The Effects of Individualism Vs. Collectivism on Learner's Recall, Transfer and Attitudes Toward Collaboration and Individualized Learning

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Dissertation submitted to the faculty of the
Virginia Polytechnic Institute and State University
In partial fulfillment of the requirements for the degree of

Doctor of Philosophy in
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May 23, 2003

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Keywords: online learning, culture, individualism, collectivism, learner preference, recall, transfer of knowledge, behaviorism, socio cultural constructivism, instructional environments

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ABSTRACT

This study examined the differences in achievement between groups exhibiting different cultural dimensions in a particular online instructional environment. Variables were measured concerning the relationship between instructional environments, cultural dimensions and online learner preference. The subjects of this study were a representative sample of groups of graduate students from different cultures. The instrument was composed of a treatment that was represented across two instructional environments. A web-based tool measured participant's cultural dimension, recall, transfer of knowledge and learning preference. A 2 x 2 x 2 ANOVA analysis method was used to examine the effects of individualism and collectivism on learner preference and achievement (recall, transfer). Significance in transfer measures was found. This indicated deep understanding of materials for collectivist participants. Correlational analysis revealed significance between cultural dimension and learner preference for instructional methods. Findings were consistent with the body of literature on cross-cultural psychology.

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May 23, 2003

ACKNOWLEDGEMENTS

The creation of this document has been an adventure like none other! The adventure has been filled with ups and downs, twists and turns, and countless surprises. I would like to take this time to offer my sincerest gratitude to the many people who have graciously offered their time, support, reassurance, advice and words of encouragement.

I consider myself a spiritual man, so I would first like to recognize the Creator, my Lord and Savior Jesus Christ, for putting the passion in my heart, inspiration in my mind, and persistence in my soul to complete this project.

I would like to thank my peers for a number of reasons. For listening to my crazy ideas and farfetched dreams while providing the utmost support, I would like to thank Felecia Harrelson, Andrea Grove, and Dr. Stephanie Scheer, Dr. Robert Cobb, Dr. Krista Smith-Terry and Drs. Wayne and Glenda Scales. There are those who have unknowingly helped to keep me focused as I watched them exude tenacious character in the midst of their own difficult and challenging circumstances. Their courage has served as an inspiration for me to keep writing even when I REALLY did not want to, and for that I would like to thank Antionette Moore, Benetta Dease, Emet Laboone, Lenese Colson, Darlene Eberhart and Ross Perkins. Charla Gaskins, Chanel Thomas and people in housecalls were a tremendous help. The last, but certainly not least, of my peers are my adopted family of cohorts from the HESA department. Belinda Bennett, Terrell Strayhorn, and Evelyn Leathers continued to push me forward when things looked unsure. Every late-night study group served only to lift my spirits. You all were there and listened to me ramble on and on about the progress of my study when I know you did not have to. I really appreciate you all.

There are faculty at Virginia Tech, University of San Diego and abroad who through their stalwart efforts have helped to propel my research forward. Had it not been for the contributions of these individuals, my research would have remained the nebulous cloud of vapor from which it originated. Dr. Geert Hofstede and Dr. Richard Mayer provided portions of their own renowned studies and allowed me to include them in my study. Their assistance and professional advice proved to be invaluable and I am indebted to them both.

The professors with whom I have worked in my graduate assistantship were understanding and compassionate about my success at all times, so Drs. Josiah Tlou, Patrica Proudfoot Kelly, and Jerry Niles, I thank you.

There have been a number of individuals in my department and others whose kind words opened my eyes in the beginning, although some of the things may have been very minor, I still reminisce about how the little things they may have said or done made a big difference in the direction I took early on. All of you kept an open door policy and showed me kindness. Those people are: Terry Davis, Dr. Mike Moore, Bonnie Guthrie, and Dr. John Burton, Mrs. Kim Biesecker, and Dr. Lisa Driscoll.

I would also like to thank the people in Torgerson Hall, most specifically the technical wizards in IDDL. Kevin Roonie, Tom Corbett, Eric Gilmore (who is also a great friend, I couldn't decide whether to put him here or in the peers section), Dr. Sherrie Turner and the rest of the staff of IDDL. You all devised a technological solution to many intricate design problems, thank you so much. Speaking of the technical side, I cannot emphasize enough how important Todd Bowden was to the success of this research study. Thank you, thank you, thank you Todd for allowing me to drop just one

last idea by you, when you knew good and well it wasn't going to be the last. Your patience was a Godsend. Thank you for crunching out code for my study into the wee hours of the night until everything worked perfectly.

Finally, to my committee, Dr. Glen Holmes, for providing me with the benefit of your wisdom, patience, and understanding, for encouraging me to forge ahead even when things looked uncertain, and for staying on the phone with me long distance to figure out server problems, I thank you. Dr. Peter Doolittle, for interpreting my rough ideas and sculpting them into a masterpiece of research design, for helping me understand what I was doing, even when I didn't understand what I was doing, I thank you. Drs. Barbara Lockee and Katherine Cennamo, for pointing me in the right direction and making me think about distance education and learning theories in a way I have never done before, I thank you. Dr. Tonya Smith-Jackson, for patiently sticking it out with me through all of its iterations, and for helping me to break my stuff down to make it easy to understand, I thank you.

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CHAPTER ONE: INTRODUCTION

There is a growing interest in cross-cultural research across many disciplines. Concerns that are facing the corporate world run parallel with the concerns of the classroom. The World Wide Web is making countries that were once remote, very connected. The future workforce is under prepared for the rich cultural online environment that is just on the horizon. If the success of tomorrow's industry is dependent on the ability of management to effectively employ the talents of a culturally diverse work force (Eisenburg, 1999), then the success of tomorrow's workforce is dependent on the ability of instructors to develop courses that are created in line within the cognitive context of the student's target culture.

The increase of technology has also raised the expectations of designers of instruction. Traditional instructional environments must change to meet the milieu of cultural demands from a worldwide society. Remote communities that require distance learning have their own cultural expectations for what distance learning systems should provide (Morgan, 2001). Attitudes toward technology across Europe have varied from culture to culture. Morgan also finds that there are important cross-cultural differences in online distance education systems. This substantiates the argument that designers who create online instructional environments should create instructions to include the cultural dimension of the massive audience of online learners they are reaching. Thus, the need to comprehend how culture affects the preferences that students make within an instructional environment is principal.

The global culture that is emerging is becoming more individualistic. Authors argue that it may result in changes in job behaviors, and it creates a need to study the

dimensions of culture and how the results vary in different patterns of relationships with the self and others in public and private settings (Triandis, 2001).

Although societies globally face the same basic problems such as social inequality, ineffective relationships between the individuals and groups, false concepts of masculinity and femininity: and ways of dealing with uncertainty, it may be the answers that differ (Hofstede, 1997). Each nations culture determines the way that it will handle such problems. Some problems that were predicted by Inkeles and Levinson (1969) as worldwide commonalities were

1. Relation to authority,
2. Concept of self (individual's toward society, individual's concept of masculinity and femininity),
3. Ways of dealing with conflicts (control of aggression and expressions of feelings) (p. 447).

In order to statistically analyze these problems, Hofstede conducted a study of cultural dimensions in 1980. The first section of the review of literature contains references to that study almost exclusively as they are fundamental for the basis of this study. The aspects of the IBM study will be reviewed in detail later in this section. The definitions, descriptions and attributes are essentially from Hofstede's 2001 text Culture's Consequences: Comparing Values Behaviors, Institutions, and Organizations Across Nations 2nd edition. This text is the definitive authority on Hofstede's IBM study in which he coined his five dimensions of culture. Although this researcher has used cited works of other studies that have expounded a great deal from this work, it still remains

the fundamental work in which this study is based, and is used exclusively to define and describe the dimension that is pertinent to this study.

When asked about connecting the dimensions of culture to the decisions that students may make when placed in a controlled learning environment, Dr. Hofstede (2002) made these comments.

> "One thing about culture is that it doesn't stop at any part of life or society. If it's found in families it also affects work places and schools and personality and government and literature. So there's nothing strange in transferring findings from the work place to the learning situation" (personal communication, July 18, 2002).

Hofstede's 1980 study was originally designed to identify the differences employees from different countries exhibited while in the workplace. Correspondence with Dr. Hofstede allowed this researcher to take a different perspective in interpreting the results of the IBM study. While discussing the intended nature of his research, it was agreed that the IBM study could also be used to identify the differences in students' approach to learning.

This study will also explore differences that occur in students' achievement. These students will possess attributes indicative of the different cultures of which they are natives. It has been hypothesized as important to examine these differences because "intercultural encounters in [learning] can lead to much perplexity" (Hofstede, 1997, p. 217).

Purpose of the Review

The purpose of this study was to compare the choices that participants with differing cultural dimension may make in learning situations. In addition, this research will provide useful information for training designers and other groups who use online learning within an increasingly global marketplace.

Definition of Terms

Table 1 shows the constitutive and operational definitions of achievement (specifically recall and transfer of knowledge) and attitude, which will be used as dependent variables within this study. Definitions for the independent variables associated with achievement and attitude, multimedia instruction treatment variable, cultural dimension, and instructional environments are also located in Table 1.

Table 1

Constitutive and Operational Definitions of Variables in the Study

	Variable	Constitutive	Operational
Dependent	Recall	The ability to reproduce presented material	Score on Recall pre and posttest
	Transfer of Knowledge	Deeper understanding of presented material	Score on Transfer of knowledge questions
	Attitude (Learner Preference)	The ability to give priority to one instructional situation (learning mode) over another	The mean scale score on the Learner Preferences Scale (LPSS)
Independent	Individualism vs. Collectivism	One of five dimensions of national culture differences, which were empirically, found and validated by Geert Hofstede (1980).	The mean scale score on the INDCOL questionnaire
	Behaviorism	A learning theory that is structured and sequential.	Provided the organized and logical appearance of instructional components for learning through feedback and sequence.
	Socio cultural constructivism	A learning theory that is open and contextual.	Provided the open-ended and contextual emergence of concepts for learning through collaboration.
	Multimedia Instruction Treatment Variable	All participants were assigned to view a presentation on the formation of lightning. In order to promote understanding.	Contained text, narration and slides, which provide a cause-and-effect account of how some system works

Other constitutive definitions that come from the body of literature and are included below to help further clarify the document. These definitions are not used as variables for measurement.

Hofstede's Dimensions of Culture and the Four-Dimensional Model of Cultural Differences

These dimensions are aspects of cultures that can be measured against other cultures. They are: power distance (from small to large), uncertainty avoidance (from weak to strong), collectivism versus individualism, and femininity versus masculinity. Together Hofstede (1997) has termed them the four-dimensional model of cultural differences. Abbreviations for these dimensions include:

UAI is the abbreviation for uncertainty avoidance

PDI is the abbreviation for power distance

IDV is the abbreviation for individualism

COLL is the abbreviation for collectivism

MAS is the abbreviation for masculine

FEM is the abbreviation for feminine

Learning Theories

A set of concepts invented by theorists that link observed changes in performance with what is thought to bring about those changes (Driscoll, 2000, p. 11).

Epistemology

The branch of philosophy that studies knowledge, more pertinent to this study is the structure, and source of knowledge. What counts as knowledge?

Ontology

The branch of philosophy that studies truth, more pertinent to this study is the how reality is interpreted. Is there an absolute truth? What is the nature of truth, and assumptions about reality? What counts as reality or truth?

Root metaphor

A root metaphor is an area of empirical observation, which is the point of origin for a world hypothesis.

Instructional Environment

The instructional environment is defined as the characteristics of the learning situation that contain its historical foundations, theoretical models, and background, and principles for learning. It is also the physical space allotted for learning (Joyce & Weil, 200; Shipman, 1985; Tessmer & Harris, 1992).

Families of Instructional Environments

An assortment of instructional environments that has distinct characteristics that correlates to the major learning theories and their epistemological orientations.

Learning Theories Continuum

A chart that gives a discrete separation to the highly debated learning theories (behaviorism, socio-cultural constructivism) based on the structure of the learning environment, theory, ontology, world view, epistemology, learning process, relevant framework, key principles and goal of instructions.

CHAPTER TWO: THE REVIEW OF LITERATURE

This review of literature summarizes the most recent and relevant thoughts regarding Hofstede's four-dimensional model of cultural differences as well as current perspectives on behavioral, and socio-cultural constructivism learning theories respectively. In addition to providing these overviews, a summary of the dimensions is provided along with a description of how these dimensions relate to the two learning theories.

After reviewing the four-dimensional model of cultural differences the next section reviews the learning theories. Each is divided into its philosophical assumptions (which include the ontology and epistemology), theoretical framework, and instructional environments for each theory. The concept map (see Figure 1.1) outlines the theoretical framework for the study. The review will draw from cross-cultural research in the behavioral sciences, intercultural relations, and in both corporate training and academic disciplines. The review will also make use of the wide base of theoretical literature to create a continuum of learning theories and instructional environments. After describing each theory, a discussion of the correlation of these theories to Hofstede's dimensions is presented. This study proposes to examine how a student's culture that is based on their dimension of culture (Hofstede, 1980) affects learner recall, transfer of knowledge and learner preference toward cooperative and individualized learning modes.

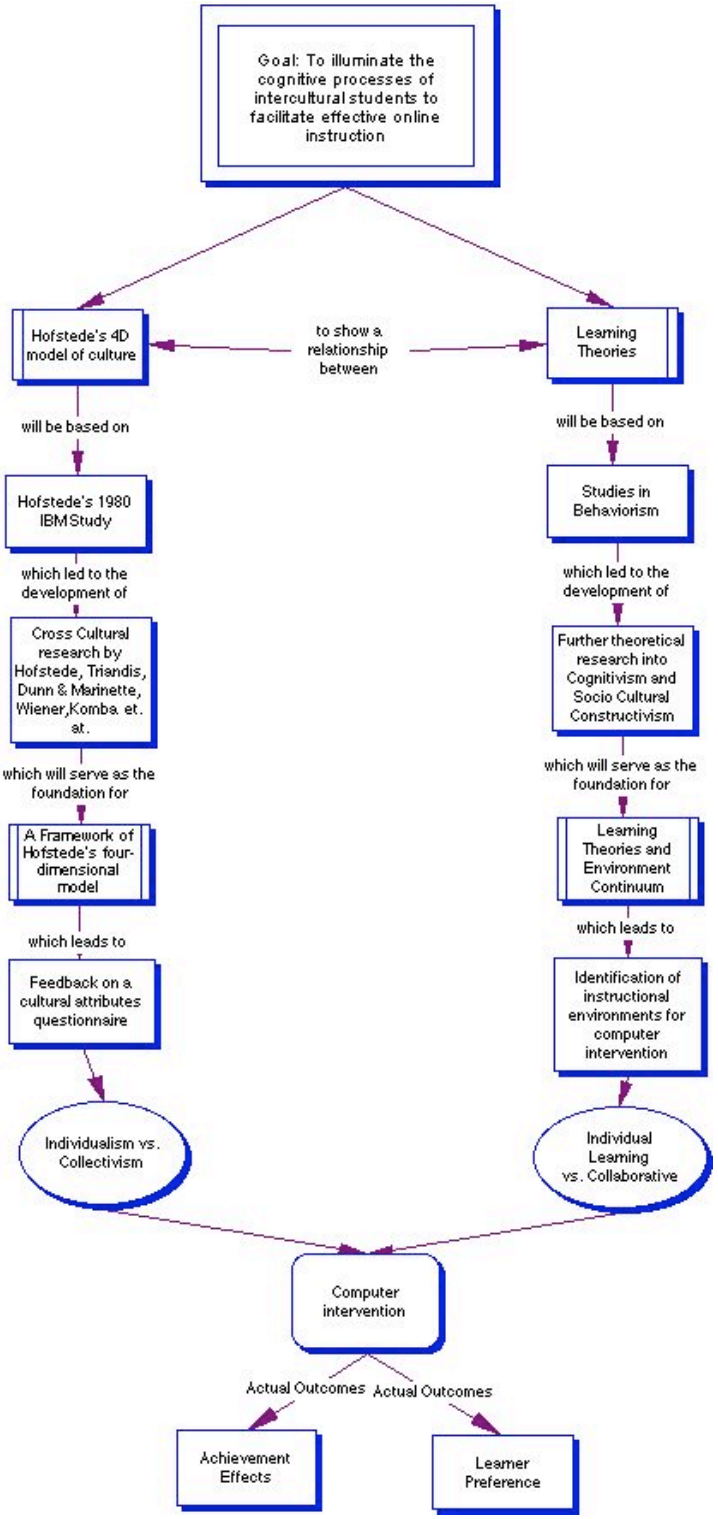

Figure 1 Concept map illustrating the relationship between Hofstede's Four Dimensions of Cultural Differences and Learning theories

Cultural variables play a significant role in student performance (Eisenburg, 1999). Therefore, it is important to review each of the dimensions proposed by Hofstede in his 1980 IBM study. The breadth of this study is not limited to psychology (Kagitçibasi, 1980) and Hofstede remains the most significant contributor to this field from his publication "Culture's Consequences" (1980) where he revived interest in this subject. Different nations were compared in terms of: power distance, uncertainty avoidance, individualism versus collectivism, and gender (or masculinity versus femininity). The next subsection will review this study in more detail.

