.040	0.00	0.9555

Note. * p < .05

Results Summary

For the given sample, the data indicate interaction satisfaction ratings differ by MBTI type, but there is no difference in performance by MBTI type for the selected Web-Based instructed courses. The data also indicated interaction satisfaction ratings differed by age range, but not by gender.

The data show the MBTI scale preference for Thinking-Feeling make a statistically significant difference in the satisfaction ratings of Learner-Learner and Learner-Content interactions within Web-Based instructed (WBI) courses. Students with MBTI preference for

Feeling rated their satisfaction with Learner-Learner interactions in the WBI courses higher than those with Thinking preference. The Feeling students also rated their satisfaction with Learner-Content interactions in the WBI courses higher than those with a Thinking preference. Satisfaction with Learner-Instructor interaction was not related to MBTI preference, but was statistically significantly different ($\alpha = .05$) by age range. The 37-42 age range Learner-Instructor satisfaction means were significantly different from the two older age ranges. The oldest aged group, 51 and older, had the highest ($M = 4.94$) satisfaction ratings for Learner-Instructor interactions. The age range of 37-42 had the lowest ($M = 3.61$) Learner-Instructor interactions satisfaction ratings of all the age groups. MBTI preference, age and gender did not make a difference in achievement as measured by end of course grade in the WBI courses.

DISCUSSION and CONCLUSION

Overview of the Study Research Questions

The original research questions for this study were:

- What is the relationship between MBTI personality type and performance (EOC) in Web-Based instruction (WBI) courses?
- What is the relationship between MBTI personality type and the perceptions of satisfaction with Learner-Learner, Learner-Content and Learner-Instructor interactions within Web-Based instruction (WBI) courses?

The study response parameters were established from previous research as described in the literature review. The theoretical constructivist-learning model posits a positive relationship between perceptions of satisfaction with the learning experience and achievement or performance. The study investigated the relationship of personality type as measured by Myers-Briggs Type Indicator and satisfaction and achievement. The related independent variables of gender and age range were investigated in conjunction with learner MBTI characteristics.

Key Findings

The key findings for the data sample from the selected WBI courses were;

- no significant difference in performance by MBTI type
- significant difference in interaction satisfaction ratings by MBTI type
- no significant difference in interaction satisfaction ratings by gender
- significant difference in interaction satisfaction ratings by age range

Results

These key findings are detailed and discussed with regard to research, expectations and possible implications in this chapter.

Results – Sample Related to Research

For comparison of the study MBTI Type representation to the general population MBTI Type representation, Table 5.1 presents estimated percentages of Types in the US population as derived from the National Representative Sample (NRS) reported by CAPT (2006) and Table 5.2 presents the percentages for the study sample. These tables indicate the study sample had a nearly reverse percentage representation on the TF scale with Thinking preference at 62% and Feeling preference at 38% to that of the NRS with Thinking at 40.2% and Feeling at 59.8%. The two types missing from the sample, INTJ and ENTP, were the third and fourth least reported type in the NRS. The sample overall scale percentages were not as equally proportionate as the general population according to the NRS 1998 data. The USA: Distribution of the Types in the National Representative Sample full report is in Appendix H.

Table 5.2 USA: Distribution of the Types in the National Representative Sample

TOTAL		Sensing		Intuitive	
		with thinking	with feeling	with feeling	with thinking
E 49.3%	I 50.7%	ISTJ 11%	ISFJ 13.8%	INFJ 1.5%	INTJ 2.1%
S 73.3%	N 26.7%	ISTP 5.4%	ISFP 8.8%	INFP 4.4%	INTP 3.3%
T 40.2%	F 59.8%	ESTP 4.3%	ESFP 8.5%	ENFP 8.1%	ENTP 3.2%
J 54.1%	P 45.9%	ESTJ 8.7%	ESFJ 12.3%	ENFJ 2.5%	ENTJ 1.8%

Note. N=3,009 *National Representative Sample* *CAPT (2006)*

Table 5.2 Percentages of Types in Research Study Population

TOTAL		Sensing		Intuitive	
		with thinking	with feeling	with feeling	with thinking
E 60%	I 40%	ISTJ 17%	ISFJ 8.5%	INFJ 2%	INTJ 0%
S 64%	N 36%	ISTP 2%	ISFP 2%	INFP 2%	INTP 6.4%
T 62%	F 38%	ESTP 4.3%	ESFP 2%	ENFP 17%	ENTP 0%
J 62%	P 38%	ESTJ 23.4%	ESFJ 4.3%	ENFJ 6.4%	ENTJ 2%

Note. N=47 *ILP Students Representative Sample*

The sample type distribution difference to those found in the general population as reported in the NRS and discussed may be attributable to the combination of small sample size and the narrowing sample attribute of business and marketing education lateral entry teacher. Somewhat confirming the Jungian theory predictions for such groups, the sample had 40% reporting two types, ISTJ and ESTJ. As such, the study sample aligned with previous research findings related to MBTI type profiles with regard to distributions of types among teachers by subject area. G. Lawrence's 1993 study found that of the Industrial and Technical disciplines 45% were in two types, ISTJ and ESTJ (Lawrence, 1993 as cited by Hammer, 1996, p. 130).

Results - Performance & Type

The present study found no statistically significant differences in performance as measured by end of course numeric scores related to MBTI profile. This finding concurs with those studies cited in the literature review reporting no performance difference related to learning style: McNeal & Dwyer (1999); Gary, Ellis & Rasmussen (2004); Buch & Bartley, 2002; Freeman & Tijerina, 2000.

Other studies reporting performance differences by learning style: Ross, Drysdale & Schulz (2001); Beets & Lobinger (2001); Huitt (1992); Campbell & Davis (1988); Gordon & Yocke (1999); Crosby and Iding (1997); Borg & Shapiro (1996) are not necessarily refuted by the study findings, but provide additional information regarding those studies' findings.

In the Ross, Drysdale & Schulz (2001) study the major recommendation of the study was the inclusion of a learning-style preference analysis for students early on in a course or program to increase learner awareness of their information processing preferences. Support for these recommendations were somewhat predicated on the Beets and Lobinger (2001)

study findings of significantly different exam scores, ($p < .001$, Friedman test), when a student's preferred method was used in class rather than when their less preferred method was used and attendance increased (possibly increasing scores). The present study sample was purposefully selected from online courses that had the benefit of assessment and update cycles through several semester offerings along with upgrades in the learning management platform used for presentation. This iterative process was believed to have resulted in a mature and robust online course offering from which to sample data for study. The iterative improvements of the selected courses were aligned with the relevant research related to web based instruction and include updates based on the knowledge gained by the instructors from each semester that the course was assessed. It is my opinion from my knowledge of the data set, that performance differences were less pronounced in the present study because of the course product maturity. The versioning of the course resulted in more accommodations than other courses within the reviewed research literature analyses. In this respect, the study findings support the cited research literature with some evidence that differences in performance could be mitigated by learner specific accommodation.

The other studies referenced herein as reporting a difference in performance did so using measurement specificity of MBTI's four distinct scales as did the present study. Gordon & Yocke (1999) and Crosby and Iding (1997) reported significance on the MBTI S-N scale. Borg & Shapiro (1996) reported results on the E-I scale and the present study's findings were significant with respect to student temperament type on the T-F scale preference. Hammer (1993) suggests to further validate the patterns that emerge with specificity measures such that specific facets or aspects of perceived satisfaction may become clearer, studies should be replicated with more diverse samples and use of MBTI overall type

as the unit of analysis. Replication of the present with the composite MBTI four-letter type as the explanatory variable would also allow the construction of type tables, a layout of the sixteen types, for use in producing a self-selection ratio table. The self-selection ratio (SSR) table is a statistical procedure used to compare the distribution of type in one group with that of another group (Zeisset, 2000). These comparisons could yield data related to facets of WBI satisfaction from other subject matter disciplines and educational programs analyzed by MBTI distribution.

All the performance studies discussed, including the present study, were constrained by a single snapshot approach. Hammer (1993) cautions this constraint "may miss the subtlety of type preferences being hidden beneath the environmental press or demands of a student's surroundings, of the peers they associate with, or of expectations of parents or authorities (p. 137)." These subtle factors exist as well in the present study model along with other performance affecting factors such as life demands and coping with change (all lateral entry students). Therefore, predictions and interpretations may not be generalized to other web based course populations especially those populations with an extended program (providing longitudinal study options) that ensure close community over many semesters. The extended community factor could easily be a factor that would impact performance measures.

Results - Learner Perceptions & Type

The present study data indicate the MBTI scale preference for Thinking-Feeling is statistically significantly different for satisfaction ratings for Learner-Learner and Learner-Content interactions within the specific WBI courses studied.

The present study's findings related to satisfaction rating for web based instruction align with findings from job satisfaction research reviewed by Hammer (1993). Perception of satisfaction has been examined in the context of occupation with the underlying premise that job satisfaction enhances job performance, retention and overall personal well-being. Of the nineteen reviewed studies on the relationship between MBTI and career satisfaction five showed no significant relationship between type and satisfaction. The hypothesis that the MBTI is related to job satisfaction was generally supported in ways consistent with the theory by the other ten reviewed studies. The studies findings suggest those who are dissatisfied in an occupation are those whose type is opposite from the modal type of the occupation. The T-F scale in particular was related to satisfaction with co-workers in William (1997) and Schlesinger (1986) studies (as cited by Hammer, 1993, p. 38). The T-F scale was found significant in the present study for satisfaction ratings for Learner-Learner and Learner-Content interactions, where the peer-to-peer interaction is analogous to co-worker interaction. The T-F scale satisfaction findings somewhat further support the findings of Johnson's (1991, as cited by Hammer, 1993, p. 39) study of job satisfaction for clergy. Johnson reported a preference for Thinking predicted satisfaction with administrative task and Feeling preference was a predictor of professional interaction satisfaction. The present study findings revealed the Feeling preference students rated their satisfaction with Learner-Learner interactions in the WBIT courses higher comparable to the clergies' professional interactions.

Irons, Jung & Keel (2002) found as the level of interactivity produced by the WBI design (as more channels of interactivity are added) of a virtual class increases there are higher student satisfaction ratings reported. Although the present study did not directly

analyze interactivity, the satisfaction ratings were directly surveyed across three dimensions of learner-learner, learner-content and learner-instructor by interactions. High levels of design interaction were specifics of the courses sampled, thereby lending support of the Irons, et. al. findings of increased satisfaction with increased interactivity with the high satisfaction ratings found.

The present study findings somewhat contradict the Valenta, Therriault, Dieter and Mrtek (2001) study indications as there was no statistical significant difference on the MBTI E-I scale which correlates with the social learner and independent learner classification of the Canfield Learning Style Inventory used by Valenta, et al (2001). The Valenta, et al (2001) study reported that individuals who had high factor loadings for social interaction in learning were more likely classified as social learners and less favorably opined regarding the effectiveness of distance learning. However, the present study's lack of significance on the E-I scale is somewhat congruent with the Rovai (2003) and Chen and Macredie (2004) studies. These studies findings showed learning style was not significantly related to a sense of community; wherein sense of community was considered to be linked to greater satisfaction with academic program, and reduced feelings of isolation (Gibbs, 1995; Rovai, 2002).

The present study's findings related to satisfaction ratings differing by MBTI type partially support the Jungian type theory's prediction of different criteria for satisfaction for differing types. However, with such a high base rate for the satisfaction ratings, the students are all satisfied, interpretation and prediction are restricted. Other samples should be located where the satisfaction rate is lower and more varied to analyze components of satisfaction

related to WBI. As well, other components or measures of satisfaction should be accounted for and measured in the satisfaction survey.

Also, empirical data related to measures of interaction (counts) should be included for analysis to review and verify findings of the various studies reported in the literature review investigating the impact of perception on learning outcomes and performance that conclude students with more interaction with an instructor and other classmates tend to be more satisfied with their Web courses or reported higher levels of perceived learning; Kim & Moore (2005); Fredericksen, Pickett, Shea, Pelz, & Swan (2000); Hong (2002); Du and Simpson (2002). Interaction count measures were not included in the present study analysis as noted in the limitations.

Results - Learning Spaces & Type

In the literature review research studies related to learning spaces and perceived satisfaction/dissatisfaction; Northrup, Lee, and Burgess (2002); Hara and Kling (1999); Beichner and Saul (2003) were presented. The Northrup, Lee, and Burgess (2002) study investigated students' perceived importance of instructional strategies and found that learners in electronic formats ranked highly the use of student controlled activities and of utmost importance timely interaction with peers and instructors. Hara and Kling (1999) conclude that frustrations such as lack of prompt feedback, ambiguous instructions on the Web, and technical problems inhibited educational opportunities. Beichner and Saul (2003) interpret their research findings as showing a positive correlation between student performance and collaborative, interactive learning spaces. The present study made use of these study findings in construction of the CES for evaluation of satisfaction measures and in the choice of the courses from which to select subject data for analysis. Although, there were no direct

analyses of previous study identified learning space elements, those elements were embedded in the course designs of the WBI courses selected for the study. The data seem to concur with the premise of the importance of interaction in that the overall satisfaction ratings were all quite high as answered in the most affirmative scale on the measures. A future study should incorporate a ranking method for the elements of course design to be completed by the student participants to further validate the learning space impact on the reported satisfaction levels. This analysis might provide additional refinements to the already rather mature course design used in the study that would further enhance performance and satisfaction and identify necessary WBI elements more concretely for use as guidelines in general WBI learning spaces.

A limitation of the present study was the decision not to include the Learner-Computer Interface interactions in the data collection and analysis which was an element identified in previous research (Hillman, Willis, & Gunawardena, 1994; Storey, Phillips, Maczewski, and Wang, 2002; Mehlenbacher, 2005) as having an impact on perceived satisfaction and learning. Future studies should include this interaction component to assist in overall WBI learning space analysis and for WBI course guideline development. Including the Learner-Computer Interface interaction component would provide data for comparison to learning space studies such as Storey, Phillips, Maczewski, and Wang (2002) who report findings of dissatisfaction with web-based learning environments based on usability factors of the technology tools and other studies (Irons, Jung & Keel (2002); Diaz and Cartnal (1999); Ellis (2003)) reporting similar interface/environment related findings. Additionally, perceived levels of computer/technology proficiency were not obtained and included in the present study analyses. These self-report measures should be included in future studies to

further evaluate the premise that self-efficacy impacts perception of satisfaction and learning (Irizarry, 2002). Preliminary measures related to proficiencies are part of the CES used in the study such as number of previous WBI courses taken, and average time spent on the course which could be incorporated into formal data analysis.

Additional Findings

The satisfaction ratings for learner-learner and learner-content were found to be statistically different by MBTI Thinking-Feeling preference scale only and the learner-instructor satisfaction ratings were not statistically significant by any MBTI preference scales. However, data showed satisfaction with Learner-Instructor interaction was statistically significant by age range. The age range of 37-42 had the lowest satisfaction ratings of all age groups and the 51+ age range had the highest satisfaction rating.

These findings are a little unexpected as one might predict the younger age group being more satisfied because online learning is more native to their culture of computer mediated communication. It would seem the least acclimated to the technology would be the older 51+ age group who by culture and generation classification are digital immigrants and thus less comfortable in the WBI environment affecting overall satisfaction. My supposition is that the 51+ and the preceding age group had higher satisfaction ratings because of the convenience factor of the WBI platform. The benefits afforded by the anywhere, anytime and self-mediated nature of the WBI course were a greater asset than any of the possible negatives were a detriment. The structure of the content, the presentation strategies and technologies of these courses were very traditional and would not be unexpected or overly foreign to the older age groups and therefore non-threatening or imposing by nature. As well,

all the study subjects are individuals from professional backgrounds that include the common computer technologies utilized in the course content platform.

The two younger age groups' (24-30; 31-36) satisfaction ratings were likely less impacted by the convenience factors than the older age group as these are not considered benefits but expected or standard features within their digital native culture and mindset. For the younger age group the traditional content presentation structure may have been a barrier or a negative element. Further data collection by subject narrative or interview, or inclusion of presentation and design statements on the CES would be necessary to analyze the impact of the design on satisfaction.

Possibly the middle age grouping 37-42, although satisfied, had lower satisfaction ratings because of tangential factors such as lifestyle, stress, environment or expectations that are generally less imposing at the other age range life stages. The data were analyzed to determine if an interaction existed with the relevant age range finding and that of gender as gender was found to be significant in the Kim and Moore (2005) study. The present study did not find statistically significant difference by gender or the interaction of gender with age group for the very narrow and specific sample of study.