Individualism Versus Collectivism

Definition

The definitions (Hofstede, 2001) are as follows

Collectivism – in collectivist cultures people are interdependent within their in-groups (family, tribe, nation, etc.), give priority to the goals of their in-groups, shape their behavior primarily on the basis of in-group norms, and behave in a communal way.

Individualism – in individualist cultures people are autonomous and independent from their in-groups; they give priority to their personal goals over the goals of their in-groups, they behave primarily on the basis of their attitudes rather than the norms of their in-groups, and exchange theory adequately predicts their social behavior (p.909). A general overview of the differences between societies who are either individual or collective is illustrated in Table 2 below:

Table 2

A General Overview of the Differences of Societies Low in Collectivism and High in Collectivism (Hofstede, 2001, pp. 215, 236,237)

Individualism	*Collectivism*
Identity is based on the individual	Identity is based on one's social network
Task prevails over relationship	Relationship prevail over task
Speaking one's mind indicates honesty	Harmony should be maintained & confrontation avoided
USA, Australia, Britain, Netherlands	Central and South America, East Asia
USA ranked 1 OF 53 – HIGH Individualism	

The dimension that has demonstrated the most differences among cultures is individualism vs. collectivism (Eisenburg, 1999, Triandis, 2001). For that reason it will be reviewed in significant detail. Many have studied individualism and collectivism. Individualism and collectivism has also been extensively researched within the corporate sector to measure performance and motivation (Eisenburg, 1999, p. 252). Hofstede's 1980 IBM study gives a broad definition of the two values. However, Kagitçibasi (1980) argues that his definitions are suited to be more useful in an "organizational context." Hofstede claims that his findings from the study make sense in relation to the culture at IBM. Studies continue to be conducted in related settings expanding upon Hofstede's model.

For the purposes of this review, an emphasis will be placed on those studies that focus on individualism vs. collectivism in areas of academe. Individualism vs.

collectivism is not a dimension that can be exclusively tied to one person. Eisenburg (1999) reminds us that although these dimensions of culture represent the patterns of most people in a given culture, individuals will differ in the amount of individualism and collectivism they will represent for themselves. Furthermore, no society can be either exclusively individualistic or collective. Triandis (1995) argued that functional cultures have a mixture of each. Cultures that are severely individualistic or collective would be severely dysfunctional. A culture that would contain all individualistic people would be a society of narcissists. There would be high rates of crime, divorce, and child abuse. On the opposite side of the continuum would be a pure collectivist society that would ostracize anyone not closely associated with the "in-crowd." This would result in situations of ethnic cleansing and oppression.

It is important to examine this dimension because of the vast differences that appear between cultures when using individualism and collectivism as measuring tools (Eisenburg, 1999, Triandis, 2001). This subsection will provide a description of the attributes that are associated with cultures that exhibit individualism and collectivism.

Description

Triandis (1995) describes individualism and collectivism as cultural syndromes. A cultural syndrome includes all of the shared beliefs, attitudes, norms, roles and values contained in a culture. This syndrome pertains only to a society's subjective culture, or the way a society perceives its environment. Although the precise definition of individualism and collectivism is highly debatable (Deery & Walsh, 1999), the definition that is most important to this review was suggested by Hofstede in 1980 and used most

recently by Triandis in 2001 for the purposes of cross cultural research in the behavioral sciences.

There are many types of individualism and collectivism. They vary from culture to culture. They are very culture specific. The defining attitudes of individualism and collectivism as stated by Triandis (1995) follow.

1. The nature of the self (autonomous versus interdependent),
2. The structure of goals (priority given to personal or group goals),
3. The emphasis on attitudes and self-needs versus norms and duties,
4. The emphasis on maintaining communal relationships versus exchange relationships (pp. 2-3).

The vast numbers of cultures and cultural attributes make studying these attitudes from one culture to another very difficult, therefore, for the purposes of this study, this researcher will only describe two of the four types of individualism and collectivism pointed out by Triandis (1995, 2001).

1. Vertical Individualism (VI) – people want to do their own thing and also to be "the best."
2. Horizontal Collectivism (HC) – people merge themselves with their in-group.

A culture that is vertical in its attitude toward individualism or collectivism has more of a tendency to stress hierarchy and inequality or high power distance and authority ranking. A culture that is more horizontal in its attitude for collectivism has more of a tendency to stress equality.

In vertical individualistic (VI) cultures "inequality is acceptable," top managers may bring home ridiculously high salaries while lower level employees take home

pennies. In horizontal collectivists (HC) cultures, every one is of the same self, on an equal basis. There is no one leader, as all decisions would be made collectively (Hofstede, 1980; Triandis, 1995).

Another attribute that is important to this review is the concept of cultural tightness and looseness. A society is considered tight when it has little to no tolerance for deviation from accepted norms. Tight societies are those that tend to be relatively simple, and isolated from the influence of other societies. They are densely populated with members who appear highly collective and generally very sure of the morals and standards considered acceptable to the society. There would be but one choice of lifestyle. Examples of this type of society would be those found on islands that have been isolated from other cultures. On the other hand, a loose society is one commonly more tolerant of departure from the norm. Members of this society tend to be more tolerant because they are more individualistic and less dependent on one another. The society is usually complex, with many choices of lifestyles (complexity in a society is hard to measure, it may include urban living rather than rural or hunter-gathers vs. service-information societies) (Triandis, 1995; 2001).

Eisenburg (1999) also relates cultural differences to the aspect of control. There are two types of control, primary and secondary. He shows that there appears to be a relationship with individualism and collectivism and control. Individualists have a tendency to exert primary control over their environment. "Primary control involves influencing existing realities" (p. 253). Collectivists are more inclined to exert secondary control. "Secondary control acts through accommodating to existing realities" (p. 253). Triandis (1995) explains it more clearly that collectivists focus on changing himself or

herself to fit the environment, while individualists focus on changing the environment to fit themselves (p. 19).

As stated in the introduction, individualism and collectivism as traits are not dimensions that can be exclusively tied to one person. This is partly because, an individual can move toward collectivism or individualism based on external cues and prompts (Eisenburg 1999, Triandis, 1995). Triandis (1995) gives a list of personal circumstances that may shift a person's view from collectivism to individualism and vice versa.

a) Marriage – shift toward collectivism
b) Group memberships – shift toward collectivism
c) Age – over 50 shifts toward collectivism
d) Travel – shift toward individualism
e) Change of residence – shift toward individualism
f) Size of the community – shift toward collectivism
g) Influence of relatives – either way
h) Interdependence in finances – shift toward collectivism
i) Traditional education – shift toward collectivism
j) Living abroad – shift toward individualism
k) Growing up in a large family vs. small – shift toward collectivism
l) Hours of TV viewing per week – shift toward individualism
m) Occupation – either way (depends on the occupation)
n) Participation in sports either in groups or alone – either way
o) Self play – shift toward individualism

p) Enjoying privacy – shift toward individualism (pp. 11-13)

The remainder of this subsection will review some of the more obvious attributes of cultures that may be regarded as high in collectivism vs. individualism.

Collectivism and individualism are usually used to describe entire cultures (Smith & Schwartz, 1980; Triandis, 2001). Authors sometimes refer to the collective or individualistic traits of an individual as allocentric and idiocentric respectively (Triandis, 2001). Triandis (1985) introduced the terms to analyze participants on an individual level. People who are allocentric (*collective*) tend to pay attention to other people. People who are idiocentric (*individualistic*) tend to pay more attention to the internal attributes, and their own beliefs and emotions. Triandis (1995, 2001) goes on further to say that these virtues are not set in stone. He uses the terms idiocentric and allocentric to describe individuals as separate from their societal cultural designation. Similarly, this researcher will speak of cultures as individualistic or collective, and will speak of individuals as being idiocentric or allocentric respectively. An individual will use their idio- or allocentric nature as tools that depend on what the situation demand. This allows the individual to appear more VI or HC whenever it suits them.

The next subsection will give details of how students exhibit either collectivist or individualist traits in a classroom setting, and how these traits can affect achievement.

In Educational Settings

Achievement can be affected by the influence of culture (Holmes, Sherman, William-Green, 1997). Holmes et al. (1997) posits that a student's more dominant cultural orientation will determine which instructional activities they prefer. If learners are not made to feel culturally at ease they may reject the instructional method or, worse, be estranged from the very instructional environment's "cultural incompatibilities." This may in turn affect a student's learning preference.

Triandis (1995) states that both collectivists and individualists attribute their successes and failures to different events. Since a reasonable case can be made that culture has an influence on achievement and comprehension (Holmes, Sherman, William-Green, 1997), this sub-section will review the cultural attributes of Hofstede's 3rd dimension individualism vs. collectivism – as they pertain to achievement in an academic environment – in order to shed some light on how idiocentric and allocentric students may be influenced by their collectivist or individualist background.

The educational system of collectivist and individualist's cultures vary greatly. The purpose of education serves a different meaning for collectivist cultures than for individualist cultures. According to investigators (Hofstede, 2001; Komba, 1998), the purpose of education in individualist cultures is to learn how to learn. This learning continues on throughout an individualist's life readying him for life with other individuals and new situations. The purpose for learning in a collectivist culture is to acquire the customs and norms of that society in order function better as an in-group member. This learning tends to be given to the young only, in the hopes of passing on traditions important to perpetuation of the society. An example of a collectivist education

system is the traditional indigenous African education system. Komba (1998) gives an example of the African concept of community. This concept illustrates how an individual born in this community becomes "infused" into the community through rites, rituals, and initiations at developmental stages of the child. He further describes this respect for tradition within the school system:

> There is more continuity than change in African thought about education broadly conceived … Notwithstanding its diversity across ethnic boundaries, indigenous African thought on education was highly value-orientated and transmitted a well-defined social ethic. Intense social bonds reinforced these values, namely lineage, family, and age group and they were internalized by the 'initiation pedagogy' (Njoroge and Bannaars, 1986, p. 64).

The completion of a degree yields a different significance for individualists and collectivists as well. Hofstede (2001) has revealed that whereas diplomas "increase economic worth and self-respect for individualist" (p. 237), collectivists may well use the diploma as a method of achieving honor and entry to higher-status groups.

Another important consideration for cross-cultural instructional designers is the concept of "face." Strong collectivists societies (China) possibly value "the actions placed upon [the individual] by virtue of the social position he occupies" (p. 230). This concept is called face. There is no equivalent in individualist cultures. The Greeks call it "philotimos." Some argue (Triandis, 1972) that to lose face can be a humiliating event that is preserved by all in the group. The teacher is known to avoid conflict with the individual in order to maintain harmony (Hofstede, 2001, Rubin and Wu, 2001). Instead of confronting the individual directly, the teacher will allow "shaming" to occur. This

tendency involves the in-group in the confrontation (Hofstede, 2001). Triandis (1995) also notes that Japanese teachers often address the group, rather the individual. While in the collectivist classroom, the object is to avoid confrontation, to not embarrass anyone; the norm for an individualist classroom promotes the feeling of open discussion and confrontation and invites the forum of debate.

Gardner, Gabriel, and Lee (1999) found that depending on the "situational accessibility," allocentrics and idiocentrics might deviate from their expected patterns of behavior. Given certain cues, or primes, participants who perceived themselves as independent performed as individualists. People who perceived themselves as interdependent performed as collectivists. This validates Triandis (1995) finding that collectivist's prompts trigger a collectivist system and vice versa. Taking these conclusions into consideration can "radically change the impact of a learning system" (Morgan, 2000, p. 495).

Teachers rarely single out individual students in collectivist's classrooms. This tendency not to single out students does not only pertain to confrontation, but praise as well. Triandis (1995) explains that Japanese teachers may rarely refer to the differences in ability among their students. People in collectivist cultures have a tendency not to want to stick out. Chinese students commonly are more liked when they humble themselves and appear more self-effacing than self-promoting. Furthermore, collectivist cultures view nepotism differently. It is considered immoral for family members to receive preferential treatment in individualist's cultures. However, nepotism is expected in collectivist's cultures (Hofstede, 2001). Treatment of this kind is done to continue the family sphere that is learned in the home. Ho and Chin (1994) found in a content

analysis of Chinese popular sayings that "achievement through cooperative group effort is affirmed but achievement through individual effort is negated" (p. 152). Eisenburg (1999), Kagitçibasi (1997), and Triandis (1995) found that this "socially oriented achievement orientation" reduces social loafing and leads to higher productivity. Triandis (1995) gives an example of how socially oriented achievement motivation is prevalent in the collective minds of immigrant children new to the United States.

> Three years after their arrival in the United States without knowledge of English, the children of immigrants from collectivist cultures performed at above average levels in American schools. The refugees arrived without material possessions, and little education. Eighty-five percent of them had no English language proficiency when they arrived. Yet, within 40 months of their arrival their children surpassed even the average of the U.S. population in school achievement. Eighty percent of the children had an overall grade point average of A or B. Caplan explained these results by using three variables: household composition, values, and a longtime perspective (I will achieve through my children). The values were highly collectivist. They also rejected individualistic values, such as material possessions, fun, and excitement. They supervised the schoolwork of the children, and asked every day what homework there was to do, and made sure it was done, hired tutors and read to their children (p. 24).

Differences in teacher to student interaction in collectivist and individualist cultures are illustrated in Table 3 below.

Table 3

Differences in Teacher/Student and Student/Student Interaction Related to the Individualism versus Collectivism Dimension (Hofstede, 1986, p. 312)

Collectivist Societies	Individualist Societies
Positive association in society with whatever is rooted in tradition	Positive association in society with whatever is "new"
Students expect to learn how to do	Students expect to learn how to learn
Individual students will only speak up in class when called upon personally by the teacher	Individual students will speak up in class in response to a general invitation by the teacher
Individuals will only speak up in small groups	Individuals will speak up in large groups
Neither the teacher nor any student should ever be made to lose face	Face-consciousness is weak
Education is a way of gaining prestige in one's social environment and of joining a higher status group ("a ticket to a ride")	Education is a way of improving one's economic worth and self-respect based on ability and competence

The next section reviews empirical research that supports the characteristics illustrated in Hofstede's four-dimensional model of cultural differences.

Cross Cultural Empirical Research

Hofstede's Four Dimensions

Of the studies that have had the most influence in the investigation of cross-cultural differences, Hofstede's IBM study is the most influential and authentic descriptor for the differences of culture found across many of the social sciences. In 1974 Hofstede began a study of a large body of survey data from employees of IBM. Statistical analyses were conducted on the values of these employees. Results from these questionnaires revealed that although different countries shared common problems, they responded to those problems with different solutions.