Another possible explanation for the age range difference could be related to the instructor's sense of presence (Picciano, 2002; Jung et al. , 2002) within the learning space, timeliness for feedback, promptings and interactions within the course (Hwang, Chang, Chen, 2004; Baker, 2004. The instructor difference was part of the data analysis and was not found to be significantly related to the response variables or a contributing interaction effect. However, direct measures of instructor interactions were not retrieved from the course data and interaction patterns and correlations were not investigated from the available course

tracking data. Further study of the sample course data related to interaction counts and measures specific to Learn-Instructor interaction might possibly show revealing patterns related to student satisfaction ratings (Fredericksen et al., 2000; Swan et al., 2003).

Review of the course data, specifically narrative and interaction count frequencies, related to the instructors' MBTI profiles (ENFP, INTJ) and that of the students might also reveal possible indications for the Learner-Instructor satisfaction rating differences regardless of the age range. Data analysis should be predicated on preceding research findings related to match of student MBTI type to similar or like instructor MBTI type (Borg and Shapiro, 1996). In the Hammer (1993) review of a decade of MBTI research there are three significant study findings related to instructor to learner type matching; Boyd (1995), Lamphere (985), Cooper and Miller (1991). Boyd (1995, as cited by Hammer, 1993, p. 134) found that students reported higher satisfaction as the number of matching dimensions, MBTI letter pairs, increased, except when all four letter codes matched. Lamphere (1985, as cited by Hammer, 1993, p. 194) reported "type similarity led to more favorable ratings of elementary students by their teachers on a six-point Likert scale (p. 131)." The Cooper and Miller (1991, as cited by Hammer, 1993, p. 132) study found higher satisfaction ratings reported by students who matched their instructor on the S-N dimension. The type similarity or match of the present study instructors conceivably could be an underlying factor in the differences found in the Learner-Instructor ratings not directly related to the age group findings.

Recommendation for Future Research

As discussed throughout the findings, there are many possible future studies generated by the present study findings and related research. An immediately relevant future study would be one with qualitative interviews of students and instructors regarding

interactions, sense of presence, and impact of computer mediated learning space. This data would be valuable in constructing an understanding of the essence of online interactions and perceived satisfaction. Use of interviews and questionnaires aimed at students' experiences in the program could yield data aiding the identification of other personal or institutional factors that might be contributing to overall levels of satisfaction and performance with WBI courses and programs.

In conjunction with the qualitative data collection, the quantitative interaction counts and relation of counts to MBTI scale match between student and instructor as previously discussed should comprise additional research analysis and review. Possible outcomes in addition to understanding or finding a relationship in type scale match could be information that would be beneficial in constructing instructor guidelines to avoid interaction biases related to WBI and to establish an interaction amount recommended for creating optimal online presence and ensuring learner satisfaction with instructor interaction.

A future study to evaluate self-efficacy and level of interaction impact on perception of satisfaction and learning (Irizarry, 2002; Kim & Moore, 2005; Fredericksen, et al., 2000) using the proficiency portion of the CES of the present study and the additional course statistics available from the WBI course learning management system related to interactivity and time spent in the learning space could yield more information regarding WBI performance and satisfaction. The present study did not manipulate any of the online environment independent variables in order to compare student learning and perceptions in the online courses as dependent variables. Modifying the study design to allow this experimental intervention for comparisons would be a reasonable extension to further analyze the present findings.

As previously discussed an extended community element in a course of study might impact performance measures. As such, a future study wherein the lateral entry subjects are followed and surveyed for the duration of the program enrollment would be merited. However, this data set would still be quite limited as most subjects complete the program requirements within three semesters. Some students continue after the initial licensure program with continuous enrollment into the master degree program which would allow continued participation in a longitudinal study, but would greatly lessen the sample size.

Other samples should be located where the satisfaction rate is lower and more varied to analyze components of satisfaction related to WBI and to strengthen the correlations of the course evaluation survey (CES) elements considered constructs of satisfaction. As well, other components or measures of satisfaction should possibly be accounted for and measured in the satisfaction survey. Additionally, an equivalent study to the present study from other subject matter disciplines and educational programs analyzed by MBTI distribution to validate the present study findings is recommended.

Conclusion

So what are the implications of the present study's key findings?

First, with respect to no significant difference in performance the present study findings suggest that in an online learning environment, learner difference with respect to performance are mitigated by course design that accommodates the diverse interaction needs of all learner types. The course offering used in the sample adhered to guidelines produced by previous research that identified presentation elements which were conducive to successful online implementations. Use of specific instructional strategies that correspond to each of the Myers-Briggs types learning preference strengths to maximize a learner's

potential is appropriate and doable in WBI as demonstrated by the present study's course design. Additionally, the absence of performance and satisfaction difference in the extrovert to introvert learner style (Soles, et al., 2001), previously believed to affect compatibility of learner to online courses, provides evidence that both styles can be dually accommodated with content presentation targeted to the primary needs of all learner types.

Secondly, the absence of significant difference with respect to satisfaction with the learning experience by gender adds support to the notion that online educational opportunities level the playing field by minimizing some of the traditional barriers and biases of age, gender, ethnicity, geography and socio-economic status of the leaner and also that of the instructor.

Thirdly, the finding that Feeling preference students rated their satisfaction with Learner-Learner and Learner-Content interactions higher than those with Thinking preference implies the course design studied situates the learning experience in a very social context. According to social learning theory (A. Bandura, 1977) and constructivist theory (J. Brunner, 1966), learning is a social activity that involves interaction with the instructor, among students and with the content. Creating a social or community context has been a concern for WBI platforms that has been overcome by intentional design of courses with social interaction elements. The Learner-Instructor interaction significant difference by age requires further investigation to aptly determine the implications as discussed herein.

In conclusion, there has been much research conducted on interaction, satisfaction and performance in Web-Based instruction from numerous perspectives and with various goals. The National Center for Education Statistics reports and predicts that Web-Based instruction and training will continue to increase. Thus, continued research related to what

learners are interested in (motivation) and what learners need to achieve comprehension and mastery is required. MBTI Type theory provides a structured method to understand and define learner type and characteristics related to WBI course design elements. Continued research is not only for design and implementation of course offerings with the current technology, but with the ever-evolving technologies that are yet to come. Further research regarding the nature of interaction and its impact on overall satisfaction and performance with Web–based courses will help instructors to create more effective learning activities, and to choose wisely what to use and incorporate from the plethora of technologies available.

REFERENCES

Apperson, J., Laws, E., & Scepansky, J. (2004). The impact of presentation graphics on students' experience in the classroom. *Computers & Education, 47(1),* 116-126. Online access from:doi:10.1016/j.compedu.2004.09.003

Baker, J. D. (2004). An Investigation of Relationships among Instructor Immediacy and Affective and Cognitive Learning in an Online Classroom. Internet and Higher Education, 7 (1), 1-13.

Bandura, A. (1977). Social Learning Theory. New York: General Learning Press. Retrieved February, 2006 from http://tip.psychology.org/bandura.html

Beets, S. D., & Lobingier, P. F. (2001). Pedagogical techniques: Student performance and preferences.Journal of Education for Business, 76(4), 231-235. Retrieved February, 2006 from: Academic Search Premier http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=4787241&site=ehost-live

Berge, Z., & Irwin, C. (2006) Socialization in the online classroom. *e-JIST e-journal of Instructional Science & Technology 9(1)*

Berge, Z.L. and Muilenburg, L.Y. (2005) Student barriers to online learning: A factor analytic study. Distance Education, 26(1), pp. 29-48.

Borg, Mary O.; Shapiro, Stephen L.(1996). Personality Type and Student Performance in Principles of Economic Education, *Social Studies/Social Science Education (SO527781)* Retrieved from ERIC Database ERIC#: EJ528460

Bransford, J. D., Brown, A. L., Cocking, R.R. (Eds.). (2000). *How People Learn: Brain, Mind, Experience, and School.* Washington, DC: National Research Council.

Brownfield, Kelley M.(1993). The Relationship between the Myers-Briggs Personality Types and Learning Styles, *Tests, Measurement and Evaluation (TM023044)* Retrieved from ERIC Database ERIC#: ED381577

Bruner, J. (1966). Toward a Theory of Instruction. Cambridge, MA: Harvard University Press. Retrieved February, 2006 from http://tip.psychology.org/bandura.html

Buch, K., & Bartley, S. (2002). Learning style and training delivery mode preference. *Journal of Workplace Learning, 14(1-2),* 5-10.

Campbell, Dennis E.; Davis, Carl L. (1988). Improving Learning by Combining Critical Thinking Skills with Psychological Type, *Science, Mathematics and Environmental Education (SE033241),* Retrieved from ERIC Database

Capraro, R., Capraro, M. (2002). "Myers-Briggs Type Indicator score reliability across studies: a meta-analytic reliability." Educational and Psychological Measurement 62(4): 590-602.

CAPT (2005) Retrieved January, 15, 2006 from: http://www.capt.org/research/MBTI-bibliography-search.htm

CAPT (2006) Retrieved October, 15, 2006 from: http://www.capt.org/mbti-assessment/estimated-frequencies.htm

Cassidy, S. (2004). Learning styles: An overview of theories, models, and measures. *Education Psychology, 24(4),* 419-444.

Center for Applications of Psychological Type. (1995). *MBTI bibliography*. Gainesville, FL: Author.

Chen, S. Y., & Macredie, R. D. (2004). Cognitive modeling of student learning in Web-Based instructional programs. *International Journal of Human Computer Interaction, 17(3),* 375-402.

Crosby, Martha E.; Iding, Marie K. (1997).The Influence of Cognitive Styles on the Effectiveness of a Multimedia Tutor, *Journal of Languages and Linguistics (FL527803)*, Retrieved from ERIC Database ERIC#: EJ561180

Culligan, M. (2006). Digital natives in the classroom. Encyclopedia of educational technology. Retrieved May, 2006 from: http://coe.sdsu.edu/eet/Articles/digitalnatives/index.htm

Darlington, R. B., Weinberg, S., & Walberg, H. (1973). Canonical variate analysis and related techniques. *Review of Educational Research,* 453-454. Retrieved July, 2006 from: http://www.psych.cornell.edu/Darlington/factor.htm

Dewar, T. & Whittington, D. (2000). Online learners and their learning strategies. *Journal of Educatational Computing Research 23(4).* 385-403. Retrieved from ERIC Database ERIC#: EJ625247

Diaz, D.P., Cartnal, R.B. (September, 1999) Students' Learning Styles in Two Classes. *College Teaching 47(4),* 130 . Retrieved February, 2006 from: Academic Search Elite. (Document AN No. 2516393)

Dickey, M. (2005). Engage by design: How engagement strategies in popular computer and video games can inform instructional design. *Educational Technology Research & Development (EDRT) , 52(2).* 67-83 ISSN 1042-1629

Dictionary.com Unabridged (v 1.0.1). Retrieved September 14, 2006, from Dictionary.com website: http://dictionary.reference.com/

DiTiberio, J. K. (1996). Education, learning styles, and cognitive styles. In A. L. Hammer (Ed.), MBTI Applications: A decade of research on the Myers-Briggs Type Indicator. (pp. 227). Palo Alto, California: Consulting Psychologists Press, Inc.

Du, Y., & Simpson, C., (2002). "Effects of learning styles and class participation on students'enjoyment level in distributed learning environments," paper presented at the Annual Conference of the Association for Library and Information Science Education (New Orleans, La., 15–18 January); also ERIC Document Reproduction Service No. ED463755.

Easterling, D.N (2001). *Distance learning performance/completion rates: Are there any predictors* Dayton, Oh.: Sinclair Community College, Office of Institutional Planning and Research.

Ellis, A. (2003). Personalty type and participation in networked learning environments. *Educational Media International 40(1-2).* 101-14. Retrieved May 2006 from ERIC database ERIC #: EJ673486.

Ferris, S., & H. Wilder (2006). Uses and Potentials of Wikis in the Classroom. Innovate 2 (5). Retrieved May, 2006 from: http://www.innovateonline.info/index.php?view=article&id=258

Ford, D. H., & Lerner, R. M. (1992). *Developmental systems theory: An integrative approach*. Newbury Park, CA: Sage Publications.

Fredericksen, E., Pickett, A., Shea, P., Pelz, W., &Swan, K., (2000). Student satisfaction and perceived learning with online courses: Principles and examples from SUNY learning network. *Journal of Asynchronous Learning Networks, 4(2).* Retrieved April, 2006 from: http://www.sloan-c.org/publications/jaln/v4n2/v4n2_fredericksen.asp

Freeman, V. S., & Tijerina, S. (2000). Delivery methods, learning styles, and outcomes physician assistant students. Physician Assistant, 24(7), 43-50.

Friedman, T. (2005). *The world is flat*. 1st ed. 19 Union Square West, NY: Farrar, Straus and Giroux.

Garson, D. (2006). *Statnotes: Topics in Multivariate Analysis* Unpublished manuscript, North Carolina State University at Raleigh.

Gary, H. W., Ellis, H. H., & Rasmussen, K. (2004). From the arcade to the classroom: Capitalizing on students' sensory rich media preferences in disciplined-based learning. College Student Journal, 38(3), 431-440. Retrieved February, 2006 from: Academic Search Premier http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=14669495&site=ehost-live

Ghinea, G. & Chen, S. Y. (2003). The Impact of Cognitive Styles on Perceptual Distributed Multimedia quality. *British Journal of Educational Technology*, *34*(n4), 393-406.

Gordon, H. & Yocke, R. (1999). Relationship between personality characteristics and observable teaching effectiveness of selected beginning career and technical education teachers. *Journal of Vocational and Technical Education, 16(n1),*. Retrieved January, 2006 from: http://scholar.lib.vt.edu/ejournals/JVTE/v16n1/gordon.html

Hara, N. & Kling, R. (1999) Students' Frustrations with a Web-Based Distance Education Course. *First Monday, 4(12).* Retrieved May, 2006 from URL: http://firstmonday.org/issues/issue4_12/hara/index.html

Hillman, D., Willis, D. & Gunawardena, D, (1994). Learner–interface interaction in distance education: An extension of contemporary models and strategies for practitioners. *American Journal of Distance Education, 8(2),* pp. 31–42.

Hong, K-S. (2002). Relationships Between Students' and Instructional Variables with Satisfaction and Learning in a Web-Based Course. Internet and Higher Education, 5 (3), 267-281. Retrieved February, 2006 from: doi:10.1016/S1096-7516(02)00105-7

Huitt, W. (1992). Problem solving and decision making: Consideration of individual difference using the Myers-Briggs Type Indicator. *Journal of Psychological Type, 24*, 33-44.

Irizarry, R. (2002).Self-Efficacy & Motivation Effects on Online Psychology Student Retention.United States Distance Learning Association Journal 16(2). ISSN 1537-5080 Retrieved June, 2006 from: http://ifets.ieee.org/periodical/vol_3_2002/jung.pdf

Irons, L., Keel, R., & Bielema, C. (2002). Blended learning and learner satisfaction: Keys to user acceptance?. United States Distance Learning Association Journal 5(3). ISSN 1436-4522 Retrieved June, 2006 from: http://ifets.ieee.org/periodical/vol_3_2002/jung.pdf

Irons, L., Jung, D., & Keel, R. (2002). Interactivity in distance learning: The digitial divide and student satisfaction. Educational Technology & Society 16(12). ISSN 1537-5080. Retrieved February, 2006 from: http://ifets.ieee.org/periodical/vol_3_2002/jung.pdf

Jones, C., & Reichard, C. (2003). Are students' learning styles discipline specific? *Community College Journal of Research and Practice, 27,* 363-375. Retrieved February, 2006 from: Academic Search Premier http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=9742182&site=ehost-live

Jones, W. P. (1994). Computer use and cognitive style. *Journal of Research on Computing in Education 26(4).*

Karuppan, C. (2001), Web-Based Teaching Materials: A User's Profile. Electronic Network Applications and Policy, 11 (2), 138-148.

Kearsley, G. (2000). Online education: Learning and teaching in cyberspace. Belmont, Calif.:Wadsworth Thomson Learning

Kim, K., & Moore, J. (November, 2005). Web–based learning: Factors affecting students' satisfaction and learning experience *First Monday,* 10(11), Retrieved April, 2006 from: URL: http://firstmonday.org/issues/issue10_11/kim/index.html

Koch, J. (2006). Does Distance Learning Work? E-Journal of Instructional Science and Technology (e-JIST), 2006 ID:CSD4376 Retrieved January 3, 2006 from : http://www.educause.edu/LibraryDetailPage/666?ID=CSD4376

Kolb, D (1993). Learning-style inventory. Mcber and Company.

McNeal, G. H., & Dwyer, F. (1999). Effects of learning styles on consistent and inconsistently designed instruction. International Journal of Instructional Media, 26(3), 337-345.

McNicol, T. 2004. Language e-learning on the move. *Japan Media Review, April 5*. Article retrieved June, 2006 from URL: http://ojr.org/japan/wireless/1080854640.php

Mehlenbacher, B. (2003). *Research in Web-Based Instruction Spring 2005*. Unpublished manuscript, North Carolina State University at Raleigh.

Mehlenbacher, B., Bennett, L., Bird, T., Ivey, M., Lucas, J., Morton, J., & Whitman, L. (2005).Usable E-Learning: A Conceptual Model for Evaluation and Design. Proceedings of HCI International 2005: 11th International Conference on Human-Computer Interaction, Volume 4 — Theories, Models, and Processes in HCI. Las Vegas, NV: Mira Digital P, 1-10.

Miller, S. M. & Miller, K. L. (1999). Using instructional theory to facilitate communication in web-based courses. *Educational Technology & Society*, *2*(3), ISSN 1436-4522. Retrieved January, 2006 from: http://ifets.ieee.org/periodical/vol_3_99/miller.html

Myers, I. B. (1998) Introduction to Type: A Guide to Understanding Your Results on the Myers-Briggs Type Indicator (6th ed.) [Booklet]. L. K. Kirby & K. D. Myers (Eds.). Palo Alto, CA: Consulting Psychologists Press, Inc.

Myers, I. B., McCaulley, M. H., Quenk, N. L., Hammer, A. L. (2003). MBTI Manual: A guide to development and use of the Myers-Briggs Type Indicator, (3rd ed.). Palo Alto, CA: Consulting Psychologists Press, Inc.

National Center for Educational Statistics (2003)

Nicholson, S. (2002). Socialization in the "Virtual Hallway": Instant Messaging in the Asynchronous Web-Based Distance Education Classroom. *Internet and Higher Education, 5(4),* 363-372. Retrieved January, 2006 from: doi:10.1016/S1096-7516(02)00127-6

Northrup, P., Lee, R., Burgess, V. (January, 2004) Learner Perceptions of Online Interaction. *Information & Technology*. Retrieved February, 2006 from ERIC database. (ERIC Document Reproduction Service No. ED477075)

O'Brien, T. P. (2005). *ECI 510: Research Application in Curriculum and Instruction Fall 2005*. Unpublished manuscript, North Carolina State University at Raleigh

Oblinger, D. & Oblinger, J. (Eds.). (2005). Educating the Net Generation. Educase Online Learning, Rochester Institute of Technology Retrieved (2000). February, 2006 from: http://www.rit.edu/~609www/ch/faculty/learner.htm

Osciak, S., & Milheim, W. (2001). Multiple Intelligences and the Design of Web-Based Instruction. *International Journal of Instructional Media, 28*(4), 355-361.

Palloff, R., & Pratt, L. (1999). Building Learning Communities in Cyberspace. San Francisco: Jossey-Bass, Inc., pp. 8, 18, 24, 32-38, 166.

Picciano, A. G. (2002). Beyond Student Perceptions: Issues of Interaction, Presence, and Performance in an Online Course. Journal of Asynchronous Learning Networks, 6 (1).

Retrieved June 15, 2004, from http://www.aln.org/publications/jaln/v6n1/v6n1_picciano.asp.

Plake, B. S., Impara, J. C., Spies, R. A. (Eds.). (2003). *The fifteenth Mental Measurements Yearbook.* Lincoln, NE: Buros Institute of Mental Measurements.

Prensky, M. (2001). Digital natives, digital immigrants. Part I. *On the Horizon 9 (5).*

Retrieved May, 2006 from:

http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf

Prensky, M. (2001). Digital natives, digital immigrants. Part II *On the Horizon 9 (6).*

Retrieved May, 2006 from:

http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part2.pdf

Prensky, M. (2004) The Death of Command and Control? Strategic News Service™ LLC. Retrieved May, 2006 from:

http://www.marcprensky.com/writing/Prensky-SNS-01-20-04.pdf

Prensky, M. (2005) Engage me or enrage me: What today's learners demand *EDUCAUSE Review, 40(5) 60–65.* Retrieved February, 2006 from:

http://www.educause.edu/apps/er/erm05/erm0553.asp

Prensky, M. 2005. What can you learn from a cell phone? Almost anything!. *Innovate 1 (5).* Retrieved June, 2006 from: http://www.innovateonline.info/index.php?view=article&id=83

Richardson, J. C., & Swan, K. (2003). Examining Social Presence in Online Courses in Relation to Students' Perceived Learning and Satisfaction. Journal of Asynchronous Learning Networks, 7 (1). Retrieved June 29, 2004, from http://www.aln.org/publications/jaln/v7n1/v7n1_richardson.asp.

Ross, J. L., Drysdale, M. T. B., & Schulz, R. A. (2001). Cognitive learning styles and academic performance in two postsecondary computer application courses. Journal of Research on Computing in Education, 33(4), 400-409. Retrieved February, 2006 from: Academic Search Premier http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=5078103&site=ehost-live

Rourke, L., Anderson, T., Garrison, D. R., & Archer, W. (2001). Assessing Social Presence in Asynchronous Text-based Computer Conferencing. Journal of Distance Education, *14 (2).* Retrieved online July 2, 2004, from: http://cade.athabascau.ca/vol14.2/rourke_et_al.html.

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

Rovai, A. P. (2003). The Relationships of Communicator Style, Personality-Based Learning Style, and Classroom Community among Online Graduate Students. The Internet and Higher Education, 6 (4), 347-363. Online access from: **http://dx.doi.org/doi:10.1016/j.iheduc.2003.07.004**

SAS Institute Inc., SAS OnlineDoc, 9.1.3, Cary, NC: SAS Institute Inc., 2002-2005.

Sabry, K. & Baldwin, L. (2003). Web–based learning interaction and learning styles. *British Journal of Educational Technology, 34(4),* 443–454.

Shea, P. J., Pickett, A. M., & Peltz, W. E. (2003). A Follow-up Investigation of "Teaching Presence" in the SUNY Learning Network. *Journal of Asynchronous Learning Networks, 7(2).* Retrieved online 2005 from URL: http://www.aln.org/publications/jaln/v7n2/pdf/v7n2_shea.pdf.

Smith, M.K. (2002) *Jerome S. Bruner and the process of education',* the encyclopedia of informal education http://www.infed.org/thinkers/bruner.htm

Soles, C., & Moller, L. (2001). Myers Briggs type preference in distance education. International Journal of Educational Technology. [online] Retrieved January 3, 2006 from http://www.ao.uiuc.edu/ijet/v2n2/v2n2articles.html

Stemler, Steven E. (2004). A comparison of consensus, consistency, and measurement approaches to estimating interrater reliability. Practical Assessment, Research & Evaluation, 9(4). Retrieved October 20, 2006 from http://PAREonline.net/getvn.asp?v=9&n=4

Storey, M.A., Phillips, B., Maczewski, M. & Wang, M. (2002). Evaluating the usability of Web-based learning tools. *Educational Technology & Society, 5(3).* 91-100. Retrieved from URL: http://ifets.ieee.org/periodical/vol_3_2002/storey.pdf

Terenzini, E. (2005). How College Affects Students (Vol.2): A Third Decade of Research. San Francisco: Jossey-Bass

Terrell, S. & Dringus, L. (1999). An investigation of the effect of learning style on student success in an online learning environment. *Journal of Educational Technology Systems, 28(3).* 231–238.

Terrell, S. (2002). The effect of learning style on doctoral course completion in a Web–based learning environment. *Internet and Higher Education, 5*. 345–352.

The National Resource Center for The First-Year Experience and Students in Transition Web site. Retrieved February, 2006 from: http://www.brevard.edu/fyc/resources/Learningstyles.htm#Field

The University of Texas at Austin Statistical Services (1995). Stat-53. Retrieved August 2006 from: *http://www.utexas.edu/cc/docs/stat53.html*

Theory Into Practice [TIP] Database (1994-2005) Website (Version 2.5) Retrieved February, 2006 from: http://tip.psychology.org/backgd.html

Vacca, R. & Vacca J.L. (2002). Content Area Reading (7th ed). Boston: Allyn and Bacon.

Valenta, A., Therriault, D., Dieter, M., & Mrtek, R. (2001). Identifying student attitudes and learning styles in distance education. Journal of Asynchronous Learning Networks, (2), 111-127. ISSN 1092-8235. Retrieved January, 2006 from URL: http://www.sloan-c.org/publications/jaln/v5n2/v5n2_valenta.asp

Waits, & Lewis, (2003) Distance education at degree–granting postsecondary institutions: 2001–2002, Retrieved November, 2005 from: http://nces.ed.gov/surveys/peqis/publications/2003017,

Wallace, M. (2005). Notes towards a literacy for the digital age. Retrieved May, 2006 from: http://uclaccc.ucla.edu/articles/article-digitalage.htm

Zeisset, R. (2000). Statistics and measurement: an introduction for MBTI users, (3rd ed.). Gainesville, FL: Center for Applications of Psychological Type, Inc.

APPENDICES

Appendix A – MBTI Permission Agreement

Jan W. Lucas
North Carolina State University
Box 7801
528D Poe Hall
Raleigh, NC 27695-7801

PERMISSION AGREEMENT TO INCLUDE SAMPLE ITEMS IN A RESEARCH PUBLICATION
Agreement Issued: **January 10, 2006**

Customer Number: **322374**
Product Code: **6165DL**
Permission Number: **15821**

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6.1 Test users should evaluate the available written documentation on the validity and reliability of tests for the specific use intended.

6.3 When a test is to be used for a purpose for which it has not been validated, or for which there is no supported claim for validity, the user is responsible for providing evidence of validity.

6.5 Test users should be alert to probable unintended consequences of test use and should attempt to avoid actions that have unintended negative consequences."

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(e) **Jan W. Lucas,** agrees that the **(MBTI® Form-M)** as modified under this Agreement is a derivative work of the **(MBTI® Form-M)** and hereby assigns all right, title, and interest in any such derivative work created under this Permission Agreement in perpetuity to CPP, Inc. or as directed by CPP, immediately upon completion and without further consideration.

CPP, INC.
Authorized Representative

Date_____

I AGREE TO THE ABOVE CONDITIONS

By_____
Jan W. Lucas

Date_____

Appendix B – Course Evaluation Survey

Paper version of the online survey, online presentation is somewhat different and has restricted access for confidentiality.

Student Course Evaluation Survey (CES)

Student UnityID:_____*(used to code for confidentiality)*

(If you feel the following <u>two</u> items invade your privacy you are free to decline answering them.)

Student Gender: ___ Female ___ Male

Student Age Range: ___ 24-30; ___ 31- 36; ___37- 42; __ 43-50; __ 51 or older

All DATA Confidentiality will be maintained. Data will be aggregated for frequency. Narrations will be summarized.

On a Scale of 1 to 5 indicate with an X how strongly you Agree or Disagree with each statement regarding <u>Learner-to-Learner</u> Interaction within the course.
1=Srongly Disagree; 2=Somewhat Disagree; 3= Agree
4=Somewhat Agree; 5=Strongly Agree

Strongly Disagree	Somewhat Disagree	AGREE	Somewhat Agree	Strongly Agree
1.	**2.**	**3.**	**4.**	**5.**

1. Using online discussion made me communicate with my fellow students.

1.	2.	3.	4.	5.

2. I felt unconstrained in taking part in online discussion sessions.

1.	2.	3.	4.	5.

3. There were sufficient opportunities to interact online with classmates.

1.	2.	3.	4.	5.

4. I was satisfied with the level or interactivity with classmates in this online course.

1.	2.	3.	4.	5.

5. Having access to other students' ideas and opinions helped me to compose and submit my ideas and opinions.

1.	2.	3.	4.	5.

6. Having access to other students' ideas and opinions helped me to understand the topics.

1.	2.	3.	4.	5.

7. I learned as much from other students as from course materials.

1.	2.	3.	4.	5.

8. Having classmates' introduction of themselves improved the interaction during the semester.

1.	2.	3.	4.	5.

9. Having classmates' replies to my discussion topic responses was helpful.

1.	2.	3.	4.	5.

10. Participation in this online course enhanced my awareness of myself as a learner.

1.	2.	3.	4.	5.

On a Scale of 1 to 5 indicate how strongly you Agree or Disagree with each statement regarding <u>Learner-to-Content</u> Interaction within the course:

Strongly Disagree	Somewhat Disagree	AGREE	Somewhat Agree	Strongly Agree
1.	**2.**	**3.**	**4.**	**5.**

1. Structured scheduling of weekly modules and discussions helped me stay on schedule.

1.	2.	3.	4.	5.

2. Assignments/projects helped me to understand and apply the course content.

1.	2.	3.	4.	5.

3. The design of the course was conducive to my learning experience.

1.	2.	3.	4.	5.

4. I needed the incentive (i.e. points) to motivate me to put time and effort into online discussions.

1.	2.	3.	4.	5.

5. I found the quality of the web-based course equal to or better than that of similar face-to-face courses.

1.	2.	3.	4.	5.

6. The course website navigation was user-friendly.

1.	2.	3.	4.	5.

7. This online course was a positive and satisfying experience for me.

1.	2.	3.	4.	5.

8. This course contributed to my educational or professional development.

1.	2.	3.	4.	5.

9. The amount of work for this online course was more than what I had expected.

1.	2.	3.	4.	5.

10. I would recommend taking **a** web-based course to friends or associates.

1.	2.	3.	4.	5.

On a Scale of 1 to 5 indicate how strongly you Agree or Disagree with each statement regarding Learner-to-Instructor Interaction within the course:

Strongly Disagree	Somewhat Disagree	AGREE	Somewhat Agree	Strongly Agree
1.	**2.**	**3.**	**4.**	**5.**

1. Having email communication with the instructor was helpful.

1.	2.	3.	4.	5.

2. I received responses to my email questions in a timely manner from the instructor.

1.	2.	3.	4.	5.

3. Receiving responses to my emails in a timely manner motivated me to participate.

1.	2.	3.	4.	5.

4. In general, my instructor returned graded assignments in a timely manner.

1.	2.	3.	4.	5.

5. Instructor explained necessary steps to take to succeed in this online course.

1.	2.	3.	4.	5.

6. The instructor provided direction for online discussion.

1.	2.	3.	4.	5.

7. The instructor regularly monitored the discussion.

1.	2.	3.	4.	5.

8. The instructor offered adequate structure and guidance for the course assignments.

1.	2.	3.	4.	5.

9. I was satisfied with the quality interactivity with the instructor in this online course.

1.	2.	3.	4.	5.

10. The instructor provided and maintained a sense of presence throughout the semester.

1.	2.	3.	4.	5.

Optional Learner Preference Evaluation Data:

(Please answer and add comment. This data will be used to assess online work method as related to the BME course offerings.)

Course Material in the following includes; syllabus (5 %), assignment descriptions (10%) content pages (25%), discussion posts (40%), emails (20%).

1. Choose from 1 to 5 the ONE option that BEST describes your hard copy Printing for this online course:
    1. I printed NONE of the course material: 0%.
    2. I printed 5 - 15% of the course material (for example - course syllabus and assignment descriptions).
    3. I printed 20 - 45 % of the course material.
    4. I printed 30 – 60 % of the course material.
    5. I printed 40 - 75% of the course material.

1.	2.	3.	4.	5.

2. Choose from 1 to 5 the ONE option that BEST describes your Electronic Save (e-saved) or print to file for this online course. Mark choice with X in selection Box.
    1. I e-saved NONE of the course material: 0%.
    2. I e-saved 5 - 15% of the course material (for example - course syllabus and assignment descriptions).
    3. I e-saved 20 - 45 % of the course material.
    4. I e-saved 30 – 60 % of the course material.
    5. I e-saved 40 - 75% of the course material.

1.	2.	3.	4.	5.

3. Choose from 1 to 5 the ONE option that BEST describes your Typical (**most** often employed) method for Posting your original Response (not reply) to this online course's Discussion Topic:
    1. Read the Topic then write my Response.
    2. Read the Topic, read some of the other student's posts, then write my Response.
    3. Read the Topic, discuss with a colleague or classmate, then write my Response.
    4. Read the Topic, read other's posts, discuss with colleague, then write my response.
    5. Used a variation of methods 1-4 randomly.

1.	2.	3.	4.	5.

4. Choose from 1 to 5 the ONE option that BEST describes your Typical (**most** often employed) method for getting help or clarification to this online course's discussion topics and assignments:
    1. I submitted/posted what I considered correct and used feedback to adjust or change.
    2. I read the Lecture notes or other assigned readings or descriptions repeatedly as required for understanding.
    3. I posted an email to a classmate or colleague (not a fellow student).
    4. I posted an email to the instructor.
    5. I discussed verbally (face-to-face, phone, etc) with a classmate or colleague (not a fellow student).