The common problems were:

1. Social inequality, including the relationship with authority;
2. The relationship between the individual and the group;
3. Concepts of masculinity and femininity, the social implications of having been born as a boy or a girl;
4. Ways of dealing with uncertainty, relating to the control of aggression and the expression of emotions.

This study revealed an empirically accurate representation of the aforementioned areas that were predicted by Inkeles and Levinson 20 years before. There were 117,000 surveys administered to 70 countries represented at the International Business Machines Corporation (IBM). The first data obtained were frequency distributions that were later put into ordinal and nominal scales. The data was then analyzed according to groups. Major analyses that were conducted included cross tabulations, correlations, factor analysis, and within group/between group comparisons. An analysis of variance

(ANOVA) was conducted that accounted for group differences according to country, occupation, gender, and age. The country effect was highly significant (beyond the .001 level). An excerpt of the significance of effects for each factor can be found in Table 4 below.

Table 4

Excerpt from Results table of ANOVA on Data from 3,220 Respondents from the 1970 Manufacturing Survey (Hofstede, 2001, p. 51)

	F Value and Significance of Effects for				
Significance limits of F	Country 9df	Occupation 4df	Country x Occupation 36df	Gender 1df	Age 1df
.001	3.1	4.6	2.1	10.8	10.8
.01	2.4	3.3	1.7	6.6	6.6
.05	1.9	2.4	1.3	3.8	3.8

Other tests run to identify national differences were comparisons that matched occupation first among 40 countries and then extended to include 50 countries. Some countries were combined due to lost data (Middle East contained Egypt, Lebanon, Libya, Kuwait, Iraq, Saudi Arabia, United Arab Republic; East Africa contained Kenya, Ethiopia, Tanzania, Zambia; and West Africa contained Ghana, Nigeria, Sierra Leone). Their combination fit smoothly into the four-dimensional framework for the original 40 country set.

Questions dealing with hierarchical relationships between employee, employer and work-related stress lead to the development of the uncertainty avoidance and power distance indices. A factor analysis on the work goals of 50 countries allowed Hofstede to create a masculinity index. The individualism and masculinity index were derived from two main factors that explain country differences. The individualism index, based on the first of these factors accounted for 24% of the variance. These areas were then represented numerically into what Hofstede calls the dimensions of culture. They are individualism versus collectivism, power distance, uncertainty avoidance, femininity versus masculinity (gender), and long-term versus short-term orientation. Excluding the fifth dimension, they are called the four-dimensional model of differences among national cultures. Hofstede (1997) characterizes each country by a score from each of the four dimensions. A cross-national factor analysis of all the relevant combined data was conducted to explain the four dimensions. Various other analyses were run along the course of the research (multivariate and smallest space). Four factors (Factor 1: individualism and power distance, Factor 2: uncertainty avoidance, Factor 3: masculinity, Factor 4 weak/unclear power distance) explained 37% of the variance, after removing one factor (Factor 4) 49% of the variance was explained.

Although the IBM indexes are supposed to be independent, power distance (PDI) and individualism (IDV) loaded on the same factor for 40 countries. Correlations for the other dimensions were weak across all countries. Which demonstrated independence for the remaining dimensions (uncertainty avoidance, femininity, and collectivism). All five dimensions were then found to be empirically verifiable and statistically independent (Hofstede, 2001).

It is important to point out that what may be true for societies, may not be for individuals. The dimension consists of a grouping of phenomena that is based on the trends of statistical relationships that are found in societies.

Hofstede uses the metaphor of a garden to describe how to interpret the values data about cultures. He relates the levels of analysis to the hierarchy of flowers found in a garden. According to Van Deusen (2001) the analysis of a garden of data is likened to analyzing the results of entire countries. Bouquet data are similar to organizations, and flowers would represent individuals.

It is recommended that researchers be careful not to mix the levels of analysis. It should not be assumed that what is true for societies (gardens) would be true for that society's individuals (flowers). Triandis (2001) suggests that it is wrong to assume that just because one is from an individualistic culture he/she is solely individualistic. The same can be said for someone from a collective culture. It is also important to note that from the beginning, this study includes statements that describe cultures and the central tendencies of its individuals. The results of the data that have been researched represent the *average* person (which is a non-entity), or the average representation of the responses from a collection of individuals from a particular culture. Also, there are statements made in this review of literature that describes cultures at the extremes of their cultural values. No society can exhibit all or none of the values that are presented.

The descriptions are not intended to describe or stereotype individuals. Stereotypes are assumptions that are wrongly ascribed to individuals based on the collective properties of a group. These types of descriptions are needless, and were not the purpose of the IBM study, however these "ecological fallacies" are common to

authors and should be avoided. Implications of this research did, according to the researcher, allow for a quantifiable measure to be obtained for cultural dimension across societies. Key differences of many types could then be ascertained. Some of the implications that were found for societies based on the dimension of individualism and collectivism were:

1. Differences in the family
2. Personality and behavior
3. Language use and group identity
4. Schools, and educational systems
5. Work situation
6. Applicability of management methods
7. Consumer behavior
8. Health and Disability
9. Political Systems and Legislation
10. Religions and Ideas
11. Wealth and Latitude
12. Historical Factors

Studies indicate that culture is influential in learning achievement (Holmes, Sherman, Williams-Green, 1997). Hofstede's four dimensions of culture allow researchers to measure motivation and achievement in educational settings.

According to Triandis (2000) measurement of the constructs of individualism and collectivism has been difficult. Of the 20 different methods there have not been any which prove successful. Measurement problems include an argument as to whether the

constructs of individualism and collectivism are dichotomous or polythetic. Triandis and Gelfand (1998) state the following.

> "As in zoology, in which, for instance, a "bird" is defined by two attributes (e.g., feathers and wings) and hundreds of species of birds are defined by other attributes, individualism and collectivism may be defined by four attributes and different species of these constructs (e.g., Korean and Japanese collectivism) can be defined by additional attributes" (p.118).

Studies (Triandis & Gelfand, 1998) have been conducted to validate the constructs as either orthogonal or related. Literature supports (Triandis, 1995,) that individualism and collectivism are independent dimensions. For instance, a participant may score high and low on both individualism or collectivism or high on individualism and low on collectivism. However, according to Triandis and Gelfand (1998) the four divisions of collectivism and individualism (vertical individualism [VI], vertical collectivism [VC], horizontal individualism [HI], and horizontal collectivism [HC]) have been studied to validate how unique they were. It was found that their analysis demonstrated good convergent validity and divergent validity. This showed a discriminate difference between the two dimensions.

Hofstede (1980) Triandis (1984) and Schwartz (1990) conducted studies on individualism and collectivism based on Western values. In 1984, Bond and Hofstede reanalyzed data across six countries from a non-Western approach (Kagitçibasi, 1980). Bond's focus was with Asian and Pacific countries. This reanalysis produced factors that corresponded with Hofstede's dimensions. This study along with its four positive

correlations gave greater validation to Hofstede's individualism vs. collectivism dimension since it was conducted out of the realm of a non-Western perspective.

Although Hofstede's study remains the most significant contributor to this field with his 1980 IBM study (Hofstede, 2001), there are other studies that have illustrated the partitioning of cultural values. For example, in a study in which 535 students (301 females, 234 males) were measured on their agreement or disagreement with statements related to Hofstede's dimensions of culture compared to their own cultural characteristics, Stull and Till (1995) found that significant differences revealed true ethnocentrism according to the following categories: birthplace, number of family generations born in the United States, languages spoken, culture identified with, exposure through living in another culture, travel, and academic study of culture. Results from an analysis of variance (ANOVA) illustrated in the following tables indicated that both males and females agreed with statements representing individualism vs. collectivism. Significant differences were found in five of the eight variables between those respondents living in the United States more than 20 years and those respondents falling into other groups. Significant differences were found in every category regarding birthplace. Those raised in the United States agreed more with individualist statements than those raised elsewhere. Students who spoke a language other than English (LOTE) at home agreed with students who did speak English at home in many statements. Those with a course in cross-cultural relations agreed less with collectivism statements than those without such a course (Stull & Till, 1995). These findings reveal a consistency with the delineations that were proposed by Hofstede in his 1980 IBM study's four-dimensional model.

Triandis (1995) posits another significant finding by Hui (1988) with the creation of the Individualism/Collectivism INDCOL scale. According to C. Harry Hui (1988), this scale is the first measuring instrument specifically designed to tap the constructs of individualism and collectivism. The INDCOL scale is a group-administered scale that covers beliefs, attitudes, behavioral intentions, and behaviors from a psychometric perspective.

The instrument consists of 63 items that are divided across six subscales that examine the participants' beliefs regarding spouse, parent, kin, neighbor, friend, and co-worker. Hui (1988) describes how the instrument was given expert judgment validity:

> In order to validate the instrument, a panel of social scientists was evaluated across a variety of countries in Africa, Asia, Australia, Europe, and the Americas. Those who had primary contacts with individualist cultures were asked to assume the individualist role while responding, while those who had primary contacts with collectivist cultures were assigned to answer as a collectivist would (p. 24).

Results from the test revealed that from the 41 responses, 18 were "individualists" and 23 were "collectivists." *T* tests comparing the two groups showed significant differences ($p < .025$, one tailed) for 58 out of 63 items. A more detailed description of the scores from the results of this study can be found later in this document.

The development of the INDCOL scale allowed researchers to show positive correlations between collectivism in Chinese students and negative correlations in American students. There were also INDCOL differences in the psychological links established between perceived obligation (a characteristic of collectivists) and behavioral

intention (a characteristic of individualist). Generally, this scale once completed allowed researchers to specifically target the construct of individualism versus collectivism.

Another study, (Fletcher & Olekains, 1996) which dealt with conflict resolution strategies of collectivists and individualists, examined how social cues play a role in the dimension of cultural differences. Surveys were given out to 378 undergraduate students at Melbourne University. Participants completed three questionnaires (Demographic information, Thomas-Kilmann MODE Instrument, and the INDCOL). A series of analyses of variances (ANOVAs) showed that after being grouped Asian countries did not differ in either individualism F (3,59)= .62, ns, or collectivism scores F(3,59)= 2.7, ns. Results supported the researcher's hypothesis that students from Australia are more likely to report individualist values, where students from Asian countries were more likely to report collectivist values x^2 (1) = 4.59, p<. 05. Results also indicated collectivists showed a stronger preference for collaborating, compromising, and accommodating than individualists did for accommodating.

The implication made by this study, therefore, is that for collectivists, social obligation is viewed differently and is more important to them than with individualists. Although the basis of this study lies in the corporate environment, it has been documented that the disparities between individualists and collectivists have an influence on a student's educational achievement as well. The next subsection will review studies that have investigated retention of learning and transfer of knowledge skills from multimedia presentations.

Achievement

Review of the literature reveals studies in which Mayer (2001) investigated achievement, specifically recall and transfer of knowledge, by examining how deeper learning outcomes were affected by simple user interaction of a multimedia explanation.

In two experiments, participants received two presentations of narrated animation that explained the formation of lightning; retention and transfer of knowledge test then followed these presentations. In this investigation, it was expected by the researcher that a multimedia explanation that was presented in a causal model (a state in which one part of the system causes another part) method of presentation would impose a high cognitive load during learning and cause learners to perform poorly on retention test. It was also anticipated that participants who were given learner control over the pace of the presentation would perform better on transfer test.

It was found that participants who were allowed to exercise control over the pace of one presentation before viewing a second presentation of the same material with no pacing control performed better on transfer test when compared to participants who viewed the two presentations in reverse order $t(28) = 2.877$, $p<.01$. In the study Mayer (2001) sought to measure meaningful understanding by giving participants transfer test that would assess whether they could use presented material in ways beyond the methods in which it was explained. It was presumed that simple user interaction would lead to deeper learner outcomes and would be reflected on the transfer test.

These findings were consistent with cognitive load theory which states that learners will place less unnecessary load on working memory when viewing explanations which progress from part to whole. This allowed them to better relate material with prior

knowledge, in turn, providing a deeper level of understanding. The deeper level of understanding was evident in the findings (see Table 5) where superior performance was noted on transfer test.

Table 5

Excerpt of Mean Retention, Transfer, and Rating Change Scores for Each Group in Experiment 1, (*Mayer, 2001, p. 395)*

	Retention		Transfer		Rating Change	
Group	*M*	*SD*	*M*	*SD*	*M*	*SD*
Experiment 1						
PW	4.60	2.06	6.13*	2.39	0.13*	0.83
WP	4.93	1.39	3.80	2.04	-0.67	0.16

Note: PW = part-whole presentation: WP = whole-part presentation
*p<.05

The research proved that transfer was a better measure than retention when the goal is to assess how well participants understand explanations that come from multimedia presentations.

Implications from this study, therefore, point to complex and mixed results linking motivation and achievement to individualism and collectivism. However, most results point to the proposition that there are conditions under which individualists will be most motivated to perform and conditions where collectivist will perform best.

In a study where students from Japan and students from the United States were compared according to there creative performance, James and Eisenburg (1999) found that when there is a congruence between organizational situational factors (reward and appraisal type) and cultural values creative performance is higher, congruence is offered

as a theoretical framework for explaining why students will demonstrate improved performance when placed in environments that are pedagogically unfamiliar to them. Due to arguments against intercultural education, research remains limited. However, investigations by Albert and Triandis (1985) into the need for intercultural education in multicultural societies have lead to major findings. Objections to the need for intercultural education are refuted by the results. Interviews with samples of teachers (N=70) and students (N=150) and observations of the classroom exchanges were implemented to create what the researchers called "critical incidents" (p. 323). These incidents were presented in the form of scenarios. Within each scenario, a student from an ethnic group other than the teacher's is placed in a position where they interact. The scenario is presented to samples of teachers and students from each ethnic group (Latin American and Anglo). The authors then asked the participants to provide and interpretation of the behaviors and feelings of pupils and teachers in each of the scenarios. The interpretations were then synthesized by a panel of bicultural judges into alternative interpretations of the interaction for the scenario. Once the alternative interpretations were paired with the original scenario, the participants were then asked which interpretation they preferred. Results indicated that there were significant differences between participants in interpreting school situations that naturally occurred between students and teachers from different cultural backgrounds. The greatest number of significant differences occurred between American teachers and Hispanic students. The major implication made by this study, therefore, is that there is a need for intercultural education for teachers as well as students. The authors in the course of interviewing teachers for their research noted that many teachers failed to realize that

cultural differences exist and furthermore that these differences may exude an influence over the behaviors of both teacher and student.

Another study by Wu and Rubin (2000) pointed out the need for educators to make themselves more aware of the cultural differences that students bring with them to the instructional environment. Participants in both Taiwanese and American college classrooms were studied to see the impact of collectivism and individualism on their argumentative writing skills. The study analyzed writing features conceptually linked to collectivist or individualist orientations such as indirectness and personal disclosure (use of first person singular pronouns and personal anecdotes), use of proverbs, collective self (statements of humanness and collective virtues), and assertiveness. Students were compared across languages and nationalities. Results indicated that American students were more direct in their writing. Scores on the Twenty Statements Test (TST) for Taiwanese were 38.63% (collectivists range in scores from 20% to 50% range), scores for American students were 12.50% (individualist's range in scores from zero to 15%). A t-test revealed that there was a significant difference between Taiwanese and American students in collectivism $t(78)=5.93$, $p<.001$. This finding was in agreement with the general view that Eastern cultures are more collectivist than Western cultures (Hofstede, 1908,1997,1986,2001; Hui, 1988; Triandis, 1995,1996,1997, 2000).

There were 2x2 multivariate analyses of covariance (MANCOVAS) that were also conducted on scores, and they revealed that the American students showed more intra-group consistency, whereas the Taiwanese students revealed individualistic tendencies within their groups. According to the authors, this shift is due to the influence of Western culture on Taiwan. The implication, therefore, as stated by the author is that

educators must be aware of the cultural differences that students bring with them to the instructional environment and not be quick to stereotype or generalize.