1.	2.	3.	4.	5.

5. Estimate how much time you spent EACH WEEK on this online course, include all online and offline activity associated with the course
    1. Less than 2 hours
    2. 3-5 hours
    3. 6-9 hours
    4. 10-12 hours
    5. More than 12 hours

1.	2.	3.	4.	5.

6. The number of online Web-based courses you previously have taken prior to this course.
    1. None
    2. One
    3. Two
    4. Three
    5. More than Three

1.	2.	3.	4.	5.

You are invited to comment on the items in this survey or on specifics of your online course in the following section.

Additional Narrative Comments:

Appendix C – General Course Design

General Design for ECI online courses:

- Before the first day of semester classes a welcome email is posted by the instructor to all enrollees providing course access information and mandatory university information regarding course participation.
- The following website page links are provided and explained to the students:
  - Getting Started: for course and learning management system introduction and usage
  - Meet Instructor: A brief personal "Hello" and introduction from instructor
  - Announcements: Important course related Announcements post area
  - Classmates: Information about WebCTs communication features
  - Syllabus:
    - Course overview, description, objectives
    - Course outline of topics and dates to be covered & assignment due dates
    - Course assessment criterion
    - University policy statement on academic integrity
  - Course Content: Lecture Notes related to the Weekly Readings or assignments.
  - Discussion: Forum for student posting on specified Topic prompts
  - Email: for communication to instructor and classmates
  - Classmates Info: additional contact information outside the learning management system (phone numbers and alternate emails)
  - Assignment/Projects: link for electronic submission of assignments Grade Book: This is the location where students can view their grades.
- The following instructional methods are utilized
  - Individual Projects for content practice and assessment
  - Weekly required class discussions postings related to readings and lecture
  - Reflection and electronic communication
  - Fieldwork related to projects and content
  - Lecture narratives
  - Web site search and reviews related to content
  - Case study analyses
- Content controlled accessibility, by calendar date, is used to mirror University on-campus schedule.
- Access to course materials is permitted with asynchronous communication among students and the instructor.
- Course is managed using the Campus Edition of WebCT learning management system (http://www.blackboard.com/WebCT)

Appendix D – IRB Permission

North Carolina State University is a land-grant university and a constituent institution of The University of North Carolina

Office of Research and GraduateStudies

NC STATE UNIVERSITY

Sponsored Programs and
Regulatory Compliance
Campus Box 7514
1 Leazar Hall
Raleigh, NC 27695-7514
919.515.7200
919.515.7721 (fax)

From: Debra A. Paxton, Regulatory Compliance Administrator
North Carolina State University
Institutional Review Board

Date: May 17, 2006

Project Title: The Relationship Between Psychological Type (MBTI) and Performance and Satisfaction in Web-based Instruction (WBI)

IRB#: 153-06-5

Dear Ms. Lucas:

The research proposal named above has received administrative review and has been approved as exempt from the policy as outlined in the Code of Federal Regulations (Exemption: 46.101.b.1). Provided that the only participation of the subjects is as described in the proposal narrative, this project is exempt from further review.

NOTE:

1. This committee complies with requirements found in Title 45 part 46 of The Code of Federal Regulations.
   For NCSU projects, the Assurance Number is: M1263; the IRB Number is: 01XM.

2. Review de novo of this proposal is necessary if any significant alterations/additions are made.

Please provide your faculty sponsor with a copy of this letter. Thank you.

Sincerely,
Debra PaxtonNCSU IR

Appendix E – Research Consent Form

North Carolina State University
INFORMED CONSENT FORM for RESEARCH

Psychological Type (MBTI) Relationship to Performance and Satisfaction in Web-Based instruction (WBI)
Principal Investigator: Jan W. Lucas Faculty Sponsor: Dr. Terrance P. O'Brien

We are asking you to participate in a research study. The purpose of this study is to provide empirical data that reports the association between students' learning style preferences as understood by the MBTI personality profile and their perceptions of satisfaction in web-based learning environments as it relates to performance.

INFORMATION
If you agree to participate in this study, you will be asked to :

- Allow access to your course records.
- Allow aggregated data reporting of your course evaluation survey results.
- Allow coded reporting of student grades from your course.

RISKS None

BENEFITS
The findings hopefully can be utilized in making recommendation and observations for the definition and implementation of instructional delivery models effective for the new digital global world and specifically for the economy of Web-Based instruction (WBI). Specifically you can use the resultant data to form your own conclusions about the activity, performance and satisfaction of your students.

CONFIDENTIALITY
The information in the study records will be kept strictly confidential. Data will be stored securely in the researcher's office and all data will be coded such as to conceal personally identifying information of the students and instructor in the courses of study. **No reference will be made in oral or written reports which could link you to the study.**

COMPENSATION (if applicable) Not applicable

EMERGENCY MEDICAL TREATMENT (if applicable) Not applicable

CONTACT
If you have questions at any time about the study or the procedures, you may contact the researcher, Jan Lucas at 919-522-9868 or jw_lucas@hotmail.com. If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. Matthew Zingraff, Chair of the NCSU IRB for the Use of Human Subjects in Research Committee, Box 7514, NCSU Campus (919/513-1834) or Mr. Matthew Ronning, Assistant Vice Chancellor, Research Administration, Box 7514, NCSU Campus (919/513-2148)

PARTICIPATION
Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be returned to you or destroyed at your request.

CONSENT
"I have read and understand the above information. I have received a copy of this form. I agree to participate in this study with the understanding that I may withdraw at any time."
Subject's signature_____ Date _____
Investigator's signature_____ Date _____

Appendix F – SAS Output Tables

F- 1

SAS Analysis Output in Rich Text Format
The Table identifiers were added for reference clarity.

The SAS System 14:03 Thursday, August 3, 2006 1

Obs	stId	qq1	qq2	qq3	qq4	qq5	qq6	qq7	qq8	qq9	qq10	qq11	qq12	qq13	qq14	qq15	qq16	qq17	qq18	qq19	qq20	qq21	qq22	qq23	qq24	qq25	qq26	qq27	qq28	qq29	qq30
1	34286	3	5	3	3	4	4	3	5	5	5	5	5	5	4	3	3	5	5	4	5	5	3	.	5	3	3	3	3	3	5
2	34317	5	4	5	4	5	5	5	5	5	5	5	5	5	3	5	5	5	5	3	5	5	5	5	5	5	5	5	5	5	5
3	34357	2	3	3	2	1	1	1	1	1	5	1	3	2	1	2	3	2	2	2	3	5	3	3	3	3	3	3	3	3	3
4	34380	5	4	5	5	5	5	5	5	5	5	5	5	5	4	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5
5	34427	5	5	5	5	5	5	5	5	.	5	5	5	5	5	5	5	5	5	2	5	5	5	5	5	5	5	5	5	5	5
6	34434	5	5	5	4	4	4	4	4	4	4	3	3	3	2	4	3	3	3	2	5	5	5	3	5	4	4	3	4	3	3
7	34481	5	5	5	5	5	5	3	3	4	5	5	5	5	5	5	5	5	.	2	5	5	5	5	5	5	5	5	5	5	5
8	34544	5	5	5	5	4	5	5	5	5	5	5	5	5	3	4	4	5	5	2	5	5	5	5	5	5	5	5	5	5	5
9	34597	4	2	3	3	3	3	2	2	2	3	3	3	3	3	3	3	3	3	2	3	3	5	5	5	5	5	5	5	5	5
10	34756	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	2	3	3	3
11	34873	5	5	5	5	5	5	4	5	5	4	5	5	5	4	5	4	5	5	2	5	5	5	5	5	5	5	5	5	5	5
12	34965	1	3	3	2	5	3	5	1	4	3	4	2	1	1	1	2	1	2	5	4	1	2	1	3	3	4	4	3	3	2
13	34989	3	3	3	4	3	3	5	4	4	4	4	4	4	3	3	5	5	5	2	5	5	5	5	5	5	5	5	5	5	5
14	34993	3	2	2	2	2	5	5	3	4	2	3	3	3	2	2	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3
15	35003	3	4	4	3	3	3	2	3	3	2	3	3	3	4	3	3	3	2	3	4	3	3	3	3	3	3	3	3	3	3
16	35038	5	5	5	5	5	5	4	4	4	5	3	4	4	5	5	4	4	4	2	4	5	5	4	5	5	5	3	4	4	5
17	35062	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
18	35531	4	4	5	5	4	4	5	5	5	4	5	5	5	3	5	5	5	5	2	5	5	5	4	5	5	4	5	5	5	5
19	35544	5	5	5	5	5	5	5	.	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
20	35546	4	5	5	5	5	5	4	5	5	4	5	5	5	2	4	5	3	3	2	5	5	5	5	5	5	5	5	5	5	5
21	34282	5	5	5	4	3	5	4	5	5	5	5	5	5	4	5	5	5	5	3	5	5	4	5	4	5	5	3	5	4	4
22	34295	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
23	34300	5	5	5	5	5	5	5	5	5	5	5	5	5	3	4	5	5	5	2	3	5	5	5	5	5	5	5	5	5	5
24	34341	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	2	5	5	5	5	5	5	5	5	5	5	5
25	34428	5	3	5	5	5	5	5	3	3	5	3	5	3	1	4	5	5	5	3	5	5	5	5	5	3	3	3	3	3	3
26	34463	3	5	5	5	5	5	3	5	5	5	5	5	5	5	5	5	5	5	2	5	5	5	5	5	5	5	5	5	5	5
27	34998	5	5	5	5	4	5	4	4	5	5	5	5	5	4	5	5	5	5	2	5	5	5	5	5	5	5	5	3	5	5
28	35532	5	4	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	2	5	5	5	5	5	5	5	4	5	5	5
29	35534	5	5	5	5	5	5	5	5	5	5	5	5	5	2	5	5	5	5	2	5	5	5	5	5	5	5	5	5	5	5
30	35535	5	5	5	5	5	5	4	5	5	5	5	5	5	4	5	5	5	5	1	5	5	5	5	5	5	5	5	5	5	5
31	36849	5	5	5	5	5	5	4	5	5	5	5	5	5	5	4	5	5	5	3	5	5	5	5	5	5	5	5	5	5	5
32	34290	5	5	5	5	4	4	5	5	5	5	5	5	5	3	5	5	5	5	2	5	5	5	5	5	5	5	5	5	5	5
33	34360	5	5	5	5	1	5	5	5	5	5	5	5	5	3	3	5	5	5	3	5	3	3	3	3	5	5	3	3	3	3
34	34376	4	3	5	4	3	4	2	3	3	3	5	3	.	3	3	3	5	5	4	5	3	3	3	3	3	3	5	5	5	5
35	34423	4	4	4	4	5	5	4	4	4	3	4	4	4	4	4	4	.	5	4	4	5	4	4	4	4	4	4	5	5	4
36	34505	5	5	5	5	4	5	5	5	5	4	5	5	5	2	5	5	5	5	1	5	5	5	3	5	5	5	5	5	5	5
37	34545	5	5	5	5	5	5	5	5	5	5	5	5	5	1	5	5	5	.	2	5	5	4	4	4	5	5	5	5	5	5
38	34638	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
39	34659	3	3	3	3	3	3	4	3	3	5	3	3	3	4	3	3	3	5	2	3	3	3	3	3	3	3	3	3	3	3
40	34826	3	3	3	3	3	3	3	5	3	3	3	3	3	3	3	3	3	3	4	3	5	5	5	5	5	.	5	5	5	5
41	34968	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	2	5	5	5	5	5	5	5	5	4	5	5
42	35063	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
43	35545	4	2	3	3	3	3	3	2	3	3	3	.	3	2	3	3	3	3	2	3	3	3	3	5	3	3	3	3	3	3
44	34287	4	3	3	3	3	3	5	3	3	4	3	4	3	3	3	4	3	3	3	4	3	5	3	5	3	3	3	3	.	3
45	34291	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	5	5
46	34572	3	5	5	3	5	5	3	4	3	3	5	5	5	4	5	3	3	3	4	5	5	3	3	5	5	5	3	3	5	5
47	35344	4	3	3	3	5	4	5	4	4	5	4	5	5	2	3	5	3	3	2	5	3	3	3	3	3	3	3	3	3	3

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Obs	sid	qqq1	qqq2	qqq3	qqq4	qqq5	qqq6	qqq7	qqq8	qqq9	qqq10	qqq11	qqq12	qqq13	qqq14	qqq15	qqq16	qqq17	qqq18	qqq19	qqq20	qqq21	qqq22	qqq23
48	35530	4	4	4	4	4	4	4	4	4	3	3	3	2	3	5	5	3	3	5	3	3	3	3	3	3	3	5	3
49	36841	4	5	4	4	5	4	5	5	4	4	4	4	4	5	4	4	5	5	2	5	5	5	5	5	5	4	5	4	5	4
50	36848	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	.	.	5	5	5	5	5	5	5	5	5	5	5	5	5
51	36867	5	3	3	2	5	5	3	3	3	3	4	5	3	4	2	4	4	4	3	4	4	5	5	5	4	5	2	5	5	4
52	36838	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
53	36840	5	5	5	5	4	4	5	5	5	4	5	5	5	2	5	4	5	5	2	5	5	4	4	4	5	5	4	5	4	4
54	36844	5	5	5	5	5	5	5	4	4	5	5	5	5	5	5	5	4	5	5	4	5	5	5	5	5	5	5	5	5	5
55	36850	2	3	4	3	2	3	4	3	3	3	3	5	4	3	3	1	5	3	3	2	3	3	4	5	4	4	4	4	4	4
56	36857	5	5	5	5	5	5	5	5	5	5	5	5	5	1	5	5	5	5	2	5	5	5	5	5	5	5	5	5	5	5
57	36866	5	5	5	5	5	5	5	5	5	5	5	2	4	2	4	5	5	5	2	5	5	4	3	4	4	4	5	4	4	4
58	36839	5	5	5	5	4	3	3	4	5	5	5	5	5	3	5	5	5	5	2	5	5	5	5	4	5	5	3	5	5	5
59	36842	5	5	5	5	5	5	4	5	5	5	5	5	5	5	5	5	5	5	3	5	5	5	5	5	5	5	5	5	5	5
60	36847	.	5	5	5	5	5	5	5	3	5	5	5	5	4	5	5	5	5	4	5	5	5	3	5	5	5	5	5	5	5
61	36853	5	4	5	4	5	5	4	4	4	4	4	4	5	5	4	5	5	5	4	5	5	5	5	5	5	5	5	5	5	5
62	36865	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
63	36870	5	5	5	5	3	3	2	3	3	3	5	4	5	3	3	3	3	3	3	5	5	5	3	5	5	5	5	5	5	5
64	36872	5	4	5	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	5	4	4	5	5
65	36843	5	4	5	5	5	5	3	5	5	4	5	5	5	3	4	4	5	5	2	5	5	5	5	5	5	5	5	5	5	5
66	36845	5	5	5	5	3	4	5	5	5	5	3	4	5	5	4	5	5	5	2	5	5	5	5	5	5	5	5	5	5	5
67	36851	3	4	3	3	3	3	1	4	3	3	5	3	3	2	2	3	3	4	3	3	5	5	3	4	3	3	3	3	3	3
68	36860	3	3	3	3	4	4	4	4	4	4	4	4	5	3	3	5	5	5	2	5	3	3	3	5	5	5	3	4	4	4

Table F.1 Data Observations Frequency Procedure

SAS Output Charts PROC FREQ per Question (pages 2 – 7)

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The FREQ Procedure

qq1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	1.49	1	1.49
2	2	2.99	3	4.48
3	14	20.90	17	25.37
4	10	14.93	27	40.30
5	40	59.70	67	100.00

Frequency Missing = 1

qq2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	3	4.41	3	4.41
3	16	23.53	19	27.94
4	11	16.18	30	44.12
5	38	55.88	68	100.00

Table F.1 continued

qq3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	1	1.47	1	1.47
3	17	25.00	18	26.47
4	5	7.35	23	33.82
5	45	66.18	68	100.00

qq4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	4	5.88	4	5.88
3	16	23.53	20	29.41
4	9	13.24	29	42.65
5	39	57.35	68	100.00

qq5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	2.94	2	2.94
2	2	2.94	4	5.88
3	16	23.53	20	29.41
4	11	16.18	31	45.59
5	37	54.41	68	100.00

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The FREQ Procedure

qq6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	1.47	1	1.47
3	16	23.53	17	25.00
4	12	17.65	29	42.65
5	39	57.35	68	100.00

qq7	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	2.94	2	2.94
2	4	5.88	6	8.82
3	13	19.12	19	27.94
4	16	23.53	35	51.47
5	33	48.53	68	100.00

qq8	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	2.99	2	2.99
2	2	2.99	4	5.97
3	14	20.90	18	26.87
4	14	20.90	32	47.76
5	35	52.24	67	100.00

Table F.1 continued

Frequency Missing = 1

qq9	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	1.49	1	1.49
2	1	1.49	2	2.99
3	17	25.37	19	28.36
4	12	17.91	31	46.27
5	36	53.73	67	100.00

Frequency Missing = 1

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The FREQ Procedure

qq10	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	2	2.94	2	2.94
3	15	22.06	17	25.00
4	13	19.12	30	44.12
5	38	55.88	68	100.00

qq11	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	1.47	1	1.47
3	16	23.53	17	25.00
4	8	11.76	25	36.76
5	43	63.24	68	100.00

qq12	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	2	2.99	2	2.99
3	14	20.90	16	23.88
4	10	14.93	26	38.81
5	41	61.19	67	100.00

Frequency Missing = 1

qq13	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	1.49	1	1.49
2	1	1.49	2	2.99
3	17	25.37	19	28.36
4	5	7.46	24	35.82
5	43	64.18	67	100.00

Frequency Missing = 1

Table F.1 continued

qq14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	5	7.35	5	7.35
2	11	16.18	16	23.53
3	20	29.41	36	52.94
4	13	19.12	49	72.06
5	19	27.94	68	100.00

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The FREQ Procedure

qq15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	2.94	2	2.94
2	4	5.88	6	8.82
3	19	27.94	25	36.76
4	12	17.65	37	54.41
5	31	45.59	68	100.00

qq16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	1	1.49	1	1.49
3	17	25.37	18	26.87
4	11	16.42	29	43.28
5	38	56.72	67	100.00

Frequency Missing = 1

qq17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	1.52	1	1.52
2	1	1.52	2	3.03
3	18	27.27	20	30.30
4	2	3.03	22	33.33
5	44	66.67	66	100.00

Frequency Missing = 2

qq18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	3	4.55	3	4.55
3	16	24.24	19	28.79
4	3	4.55	22	33.33
5	44	66.67	66	100.00

Frequency Missing = 2

Table F.1 continued

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The FREQ Procedure

qq19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	2.94	2	2.94
2	34	50.00	36	52.94
3	15	22.06	51	75.00
4	9	13.24	60	88.24
5	8	11.76	68	100.00

qq20	Frequency	Percent	Cumulative Frequency	Cumulative Percent
3	13	19.12	13	19.12
4	6	8.82	19	27.94
5	49	72.06	68	100.00

qq21	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	1.47	1	1.47
3	16	23.53	17	25.00
4	1	1.47	18	26.47
5	50	73.53	68	100.00

qq22	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	1	1.47	1	1.47
3	16	23.53	17	25.00
4	6	8.82	23	33.82
5	45	66.18	68	100.00

qq23	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	1.49	1	1.49
3	22	32.84	23	34.33
4	5	7.46	28	41.79
5	39	58.21	67	100.00

Frequency Missing = 1

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The FREQ Procedure

qq24	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Table F.1 continued

3	13	19.12	13	19.12
4	8	11.76	21	30.88
5	47	69.12	68	100.00

qq25	Frequency	Percent	Cumulative Frequency	Cumulative Percent
3	17	25.00	17	25.00
4	5	7.35	22	32.35
5	46	67.65	68	100.00

qq26	Frequency	Percent	Cumulative Frequency	Cumulative Percent
3	16	23.88	16	23.88
4	7	10.45	23	34.33
5	44	65.67	67	100.00

Frequency Missing = 1

qq27	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	2	2.94	2	2.94
3	21	30.88	23	33.82
4	7	10.29	30	44.12
5	38	55.88	68	100.00

qq28	Frequency	Percent	Cumulative Frequency	Cumulative Percent
3	19	27.94	19	27.94
4	9	13.24	28	41.18
5	40	58.82	68	100.00

qq29	Frequency	Percent	Cumulative Frequency	Cumulative Percent
3	16	23.88	16	23.88
4	6	8.96	22	32.84
5	45	67.16	67	100.00

Frequency Missing = 1

qq30	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	1	1.47	1	1.47
3	16	23.53	17	25.00
4	8	11.76	25	36.76
5	43	63.24	68	100.00

Table F.2 PROC FREQ per 10 Question Subset *(pages 8- 16)*

LL	Frequency	Percent	Cumulative Frequency	Cumulative Percent
20	1	1.54	1	1.54
27	1	1.54	2	3.08
29	1	1.54	3	4.62
30	9	13.85	12	18.46
32	1	1.54	13	20.00
33	1	1.54	14	21.54
34	2	3.08	16	24.62
35	1	1.54	17	26.15
36	2	3.08	19	29.23
37	1	1.54	20	30.77
39	1	1.54	21	32.31
40	3	4.62	24	36.92
41	1	1.54	25	38.46
43	1	1.54	26	40.00
44	4	6.15	30	46.15
45	2	3.08	32	49.23
46	4	6.15	36	55.38
47	5	7.69	41	63.08
48	6	9.23	47	72.31
49	7	10.77	54	83.08
50	11	16.92	65	100.00

Frequency Missing = 3

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The FREQ Procedure

LC	Frequency	Percent	Cumulative Frequency	Cumulative Percent
21	1	1.61	1	1.61
23	1	1.61	2	3.23
27	1	1.61	3	4.84
29	2	3.23	5	8.06
30	3	4.84	8	12.90
31	4	6.45	12	19.35
32	2	3.23	14	22.58
33	1	1.61	15	24.19
35	1	1.61	16	25.81
37	3	4.84	19	30.65
39	4	6.45	23	37.10
40	1	1.61	24	38.71
41	1	1.61	25	40.32
42	3	4.84	28	45.16
43	6	9.68	34	54.84
44	3	4.84	37	59.68
45	5	8.06	42	67.74
46	5	8.06	47	75.81
47	6	9.68	53	85.48
48	3	4.84	56	90.32
49	1	1.61	57	91.94
50	5	8.06	62	100.00

Frequency Missing = 6

Table F.2 continued

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The FREQ Procedure

LI	Frequency	Percent	Cumulative Frequency	Cumulative Percent
26	1	1.54	1	1.54
29	1	1.54	2	3.08
30	7	10.77	9	13.85
32	3	4.62	12	18.46
34	1	1.54	13	20.00
35	1	1.54	14	21.54
38	2	3.08	16	24.62
39	2	3.08	18	27.69
40	1	1.54	19	29.23
41	1	1.54	20	30.77
42	1	1.54	21	32.31
43	1	1.54	22	33.85
44	3	4.62	25	38.46
45	1	1.54	26	40.00
47	3	4.62	29	44.62
48	8	12.31	37	56.92
49	2	3.08	39	60.00
50	26	40.00	65	100.00

Frequency Missing = 3

Table F.2 continued

PROC CORR per 10 Question Subset (pages 10 - 16)

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The CORR Procedure

10 Variables: qq1 qq2 qq3 qq4 qq5 qq6 qq7 qq8 qq9 qq10

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
qq1	65	4.26154	1.00432	277.00000	1.00000	5.00000
qq2	65	4.20000	0.97147	273.00000	2.00000	5.00000
qq3	65	4.35385	0.92586	283.00000	2.00000	5.00000
qq4	65	4.18462	1.01385	272.00000	2.00000	5.00000
qq5	65	4.12308	1.08264	268.00000	1.00000	5.00000
qq6	65	4.26154	0.94003	277.00000	1.00000	5.00000
qq7	65	4.04615	1.09588	263.00000	1.00000	5.00000
qq8	65	4.13846	1.05885	269.00000	1.00000	5.00000
qq9	65	4.21538	0.97616	274.00000	1.00000	5.00000
qq10	65	4.24615	0.91908	276.00000	2.00000	5.00000

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.939036
Standardized	0.940621

Cronbach Coefficient Alpha with Deleted Variable

Deleted Variable	Raw Variables: Correlation with Total	Raw Variables: Alpha	Standardized Variables: Correlation with Total	Standardized Variables: Alpha
qq1	0.768808	0.931909	0.771925	0.933741
qq2	0.772952	0.931760	0.777295	0.933486
qq3	0.816082	0.929978	0.819187	0.931482
qq4	0.864194	0.927191	0.868382	0.929104
qq5	0.630940	0.939064	0.632084	0.940279
qq6	0.787577	0.931191	0.783719	0.933180
qq7	0.573329	0.942103	0.572723	0.942989
qq8	0.793875	0.930658	0.794448	0.932668
qq9	0.873711	0.926952	0.870929	0.928980
qq10	0.689881	0.935583	0.689185	0.937636

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The CORR Procedure

Pearson Correlation Coefficients, N = 65
Prob > |r| under H0: Rho=0

Table F.2 continued

	qq1	qq2	qq3	qq4	qq5
qq1	1.00000	0.61817	0.75591	0.79583	0.50163
		<.0001	<.0001	<.0001	<.0001
qq2	0.61817	1.00000	0.80606	0.77100	0.49620
	<.0001		<.0001	<.0001	<.0001
qq3	0.75591	0.80606	1.00000	0.89477	0.53263
	<.0001	<.0001		<.0001	<.0001
qq4	0.79583	0.77100	0.89477	1.00000	0.51991
	<.0001	<.0001	<.0001		<.0001
qq5	0.50163	0.49620	0.53263	0.51991	1.00000
	<.0001	<.0001	<.0001	<.0001	
qq6	0.68773	0.59201	0.66398	0.63713	0.68947
	<.0001	<.0001	<.0001	<.0001	<.0001
qq7	0.42896	0.31408	0.36864	0.47036	0.42973
	0.0004	0.0108	0.0025	<.0001	0.0004
qq8	0.61192	0.71697	0.63459	0.71813	0.48922
	<.0001	<.0001	<.0001	<.0001	<.0001
qq9	0.62697	0.72827	0.67505	0.76438	0.58070
	<.0001	<.0001	<.0001	<.0001	<.0001
qq10	0.58934	0.60900	0.59380	0.67151	0.44017
	<.0001	<.0001	<.0001	<.0001	0.0002

Pearson Correlation Coefficients, N = 65
Prob > |r| under H0: Rho=0

	qq6	qq7	qq8	qq9	qq10
qq1	0.68773	0.42896	0.61192	0.62697	0.58934
	<.0001	0.0004	<.0001	<.0001	<.0001
qq2	0.59201	0.31408	0.71697	0.72827	0.60900
	<.0001	0.0108	<.0001	<.0001	<.0001
qq3	0.66398	0.36864	0.63459	0.67505	0.59380
	<.0001	0.0025	<.0001	<.0001	<.0001

The CORR Procedure

Pearson Correlation Coefficients, N = 65
Prob > |r| under H0: Rho=0

	qq6	qq7	qq8	qq9	qq10
qq4	0.63713	0.47036	0.71813	0.76438	0.67151
	<.0001	<.0001	<.0001	<.0001	<.0001
qq5	0.68947	0.42973	0.48922	0.58070	0.44017

Table F.2 continued

	<.0001	0.0004	<.0001	<.0001	0.0002
qq6	1.00000	0.54930	0.66946	0.73796	0.46688
		<.0001	<.0001	<.0001	<.0001
qq7	0.54930	1.00000	0.53303	0.67705	0.50048
	<.0001		<.0001	<.0001	<.0001
qq8	0.66946	0.53303	1.00000	0.83237	0.55850
	<.0001	<.0001		<.0001	<.0001
qq9	0.73796	0.67705	0.83237	1.00000	0.63662
	<.0001	<.0001	<.0001		<.0001
qq10	0.46688	0.50048	0.55850	0.63662	1.00000
	<.0001	<.0001	<.0001	<.0001	

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The CORR Procedure

10 Variables: qq11 qq12 qq13 qq14 qq15 qq16 qq17 qq18 qq19 qq20

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
qq11	62	4.33871	0.95717	269.00000	1.00000	5.00000
qq12	62	4.33871	0.92228	269.00000	2.00000	5.00000
qq13	62	4.30645	1.01769	267.00000	1.00000	5.00000
qq14	62	3.45161	1.23710	214.00000	1.00000	5.00000
qq15	62	3.95161	1.13697	245.00000	1.00000	5.00000
qq16	62	4.30645	0.89788	267.00000	2.00000	5.00000
qq17	62	4.30645	1.03367	267.00000	1.00000	5.00000
qq18	62	4.32258	1.00448	268.00000	2.00000	5.00000
qq19	62	2.77419	1.07763	172.00000	1.00000	5.00000
qq20	62	4.53226	0.80404	281.00000	3.00000	5.00000

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.904257
Standardized	0.911303

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
qq11	0.717677	0.891322	0.726060	0.899402
qq12	0.799968	0.886758	0.806549	0.894461

Table F.2 continued

qq13	0.874326	0.880736	0.881396	0.889774
qq14	0.505173	0.907556	0.495047	0.913030
qq15	0.752845	0.888407	0.756747	0.897530
qq16	0.698879	0.892857	0.709202	0.900425
qq17	0.844635	0.882528	0.852282	0.891608
qq18	0.812606	0.884969	0.815490	0.893906
qq19	0.060357	0.931774	0.052033	0.936962
qq20	0.739769	0.891769	0.747244	0.898112

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The CORR Procedure

Pearson Correlation Coefficients, N = 62
Prob > |r| under H0: Rho=0

	qq11	qq12	qq13	qq14	qq15
qq11	1.00000	0.70357	0.76681	0.31172	0.54253
		<.0001	<.0001	0.0136	<.0001
qq12	0.70357	1.00000	0.83075	0.39536	0.67249
	<.0001		<.0001	0.0015	<.0001
qq13	0.76681	0.83075	1.00000	0.47422	0.76392
	<.0001	<.0001		<.0001	<.0001
qq14	0.31172	0.39536	0.47422	1.00000	0.45869
	0.0136	0.0015	<.0001		0.0002
qq15	0.54253	0.67249	0.76392	0.45869	1.00000
	<.0001	<.0001	<.0001	0.0002	
qq16	0.54486	0.66446	0.68492	0.28660	0.59287
	<.0001	<.0001	<.0001	0.0239	<.0001
qq17	0.60584	0.69754	0.78195	0.44125	0.71026
	<.0001	<.0001	<.0001	0.0003	<.0001
qq18	0.65177	0.67642	0.75165	0.44812	0.67418
	<.0001	<.0001	<.0001	0.0003	<.0001
qq19	0.12304	0.04523	-0.01061	0.32369	-0.02244
	0.3407	0.7271	0.9348	0.0103	0.8625
qq20	0.61395	0.65928	0.73901	0.28177	0.65627
	<.0001	<.0001	<.0001	0.0265	<.0001

Pearson Correlation Coefficients, N = 62
Prob > |r| under H0: Rho=0

	qq16	qq17	qq18	qq19	qq20
qq11	0.54486	0.60584	0.65177	0.12304	0.61395
	<.0001	<.0001	<.0001	0.3407	<.0001
qq12	0.66446	0.69754	0.67642	0.04523	0.65928
	<.0001	<.0001	<.0001	0.7271	<.0001

Table F.2 continued

```
         qq13       0.68492       0.78195       0.75165      -0.01061       0.73901
                      <.0001        <.0001        <.0001        0.9348        <.0001
```

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                                    The CORR Procedure

                          Pearson Correlation Coefficients, N = 62
                                  Prob > |r| under H0: Rho=0

                            qq16          qq17          qq18          qq19          qq20

         qq14       0.28660       0.44125       0.44812       0.32369       0.28177
                     0.0239        0.0003        0.0003        0.0103        0.0265

         qq15       0.59287       0.71026       0.67418      -0.02244       0.65627
                      <.0001        <.0001        <.0001        0.8625        <.0001

         qq16       1.00000       0.78031       0.68836      -0.11368       0.63325
                                    <.0001        <.0001        0.3790        <.0001

         qq17       0.78031       1.00000       0.91370      -0.02516       0.70786
                      <.0001                      <.0001        0.8461        <.0001

         qq18       0.68836       0.91370       1.00000      -0.02247       0.61614
                      <.0001        <.0001                      0.8624        <.0001

         qq19      -0.11368      -0.02516      -0.02247       1.00000       0.08422
                     0.3790        0.8461        0.8624                      0.5151

         qq20       0.63325       0.70786       0.61614       0.08422       1.00000
                      <.0001        <.0001        <.0001        0.5151
```

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 10  Variables:    qq21     qq22     qq23     qq24     qq25     qq26     qq27     qq28     qq29
                   qq30


                                    Simple Statistics

  Variable           N          Mean       Std Dev           Sum       Minimum       Maximum

  qq21              65       4.46154       0.95323     290.00000       1.00000       5.00000
  qq22              65       4.40000       0.89791     286.00000       2.00000       5.00000
  qq23              65       4.21538       1.00766     274.00000       1.00000       5.00000
  qq24              65       4.47692       0.81217     291.00000       3.00000       5.00000
  qq25              65       4.46154       0.84921     290.00000       3.00000       5.00000
  qq26              65       4.46154       0.83060     290.00000       3.00000       5.00000
  qq27              65       4.21538       0.97616     274.00000       2.00000       5.00000
  qq28              65       4.33846       0.87101     282.00000       3.00000       5.00000
  qq29              65       4.44615       0.84836     289.00000       3.00000       5.00000
  qq30              65       4.36923       0.89389     284.00000       2.00000       5.00000
```