Ramirez & Castaneda (1974) and Hale (1982) as cited in Albert & Triandis (1985) support the use of methods that display expression of approval and warmth, personalized rewards, along with other "culture-matching teaching strategies" to optimize instructional environments for cross-cultural instruction. In additions to this study, others researchers support the implication posited by Albert and Triandis (1985) (Smith-Jackson and Essuman-Johnson, 2002; Smith-Jackson and Williges, in-press; Smith-Jackson and Wogalter, 2000). This support extends the implications of this study beyond the traditional classroom and into the online instructional environment.

Research indicates that ethnocentric design of a technology that is deployed to an out-group culture can disempower those with different cultural views. Trentin (2001) argues that good online instructional environments are those that foster "strong interaction between the players in the process; [are] organized in full-fledged virtual classes, [and require that] the participants must obviously respect schedules and deadlines if a collaborative working strategy is to be successful" (p. 20). Starkey (2001) contends that "it has been well-documented and much commented on that American educational curriculum has a tendency toward Euro-centrism and is particularly lacking when it comes to foreign language immersion and appreciation of multiculturalism" (p. 57). These findings can be extended to distance instructional environments where there is a culturally diverse audience of participants.

Distance Learning

The culturally diverse audience of participants in online instructional environments has lead authors to consider how students learn when using computers. Morgan (2000) examined the amount of computer anxiety that was present in people across cultures. In a comparison of approximately 2500 participants across 10 countries, the author reported significant differences in computer anxiety between students from America. There were three different types of anxiety reported: interactive computer learning anxiety (ICLA), consumer technology anxiety (CTA), and observational computer anxiety (OCLA). In countries such as Czechoslovakia, Germany, Hungary, Israel, Italy, Japan, Spain, and Yugoslavia the components of stress were associated with computer anxiety involved with their studies. Implications of this study, according to the author, are that in both technologically and non-technologically advanced populations there is anxiety connected with using interactive instructional environments.

These findings, as cited by the authors were in agreement with cross-cultural research that states there must a consistency between the situational factors (the design of the instructional environment) and the cultural values of the students that participate in them. It is then plausible to state, that based on studies that have examined motivation and achievement across cultures (Eisenburg, 1999; Triandis, 1995), individualism and collectivism (Hui, 1988; Stull & Till, 1995; Triandis, 1996), student performance and attitudes (Ku & Sullivan, 2002) that participants will show significant differences in recall when placed in environments that are culturally and pedagogically unique.

Learning Preferences

Research has been conducted on the learning preferences of students (Owens, 1985). The Learner Preference Scale (LPSS) was used to compare Australian and American students' preference for learning either competitively or cooperatively. Large samples from both schools in Sydney, Australia (n=1814, 619) and Minneapolis, Minnesota, America (n=1059, 342) were tested.

A two-way analysis of variance (ANOVA) was carried out on LPSS scores from the schools in Sydney and Minneapolis. The author regards the Sydney scores as a representative of a typical city and is representative to "how Australians think" (p.238). This claim is less tenable for the schoolchildren in the Minneapolis sample however calling them more "typical" but not "representative" of American culture. Although large international claims would not be warranted in this case, the author does see useful and discernable cultural differences and similarities.

School year and sex findings were reported. Results reported that girl-boy differences were consistent across nationalities, with the girls showing stronger cooperative preferences: Sydney (coop = F (1,6) = 2.7), Minneapolis (coop= F (1,8) = 2.1) and the boys showing stronger competitive and individualized preferences: Sydney (indiv = F (1,6) <1), Minneapolis (indiv = F (1,8) <1). Implications, according to the author that were relevant to this study showed the competitive/individualistic ethos to be more predominant in Australian culture than in American culture. Both students and teachers from Sydney were more competitively and individualistically inclined, and less cooperatively inclined than their American counterparts. The author argues that the tendency for Australians to have more competitive tendencies stems from the emphasis of teachers and students to view competition in the school system's procedures as necessary

for schooling to function effectively. The findings were consistent with research regarding preferred learning modes and allow this researcher to compare cultural groups on this basis.

Summary

The previous section described individualism versus collectivism as the characteristics of cultures in which people assume that they should look after their own self-interest as opposed to the interests of others. Hofstede's dimensions have been the most prominent influence in the areas of cross-cultural psychology and research in the past 20 years. This section reviewed the findings of Hofstede, Triandis, Eisenburg, Kagitcibasi, Holmes, Sherman and William-Green and others as they have continued research that has furthered the knowledge of Hofstede's original 1980 IBM study. The rationale of this section was to define and describe the dimensions of culture separately in order to lay a foundation for hypotheses that will be proposed later in the document. In order to substantiate the average representation of the responses from a collection of individuals to a particular culture or region, this section also tied each dimension to the family and geographic surroundings. This sectioned then reviewed the differences that occur in student's learning as well. It was based on how each cultural dimension related to achievement in the educational setting.

Studies have revealed that there are correlations between the dimensions with achievement, distance learning, and student preference in learning as well. Although it should be noted that there could be other factors that play a role in the differences associated with learning, these relationships are merely a representation of the research

conducted. Table 6 illustrates a brief overview of the countries that have been proven to exhibit cultural differences in individualism or collectivism.

Table 6

Overview of Nations' Four Dimensions of Culture with Index Scores

Region/County	IDV/COLL	Score
USA	IDV	91
Europe: Anglo	IDV	89
Nordic	Med/Hi IDV	71
Germanic: West Slavic, West Ugric	Med IDV	67
Near Eastern: Balkan	COLL	55
Latin Europe	Med/Hi	51
Japan	COLL & IDV	46
China	COLL	25
Africa	COLL	20
Latin America	COLL	6

Research has led some to believe (Eisenburg, 1999; Hofstede, 1980, 1986, 1997, 2001; Holmes, Sherman and William-Green; Kagitçibasi, 2001; Triandis, 1997) that Hofstede's dimensions of culture play a role in learning. The previous section examined the distinct attributes that each dimension can ascribe to certain societies. The next section of this review of literature will examine the instructional environments that have been popularized across theorists and cognitive psychologists in an effort to distinguish the theories as pedagogically separate. This is done as an attempt to familiarize the reader with these theories, as they will be connected with the dimensions of culture.

Learning Theories And Instructional Environments

It is argued by some (Hofstede 1986; Morgan, 2000; Smith-Jackson, 2001; Wiener, 1986) that to facilitate effective online instruction, instructional environments should provide a mixture of all cultures and approaches to learning. This section also focuses on the instructional design of instructional environments, more specifically, the models of teaching used by instructors. Hofstede (1986) and Wiener (1986) agree that productive learning results when students and teachers align cultural experiences with effective teaching practices. The following two approaches to learning (behaviorism, and socio-cultural constructivism) explain how learning in an interactive environment occurs. This section will also demonstrate that learning prior to participation (such as culture and experience) will have influenced the way activities affect the learning process (Morgan, 2000).

Wiener (1986) suggests a number of theorists that have derived explanations to address the needs of intercultural students. Some of those theorists have been included in this section as they contribute to the continuum of approaches to learning that are being addressed in this section.

The approaches will be reviewed in terms of their ontology, epistemology, learning environment, and teaching methods. Shipman (1985) calls the major divisions of these families "approaches to learning." Theories from the two major approaches to learning will be reviewed in this section.

First, behavioral theorists will be reviewed. Theorists from this family argue that learning is found in observable events, both environmental and behavioral. They assert this theory of learning based on controlled experiments that were conducted on the

behavior of animal and human participants. Second, socio- cultural constructivism theorists will be reviewed. Theorists from this family argue that learning is communal. They assert that learning is based on the successful interaction between the students within the instructional environment. Teachers and students may serve as a purpose of puzzlement or cognitive conflict to be solved (Duffy & Cunningham, 2001; Driscoll 2000; Grabinger, 2001, Hicks & Doolittle, In Press; Joyce & Weil 2000; Shipman 1985; Vygotsky, 1978).

Two major concerns for this researcher are: first, how knowledge is structured and second, how the instructional environment is structured. The following section will include an introduction to each family of theories, and a section containing the theoretical foundation called the instructional environment. The structure of knowledge (hereafter called epistemology) will also be reviewed for each approach. The section will then be summarized as an attempt to separate the two approaches on a continuum.

At this point in the review of literature, it is important to give a clear definition of learning for the purposes of this review. Behaviorists see learning as a change in the frequency of observable behaviors. Constructivists believe that learning occurs when meaning is created from experience (Ertmer & Newby, 1993). Although theorists disagree on the nature of learning, the common assumption is that when something is learned, there is a change in performance as a result of some form of practice or other experience. Therefore, for the purposes of this review, the following definition by Ertmer and Newby (1993) who cites Shuell (as interpreted by Schunk, 1991) will be used. "Learning is an enduring change in behavior, or in the capacity to behave in a given fashion, which results from practice or other forms of experience" (p. 2).

According to the literature, there are many factors that determine why cultural differences emerge while learning. Morgan (2000) proposes at least four major components: biological, psychological, philosophical, and educational. Hofstede (1986) proposes that problems in cross-cultural learning situations can manifest themselves in four different areas.

1. Differences in the social positions of teachers and students;
2. Differences in the relevance of the curriculum (training content);
3. Differences in profiles of cognitive abilities between the populations from which the teacher and student are drawn;
4. Differences in expected patterns of teacher/student and student/student interaction (p. 303).

This study is concerned only with the fourth area of concern from both authors, the differences in expected patterns of teacher/student and student/student interaction and the educational factors that are suggested by Morgan. As this study is concentrating on the differences in achievement that may appear in learners that are from different cultural groups in a instructional environment, it is important to review appropriate learning theory as it applies to the teacher and the learner.

Behaviorism

There are many theorists that have contributed to behaviorism theory, each come with different views that have created debate among the behaviorism camp. Some theorists of note are Pavlov, Thorndike, and Skinner. Skinner's radical behaviorism developed as a psychology at the end of the nineteenth century (Shipman, 1985). Skinner defined learning as a permanent change in behavior that is detectable over time. He felt

that it was not necessary to know the inner workings of the mind in order to determine how behavior is governed (Driscoll, 2000).

What are most important to behaviorists are the stimulus, response, and the association between the two (Ertmer & Newby, 1993). This notion serves as the foundation of behaviorism theory. Learning occurs when the desired response is revealed following a specific environmental stimulus (Shipman, 1985). The model for a behaviorist learning relationship is illustrated below (see Figure 2).

Stimulus **S** ⟶ **R** Response

Figure 2 The basis association between stimulus (S) and response (R) in behaviorism learning.

From the experiments conducted by Pavlov and Skinner there emerged two key conclusions:

1. The strength of the bond between stimulus and response is increased by practice.
2. Learning depends on the reward of successful performances (Shipman, 1985)

Reinforcement is pivotal to the success of instruction in a behaviorist environment. Strategies such as instructional cues, practice, and reinforcement are most effective when used within behaviorist instructional environments. These strategies encourage the stimulus – response associations.

Philosophical Assumptions

John B. Watson has been credited with the creation of behaviorism (DeMar, 1988). He claimed that psychology was less concerned with the mind and more with behavior. His work was based on Pavlov's experiments with dogs. He trained dogs to associate a tone with a food-reward. In Pavlov's experiments, it was proved that if one

exposed dogs to the sound of a bell that was connected with feeding time, consequently, the dogs would salivate at the sound of the bell alone. In such experiments, the subject initially shows weak or no response to a *conditioned stimulus* (CS, e.g. a tone), but a measurable *unconditioned response* (UR, e.g. saliva production) to an *unconditioned stimulus* (US, e.g. food). Pavlov argued that the repeated external stimulus of the bell was a means of conditioning the dogs to react in certain way. As a result, it was believed that this process could then be repeated in humans. Pavlov called it classical conditioning.

Skinner took this notion one step further and contended that humans may be conditioned to a stimulus, but not as a result of simple environmental cues. He believed that we react to stimulus in the ways that we do because of previous consequences we may have faced. These consequences may have been the result of past behavior. Skinner agreed with Watson's contention that the mind had little to do with behavior, but he took it a step further and argued that our actions are based on our experience and reinforcements control our behavior.

Behaviorism can be found in a wide variety of disciplines. Instructional design is rooted in behaviorism, as are many other concepts and methods found in education. The root metaphor for behaviorist theory is mechanistic. Individuals are regarded as machines, where the environment is a key determinant in the behavior (Floden, & Prawat, 1994). Man appears as a biological machine, merely a respondent to the external environment. In this view, man's behavior can be manipulated or "shaped" and he (or she) may have no influence on his (or her) own actions.

Ontology

It has been argued by some (Pepper, 1942) that there may exist separate realities for all the features of nature. In this worldview, for example, space may be described in ways that have no relation to time. Natural laws, such as gravity or inertia, can be described separate from each other. Reality is also considered separate from the mind. This perspective is called a mechanistic primary metaphor and serves as the most important worldview for behaviorism learning theory. Within this assumption, knowledge may be derived from the environment where there exists an absolute truth to be attained from natural laws derived from a material world (DeMar, 1988). Many behaviorists posit that coming to know reality does not come from reason (Driscoll, 2000; Heylighen, 1993; Burton, Moore, & Magliaro, 2000; Shipman, 1985) but through the incremental objective exploration toward a permanent characteristic of knowledge that is fixed and external from the learner. These ideas were independent of the body and could only be understood through empirical approaches (Heylighen, 1993; Burton, Moore, & Magliaro, 2001). The next subsection will examine the structure of knowledge and how learners come to obtain knowledge in behaviorism theory.

Epistemology

Of the three major and most debated epistemological orientations, the one most closely associated with behaviorism is objectivism. In the objectivism epistemology, authors note (Burton, Moore, & Magliaro, 2001; Driscoll, 2000) that knowledge is believed to be external from the learner. Also, the learner reacts to this knowledge and then transfers it into their realm of belief. It is argued that there is an absolute reality, and once this reality is verified objectively, it is regarded as true if it comes from

generalizations that are based on laws, which focus on similarities between concepts (Driscoll, 2000). The locus of control is not within the learner but the instructor. The source of knowledge is based on experience. Researchers in behaviorism first believed that consciousness did not exist (Thorndike, 1913; Watson, 1919). It was thought that people may perhaps have been similar to animals and had no mental reasoning connected with their actions. This belief is born from one of two opposing epistemologies, empiricism and rationalism. Researchers began experiments with associating the sensation of satisfaction to a corresponding environmental stimulus. No regard was given to the internal thinking processes. This view continued through history and became the most important principle found in the empiricism epistemology. Empiricists see humans as being born in possession of no inherent knowledge, and only acquire it as the product of the senses interaction with the environment (Driscoll, 2000; Heylighen, 1993).

According to Driscoll (2000) a combination of the empiricism and realism epistemologies are what make up the epistemology that behaviorists follow, objectivism. Realism is the epistemological belief that things in the world can be known directly, combined with empiricism, creates the epistemology of objectivism. In objectivism it is commonly assumed that reality, which is external to and separate from the learner has the capability to be known by the learner. In this subsection, the source and structure of knowledge was reviewed. The next subsection will identify how instructors use these philosophical assumptions to create a theoretical framework in which to design instruction.

Theoretical Framework

Behaviorist-instructional environments as a rule are designed to elicit a desired response from the learner who is given a target stimulus (Ertmer & Newby, 1993). Behavioral theory tends to focus only on what is observable and happening at the present time. Human beings appear as self-correcting communication systems that modify their behavior in response to information about how successfully tasks are navigated (Joyce & Weil, 2000). The transfer of learning is based on conditioned responses with an emphasis on the promotion of an adhesion between those desired responses and an appropriate stimuli (Bigge, 1976).

Joyce and Weil (2000) suggest principles common in this theory that are consistent with the purposes of this study. The first relevant principle is "behavior is an observable, identifiable phenomenon" (p. 319). Behaviorists are likely to be less concerned with consciousness and more concerned with responses. It is argued (Ertmer & Newby, 1993; Shipman, 1985) that with practice and positive reinforcement, the reoccurrence of a desired behavior is more likely to occur. It is this focus on structure that leads this researcher to place this approach separate and distinct from the constructivist perspective.