Table F.2 continued

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.961858
Standardized	0.963296

Cronbach Coefficient Alpha with Deleted Variable

Deleted Variable	Raw Variables: Correlation with Total	Raw Variables: Alpha	Standardized Variables: Correlation with Total	Standardized Variables: Alpha
qq21	0.761797	0.960600	0.761741	0.962108
qq22	0.865837	0.956326	0.863348	0.958237
qq23	0.775131	0.960412	0.775357	0.961595
qq24	0.834849	0.957734	0.834899	0.959329
qq25	0.891379	0.955512	0.894806	0.957020
qq26	0.842742	0.957378	0.846844	0.958871
qq27	0.733390	0.961922	0.735218	0.963105
qq28	0.833479	0.957613	0.833292	0.959391
qq29	0.868692	0.956359	0.868671	0.958031
qq30	0.923650	0.954060	0.924583	0.955861

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The CORR Procedure

Pearson Correlation Coefficients, N = 65
Prob > |r| under H0: Rho=0

	qq21	qq22	qq23	qq24	qq25
qq21	1.00000	0.82148	0.65944	0.72036	0.69785
		<.0001	<.0001	<.0001	<.0001
qq22	0.82148	1.00000	0.80129	0.84847	0.73769
	<.0001		<.0001	<.0001	<.0001
qq23	0.65944	0.80129	1.00000	0.69349	0.68544
	<.0001	<.0001		<.0001	<.0001
qq24	0.72036	0.84847	0.69349	1.00000	0.78595
	<.0001	<.0001	<.0001		<.0001
qq25	0.69785	0.73769	0.68544	0.78595	1.00000
	<.0001	<.0001	<.0001	<.0001	
qq26	0.61481	0.69136	0.64478	0.75723	0.95594
	<.0001	<.0001	<.0001	<.0001	<.0001
qq27	0.52959	0.63106	0.53984	0.59762	0.66986
	<.0001	<.0001	<.0001	<.0001	<.0001
qq28	0.61814	0.72322	0.66335	0.65176	0.75723
	<.0001	<.0001	<.0001	<.0001	<.0001

Table F.2 continued

qq29	0.63018	0.70561	0.69006	0.70684	0.79413
	<.0001	<.0001	<.0001	<.0001	<.0001
qq30	0.71375	0.76700	0.72563	0.76520	0.86293
	<.0001	<.0001	<.0001	<.0001	<.0001

Pearson Correlation Coefficients, N = 65
Prob > |r| under H0: Rho=0

	qq26	qq27	qq28	qq29	qq30
qq21	0.61481	0.52959	0.61814	0.63018	0.71375
	<.0001	<.0001	<.0001	<.0001	<.0001
qq22	0.69136	0.63106	0.72322	0.70561	0.76700
	<.0001	<.0001	<.0001	<.0001	<.0001
qq23	0.64478	0.53984	0.66335	0.69006	0.72563
	<.0001	<.0001	<.0001	<.0001	<.0001

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The CORR Procedure

Pearson Correlation Coefficients, N = 65
Prob > |r| under H0: Rho=0

	qq26	qq27	qq28	qq29	qq30
qq24	0.75723	0.59762	0.65176	0.70684	0.76520
	<.0001	<.0001	<.0001	<.0001	<.0001
qq25	0.95594	0.66986	0.75723	0.79413	0.86293
	<.0001	<.0001	<.0001	<.0001	<.0001
qq26	1.00000	0.60778	0.75259	0.76757	0.81912
		<.0001	<.0001	<.0001	<.0001
qq27	0.60778	1.00000	0.72151	0.75007	0.76696
	<.0001		<.0001	<.0001	<.0001
qq28	0.75259	0.72151	1.00000	0.80743	0.82034
	<.0001	<.0001		<.0001	<.0001
qq29	0.76757	0.75007	0.80743	1.00000	0.91261
	<.0001	<.0001	<.0001		<.0001
qq30	0.81912	0.76696	0.82034	0.91261	1.00000
	<.0001	<.0001	<.0001	<.0001	

Table F.3 PROC FREQ All Questions Set *(pages 17-18)*

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The CORR Procedure

30 Variables: qq1 qq2 qq3 qq4 qq5 qq6 qq7 qq8 qq9
qq10 qq11 qq12 qq13 qq14 qq15 qq16 qq17 qq18
qq19 qq20 qq21 qq22 qq23 qq24 qq25 qq26 qq27
qq28 qq29 qq30

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
qq1	56	4.28571	1.03948	240.00000	1.00000	5.00000
qq2	56	4.25000	0.93905	238.00000	2.00000	5.00000
qq3	56	4.41071	0.91008	247.00000	2.00000	5.00000
qq4	56	4.23214	1.02675	237.00000	2.00000	5.00000
qq5	56	4.14286	1.10254	232.00000	1.00000	5.00000
qq6	56	4.28571	0.94800	240.00000	1.00000	5.00000
qq7	56	4.10714	1.09010	230.00000	1.00000	5.00000
qq8	56	4.17857	1.04633	234.00000	1.00000	5.00000
qq9	56	4.26786	0.98148	239.00000	1.00000	5.00000
qq10	56	4.28571	0.90883	240.00000	2.00000	5.00000
qq11	56	4.33929	0.95873	243.00000	1.00000	5.00000
qq12	56	4.32143	0.93628	242.00000	2.00000	5.00000
qq13	56	4.30357	1.02549	241.00000	1.00000	5.00000
qq14	56	3.39286	1.26028	190.00000	1.00000	5.00000
qq15	56	3.94643	1.15080	221.00000	1.00000	5.00000
qq16	56	4.32143	0.89660	242.00000	2.00000	5.00000
qq17	56	4.30357	1.04307	241.00000	1.00000	5.00000
qq18	56	4.32143	1.01098	242.00000	2.00000	5.00000
qq19	56	2.67857	1.04633	150.00000	1.00000	5.00000
qq20	56	4.53571	0.80824	254.00000	3.00000	5.00000
qq21	56	4.44643	0.97084	249.00000	1.00000	5.00000
qq22	56	4.41071	0.91008	247.00000	2.00000	5.00000
qq23	56	4.23214	1.02675	237.00000	1.00000	5.00000
qq24	56	4.46429	0.83043	250.00000	3.00000	5.00000
qq25	56	4.46429	0.85204	250.00000	3.00000	5.00000
qq26	56	4.46429	0.83043	250.00000	3.00000	5.00000
qq27	56	4.14286	0.99870	232.00000	2.00000	5.00000
qq28	56	4.26786	0.88402	239.00000	3.00000	5.00000
qq29	56	4.39286	0.86715	246.00000	3.00000	5.00000
qq30	56	4.32143	0.91666	242.00000	2.00000	5.00000

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.973115
Standardized	0.974684

Table F.3 continued

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The CORR Procedure

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
qq1	0.797212	0.971813	0.797146	0.973522
qq2	0.742530	0.972145	0.742042	0.973822
qq3	0.842154	0.971629	0.842790	0.973272
qq4	0.866316	0.971401	0.866674	0.973141
qq5	0.622073	0.972927	0.621621	0.974473
qq6	0.743007	0.972140	0.738590	0.973841
qq7	0.513147	0.973587	0.511914	0.975061
qq8	0.845278	0.971519	0.842778	0.973272
qq9	0.824202	0.971673	0.821281	0.973390
qq10	0.670656	0.972531	0.666989	0.974229
qq11	0.736845	0.972172	0.739042	0.973838
qq12	0.798691	0.971841	0.799924	0.973507
qq13	0.874446	0.971353	0.875420	0.973093
qq14	0.475686	0.974212	0.474826	0.975258
qq15	0.809440	0.971748	0.807844	0.973463
qq16	0.734669	0.972201	0.733905	0.973866
qq17	0.845123	0.971522	0.843282	0.973269
qq18	0.816263	0.971706	0.813476	0.973433
qq19	0.034909	0.976282	0.030578	0.977573
qq20	0.759662	0.972138	0.759641	0.973726
qq21	0.753686	0.972076	0.757290	0.973739
qq22	0.776084	0.971978	0.779768	0.973617
qq23	0.751613	0.972086	0.753574	0.973759
qq24	0.800666	0.971921	0.804900	0.973480
qq25	0.869352	0.971558	0.874311	0.973099
qq26	0.813364	0.971860	0.818894	0.973403
qq27	0.683060	0.972480	0.688203	0.974114
qq28	0.747873	0.972139	0.753883	0.973758
qq29	0.809065	0.971842	0.812995	0.973435
qq30	0.852510	0.971567	0.856769	0.973195

Table F.4 Pearson Correlation Coefficients Matrix *(pages 19 – 26)*

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The CORR Procedure

Pearson Correlation Coefficients, N = 56
Prob > |r| under H0: Rho=0

	qq1	qq2	qq3	qq4	qq5	qq6	qq7	qq8
qq1	1.00000	0.65193	0.75780	0.78850	0.48727	0.69058	0.42177	0.70449
		<.0001	<.0001	<.0001	0.0001	<.0001	0.0012	<.0001
qq2	0.65193	1.00000	0.85632	0.78730	0.43903	0.55145	0.29307	0.73093
	<.0001		<.0001	<.0001	0.0007	<.0001	0.0284	<.0001
qq3	0.75780	0.85632	1.00000	0.88845	0.52031	0.64126	0.39469	0.72351
	<.0001	<.0001		<.0001	<.0001	<.0001	0.0026	<.0001
qq4	0.78850	0.78730	0.88845	1.00000	0.48413	0.60308	0.48095	0.78999
	<.0001	<.0001	<.0001		0.0002	<.0001	0.0002	<.0001
qq5	0.48727	0.43903	0.52031	0.48413	1.00000	0.65606	0.42574	0.49759
	0.0001	0.0007	<.0001	0.0002		<.0001	0.0011	<.0001
qq6	0.69058	0.55145	0.64126	0.60308	0.65606	1.00000	0.58563	0.71749
	<.0001	<.0001	<.0001	<.0001	<.0001		<.0001	<.0001
qq7	0.42177	0.29307	0.39469	0.48095	0.42574	0.58563	1.00000	0.55678
	0.0012	0.0284	0.0026	0.0002	0.0011	<.0001		<.0001
qq8	0.70449	0.73093	0.72351	0.78999	0.49759	0.71749	0.55678	1.00000
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
qq9	0.65429	0.69538	0.70916	0.78516	0.55207	0.73697	0.70342	0.85551
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq10	0.60487	0.55391	0.62493	0.68752	0.41216	0.45221	0.50075	0.57633
	<.0001	<.0001	<.0001	<.0001	0.0016	0.0005	<.0001	<.0001
qq11	0.50302	0.63111	0.65008	0.63888	0.50374	0.61158	0.39951	0.71787
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0023	<.0001
qq12	0.65119	0.54801	0.67443	0.65858	0.48310	0.65257	0.41100	0.68272
	<.0001	<.0001	<.0001	<.0001	0.0002	<.0001	0.0017	<.0001
qq13	0.71881	0.69387	0.74065	0.77798	0.45946	0.65726	0.42578	0.84664
	<.0001	<.0001	<.0001	<.0001	0.0004	<.0001	0.0011	<.0001
qq14	0.34301	0.37640	0.34818	0.33572	0.32526	0.36089	0.11438	0.38705
	0.0097	0.0042	0.0085	0.0114	0.0144	0.0063	0.4012	0.0032
qq15	0.71219	0.73608	0.78524	0.78009	0.57934	0.61426	0.39598	0.73287
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0025	<.0001

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The CORR Procedure

Table F4 continued

Pearson Correlation Coefficients, N = 56
Prob > |r| under H0: Rho=0

	qq9	qq10	qq11	qq12	qq13	qq14	qq15	qq16
qq1	0.65429	0.60487	0.50302	0.65119	0.71881	0.34301	0.71219	0.58246
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0097	<.0001	<.0001
qq2	0.69538	0.55391	0.63111	0.54801	0.69387	0.37640	0.73608	0.46429
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0042	<.0001	0.0003
qq3	0.70916	0.62493	0.65008	0.67443	0.74065	0.34818	0.78524	0.59286
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0085	<.0001	<.0001
qq4	0.78516	0.68752	0.63888	0.65858	0.77798	0.33572	0.78009	0.66798
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0114	<.0001	<.0001
qq5	0.55207	0.41216	0.50374	0.48310	0.45946	0.32526	0.57934	0.39413
	<.0001	0.0016	<.0001	0.0002	0.0004	0.0144	<.0001	0.0027
qq6	0.73697	0.45221	0.61158	0.65257	0.65726	0.36089	0.61426	0.57450
	<.0001	0.0005	<.0001	<.0001	<.0001	0.0063	<.0001	<.0001
qq7	0.70342	0.50075	0.39951	0.41100	0.42578	0.11438	0.39598	0.57801
	<.0001	<.0001	0.0023	0.0017	0.0011	0.4012	0.0025	<.0001
qq8	0.85551	0.57633	0.71787	0.68272	0.84664	0.38705	0.73287	0.71293
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0032	<.0001	<.0001
qq9	1.00000	0.60567	0.75185	0.63667	0.76677	0.32495	0.68902	0.68551
		<.0001	<.0001	<.0001	<.0001	0.0145	<.0001	<.0001
qq10	0.60567	1.00000	0.36666	0.57386	0.58804	0.28120	0.62334	0.68851
	<.0001		0.0054	<.0001	<.0001	0.0358	<.0001	<.0001
qq11	0.75185	0.36666	1.00000	0.68651	0.74402	0.27892	0.52763	0.54767
	<.0001	0.0054		<.0001	<.0001	0.0374	<.0001	<.0001
qq12	0.63667	0.57386	0.68651	1.00000	0.82442	0.36871	0.67437	0.67606
	<.0001	<.0001	<.0001		<.0001	0.0052	<.0001	<.0001
qq13	0.76677	0.58804	0.74402	0.82442	1.00000	0.45471	0.76895	0.70270
	<.0001	<.0001	<.0001	<.0001		0.0004	<.0001	<.0001
qq14	0.32495	0.28120	0.27892	0.36871	0.45471	1.00000	0.44101	0.27239
	0.0145	0.0358	0.0374	0.0052	0.0004		0.0007	0.0423
qq15	0.68902	0.62334	0.52763	0.67437	0.76895	0.44101	1.00000	0.56325
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0007		<.0001

Table F.4 continued

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The CORR Procedure

Pearson Correlation Coefficients, N = 56
Prob > |r| under H0: Rho=0

	qq17	qq18	qq19	qq20	qq21	qq22	qq23	qq24
qq1	0.75700	0.68958	0.00239	0.63687	0.68206	0.71936	0.61815	0.62286
	<.0001	<.0001	0.9861	<.0001	<.0001	<.0001	<.0001	<.0001
qq2	0.57080	0.52667	0.02776	0.65878	0.69303	0.53719	0.39129	0.52460
	<.0001	<.0001	0.8391	<.0001	<.0001	<.0001	0.0029	<.0001
qq3	0.67071	0.60484	0.08388	0.73360	0.73531	0.64877	0.55767	0.65729
	<.0001	<.0001	0.5388	<.0001	<.0001	<.0001	<.0001	<.0001
qq4	0.78185	0.73254	-0.03083	0.70189	0.71494	0.71333	0.60333	0.63896
	<.0001	<.0001	0.8216	<.0001	<.0001	<.0001	<.0001	<.0001
qq5	0.45172	0.44741	0.22966	0.56547	0.43194	0.50219	0.43595	0.62128
	0.0005	0.0005	0.0886	<.0001	0.0009	<.0001	0.0008	<.0001
qq6	0.66457	0.62333	0.11260	0.60341	0.47130	0.49374	0.50968	0.59059
	<.0001	<.0001	0.4087	<.0001	0.0002	0.0001	<.0001	<.0001
qq7	0.54653	0.56211	0.07856	0.51149	0.17732	0.22974	0.30226	0.30558
	<.0001	<.0001	0.5649	<.0001	0.1911	0.0885	0.0236	0.0220
qq8	0.81571	0.76978	-0.04626	0.68031	0.65394	0.58986	0.56998	0.57245
	<.0001	<.0001	0.7349	<.0001	<.0001	<.0001	<.0001	<.0001
qq9	0.75385	0.73622	0.03225	0.70970	0.48282	0.50561	0.49648	0.49156
	<.0001	<.0001	0.8135	<.0001	0.0002	<.0001	<.0001	0.0001
qq10	0.65485	0.70956	0.00273	0.55516	0.57404	0.47105	0.53165	0.42331
	<.0001	<.0001	0.9841	<.0001	<.0001	0.0002	<.0001	0.0012
qq11	0.56785	0.61702	0.12882	0.58241	0.47894	0.52505	0.47265	0.55217
	<.0001	<.0001	0.3441	<.0001	0.0002	<.0001	0.0002	<.0001
qq12	0.68020	0.65720	0.03314	0.63327	0.61936	0.61042	0.71532	0.64642
	<.0001	<.0001	0.8084	<.0001	<.0001	<.0001	<.0001	<.0001
qq13	0.76217	0.72843	-0.02602	0.72156	0.66495	0.58480	0.60530	0.64280
	<.0001	<.0001	0.8490	<.0001	<.0001	<.0001	<.0001	<.0001
qq14	0.41938	0.42708	0.31811	0.25372	0.31472	0.37989	0.50433	0.41322
	0.0013	0.0010	0.0169	0.0592	0.0182	0.0039	<.0001	0.0015
qq15	0.71055	0.67143	-0.02966	0.65694	0.72157	0.59428	0.56467	0.61629
	<.0001	<.0001	0.8282	<.0001	<.0001	<.0001	<.0001	<.0001