The following principle validates the argument that behaviorism produces instructional environments which are structured and rigorous. Joyce and Weil (2000) posit, "Behavioral goals are specific, discrete and individualized." It is argued that since no two responses can necessarily proceed from the same stimulus, that no two individuals will respond in the same way. Therefore behavioral goals that are individualized tend to be better suited for a behaviorist-teaching environment. Individualized, specific and

discrete goals have proven to benefit students in terms of pacing and content. Students that are taught in behaviorist instructional environments from time to time learn at their own pace (Joyce and Weil, 2000).

Within this environment it is the job of the learner to respond to the proper stimulus with the desired response. Although the learner is an active participant (Burton, Magliaro, & Moore, 2001), the focus of learning is on their responses not on how they interpret the world (Shipman, 1985). The accuracy of the response is based on the appropriate cues, which are accompanied by proper instruction. The prescription usually follows a cue/reinforcement relationship (Ertmer & Newby, 1993).

Based on the literature, instruction should be structured, where the teacher has done the following.

1. Determined which cues can elicit the desired response
2. Arranged practice situation where target stimuli and prompts are paired within a natural performance setting
3. Allow for correct responses within the teaching environment and provide reinforcement and feedback.

Behavioral objectives must be included in all behaviorist-instructional environments. Objectives should be "specified, quantifiable, terminal behaviors" (Saettler, 1990). Broadly speaking, behavioral objectives have been normally summed up using the mnemonic device ABCD.

For example, after having completed the unit the student will be able to answer correctly 90% of the questions on the posttest.

A - Audience – the student

B - Behavior – answer correctly

C - Condition – after having completed the unit, on a posttest

D - Degree – 90% correct (p. 288)

To develop behavioral objectives a learning task may be broken down through analysis into specific measurable tasks. The learning success may be measured by tests developed to measure each objective. The following subsection will review some instructional environments that are popular with behavioral theorists.

Instructional environments

Common instructional environments within the behaviorist's theory are mastery learning/programmed instruction, direct instruction, simulations, behavior modification, and social learning theory.

Mastery Learning/Programmed Instruction

This first instructional environment of instruction is generally highly structured, straightforward, and clear. There is an ordered and systematic method of instruction given by the teacher, who also acts as a support agent toward specific learner problems. Although the student tends to be placed in a positive social climate, they are only encouraged to respond.

Mastery learning and programmed instruction are frameworks that develop preplanned sequences of instruction. Bloom and Carroll (1971) proposed that given enough time and individual attention, a student would achieve the desired objective. Modern instructional technology has allowed curriculum designers to encompass a greater degree of individualized instruction than has been possible by traditional methods.

Programmed instruction usually provides a systematic means of stimulus and immediate reinforcement. It has been proposed by some that the three essential features for effective programmed instruction are:

1. An ordered sequence of items for which the student should respond
2. The student's response
3. Provision for immediate response confirmation (Joyce and Weil, 2000, p. 332).

However, many modifications have been made to this basic structure without adversely affecting student achievement. Programmed instruction has been widely used in participants such as English, math, geography, statistics and science, and has been applied to a variety of behaviors such as concept formation, rote learning, creativity and problem solving.

The next subsection will review how the online multimedia treatment will be represented within the two instructional environments. These instructional environments were based on the five basic assumptions of behaviorism.

Behaviorist Learning Environment

It is commonly believed that through the use of reinforcement, behaviorist environments will increase the likelihood of a desired behavior (Ertmer & Newby, 1993; Shipman, 1985). Therefore, the investigator added behaviorist/individualist attributes to the intervention and assessed whether those characteristics would affect recall and transfer of knowledge.

The behaviorist-instructional environment was based on the five basic assumptions of behaviorism listed below which have been delineated in Ertmer and

Newby (1993). These assumptions are believed to be consistent across behaviorist theory and have relevance to instructional design. It is plausible to further state that these assumptions are pertinent to the behaviorist instructional environments. The assumptions include

1. An emphasis on producing observable and measurable outcomes in participants
2. Pre-assessment of participants to determine where instruction should begin
3. Emphasis on mastering early steps before progressing to more complex levels of performance
4. Use of reinforcement to impact performance
5. Use of cues, shaping and practice to ensure a strong stimulus-response association (p. 56).

An emphasis on producing observable and measurable outcomes in participants

Joyce and Weil (2000) posit, “Behavioral goals are specific, discrete and individualized.” It is argued that since no two responses can necessarily proceed from the same stimulus, that “no two individuals will respond in the same way” (p. 320). Therefore behavioral goals that are individualized tend to be better suited for a behaviorist-teaching environment. Individualized, specific and discrete goals have proven to benefit participants in terms of pacing and content. Behavioral objectives must be included in all behaviorist-instructional environments. Objectives should be "specified, quantifiable, terminal behaviors" (Saettler, 1990, p. 288). To develop behavioral objectives a learning task may be broken down through analysis into specific measurable tasks.

Pre-assessment of participants to determine where instruction should begin

In order to measure learning success, formative and summative assessments were to be included in behaviorist environments toward each objective. These assessments were conducted at the beginning and end of the instruction to provide frequent evaluations of pupil's progress and provide a basis for further customization of the learning process. The meteorological filter test was such a measurement in this environment. It determined each participant's level of prior knowledge or familiarity with weather subject matter.

Emphasis on mastering early steps before progressing to more complex levels of performance

Participants that are taught in behaviorist instructional environments learn at their own pace (Joyce and Weil, 2000). The amount of time it takes to learn is a matter of consideration for learning in behaviorist environments; according to Carroll (1971) this is called aptitude. A student's aptitude is also a determinant in the sequencing instruction.

Use of reinforcement to impact performance

It is argued (Ertmer & Newby, 1993; Shipman, 1985) that with practice and positive reinforcement, the reoccurrence of a desired behavior is more likely to occur. Within this environment it is the job of the learner to respond to the proper stimulus with the desired response. Although the learner is an active participant (Burton, Magliaro, Moore, 2001), the focus of learning is on their responses not on how they interpret the world (Shipman, 1985).

Use of cues, shaping and practice to ensure a strong stimulus-response association

The accuracy of the response is based on the appropriate cues, which are accompanied by proper instruction. The prescription usually follows a cue/reinforcement relationship (Ertmer & Newby, 1993). Based on the literature, instruction should be structured, where the teacher has done the following:

1. Determined which cues can elicit the desired response
2. Arranged practice situation where target stimuli and prompts are paired within a natural performance setting
3. Allow for correct responses within the teaching environment and provide reinforcement and feedback.

Individualized Characteristics

In order to create an environment that was reliably individualistic, the individualized form of the treatment was designed according to the characteristics of an application of systems planning that was developed by the Learning Research and Development Center of the University of Pittsburgh. This program, aptly named Individually Prescribed Instruction (IPI) burgeoned into the 1970s until it lost funding and its use diminished. This modular curriculum was based on the characteristics of mastery learning (Carroll & Bloom, 1971) as it allows for the most essential elements in this behaviorism theory according to Guskey (1985).

1. Feedback and correctiveness.
2. Congruence among instructional components.
3. Clearly specified learning objectives.
4. Clearly formulated learning standards.

5. Appropriate group based instruction (pp. 131-134).

Furthermore, according to Mergel (1998) the main features of IPI are:

1. Prepared units.
2. Behavioral objectives.
3. Planned instructional sequences.
4. Used for reading, math and science.
5. Included pretest and posttest for each unit.
6. Materials continually evaluated and upgraded to meet behavioral objectives. (Saettler, 1990)

The modular curriculum operates on the assumption that participants differ at their rate of learning; therefore accommodations are made for each pupil by providing a program of study that includes specific objectives that are customized to every student's rate of learning. The provision for student individuality in learning creates self-initiation, and self-directed paths for learning. According to literature (Joyce & Weil, 2000) the environment is designed

1. To enable each pupil to work at his or her own rate through units of study in a learning sequence.
2. To foster the development in each pupil a demonstrable degree of mastery.
3. To foster the development of self-initiation and self-direction of learning.
4. To foster the development of problem solving through processes
5. To foster the ability to encourage self-evaluation and motivation for learning. (p. 325)

In the IPI program, the participants will differ in their time to complete their objectives so the learning environment is arranged to accommodate those differences. Also, assessment is conducted throughout the program in order to respect the rates of individual achievement. The fundamental characteristics of IPI as noted by Joyce and Weil (2000) are as follow.

1. Each objective should tell exactly what the student would do.
2. Objectives should be grouped in meaningful streams of content.
3. Within each stream or area, the objectives should be sequenced in such an order that each would build on those that precede it, and, in turn, be a prerequisite to those that follow.
4. Within the sequence of objectives in each area, the objectives meaningful subsequences or units.

Socio Cultural Constructivism

Constructivism is based on a number of different theories, many of which do not agree, however Cunningham and Duffy (2001) proffer two general views that are widely accepted, they are

1. Learning is an active process of constructing rather than acquiring knowledge, and
2. Instruction is a process of supporting that construction rather than communicating knowledge.

Constructivism exists in a continuum where on one end there is the belief that knowledge is still inherent in the individual and, on the other end, where knowledge is the totality of the engagement with others (Palincsar, 1998). These perspectives have

been divided into two schools of thought (Duffy & Cunningham, 2001). The first borrows from Piaget in that it argues learning is a constructive process inherent in the individual as he or she discovers the world around them through a process called disequilabration. This view is called radical constructivism, represented by such theorists as von Glasersfeld, Fosnot, and Piaget.

The second school of thought, the one that is most important to this study, is the socio-cultural constructivists perspective. It examines the collective insights of the learning community. Learning appears to be a process of acculturation, with all students serving the purpose of participating in shared activities that add to the culture of the instructional environment. The social and cultural context in which learning occurs is critical to learning. Learning is generally context specific (Palincsar, 1998).

These contrasting views have been debated throughout academia, however the views of socio-cultural constructivism are paramount for the purposes of this review. Based on the literature, Smith-Jackson and Wogalter (2000) state

> Experience and context are culturally driven, and therefore strongly influence the manner in which individuals learn and use technologies. As yet, no researcher has applied cultural cognition, a constructivist approach, to the design of interfaces for ethnic and class minority groups. Researchers in cultural cognition have identified differences in information processing that are believed to be associated with culture, yet interface designers do not consider these differences when designing software interfaces, nor is there any attempt to increase the customizability of software interfaces (p. 5).

The cultural component of socio cultural constructivism makes this theory vital to this study. Some argue toward the possibility of cross-cultural research for delineating cultural values and their effects on an instructor's perception when approaching intercultural learning situations, as well as culture's effects on what is considered knowledge (Rorty, 2000; Baumgart & Halse, 2000; Cunningham & Duffy, 2000). This study examines how the national differences of culture affect choices made by intercultural students toward their learning. Therefore by examining the theoretical tenets of socio-cultural constructivism, this researcher seeks to understand how a student's cultural perceptions of their learning will affect what choices will be made when provided with learning situations unfamiliar to their native culture.

Philosophical Assumptions

There are many notions proposed as to the process of negotiation within socio cultural constructivism. It has been argued (Floden & Prawat, 1994; Moshman, 1982; Pepper, 1970, Morgan, 2001) that contextualism may be the primary worldview best associated with socio-cultural constructivism. The contextualism root metaphor relies on an act, which unfolds in context of the learner (Floden & Prawat, 1994). There is an open-endedness that appears to be opposite than that of mechanistic theories such as behaviorism. The fact that anything may happen is what makes the socio-cultural constructivism – instructional environment so unique.

Contextualists tend to view the process of learning as emergence, as opposed to the learner having to conform his ideas to that of the environments. The classroom is viewed as a place where a new relationship is formed between the environment and the organism. Within this emergence, new features arise out of each interaction. This is

similar to Vygotsky's Zone of Proximal Development (1978) where he argues that learning, although it may be constrained by development can be also dependent on the successful negotiation between the learner, his peers, and the learning environment. Vygotsky (1978) defines the zone of proximal development or ZPD as

> The distance between the actual developmental level as determined by independent problem solving and the level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers (p. 86).

Vygotsky is regarded a socio-cultural constructivist. He was concerned with the unity and interdependence of learning and development. For example, he was critical of Piaget's theory in which "maturation is viewed as a precondition of learning but never the result of it" (Palincsar cites Vygotsky, 1978, p. 80).

In contrast, Cole (1985) has characterized the ZPD as "where culture and cognition create each other." For the purposes of this review of literature, it is something that is established dynamically, and it also stands as a gauge for instructional design consideration. The ZPD can be instrumental in determining how much intercultural understanding and support is necessary in an instructional environment for a particular culture. It can serve to create or increase cultural sensitivity in course designers. This type of learning has also been called dialectical constructivism (Moshman, 1982), where dialogue is used in the investigation and acquisition of knowledge.

Ontology

The nature of truth for contextualism tends to be based on contradiction. It is not fixed and external but it evolves as a continuing dialectical process of understanding

between learners. Truth tends to be an ever-changing concept contained in a world that is in constant flux. Some argue (Driscoll, 2000; Duffy & Cunningham, 2001; Moshman, 1982; Palincsar, 1982) that there may be no "whole" truth. Truth as a rule is not some random belief to be misinterpreted at our leisure. The variables contained within an event may influence how we experience that event. Our awareness of the truth for an event may emerge through the amount of our involvement with that event. When contained in a particular context, there may be no such thing as absolute truth. According to Moshman (1982) it is the continued synthesis brought about by ongoing construction of theses and antitheses that tends to create and in turn transcend a given truth. Within the constructivist-learning environment however, generally collaboration is more than just the sharing of ideas. It is the collective total conclusion reached by all of the participants in the group, which would otherwise have been impossible for them to reach independently. The ideas generated by the collective have a propensity to allow individual participants to formulate new strategies toward problem solving.

With respect to the philosophy of constructivism, some argue (Moshman, 1982; Salomon, 1993) that context plays a central role. Experience and prior knowledge also guide the adult learner through material they are learning. Oliver (2000) contends that the constructivist theory is built upon a view of knowledge similar to Aristotle, in which knowledge is practical and situational. It is based more on experience than theory. Therefore, learning activities should be authentic and realistic enough to motivate students within a practical context. This is done in order to keep students interested in learning.

The next subsection will examine the structure of knowledge and how learners come to obtain knowledge in socio-cultural constructivism theory.

Epistemology

Constructivism has been divided into many major paradigms. The most popular is radical constructivism, where learning is the constant reorganization of previously assimilated information, also called schemes, to create new knowledge. Authors argue that the epistemology here is a rationalist's orientation (with the world and the mind being separate). Research suggests (Duffy & Cunningham, 2001; Palincsar, 1998) that Piaget is one of the creators of what is now called cognitive constructivism, due mostly to his views on genetic epistemology, the belief that knowledge is derived as a child goes through a series of developmental stages. Vygotsky proposed that a collective cognition, which is in direct opposition of what Piaget proposed, was evident as students reached levels of development. Cognition according to Vygotsky is the result of shared endeavors that creates such development, whereas Piaget viewed learning as being constrained by ones development. This is a shared process of development where others in order to reach a new level of understanding guide an individual's actual performance toward their potential performance. This internalization gives learners a new appreciation for their world and their culture (Palincsar, 1998).

The epistemological orientation of socio cultural constructivism is interpretivism. Knowledge, in this postmodern epistemology is regarded by Prawat (1996) as not the property of the individual, but is dependent on ones frame of reference. Knowledge for constructivism therefore is not of primary importance. It is a social construct. It all depends on what conclusions are reached by the collective. There must exist however, a

guide within the instructional environment to elevate the novice from any limitations in skills they may have. This concept is similar to Vygotsky and his Zone of Proximal Development though it has been suggested (Wertsch & Rupert, 1993) that this theory is too individualistic in nature for constructivism.

Theorists (Salomon, 2001) have also associated socio-cultural constructivism with distributed cognition. However, Salomon offers a contrasting perspective, which is paramount to this study. He contends that although theorists have argued emphatically over whether the concept of knowledge is located not within the head of the individual, but as a part of a collective, this idea of distributed cognition may have been taken too far. He argues that although cognition can be distributed among the group, there must be a primary source. That within the social context there are singular withholders of knowledge, which through productive collaboration, grow and become more intelligent. Salomon further argues that within distributed cognitive situations it has been lost through many theorists' interpretations if the individual should be considered at all. Salomon (2001) explains: The product of intellectual partnership that results from the distribution of cognitions across individuals or between individuals and cultural artifacts is a joint one; it cannot be attributed solely to one or another partner. In this subsection, the source and structure of knowledge was reviewed. The next subsection will identify how instructors use these philosophical assumptions to create a theoretical framework in which to design instruction.

Theoretical Framework

Socio-cultural constructivists believe that the individual and the world are inseparable. Although there are different metaphors that have been associated with

constructivism (see Pepper, 1970; Duffy & Cunningham, 2000), theorists view memory construction as an ever interwoven collection of tubers (similar to a web) that has no apparent beginning or end, called a rhizome. Authors have defined a rhizome as a system of stems, roots, and fibers whose fruits are tubers or bulbs and leaves (Duffy & Cunningham, 2001). The constant changing rhizome may modify its configuration as each new bit of information is acquired and networking to any part of any other part. This configuration rejects any notion of structure and hierarchy or order of information and is dynamic. Every point can and must be connected with every other point. The rhizome whole is an open network.

Socio-cultural constructivists instructional environments have often been called learner-centered environments. Learner-centered environments are those that create instruction that respects the culture of the learner; moreover, they are courses in which instructors are aware that students construct their own meanings. According to Wolcott and the National Research Council, there needs to be an adjustment to a number of factors that contribute to course design. This adjustment is necessary in order to build courses that are learner-centered (Council 2001,Wolcott 1996). Wolcott suggests that course creators look carefully at the "attitudes, policies, and practices" (p. 25), while the NRC suggests a process called diagnostic teaching, in that, it "engages students in cognitive conflict" and allows them to have discussions about their viewpoints.

In keeping with the tenets of socio-cultural constructivism, the support of learner's needs extends beyond the confines of only instruction. The next section reviews existing models that have gone beyond the traditional mode of thinking to accommodate the unique needs of a diverse audience of students.

Instructional environments

Before describing the instructional environments that are found in the social family, it is important to point out the tenets that separate constructivism from behaviorism. Within the socio-cultural constructivism theory there are teaching methods that to some would seem to be unorthodox. These methods do not necessarily align with traditional classroom environments. Typically socio-cultural constructivism emphasizes that truth cannot come to be known by contemporary means in any form that is meaningful, but rather it is built upon by social interaction (Prawat & Floden, 1994). This study has reviewed the ontology and epistemology of each of the major theories, but it is this understanding of what truly is knowledge and what it is to exist (or the state of reality) that is the central issue of socio-cultural constructivism (Doolittle & Hicks, In Press). There are four philosophical tenets that constructivism is built on to address the issues of ontology and epistemology (Garrison, 1998; Gergen, 1995; von Glaserfeld, 1998).

Tenet 1: Knowledge is not passively accumulated, but rather, is the result of active cognizing by the individual.

Tenet 2: Cognition is an adaptive process that functions to make an individual's cognition and behavior more viable given a particular environment or goal.

Tenet 3: Cognition organizes and makes sense of one's experience, and is not a process to render an accurate representation of an external reality.

Tenet 4: Knowing has its roots in both biological/neurological construction and in social, cultural, and language-based interactions.

Socio-cultural constructivism is concerned with all of the four tenets, emphasizing the social nature of knowledge (Doolittle & Hicks, in press). Given the nontraditional methods used in the instructional environments that are found in socio-cultural constructivism, and the non-traditional pedagogical nature of each instructional environment; this section will be organized according to the following six theoretical principles which are based on the four tenets listed above.

1. The construction of knowledge and the making of meaning are individually and socially active processes
2. The construction of knowledge involves social mediation within cultural contexts
3. The construction of knowledge is fostered by authentic and real-world environments
4. The construction of knowledge takes place within the framework of the learner's prior knowledge and experience
5. The construction of knowledge is integrated more deeply by engaging in multiple perspectives and representations of content, skills, and social realms
6. The construction of knowledge is fostered by students becoming self regulated, self-mediated, and self aware (Doolittle & Hicks, in press, pp 18-22).

It is not that these models are mutually exclusive to the principles given, but they share characteristics directly associated to the principle with which they are presented. Neither model is unswervingly connected with the principle under which they are listed. However, the characteristics of the models are symbiotic with the principles as they serve

to create a successful environment for achievement. The teaching methods are not prescribed tasks, but best practices. This is by no means an exhaustive collection of instructional environments within the socio-cultural constructivism family. This researcher intends to review these environments on the basis of their structure (or lack thereof) in order to align them with a participant's cultural characteristic, which is based on the cultural dimensions that are proposed by Hofstede (1980).

Collaborative Learning/Cooperative Learning

Of the aforementioned theoretical principles of constructivism, the two most associated with collaborative learning are the first and fifth principles. Although collaborative learning is an environment in which the active social processes of negotiation, shared discourse and new social structures are created (Pacher & Boicoechea, 2000), it tends to mostly be associated with the engaging of multiple perspectives from groups. Not only would groups be created to provide variety in classroom activities; this discourse is needed to actively create meaning from previously puzzling scenarios (Doolittle & Hicks, In Press; Joyce & Weil. 2001). Driscoll (2000) argues that within the constructivist- instructional environment collaboration is more than just the sharing of ideas. It is the collective total conclusion reached by all of the participants in the group, which would otherwise have been impossible for them to reach independently. "Collaboration may enable insight and solutions to arise synergistically" (Brown et al, 1989, p. 385). Culture has a tendency to become integral in the process of collaboration in that it "becomes the transmission or sharing of cultural knowledge" (Driscoll, 2000). The ideas generated by the collective appear to allow individual participants to formulate new strategies toward problem solving. It is most paramount to

this study that when placed in groups, Grabinger (2001) argues that individuals may be more willing to take on risks required to tackle complex, ill structure authentic problems when they have the support of others. This contention is similar to Triandis (1995) explanation of collectivist group members seeing themselves as higher in self-efficacy when working with their in-group, and being as competitive in intergroup competition, seeing achievement as group achievement. It is also analogous to Eisenburg's (1999) contention that collectivists (in group members) tend to be more motivated and challenged by their work under external controls than under personal control, as long as the external control is perceived as originating from an in-group member. The following paragraphs will detail the instructional environments contained within socio-cultural constructivism theory.

Learning Communities

Driscoll (2000) defines learning communities as instructional environments in which teachers and learners work collaboratively to achieve important goals, goals that may well have been established jointly. Within this environment there usually is no one in "charge" or one "expert." All participants are generally respected for their interests and experiences and given an opportunity to learn different concepts.

An example of a learning community can be found in the Maricopa Community College District (Rasmussen & Skinner, 1999). Although the courses take on many forms, they all share one thing in common – the activities and courses are seamlessly linked together. Students from psychology, sociology, and economics courses all gather together in one area to attend a presentation on gang violence. Discussion follows shortly thereafter. Integrating coursework, a theme that is popular across elementary curricula

fosters collaboration between diverse populations of students found in online learning communities. Rasmussen and Skinner (1999) suggest that by erasing the divisions between courses this educational experience will tend to be more coherent and meaningful for a more diverse audience of learners.

Learning communities, believed to be more relevant to the real world, have a tendency to create environments that emphasize meaningful interaction for learners based on common themes. The contention that the integration of disciplines will improve the learning experience of students is similar to the argument that Driscoll (2000) gives for the collaboration between students from diverse cultures. She states that "culture becomes integral in the process of collaboration in that it becomes the transmission or sharing of cultural knowledge" (p. 385). Therefore, by going a step further and designing learning communities not just in respect to interdisciplinary instruction, but also in respect of the culture of diverse audiences, the co-constitutive process of learning may change all participants involved through even more meaningful interaction. Not only would students develop strategies synergistically with those of their kind, but also they would be enveloped within a community of collaborative support brought together by the common theme of the problem to be solved.

Another example of an online learning community is the Computer-Supported Intentional Learning Environment (CSILE). This online environment allows participants to share insight in the form of a communal database. Questions are posed and hypotheses are generated. There is normally no structure to the method of collaboration as the focus is on knowledge building.

Computer Based Constructivist Instructional environments: Instructional Micro Worlds/Hypermedia and Open Software/Course Management Tools

These environments are teaching methods that have been given the term constructivist instructional environments (Driscoll, 2000; Duffy & Cunningham, 2001, Grabinger, 2001).

Micro Worlds are described as having the simplest working model of system, and they are adaptable to the student's level of achievement. They can be found either in software on interactive videodisk media.

Hypermedia (web accessed media) is typically run on computers that have been networked over the Internet, giving them the capability to reach large audiences of learners simultaneously. Information is usually stored in a database and retrieved by the learners through a webpage. This data can be represented in a wide variety of ways (biographies, graphics, statistics, design, text, etc.) These environments are authentic in their activity and support self-directed learning and social negotiation (Driscoll, 2000). Open Software/Course Management Tools are normally virtual "real estate," set aside as "shells" for instructors to create the type of instructional environment that instructors feel is best suited to teach their students. Web based courses may be designed using course management tools such as eCollege, WebCT, Blackboard, or Construe as the arena for students to interact in ways that are conducive to constructivism principles. It is possible however, that instruction may not necessarily be constructivist in nature, as these tools do not guarantee the nature of the instructional environment. The level of constructivism principles employed in these instructional environments is dependent on the design methods of the instruction.

Furthermore, constructivists state that an authentic instructional environment is central in providing the appropriate context for learners in respect to their culture. It was further argued that when built from a constructivist standpoint, a quality online course should include co-operative support. There are benefits to learning that can be gained from the collaboration between students. A synergy can develop between participants, which provide differing points of view and the clarification of misconceptions (Bostock, 1998; Slavin, 1991). Some conclude that quality courses may allow individuals to use experiences to construct meaning and to interact successfully with their environment. Trentin (2000) asserts that innovative instructional environments are not those that just replicate the traditional learning setting, but that motivate students in full-fledged cooperative communities.

Hardy & Boaz (1997) assert that successful facilitation of adult learning includes the following features:

1. A learner has full responsibility for his or her own learning
2. The subject matter has relevance and meaning for the learner
3. Involvement and participation are necessary for learning
4. The relationship between learners shows helping styles and learner self-responsibility
5. The teacher is a facilitator and resource person.

With respect to the philosophy of constructivism, context plays a central role. Experience and prior knowledge also guide the adult learner through material they are learning. Oliver (2000) draws a parallel between constructivist philosophy and Aristotle's view of knowledge from the functionalist perspective. Aristotle emphasized

the need to provide situated learning opportunities that are derived from concrete events or experiences, as opposed to using abstractions and theories. Activities should be situated in authentic contexts to motivate and interest students in learning (Boyle, 1996).

The next subsection will review how the online multimedia treatment will be represented within the two instructional environments. These instructional environments were based on the five basic assumptions socio-cultural constructivism.

Socio Cultural Constructivist Instructional Environment

This instructional environment was based on the five basic assumptions of socio-cultural constructivist listed below which have been delineated in Ertmer and Newby (1993). These assumptions are believed to be consistent across socio-cultural constructivist theory and have relevance to instructional design. It is plausible to further state that these assumptions are pertinent to the characteristics of this instructional environment. The assumptions include:

1. An emphasis on the identification of the context in which the skills will be learned and subsequently applied.
2. An emphasis on learner centeredness and the capability of the learner to construct knowledge.
3. The need for information to be presented with a variety of perspectives.
4. Supporting the use of problem-solving skills that allow learners to go "beyond the information given."
5. Assessment focused on transfer of knowledge and skills.

An emphasis on the identification of the context in which the skills will be learned and subsequently applied

Social cultural constructivists believe that the individual and the world are inseparable. It is the goal of social-cultural constructivism to promote achievement in a manner that allows learners to create their own meaning through collaboration with their peers. Multiple perspectives are assimilated to bring solutions to the problem at hand. There is a usually an emphasis on real world problems. The emphasis of instruction should be on how to create and monitor the construction of knowledge that is occurring between learners, and an alignment of the instructional environment with authentic and relevant contexts. The context created is usually as real as possible in order to simulate what students will encounter once they enter the complexities of the real world. They tend to provide environments with rich realistic contexts in which the learner is a full participant in a community of practice (Driscoll, 2001). Instead of reacting to a predictable set of prescribed activities, the learner generally engages in the experiential activity of socio-cultural practice then becomes increasingly competent in this practice.

An emphasis on learner centeredness and the capability of the learner to construct knowledge

Socio-cultural constructivist instructional environments have often been called learner-centered environments. Learners are encouraged to actively use what is taught to them. Learner-centered environments are those where instruction is created that respect all cultures of learners. Learners are trained to create their own meaning through multiple perspectives and discovery. Doolittle and Hicks (In Press) posit that students actively construct intersections in order to create meaning and order from disorder.

The need for information to be presented with a variety of perspectives.

This design of instruction will give learners the practice necessary to adapt to situations that are ill structured. These ill-structured problems are typically situated in and emergent from a specific context (Jonassen, 1993). This development of different perspectives will allow learners to create more sophisticated approaches to new situations in order to better manipulate information.

Instruction must be created in which the learner is exposed to original and challenging situations. Over time, as the learner gains more confidence through discussion with their peers and becomes more adept to the variety of encounters, they move from novice to expert. Their acquired knowledge becomes suitable to the instructional environment through their creation of new ideas and their familiarity to each new occurrence. Grabinger (2001) argues that individuals may be more willing to take on risks required to tackle complex, ill structure authentic problems when they have the support of others. Through this experience, both the learner and the learning process are changed.

Supporting the use of problem-solving skills that allow learners to go "beyond the information given"

The unpredictability of most constructivism instructional environments demand excellent problem solving skills. Grabinger (2001) claims that problem based learning represents the epitome of constructivism instructional environments in that it requires that there be support from the instructor to the learner to develop critical thinking skills. This concept born out of Dewey's philosophy of learning, emphasized that teaching in schools should promote the students' ability to function in the world as it is, giving them control

in order that they would be productive citizens. Students would engage in activities in school that were useful to them when they entered the workforce.

This type of learning endeavors to ensure that instruction is centered on real world events that are relevant to the lifestyle of the learner. Self-directed learning is the goal of problem-based learning. The teacher may function as a true facilitator who challenges students while at the same time monitoring and helping them to ask the appropriate questions. He (or she) may not give opinions, information, or guide the students, but is there to offer support in developing critical thinking skills (Cunningham & Duffy, 2001; Grabinger, 2001). It is a collaborative process from start to finish. Together with peers, students appear not only to focus on group investigation of the problem, but areas of study that will apply to their own learning.

Assessment focused on transfer of knowledge and skills

In order to measure learning success in the social cultural constructivist learning environment, assessments should be designed that present the problem in ways that differ from the initial presentation (Ertmer & Newby, 1993). Although results from studies on transfer reveal that determining whether true transfer of knowledge has occurred is no easy task (Driscoll, 2000), it is worth including conditions of learning that facilitate transfer of knowledge. Learners should be able to accurately apply the knowledge they have acquired from the instruction, and be able to demonstrate its incorporation by utilizing those skills across a number of similar situations.

Collaborative Characteristics

In order to create an environment that is reliably collaborative, this version of the treatment was designed according to the constructivist conditions of learning proposed by

Driscoll (2001) and the elements of cooperative learning proposed by Hilke (1990). Some of the characteristics were combined based on the similarities of philosophies. These conditions emphasize social negotiation in which groups of individuals collaborate to bring about multiple insights to solutions that are created synergistically (Driscoll, 2000). They also stress the ability for participants to work together in heterogeneous groups in order to meet a goal (Hilke, 1990). Driscoll (2000) states the constructivist conditions of learning relevant to the treatment should include:

1. Embed learning in complex, realistic, and relevant environments
2. Provide for social negotiation as an integral part of learning
3. Support multiple perspectives and the use of multiple modes of representation
4. Nurture self-awareness of the knowledge construction process (pp. 382-383).