Table F.4 continued

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The CORR Procedure

Pearson Correlation Coefficients, N = 56
Prob > |r| under H0: Rho=0

	qq25	qq26	qq27	qq28	qq29	qq30
qq1	0.64812	0.62286	0.43285	0.60771	0.57920	0.62697
	<.0001	<.0001	0.0009	<.0001	<.0001	<.0001
qq2	0.67036	0.61786	0.50406	0.48732	0.54704	0.58086
	<.0001	<.0001	<.0001	0.0001	<.0001	<.0001
qq3	0.73441	0.68135	0.57441	0.58395	0.62123	0.68887
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq4	0.72667	0.63896	0.65858	0.61131	0.63086	0.71132
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq5	0.43133	0.46242	0.44348	0.44504	0.56780	0.51144
	0.0009	0.0003	0.0006	0.0006	<.0001	<.0001
qq6	0.57560	0.59059	0.41700	0.44940	0.52450	0.54101
	<.0001	<.0001	0.0014	0.0005	<.0001	<.0001
qq7	0.37613	0.34575	0.40320	0.29042	0.30088	0.27423
	0.0043	0.0091	0.0021	0.0299	0.0242	0.0408
qq8	0.70069	0.59338	0.53192	0.57636	0.60260	0.64046
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq9	0.67477	0.64772	0.59092	0.58637	0.57909	0.58967
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq10	0.50649	0.47149	0.41494	0.40088	0.40868	0.47702
	<.0001	0.0002	0.0015	0.0022	0.0018	0.0002
qq11	0.69397	0.68919	0.57510	0.57730	0.62408	0.63914
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq12	0.72118	0.69318	0.41667	0.59703	0.64783	0.70364
	<.0001	<.0001	0.0014	<.0001	<.0001	<.0001
qq13	0.83458	0.74955	0.57824	0.65075	0.70174	0.80338
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq14	0.48740	0.44797	0.28685	0.32814	0.47178	0.51825
	0.0001	0.0005	0.0321	0.0136	0.0002	<.0001
qq15	0.69337	0.59726	0.48137	0.53265	0.60450	0.70605
	<.0001	<.0001	0.0002	<.0001	<.0001	<.0001

Table F.4 continued

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The CORR Procedure

Pearson Correlation Coefficients, N = 56
Prob > |r| under H0: Rho=0

	qq1	qq2	qq3	qq4	qq5	qq6	qq7	qq8
qq16	0.58246	0.46429	0.59286	0.66798	0.39413	0.57450	0.57801	0.71293
	<.0001	0.0003	<.0001	<.0001	0.0027	<.0001	<.0001	<.0001
qq17	0.75700	0.57080	0.67071	0.78185	0.45172	0.66457	0.54653	0.81571
	<.0001	<.0001	<.0001	<.0001	0.0005	<.0001	<.0001	<.0001
qq18	0.68958	0.52667	0.60484	0.73254	0.44741	0.62333	0.56211	0.76978
	<.0001	<.0001	<.0001	<.0001	0.0005	<.0001	<.0001	<.0001
qq19	0.00239	0.02776	0.08388	-0.03083	0.22966	0.11260	0.07856	-0.04626
	0.9861	0.8391	0.5388	0.8216	0.0886	0.4087	0.5649	0.7349
qq20	0.63687	0.65878	0.73360	0.70189	0.56547	0.60341	0.51149	0.68031
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq21	0.68206	0.69303	0.73531	0.71494	0.43194	0.47130	0.17732	0.65394
	<.0001	<.0001	<.0001	<.0001	0.0009	0.0002	0.1911	<.0001
qq22	0.71936	0.53719	0.64877	0.71333	0.50219	0.49374	0.22974	0.58986
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0001	0.0885	<.0001
qq23	0.61815	0.39129	0.55767	0.60333	0.43595	0.50968	0.30226	0.56998
	<.0001	0.0029	<.0001	<.0001	0.0008	<.0001	0.0236	<.0001
qq24	0.62286	0.52460	0.65729	0.63896	0.62128	0.59059	0.30558	0.57245
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0220	<.0001
qq25	0.64812	0.67036	0.73441	0.72667	0.43133	0.57560	0.37613	0.70069
	<.0001	<.0001	<.0001	<.0001	0.0009	<.0001	0.0043	<.0001
qq26	0.62286	0.61786	0.68135	0.63896	0.46242	0.59059	0.34575	0.59338
	<.0001	<.0001	<.0001	<.0001	0.0003	<.0001	0.0091	<.0001
qq27	0.43285	0.50406	0.57441	0.65858	0.44348	0.41700	0.40320	0.53192
	0.0009	<.0001	<.0001	<.0001	0.0006	0.0014	0.0021	<.0001
qq28	0.60771	0.48732	0.58395	0.61131	0.44504	0.44940	0.29042	0.57636
	<.0001	0.0001	<.0001	<.0001	0.0006	0.0005	0.0299	<.0001
qq29	0.57920	0.54704	0.62123	0.63086	0.56780	0.52450	0.30088	0.60260
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0242	<.0001
qq30	0.62697	0.58086	0.68887	0.71132	0.51144	0.54101	0.27423	0.64046
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.0408	<.0001

Table F.4 continued

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The CORR Procedure

Pearson Correlation Coefficients, N = 56
Prob > |r| under H0: Rho=0

	qq9	qq10	qq11	qq12	qq13	qq14	qq15	qq16
qq16	0.68551	0.68851	0.54767	0.67606	0.70270	0.27239	0.56325	1.00000
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0423	<.0001	
qq17	0.75385	0.65485	0.56785	0.68020	0.76217	0.41938	0.71055	0.80751
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0013	<.0001	<.0001
qq18	0.73622	0.70956	0.61702	0.65720	0.72843	0.42708	0.67143	0.70634
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0010	<.0001	<.0001
qq19	0.03225	0.00273	0.12882	0.03314	-0.02602	0.31811	-0.02966	-0.10106
	0.8135	0.9841	0.3441	0.8084	0.8490	0.0169	0.8282	0.4586
qq20	0.70970	0.55516	0.58241	0.63327	0.72156	0.25372	0.65694	0.63621
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0592	<.0001	<.0001
qq21	0.48282	0.57404	0.47894	0.61936	0.66495	0.31472	0.72157	0.50056
	0.0002	<.0001	0.0002	<.0001	<.0001	0.0182	<.0001	<.0001
qq22	0.50561	0.47105	0.52505	0.61042	0.58480	0.37989	0.59428	0.52602
	<.0001	0.0002	<.0001	<.0001	<.0001	0.0039	<.0001	<.0001
qq23	0.49648	0.53165	0.47265	0.71532	0.60530	0.50433	0.56467	0.64823
	<.0001	<.0001	0.0002	<.0001	<.0001	<.0001	<.0001	<.0001
qq24	0.49156	0.42331	0.55217	0.64642	0.64280	0.41322	0.61629	0.50409
	0.0001	0.0012	<.0001	<.0001	<.0001	0.0015	<.0001	<.0001
qq25	0.67477	0.50649	0.69397	0.72118	0.83458	0.48740	0.69337	0.58650
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0001	<.0001	<.0001
qq26	0.64772	0.47149	0.68919	0.69318	0.74955	0.44797	0.59726	0.52851
	<.0001	0.0002	<.0001	<.0001	<.0001	0.0005	<.0001	<.0001
qq27	0.59092	0.41494	0.57510	0.41667	0.57824	0.28685	0.48137	0.45541
	<.0001	0.0015	<.0001	0.0014	<.0001	0.0321	0.0002	0.0004
qq28	0.58637	0.40088	0.57730	0.59703	0.65075	0.32814	0.53265	0.50875
	<.0001	0.0022	<.0001	<.0001	<.0001	0.0136	<.0001	<.0001
qq29	0.57909	0.40868	0.62408	0.64783	0.70174	0.47178	0.60450	0.58296
	<.0001	0.0018	<.0001	<.0001	<.0001	0.0002	<.0001	<.0001
qq30	0.58967	0.47702	0.63914	0.70364	0.80338	0.51825	0.70605	0.57992
	<.0001	0.0002	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

Table F.4 continued

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The CORR Procedure

Pearson Correlation Coefficients, N = 56
Prob > |r| under H0: Rho=0

	qq17	qq18	qq19	qq20	qq21	qq22	qq23	qq24
qq16	0.80751	0.70634	-0.10106	0.63621	0.50056	0.52602	0.64823	0.50409
	<.0001	<.0001	0.4586	<.0001	<.0001	<.0001	<.0001	<.0001
qq17	1.00000	0.90581	-0.04224	0.68783	0.63579	0.63240	0.69696	0.61097
		<.0001	0.7572	<.0001	<.0001	<.0001	<.0001	<.0001
qq18	0.90581	1.00000	-0.03806	0.58648	0.62917	0.64436	0.66247	0.62031
	<.0001		0.7806	<.0001	<.0001	<.0001	<.0001	<.0001
qq19	-0.04224	-0.03806	1.00000	0.09982	-0.07096	-0.06887	-0.01390	0.00747
	0.7572	0.7806		0.4642	0.6033	0.6140	0.9190	0.9564
qq20	0.68783	0.58648	0.09982	1.00000	0.57018	0.48642	0.41706	0.59790
	<.0001	<.0001	0.4642		<.0001	0.0001	0.0014	<.0001
qq21	0.63579	0.62917	-0.07096	0.57018	1.00000	0.81762	0.66022	0.75308
	<.0001	<.0001	0.6033	<.0001		<.0001	<.0001	<.0001
qq22	0.63240	0.64436	-0.06887	0.48642	0.81762	1.00000	0.81062	0.87381
	<.0001	<.0001	0.6140	0.0001	<.0001		<.0001	<.0001
qq23	0.69696	0.66247	-0.01390	0.41706	0.66022	0.81062	1.00000	0.72426
	<.0001	<.0001	0.9190	0.0014	<.0001	<.0001		<.0001
qq24	0.61097	0.62031	0.00747	0.59790	0.75308	0.87381	0.72426	1.00000
	<.0001	<.0001	0.9564	<.0001	<.0001	<.0001	<.0001	
qq25	0.69777	0.68901	-0.01311	0.66194	0.66804	0.71096	0.68510	0.82045
	<.0001	<.0001	0.9236	<.0001	<.0001	<.0001	<.0001	<.0001
qq26	0.61097	0.62031	0.07025	0.62499	0.57266	0.65729	0.63896	0.78908
	<.0001	<.0001	0.6069	<.0001	<.0001	<.0001	<.0001	<.0001
qq27	0.51613	0.52994	-0.00746	0.48911	0.53310	0.65442	0.56993	0.66395
	<.0001	<.0001	0.9565	0.0001	<.0001	<.0001	<.0001	<.0001
qq28	0.60034	0.59360	-0.06248	0.50803	0.62079	0.76474	0.71147	0.74389
	<.0001	<.0001	0.6473	<.0001	<.0001	<.0001	<.0001	<.0001
qq29	0.66982	0.57923	0.04151	0.60223	0.63017	0.73643	0.73297	0.80255
	<.0001	<.0001	0.7613	<.0001	<.0001	<.0001	<.0001	<.0001
qq30	0.65673	0.63203	-0.02302	0.54867	0.73477	0.79784	0.76927	0.85134
	<.0001	<.0001	0.8663	<.0001	<.0001	<.0001	<.0001	<.0001

Table F.4 continued

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The CORR Procedure

Pearson Correlation Coefficients, N = 56
Prob > |r| under H0: Rho=0

	qq25	qq26	qq27	qq28	qq29	qq30
qq16	0.58650	0.52851	0.45541	0.50875	0.58296	0.57992
	<.0001	<.0001	0.0004	<.0001	<.0001	<.0001
qq17	0.69777	0.61097	0.51613	0.60034	0.66982	0.65673
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq18	0.68901	0.62031	0.52994	0.59360	0.57923	0.63203
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq19	-0.01311	0.07025	-0.00746	-0.06248	0.04151	-0.02302
	0.9236	0.6069	0.9565	0.6473	0.7613	0.8663
qq20	0.66194	0.62499	0.48911	0.50803	0.60223	0.54867
	<.0001	<.0001	0.0001	<.0001	<.0001	<.0001
qq21	0.66804	0.57266	0.53310	0.62079	0.63017	0.73477
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq22	0.71096	0.65729	0.65442	0.76474	0.73643	0.79784
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq23	0.68510	0.63896	0.56993	0.71147	0.73297	0.76927
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq24	0.82045	0.78908	0.66395	0.74389	0.80255	0.85134
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
qq25	1.00000	0.94894	0.68985	0.79744	0.83141	0.89958
		<.0001	<.0001	<.0001	<.0001	<.0001
qq26	0.94894	1.00000	0.62011	0.79343	0.80255	0.85134
	<.0001		<.0001	<.0001	<.0001	<.0001
qq27	0.68985	0.62011	1.00000	0.69725	0.73181	0.74336
	<.0001	<.0001		<.0001	<.0001	<.0001
qq28	0.79744	0.79343	0.69725	1.00000	0.78524	0.81174
	<.0001	<.0001	<.0001		<.0001	<.0001
qq29	0.83141	0.80255	0.73181	0.78524	1.00000	0.91331
	<.0001	<.0001	<.0001	<.0001		<.0001
qq30	0.89958	0.85134	0.74336	0.81174	0.91331	1.00000
	<.0001	<.0001	<.0001	<.0001	<.0001	

Table F.5 Factor Procedure
SAS output tables (pages 27 - 37)

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The FACTOR Procedure

Means and Standard Deviations from 65 Observations

Variable	Mean	Std Dev
qq1	4.2615385	1.0043176
qq2	4.2000000	0.9714680
qq3	4.3538462	0.9258572
qq4	4.1846154	1.0138464
qq5	4.1230769	1.0826428
qq6	4.2615385	0.9400286
qq7	4.0461538	1.0958839
qq8	4.1384615	1.0588455
qq9	4.2153846	0.9761581
qq10	4.2461538	0.9190819

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The FACTOR Procedure
Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 10 Average = 1

	Eigenvalue	Difference	Proportion	Cumulative
1	6.58150501	5.67125926	0.6582	0.6582
2	0.91024575	0.22306243	0.0910	0.7492
3	0.68718332	0.17233182	0.0687	0.8179
4	0.51485150	0.05971867	0.0515	0.8694
5	0.45513283	0.16877019	0.0455	0.9149
6	0.28636264	0.06945439	0.0286	0.9435
7	0.21690825	0.06149152	0.0217	0.9652
8	0.15541673	0.02754813	0.0155	0.9808
9	0.12786860	0.06334322	0.0128	0.9935
10	0.06452538		0.0065	1.0000

1 factor will be retained by the MINEIGEN criterion.