According to Driscoll (2000), these conditions of learning must be present if the goals of constructivism are to be achieved. These recommendations, which borrow from other learning theories, largely emphasize the process of learning. The conditions also meet the instructional goals of reasoning, critical thinking, recall, understanding, self-regulation, and mindful reflection.

Embed learning in complex, realistic, and relevant environments

Some authors contend that complex instructional environments are better suited for learning in constructivism theory (Jonassen, 1997; Spiro, 1991; Wilson, 1996). Complex instructional environments give students a variety of possible models to choose from when examining a problem. According to Doolittle and Hicks (in press) constructivist settings contain “authentic real-world environments that are comprised of

naturally occurring, spontaneous experiences, including activities, contexts, problems, and goals" (p. 19).

Support multiple perspectives and the use of multiple modes of representation

Authors agree in the importance for information to be presented in ways that are diverse, irregular and complex (Driscoll, 2000; Ertmer and Newby, 1993). Instructional design necessitates the need for multi-modal representation of content. It has been argued by some that in constructivist environments it is essential to include the capability for information to be revisited at different times, in rearranged contexts for different purposes and from different conceptual perspectives (Ertmer & Newby 1993). According to Doolittle and Hicks (In press) knowledge should "be presented in multiple formats to maximize both the learning among individuals and learning within each individual" (p. 20).

Provide for social negotiation as an integral part of learning

Social negotiation has been called a "critical feature" in constructivist instructional environments (Driscoll, 2000). Through negotiation, learners begin to develop ideas collectively that they would not have developed independently, and begin to understand perspectives other than their own. This is done by learner participation. The learners each propose an idea, and in turn, justify it, while concurrently listening to others solutions and listen to their justification also. According to Hilke (1990) the proper structure for a cooperative instructional environment includes participation from all members of the group which involves listening carefully and critically, taking turns to speak, assisting those group members who have difficulty understanding, and respecting each other's perspectives. According to Doolittle and Hicks (in press) knowledge is

created through a combination of active social and individual processes. Among them are shared discourse, the creation of social structures and social negotiation.

Nurture self-awareness of the knowledge construction process

According to Driscoll (2000) self-awareness, or reflexivity, is the ability of learners to invent and explore new structures from which they have learned. The learners, in turn, form their own assumptions and either accept or reject these structures. It is essential to understand this condition, as participants were expected to justify their perspectives when debating with their group members. According to Doolittle and Hicks (in press) within constructivism environments students should "… become self-regulatory, self-mediated, and self-aware by being directed to set their own goals, regulate their own thought processes and understandings, and monitor their own progress" (p. 21). This process is essential to promote the development of individuals who are autonomous and directing their own lives in order to become life long learners.

Assessment focused on transfer of knowledge and skills

In constructivism, Mayer (1999) contends that assessment of instruction should use multiple measurements of achievement, which includes recall and transfer. Evaluation should focus not only on just the quantity of material learned but exactly what material was learned. According to Mayer (1999), in constructivist instructional environments the creation of problem solving transfer begins with the activation of three cognitive processes, which include: selection, organization, and integration of relevant material to be learned. He calls this process the Selection, Organization, and Integration model of learning (SOI). In this experiment, the collaborative version of Mayer

multimedia presentation of the treatment was modified to facilitate the activation of these cognitive processes using the techniques identified by Mayer (1999).

The previous section described the learning theories, philosophical assumptions, theoretical frameworks and the characteristics of instructional environments. Research has shown (Burton, Magliaro, & Moore 2000; Doolittle & Hicks, In Press; Driscoll, 2000; Heylighen, 1993; Floden & Prawat, 1994; Grabinger, 2001; Duffy & Cunningham, 2001; Moshman, 1982; Morgan, 2000; Palincsar, 1998; Pepper, 1970; Saettler, 1990; Salomon, 1993; Shipman, 1985) that the two proposed theories are conversely related. It has been hypothesized that the attributes of the teaching methods used range from being very structured to having very little structure. It is central to examine these attributes as they may lead to indications of learners attitudes toward these students may use when choosing instructional environments. The next section reviews where the theories and instructional environments exist on a continuum of learning.

Continuum of Theories and Instructional environments

Based on this study this researcher argues that the learning theories, and instructional environments as they were reviewed in the previous section can be positioned on a continuum as illustrated in Table 7 and 8. As one moves along the behaviorist- cognitive- constructivist continuum, the focus of instruction shifts from teaching to learning, from the passive transfer of facts and routines to the active application of ideas to problems.

Table 7

Learning Theories Continuum

	Behaviorism	**Constructivism**
	Most Structure	Least Structure
World View	Mechanism	Contextual
Epistemology	Objectivism/empiricism	Interpretivism
Learning Process	Incremental	Interactive
Framework	Programmed Instruction	Cognitive Apprenticeship
Key Principles	Learning = correct responses + specific stimulus. Emphasis is on behaviors	Learning = personal interpretation + experiences Emphasis is on the context
Goal of Instruction	Communicate / transfer behaviors	Build personal interpretations of the world

Table 8

Instructional Environments Continuum

	Behaviorism	**Constructivism**
	Most Structure	Least Structure
Teaching Modes	Instructional cues to elicit correct response Reinforcement for correct responses Multiple opportunities/trials (Drill and practice) Mastery Learning Programmed Instruction Direct Instruction	Collaborative Learning REALs Anchored Instruction Cognitive Flexibility Hypertexts Cognitive Apprenticeships Micro Worlds Hypermedia Object-based Learning

The previous subsection has examined research that places the learning theories presented in this review on a continuum. When combined, the dimensions of culture and learning theories reveal possible relationships that may impact the use of culture as a deciding factor in the design of distance instructional environments. The next subsection explores the framework which briefly illustrates the four dimensional model proposed by Hofstede in relation to the principles, goals and relevant frameworks of the learning theories and their instructional environments.

The Four-Dimensional Model and Instructional Environments

Behaviorist instructional environments share certain commonalities. Learning is a result of a student's response to positive consequences that have been brought about by systematic rehearsal of skills. The learner typically reacts to the cues they are given from the instructional environment. Solutions are derived as a result of rehearsal of skills that have been positively reinforced.

Skinner's teaching machines, programmed text, mastery learning, and computer-assisted instruction are all examples of instruction that include behaviorism principles. It is suggested by this researcher that participants with scores that reveal high individualism (IND) (see Figure 5) will prefer environments that encompass these behavioral principals when given a choice between this situation and a more socio-cultural constructivist instructional environment. A representation of this presumed relationship between behaviorism theory and the dimensions of individualism vs. collectivism is illustrated in the Table 9 below:

Table 9

Cultural Dimensions and Instructional Environments (IND)

BEHAVIORISM THEORY Structured logical presentation of content Instruction utilizes consequences and reinforcement of learner behaviors			
	Cognitive consistency is more a factor in learning	Select learning strategies that require privacy & individual work	Be motivated by internal individual goals
Individualism Characteristics	Students expected to learn how to learn	Will perform tasks based on perceived achievement	Sub groupings in class vary based on the task at hand
	Try to change externally set goals	Success is attributed to ability	Require more choice in task selection

There are also certain shared commonalities found throughout socio-cultural constructivist instructional environments. Achievement is a result of a student-to-student and student-to-teacher interaction. These environments rely on the authentic context of the learning experience. The learner typically is given problems to solve through real life circumstances, and is driven to ascertain creative solutions through social negotiation either with a peer or in the form of an apprenticeship.

Instruction is usually designed in order to teach the student how to create meaning, monitor, evaluate and re-construct meaning. It is also created to align experiences for the learner that are authentic and within relevant contexts. This researcher suggests that participants with scores that reveal low individualism (COL) will choose environments that encompass these socio-cultural constructivists principals when given a choice between this situation and a more behavioral learning environment. A representation of the presumed relationship between social-cultural constructivism theory

and the dimensions of individualism vs. collectivism is illustrated in Table 10 below:

Table 10

Cultural Dimensions and Instructional Environments (COLL)

SOCIAL CULTURAL CONSTRUCTIVISM THEORY Unstructured learning, engaging learner in actual use of tools in real world context Instruction utilizes is a process of supporting knowledge construction			
	Be motivated by their groups	Select learning strategies that adapt to their pattern of learning and require group work	Situational determinants matter more in learning
Collectivism Characteristics	Large classes split into smaller groups for more cohesive interaction	Perform tasks because of feelings obligation more than internal intentions	Students expected to learn how to do
	Motivated also by norms and habits consistent with customs	Success attributed to effort	Try to reach higher externally set goals

The support of learners needs extends beyond the confines of only instruction. In order to reach students of all cultures, instructional designers, faculty, teachers and administrative support staff should agree on the creation of instructional environments that foster collaboration, efficient use of resources and innovation. The next section reviews existing environments of distance-learning programs that have gone beyond the traditional mode of thinking to accommodate the unique needs of a culturally diverse audience of students.

Culture and Distance Instructional Environments

Researchers indicate that ethnocentric design of a technology that is deployed to an out-group culture can disempower those with different cultural views (Smith-Jackson and Essuman-Johnson, 2002; Smith-Jackson & Williges, 2002; Smith-Jackson &

Wogalter, 2000). Trentin (2001) argues that good online instructional environments are those that foster "strong interaction between the players in the process; [are] organized in full-fledged virtual classes, [and require that] the participants must obviously respect schedules and deadlines if a collaborative working strategy is to be successful" (p. 20). Starkey (2001) contends that "it has been well-documented and much commented on that American educational curriculum has a tendency toward Euro-centrism and is particularly lacking when it comes to foreign language immersion and appreciation of multiculturalism." (p. 57) "One of the key ingredients for raising the quality of an online course is strong interaction between the players in the process" (Trentin, 2000, p. 20). It is logical to add then, that systems that are built without consideration for the different cultures of its students adversely affect the learning of its students. Therefore, with the inconsistencies that exist in the design of culturally appropriate online instructional environments, there is a need for an investigation of these discrepancies.

Existing Models

The models reviewed in this section provide details on both the design and interactivity of instructional environment. Both behaviorist and constructivist online instructional environments will be reviewed.

Behaviorist Models

The Stimulus-Response (S-R) paradigm that was proposed by Skinner lead to much of the design of instruction media, with technologies such as film, television (such as The Open University), and programmed instruction acting as the stimulus component (Burton, Magliaro, & Moore, 2001). Teaching machines used widely with the U.S. Air Force after World War II were examples of devices that taught "automatically" by providing students with immediate feedback to questions taken on tests. Programmed instruction, which was immensely popular and extensively researched in the 1950's provided students with a logical presentation of content, a requirement of obvious responses that would, in turn, provide positive or negative reinforcement. The thousands of studies that were conducted on this type of learning derived much of their basis on the principles of behaviorism or human behavior. Instructional design, which is a systematic process of incorporating learning theory to prepare and arrange instruction in an organized sequence, has it's roots in behaviorism as well. Authors argue (Gilbert, 1962; Reigeluth, 1983) that the components of behaviorism such as specification of behavioral objectives, concentration on behavioral changes in students, and the emphasis on the stimulus (environment) can be found in many of the current instructional design models today. The following are two examples of current distance learning delivery models that are consistent with behaviorism theory.

1. The Open University

2. Personalized Systems of Instruction (PSI)

The Open University: The early initiatives of distance education provided distance learners with a basic type of behaviorist learning through television. The forerunner of this distance education movement was the British Open University (BOU) in 1969. It was respected internationally through the recognition it received by televising its instruction through the United Kingdoms BBC television network. The popularity and anticipated cost effectiveness of this form of teaching created a trend that spread worldwide. The Open University's popularity allowed for institutions worldwide to begin government-supported televised courses. This was a significant leap for distance learning. Its immense popularity was found in the adaptations of it that were created in countries from Turkey to China, and Finland to British Colombia (Willis, 1994). Ironically, although the first iterations of the Open University exhibited characteristics of behaviorism theory, later iterations were closely related to the characteristics of constructivism.

Educators saw this new form of "distance learning" as an effective means of utilizing new instructional models. Systematic instructional design was incorporated that used behavioral principles such as formulating step-by-step system wide needs assessments, development schedules, and evaluation procedures in the creation of all courses that were to be televised.

Although the creation of this type of learning was considered revolutionary at the time, it was little more than a transfer of traditional classroom instruction (which was generally behaviorist) onto the airwaves. Furthermore this type of broadcast education

was generally "one way" (teacher to student) as it provided a stimulus with no feedback from the learner. There was also limited access to only the population of a particular nation.

Personalized System of Instruction (PSI): Designed by Fred Keller and associates, the Personalized System of Instruction (PSI) provides students with a methodical pattern of instruction. Similar to programmed instruction, PSI uses the tenets of behaviorism and mastery learning. That is, there is a sequential ordering of information requiring mastery before continuing. According to Burton, Magliaro and Moore (2001) the defining characteristics of PSI are: "(a) use of proctors, (b) mastery learning, (c) self-pacing, (d) teacher as motivator, and (e) use of the written word" (p. 15). Bearing similarity to learning for mastery, students increase their skills by remaining at one level until the criteria for that skill is satisfied, then they are allowed to either continue practicing that skill or moving on to the next. This type of learning is self-paced and requires little to no student-to-teacher interaction.

Constructivist Models

As the advent of digital telecommunications advances converged audio, video, voice and data onto a single delivery system, educators adapted to the fact that increased globalization would make transparent the boundaries that once existed with the one way Open University model. Partnerships between governments and advances in communications technologies allowed for quicker and more seamless access to information. Instant access has taken distance education beyond the S-R paradigm into a more collaborative and interactive environment. This new paradigm allowed those who were previously unable to intermingle with students of other nationalities because of time

and distance, to share in a global learning experience that renders both time and distance transparent, and brings many cultures together. However, it is this intermingling of culture that may effect achievement in some students.

According to literature (Dunn & Marinette, 2002) it is important to understand how student cultural differences the effect achievement in an online environment. The following sections will examine online environments from a constructivism theory perspective. Slavin (1991) argued that when built from a constructivist standpoint, a quality online course should include co-operative support. "Collaboration with fellow students can have several benefits to learning. Students can encounter different points of view, which may identify ineffective solutions to problems, clarify misconceptions, and give rise to synergistic insights (Bostock, 1998).

The following are models of learning communities that have served as visions for universities recently. The following models are context based, and focus less on the stimulus provided and more on the concerns and abilities of the learner. They are models of distance-learning communities that have existed to provide instruction for mass audiences of students from many cultures. Studies show (Ehrmann & Collins, 2001; Ryder & Wison, 2001; Starkey, 2001) progress in projects and curricula that are designed to tackle the issues of cultural diversity on the Internet. Three such efforts are listed below:

1. Project ICONS (Africa-Americas Classroom Technology Project)
2. The CULTURA Project
3. Dynamic Learning Communities

Project ICONS (Africa-Americas Classroom Technology Project): The International Communication and Negotiation Simulations (ICONS) Project out of University of Maryland University College, teaches students about cross-cultural communication, including the role of foreign language in diplomacy and the complexities of the international system. Created in 1981, ICONS offers students the opportunity to learn through role-playing (Starkey, 2001). In the 1980's the project expanded its former university only restriction to include secondary schools. This increase in population allowed for it to be 162 universities and 129 secondary schools from 37 countries (Ehrmann & Collins, 2001). The aims of the ICONS project is to give increased attention to three crucial issues – integration of computer and network technology within the classroom, integrating awareness of global interdependence into course design, and the development of curriculum support tools for under-served groups. The project spotlights quality and access areas that are under-represented in the collaborative efforts of higher education (Ehrman & Collins, 2001; Starkey, 2001).