Factor Pattern

	Factor1	
qq1	82	*
qq2	83	*
qq3	87	*
qq4	90	*
qq5	69	*
qq6	83	*
qq7	63	*

Table F.5 continued

```
                                    qq8          84 *

                                    qq9          90 *
                                    qq10         75 *

                                    Printed values
                                    are multiplied by
                                    100 and rounded
                                    to the nearest
                                    integer.  Values
                                    greater than 0.5
                                    are flagged by an
                                    '*'.
-------------------------------------------------------------------------------------------

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                                    The FACTOR Procedure
                              Initial Factor Method: Principal Components

                                   Variance Explained by Each Factor

                                                Factor1

                                             6.5815050


                              Final Communality Estimates: Total = 6.581505

                     qq1             qq2             qq3             qq4             qq5

                0.67831414      0.69417743      0.75174635      0.81901073      0.47917372

                     qq6             qq7             qq8             qq9            qq10

                0.68307027      0.40280508      0.70809858      0.80806514      0.55704356

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                                    The FACTOR Procedure
                                   Rotation Method: Varimax

                              NOTE: Rotation not possible with 1 factor.


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                                    The FACTOR Procedure

                           Means and Standard Deviations from 62 Observations

                                  Variable          Mean       Std Dev

                                  qq11         4.3387097     0.9571739
                                  qq12         4.3387097     0.9222842
                                  qq13         4.3064516     1.0176912
                                  qq14         3.4516129     1.2370963
                                  qq15         3.9516129     1.1369707
                                  qq16         4.3064516     0.8978793
```

Table F.5 continued

```
                        qq17         4.3064516     1.0336742
                        qq18         4.3225806     1.0044849
                        qq19         2.7741935     1.0776318
                        qq20         4.5322581     0.8040419

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                                The FACTOR Procedure
                        Initial Factor Method: Principal Components

                            Prior Communality Estimates: ONE

                    Eigenvalues of the Correlation Matrix: Total = 10  Average = 1

                            Eigenvalue    Difference    Proportion    Cumulative

                         1    6.08750566    4.83658965        0.6088        0.6088
                         2    1.25091601    0.54387879        0.1251        0.7338
                         3    0.70703722    0.21215761        0.0707        0.8045
                         4    0.49487961    0.05281807        0.0495        0.8540
                         5    0.44206154    0.10317405        0.0442        0.8982
                         6    0.33888750    0.06339647        0.0339        0.9321
                         7    0.27549103    0.04947386        0.0275        0.9597
                         8    0.22601716    0.10941006        0.0226        0.9823
                         9    0.11660710    0.05600994        0.0117        0.9939
                        10    0.06059716                      0.0061        1.0000

                            2 factors will be retained by the MINEIGEN criterion.


                                    Factor Pattern

                                    Factor1      Factor2

                                qq11         79 *          7
                                qq12         86 *          0
                                qq13         93 *         -2
                                qq14         53 *         59 *
                                qq15         83 *         -2
                                qq16         81 *        -24
                                qq17         91 *         -9
                                qq18         88 *         -6
                                qq19          4           91 *
                                qq20         81 *         -3

                                Printed values are multiplied
                                by 100 and rounded to the
                                nearest integer.  Values
                                greater than 0.5 are flagged
                                by an '*'.


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                                The FACTOR Procedure
                        Initial Factor Method: Principal Components
```

Table F.5 continued

Variance Explained by Each Factor

Factor1	Factor2
6.0875057	1.2509160

Final Communality Estimates: Total = 7.338422

qq11	qq12	qq13	qq14	qq15
0.62152109	0.74366805	0.86160888	0.62067622	0.68293563

qq16	qq17	qq18	qq19	qq20
0.70910567	0.83574128	0.77578793	0.82900115	0.65837577

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The FACTOR Procedure
Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2
1	0.98519	0.17147
2	-0.17147	0.98519

Rotated Factor Pattern

	Factor1	Factor2
qq11	76 *	20
qq12	85 *	15
qq13	92 *	14
qq14	42	67 *
qq15	82 *	12
qq16	84 *	-10
qq17	91 *	6
qq18	88 *	9
qq19	-12	90 *
qq20	80 *	11

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.5 are flagged by an '*'.

Variance Explained by Each Factor

Factor1	Factor2
5.9452925	1.3931292

Final Communality Estimates: Total = 7.338422

Table F.5 continued

qq11	qq12	qq13	qq14	qq15
0.62152109	0.74366805	0.86160888	0.62067622	0.68293563

qq16	qq17	qq18	qq19	qq20
0.70910567	0.83574128	0.77578793	0.82900115	0.65837577

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The FACTOR Procedure

Means and Standard Deviations from 65 Observations

Variable	Mean	Std Dev
qq21	4.4615385	0.9532334
qq22	4.4000000	0.8979142
qq23	4.2153846	1.0076629
qq24	4.4769231	0.8121671
qq25	4.4615385	0.8492078
qq26	4.4615385	0.8306045
qq27	4.2153846	0.9761581
qq28	4.3384615	0.8710074
qq29	4.4461538	0.8483581
qq30	4.3692308	0.8938895

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The FACTOR Procedure
Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 10 Average = 1

	Eigenvalue	Difference	Proportion	Cumulative
1	7.53937183	6.83074832	0.7539	0.7539
2	0.70862352	0.21951544	0.0709	0.8248
3	0.48910808	0.12970882	0.0489	0.8737
4	0.35939926	0.07670251	0.0359	0.9097
5	0.28269676	0.05770853	0.0283	0.9379
6	0.22498822	0.01980856	0.0225	0.9604
7	0.20517967	0.11946178	0.0205	0.9809
8	0.08571789	0.01286699	0.0086	0.9895
9	0.07285090	0.04078701	0.0073	0.9968
10	0.03206388		0.0032	1.0000

1 factor will be retained by the MINEIGEN criterion.

Table F.5 continued

Factor Pattern

	Factor1
qq21	81 *
qq22	89 *
qq23	82 *
qq24	87 *
qq25	92 *
qq26	88 *
qq27	78 *
qq28	87 *
qq29	90 *
qq30	94 *

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.5 are flagged by an '*'.

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The FACTOR Procedure
Initial Factor Method: Principal Components

Variance Explained by Each Factor

Factor1
7.5393718

Final Communality Estimates: Total = 7.539372

qq21	qq22	qq23	qq24	qq25
0.64857156	0.79124281	0.66792194	0.75415030	0.84447515
qq26	**qq27**	**qq28**	**qq29**	**qq30**
0.77627841	0.61299902	0.75181506	0.80465683	0.88726074

Table F.5 continued

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The FACTOR Procedure
Rotation Method: Varimax

NOTE: Rotation not possible with 1 factor.

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The FACTOR Procedure

Means and Standard Deviations from 56 Observations

Variable	Mean	Std Dev
qq1	4.2857143	1.0394804
qq2	4.2500000	0.9390517
qq3	4.4107143	0.9100806
qq4	4.2321429	1.0267525
qq5	4.1428571	1.1025354
qq6	4.2857143	0.9479986
qq7	4.1071429	1.0900971
qq8	4.1785714	1.0463294
qq9	4.2678571	0.9814844
qq10	4.2857143	0.9088311
qq11	4.3392857	0.9587262
qq12	4.3214286	0.9362817
qq13	4.3035714	1.0254869
qq14	3.3928571	1.2602824
qq15	3.9464286	1.1508043
qq16	4.3214286	0.8966025
qq17	4.3035714	1.0430662
qq18	4.3214286	1.0109787
qq19	2.6785714	1.0463294
qq20	4.5357143	0.8082368
qq21	4.4464286	0.9708411
qq22	4.4107143	0.9100806
qq23	4.2321429	1.0267525
qq24	4.4642857	0.8304278
qq25	4.4642857	0.8520411
qq26	4.4642857	0.8304278
qq27	4.1428571	0.9987005
qq28	4.2678571	0.8840212
qq29	4.3928571	0.8671494
qq30	4.3214286	0.9166568

Table F.5 continued

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The FACTOR Procedure
Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 30 Average = 1

	Eigenvalue	Difference	Proportion	Cumulative
1	18.0717560	15.9663675	0.6024	0.6024
2	2.1053886	0.6543199	0.0702	0.6726
3	1.4510687	0.2765572	0.0484	0.7209
4	1.1745115	0.0863824	0.0392	0.7601
5	1.0881291	0.1940684	0.0363	0.7964
6	0.8940607	0.1776071	0.0298	0.8262
7	0.7164536	0.1077492	0.0239	0.8500
8	0.6087044	0.0795621	0.0203	0.8703
9	0.5291423	0.0571172	0.0176	0.8880
10	0.4720251	0.0753373	0.0157	0.9037
11	0.3966878	0.0487728	0.0132	0.9169
12	0.3479150	0.0385340	0.0116	0.9285
13	0.3093810	0.0203125	0.0103	0.9388
14	0.2890685	0.0489175	0.0096	0.9485
15	0.2401510	0.0284303	0.0080	0.9565
16	0.2117207	0.0091658	0.0071	0.9635
17	0.2025549	0.0331383	0.0068	0.9703
18	0.1694166	0.0233343	0.0056	0.9759
19	0.1460823	0.0361628	0.0049	0.9808
20	0.1099195	0.0005040	0.0037	0.9845
21	0.1094155	0.0204088	0.0036	0.9881
22	0.0890067	0.0089857	0.0030	0.9911
23	0.0800210	0.0240964	0.0027	0.9938
24	0.0559246	0.0162576	0.0019	0.9956
25	0.0396671	0.0082385	0.0013	0.9969
26	0.0314285	0.0089385	0.0010	0.9980
27	0.0224900	0.0037500	0.0007	0.9987
28	0.0187400	0.0059689	0.0006	0.9994
29	0.0127712	0.0063728	0.0004	0.9998
30	0.0063984		0.0002	1.0000

3 factors will be retained by the NFACTOR criterion.

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The FACTOR Procedure
Initial Factor Method: Principal Components

Factor Pattern

	Factor1	Factor2	Factor3
qq1	82 *	11	-10
qq2	76 *	13	2
qq3	86 *	10	2
qq4	88 *	15	-14
qq5	63 *	7	40

Table F.5 continued

qq6	75 *	28	23
qq7	53 *	56 *	9
qq8	86 *	28	-6
qq9	83 *	38	7
qq10	69 *	31	-19
qq11	76 *	7	20
qq12	82 *	3	1
qq13	89 *	8	-2
qq14	49	-20	42
qq15	83 *	11	-4
qq16	76 *	27	-21
qq17	86 *	20	-15
qq18	83 *	18	-14
qq19	2	6	85 *
qq20	78 *	25	9
qq21	79 *	-21	-23
qq22	80 *	-38	-15
qq23	77 *	-30	-10
qq24	82 *	-39	5
qq25	89 *	-25	3
qq26	83 *	-26	14
qq27	71 *	-25	1
qq28	78 *	-38	-7
qq29	83 *	-37	10
qq30	87 *	-40	1

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.5 are flagged by an '*'.

Variance Explained by Each Factor

Factor1	Factor2	Factor3
18.071756	2.105389	1.451069

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The FACTOR Procedure
Initial Factor Method: Principal Components

Final Communality Estimates: Total = 21.628213

qq1	qq2	qq3	qq4	qq5	qq6	qq7	qq8
0.68936060	0.60135087	0.74323951	0.82081379	0.55853033	0.69292142	0.59769781	0.81881522
qq9	qq10	qq11	qq12	qq13	qq14	qq15	qq16
0.84072291	0.60883961	0.61854987	0.66973575	0.80171923	0.45206145	0.69798220	0.69278773
qq17	qq18	qq19	qq20	qq21	qq22	qq23	qq24
0.80413923	0.74109792	0.72572291	0.67095329	0.71095522	0.81749479	0.69919845	0.83052333
qq25	qq26	qq27	qq28	qq29	qq30		
0.85501854	0.78566061	0.56857112	0.75712183	0.83235718	0.92427056		

Table F.5 continued

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The FACTOR Procedure
Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2	3
1	0.70359	0.69839	0.13122
2	0.70132	-0.71221	0.03018
3	-0.11453	-0.07079	0.99089

Rotated Factor Pattern

	Factor1	Factor2	Factor3
qq1	66 *	50 *	1
qq2	63 *	44	13
qq3	67 *	53 *	13
qq4	74 *	52 *	-2
qq5	45	36	48
qq6	70 *	31	33
qq7	75 *	-3	17
qq8	81 *	41	6
qq9	84 *	31	19
qq10	73 *	27	-9
qq11	56 *	46	30
qq12	60 *	55 *	11
qq13	68 *	57 *	10
qq14	15	45	47
qq15	67 *	50	7
qq16	75 *	35	-10
qq17	77 *	47	-3
qq18	73 *	46	-2
qq19	-4	-9	85 *
qq20	71 *	36	20
qq21	43	71 *	-13
qq22	31	85 *	-6
qq23	35	76 *	-1
qq24	30	85 *	14
qq25	45	80 *	14
qq26	39	76 *	24
qq27	33	67 *	10
qq28	29	82 *	3
qq29	31	83 *	20
qq30	33	89 *	11

Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.5 are flagged by an '*'.

Table F.5 continued

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The FACTOR Procedure
Rotation Method: Varimax

Variance Explained by Each Factor

Factor1	Factor2	Factor3
10.000765	9.889608	1.737840

Final Communality Estimates: Total = 21.628213

qq1	qq2	qq3	qq4	qq5	qq6	qq7	qq8
0.68936060	0.60135087	0.74323951	0.82081379	0.55853033	0.69292142	0.59769781	0.81881522
qq9	qq10	qq11	qq12	qq13	qq14	qq15	qq16
0.84072291	0.60883961	0.61854987	0.66973575	0.80171923	0.45206145	0.69798220	0.69278773
qq17	qq18	qq19	qq20	qq21	qq22	qq23	qq24
0.80413923	0.74109792	0.72572291	0.67095329	0.71095522	0.81749479	0.69919845	0.83052333
qq25	qq26	qq27	qq28	qq29	qq30		
0.85501854	0.78566061	0.56857112	0.75712183	0.83235718	0.92427056		

Appendix H – MBTI National Representative Sample

USA: Distribution of the Types in the National Representative Sample
(Total = 3,009, Males = 1,478, Females = 1,531)

ISTJ T = 11.6% M = 16.4% F = 6.9%	ISFJ T = 13.8% M = 8.1% F = 19.4%	INFJ T = 1.5% M = 1.2% F = 1.6%	INTJ T = 2.1% M = 3.3% F = 0.9%
ISTP T = 5.4% M = 8.5% F = 2.3%	ISFP T = 8.8% M = 7.6% F = 9.9%	INFP T = 4.4% M = 4.1% F = 4.6%	INTP T = 3.3% M = 4.8% F = 1.7%
ESTP T = 4.3% M = 5.6% F = 3.0%	ESFP T = 8.5% M = 6.9% F = 10.1%	ENFP T = 8.1% M = 6.4% F = 9.7%	ENTP T = 3.2% M = 4.0% F = 2.4%
ESTJ T = 8.7% M = 11.2% F = 6.3%	ESFJ T = 12.3% M = 7.5% F = 16.9%	ENFJ T = 2.5% M = 1.6% F = 3.3%	ENTJ T = 1.8% M = 2.7% F = 0.9%

ISTJ T = 348 M = 242 F = 106	ISFJ T = 416 M = 119 F = 297	INFJ T = 44 M = 19 F = 25	INTJ T = 62 M = 49 F = 13
ISTP T = 162 M = 126 F = 36	ISFP T = 264 M = 112 F = 152	INFP T = 132 M = 61 F = 71	INTP T = 98 M = 71 F = 27
ESTP T = 129 M = 83 F = 46	ESFP T = 256 M = 102 F = 154	ENFP T = 243 M = 95 F = 148	ENTP T = 96 M = 59 F = 37
ESTJ T = 261 M = 165 F = 96	ESFJ T = 370 M = 111 F = 259	ENFJ T = 74 M = 24 F = 50	ENTJ T = 54 M = 40 F = 14

Total E 49.3%, I 50.7% S 73.3%, N 26.7% T 40.2%, F 59.8% J 54.1%, P 45.9%	Males E 45.9%, I 54.1% S 71.7%, N 28.3% T 56.5%, F 43.5% J 52.0%, P 48.0%	Females E 52.5%, I 47.5% S 74.9%, N 25.1% T 24.5%, F 75.5% J 56.2%, P 43.8%
Total E 49.3%, I 50.7% S 73.3%, N 26.7% T 40.2%, F 59.8% J 54.1%, P 45.9%	Males E 45.9%, I 54.1% S 71.7%, N 28.3% T 56.5%, F 43.5% J 52.0%, P 48.0%	Females E 52.5%, I 47.5% S 74.9%, N 25.1% T 24.5%, F 75.5% J 56.2%, P 43.8%

Source: Myers, I. B., McCaulley, M. H., Quenk, N. L., & Hammer, A. L. (1998). MBTI Manual: A guide to the development and use of the Myers-Briggs Type Indicator (3rd ed., 2nd printing). Palo Alto, CA: Consulting Psychologists Press.