The project creates teams between participants. These two teams are allowed to communicate through either daily messages or diplomatic cables. Picking up the messages from a queue completes negotiations. Modules are completed after a three to five week module of real-time meetings. A debriefing that is facilitated by the instructors of the project assesses the participant's progresses.

The CULTURA Project: The CULTURA project is based at Massachusetts Institute of Technology and is funded by the National Endowment for the Humanities. Through innovative approaches to students, the project seeks to provide support and development to the learning of culture and language. A *community of learners* is situated

between two countries (the United States and France), and through the exchange of multimedia documents, a common understanding is reached. Students seek to achieve this understanding by sharing a webpage to post their cultural comparisons. Then in computer conferences the groups meet to share these comparisons in their native languages. Sharing in this way preserved the unique and authentic aspects of each cultures colloquial discourse. This provided each group with an opportunity to analyze the others delivery of speech and presentation of ideas (Ehrman & Collins, 2001).

Dynamic Learning Communities*:* Authors (Ryder & Wison, 2001) have debated the traditional views associated with instruction claiming that the online learning community can be developed to move away from traditional way of instructing students to a more constructivist-learning environment for supporting learning. Dynamic learning communities (DLC) provide a metaphor of instruction, which supports the notion of students taking control of their learning.

Participants in these environments may self-organize, share control, and transform the learning experience to include everyone including the teacher. DLC's have a tendency to share many of the open-learning characteristics of a socio-cultural constructivism-learning environment. The active, distributed control and collaborative nature of instruction is also reminiscent of collectivist learning groups. DLC's commonly have the same characteristics. They are:

1. Distributed control;
2. Commitment to the generation and sharing of new knowledge;
3. Flexible and negotiated learning activities;
4. Autonomous community members;

5. High levels of dialogue, interaction, and collaboration;
6. A shared goal, problem, or project that brings a common focus and incentive to work together.

The locus of control may appear to be spread out to all members of the community. Members of the DLC appear to be self-directed and make their own decision toward learning allowing for variation in the experience as they use only those goals, which have proven to work. They generally negotiate learning activities. DLCs appear popular for having powerful lines of communication and a singular focus for existing. Although an exhaustive list of dynamic learning communities would be beyond the scope of this paper, two common examples can be found in the following two scenarios.

Scenario #1 (Workplace Learning)- employees who desire up-to-date consultation and training may begin a dialogue on possible solutions to common problems and share those solutions publicly via the Internet.

Scenario #2 (Academic Collaboration)- faculty desiring to stimulate discussion on new issues outside of the classroom may begin a chat room or listserv to facilitate new ideas on participants of common interests. (Ryder & Wison, 2001)

These aforementioned projects are the summary descriptions of ideas that have created an opportunity for good cultural exchange between students. This section proposes to detail the importance of applying this perspective toward online course design.

An individual's ability to perform well in any online management system or online course could be improved by including constructivist activities that are relevant to

the cultures of all its participants (Brown, Collins, & Duguid, 1989, p. 34). This is basically a pluralistic approach to learning, or one that recognizes the importance of all cultures rather than imposing a melting pot or assimilation-based approach (Janzen, 1994).

Another relatively universal need across cultures is the design of the online environment. A major component of this document is the relationship between the design of the online environment that facilitates all learning, and design aspects that are dependent upon the culture of the students within that environment.

Communication between participants (both teacher to student, and student to student) can be improved when instructional designers and faculty carefully consider what concept they want to teach and in which type of media it will be delivered. The source (course) and the receiver (students) should be aligned in as close as possible in this online environment in a "virtual-culture" of sorts in order to improve the conveyance of ideas. Rogers and Shoemaker (1971) note that when the source and receiver "share common meanings, a mutual sub cultural language, and are alike in personal and social characteristics, the communication of ideas is likely to have greater effects in terms of knowledge gain, attitude formation and change, and overt behavior change" (as cited in Fleming, & Levie, 1993, p. 288).

Summary

Culturally centered teaching practices should be culturally appropriate, and responsive to and compatible with culture-based needs and experiences. This document focused on programs that successfully overcame the challenges presented, illustrating that barriers are present when attempting to engage students in effective cultural

exchange while learning in an online environment. Instructional, technical, and cultural limitations were identified (for further study). Furthermore, it was demonstrated that through innovative teaching and collaborative techniques, these barriers could be surmounted. Based on this literature, inconsistencies exist in the design of culturally appropriate online instructional environments that will have to meet the needs of an increasingly growing global audience of learners.

Synthesis

This synthesis will point out the similarities found between the family of instructional environments and the dimensions of culture and briefly summarize the findings. In addition, it will connect the characteristics of both in order to show how closely related the dimensions are with the continuum of learning theories. It will then delineate what the researcher deems as plausible learning actions that students will make when found in certain dimensions. Moreover, arguments for the proper cross-cultural design of instructional environments will be explored. The statement of the problem will follow with the research questions for each sub problem.

Based on the literature, (Albert &Triandis, 1986, 1995, 1997; Driscoll, 2000; Hofstede, 1997, 2001; Eisenburg, 1999; Ertmer & Newby, 1993; Joyce and Weil, 2001; Shipman, 1985) this researcher suggests that there appears to be a relationship between Hofstede's (1980) four dimensions of culture and the learning theories reviewed in the previous section. It has been argued in this review of literature that there appears to be a connection between individualistic classrooms and the behavioral family of teaching approaches.

Situational determinants tend to matter more to collectivist learners than cognitive consistency. This study suggests that based on the literature, it may be plausible to suspect that students that exhibit collectivists traits who are involved in instructional environments such as problem based learning will perform more effectively in these when situational determinants are the basis by which performance is measured (Dunn & Marinetti, 2001; Hofstede, 1980; Triandis, 1995, 1997, 2001). Environments of this type are represented in the socio cultural constructivist theory of developing those skills that are related to the problem surrounding the participant (Duffy & Cunningham, 2001; Grabinger, 2001).

The same argument can be made for individualist learners to whom cognitive consistency may be more a factor in learning than environment (Triandis, 2001). It may perhaps be conceivable that students who exhibit individualist traits and are involved in instructional environments such as programmed instruction which use advance organizers will perform more effectively when cognitive consistency is the basis by which performance is measured (Dunn & Marinetti, 2001; Driscoll, 2000; Hofstede, 1980; Joyce & Weil, 2001; Triandis, 1995, 1997, 2001). Environments of this type are represented in the behavioral theory in which objective, and sequenced information that is meaningful and organized create the learning environment (Ertmer & Newby, 2001; Shipman, 1985).

A dimension of culture (individualism vs. collectivism) was reviewed in order to give instructors a means of teaching different cultures more effectively. It was argued that in order to instruct globally it must be taken into consideration that there are fundamental differences ascribed to individuals from their culture that influence the

decisions they make when learning (Triandis, 1986). Instructional environments based on constructivist theory which lack structure and definitive outcomes will not be as effective with cultures such as Japan and Holland where people are threatened by unknown factors (Albert & Triandis, 1986; Dunn & Marinetti 2001; Hofstede, 1980; Triandis, 1995, 1997, 2001).

In cultures like Greece and Italy, members are more individualistic; therefore group work and assessments, which are more effective in the United Kingdon and Sweden, would be equally as ineffective.

Research suggests that the dimensions established by Hofstede articulate distinctive cultural values that are identifiable in each culture, accommodating these dimensions may lead to highly effective learning experiences (Dunn & Marinetti, 2001; Hofstede, 1980; Triandis, 1995, 1997, 2001).

Researchers support the line of reasoning (Driscoll, 2000; Eisenburg, 1999; Ertmer & Newby, 1993; Hofstede, 1980, 1986, 1997, 2001; Joyce and Weil, 2001; Shipman, 1985; Triandis, 1986, 1995,1997, 2001) that students who demonstrate a cultural characteristics that are consistent with collectivism (allocentrics) are more likely to select approaches that are closer to socio-cultural constructivist theory when introduced to them within a learning environment. Therefore, this researcher suspects that students who exhibit this profile would be more likely to:

1. Attribute success and achievement to effort, therefore when placed in in-group competitive scenarios will work harder to achieve success
2. Pay less attention to internal processes (cognitive consistency) as determinants of social behavior

3. Perform a task more because of a feeling of obligation than internal intentions
4. Feel motivated by customs, norms, and habits that are consistent with customs
5. Be motivated by their groups
6. Select learning strategies that adapt to their pattern of learning and require group work
7. Try to reach higher externally set goals (but will set lower internal goals)

Therefore, these students should be placed in situations that encourage group collaboration. According to Eisenburg (1999) collectivists tend to be more motivated and challenged by their work under external controls than under personal-control if there is a perception that the external control is from a partner in the group.

Authors also support the line of reasoning (Driscoll, 2000; Eisenburg, 1999; Ertmer & Newby, 1993; Hofstede, 2001; Joyce and Weil, 2001; Shipman, 1985; Triandis, 1995) that students who demonstrate a cultural characteristic that is consistent with individualism (idiocentrics) are more likely to select approaches that are closer to behavioral theory when introduced to them within a instructional environment. Therefore, this researcher suspects that students who exhibit this profile would be more likely to:

1. Attribute success and achievement to ability, therefore when placed in in-group competitive scenarios will separate work between group members, amount of work being variable
2. Will rely on cognitive processes to be more consistent (cognitive consistency)
3. Perform a task based on perceived achievement
4. Require more choice in task selection
5. Be motivated by internal individual goals

6. Select learning strategies that require privacy and individual work
7. Try to change the externally set goals (but set internal more difficult goals)

Some argue (Cotterall, 1995; Dustdar & Hofstede, 1999; Ehrman & Collins, 2001; Ryder & Wison, 2001; Starkey, 2001; Stull & Till, 1995; Waldrip & Fisher, 1997 Wu & Rubin, 2000) that learners have a propensity to approach tasks based on their subjective culture, changes in this culture may result in changes in personality. Instructors should remain sensitive of the complications associated with teaching across cultures. It is plausible that no student in a world of increasing globalization is unaffected by the interaction with other cultures. The studies reviewed investigated interactions that occur within cross-cultural online instructional environments. Studies have shown that instructional environments that are designed to be culturally appropriate to meet the needs of their students tend to be pedagogically more effective (Rubin & Wu, 2000; Waldrip & Fisher, 1997).

Teaching approaches that would be considered should be reflective of the culturally diverse population of the class (Dunn & Marinetti, 2001; Rubin & Wu, 2000;). Presently, systematic instructional design excludes culture as a decision variable for the ecological elements of course creation (Holmes, Sherman, Williams-Green, 1997). Although there is no possible way to design courses that are pleasing to every culture, adaptation strategies should recognize the most pertinent elements that effect instruction across each culture taught (Dunn & Marinetti, 2001; Morgan, 2000). Decisions for consideration are wide and diverse and include many models and perspectives (Holmes, et.al; Dunn & Marinetti, 2001; Morgan, 2000; Sherman 1997) however; instruction that is

culturally pedagogically appropriate is one salient characteristic that persists throughout all discussions.

Many investigators have studied online learning from a cultural perspective. Holmes, et al. (1997) documents the development of culturally specific goals and objectives, identification of instructional strategies, media, time, grouping and evaluation of learning outcomes as points of consideration in software design for students. Albert and Triandis (1986) suggested a method called the attributional approach. This method, which is based on providing individuals with additional cultural knowledge to their own, may allow teachers and students to make attributions appropriate to the instructional environment in which they function. Based on empirical research this method is designed to increase cultural sensitivity in both teachers and students.

Significance of the Study

The significance of the present study lies in helping to illuminate the cognitive processes of intercultural students. More specifically, the learning situation preferences that are determined by cultural influences they have acquired through life. Migrant students and the differences they bring with them to the classrooms have prompted interest in research in intercultural communication in the United States (Morgan, 2000). Hofstede's 1980 study is relevant to clarify the dimensions of culture as key differences in this cross-cultural study. His break through in the social sciences remains the authority on comprehending and explaining distinctions between cultures. Although his work remains pivotal in the realm of cross-cultural psychology and organizational management, it has implications for teaching and learning as well.

Although the Internet has grown at an extraordinary rate and has provided the global masses with the availability of American education, it is centered on individualism, or self-reliance. This is in direct opposition to the contention that learning is a collectivist activity, which is the method of instruction for a number of nations (Smith-Jackson & Wolgater, 2000). There has not been found any example of online learning customized specifically to account for the different ways that culture affects learning. In order to facilitate effective online instruction, instructional environments should provide a mixture of all cultures and learning theories. Perspectives should be based upon the culture of the target group. Some argue that ignorance of these cultural elements may be pedagogically disastrous (Dunn & Marinetti, 2001; Holmes, Sherman, Williams-Green, 1997).

METHODOLOGY

Research Design

The current study made use of a 2 (individualism vs. collectivism) X 2 (behaviorist/socio-cultural constructivist) X 2 (pretest, posttest) mixed factor analysis of variance research design to examine the effects of Hofstede's Cultural Dimensions of individualism and collectivism on student preference and achievement (recall, and transfer of knowledge). Figure 3 illustrates the notation of the design.

	Pretest	Posttest	Transfer
Individualist vs. Collectivist			
Behaviorist vs. Socio-cultural constructivist			

Figure 3 Design of the Current Study 2x2x2 Mixed Factor Analysis

The study consisted of a within-subjects factor analysis as participants were pre-tested and post-tested on their recall, and assessed on their transfer of knowledge, and learner preference. It utilized Campbell and Stanley's (1963) true-experimental design.

The study used an online instrument that consisted of different variations of the same treatment based on individualist and collectivist instructional environments.

Participant Selection Process

The participant selection process began with the distribution of the Individualism-Collectivism (INDCOL) survey instrument to the body of graduate students registered at a university in Southwest Virginia via electronic mail. The email was disseminated to the entire body of graduate students. Although it is unknown as to exactly how many graduate students received the email concerning the study, a total of 207 participants responded. Of the 207, 108 participants participated in part one of the study.

The entire pool was divided into three groups. Each item was scored so that a high individualist receives a score of 1 and a high collectivist receives a score of 5. The INDCOL scale yields a score from (16-80), where a score of 16 indicated a maximum level of individualist attributes, and 80 indicates a maximum level of collectivist attributes. In this study, the highest individualist participants were those that scored between 40 and 62 on the INDCOL. High collectivist participants were those that scored between 54 and 71 on the INDCOL. The remaining participants, scoring between 53 and 58, were considered more neutral in regards to individualist and collectivist attributes and were not eligible to participate in this study.

The current study was designed to evaluate the novice learner on knowledge of lightning formation. Participants were assessed on their prior knowledge of lightning formation and weather related content to ensure the likelihood that there would be homogenous levels of knowledge on the subject of meteorology among participants. A 7-item meteorological filter test was utilized to assess familiarity with meteorology. The questionnaire asked participants to indicate their level of meteorological experience. Only novice participants were selected in order to maintain a consistent level of

knowledge about the weather. Participants who answered more than three questions correctly were not allowed to continue through the study.

From each of the high individualist and high collectivist's pools of participants, an initial group of 108 participants were randomly selected. (See Figure 1, divided by cultural dimension segment.) Then, 54 participants from the individualist and collectivist pools were divided further into two groups (See Figure 1, divided by assignment/preference segment). The division involved the assignment of participants to an instructional environment (either behaviorist or socio-cultural constructivist). The resulting divisions were IAB (n= 23), IAC (n = 24), CAB (n=25), CAC (n= 24). They were named according to their attribute, assignment, and instructional environment respectively. For example, the naming convention groups is shown in Table 11:

Table 11

Labeling of Groups

Group Number	Cultural Dimension	Assignment	Instructional Environment	Label
1	Individualist (I)	Assigned (A)	Behaviorist (B)	I1 (IAB)
2	Individualist (I)	Assigned (A)	Constructivist (C)	I2 (IAC)
3	Collectivist (C)	Assigned (A)	Behaviorist (B)	C1 (CAB)
4	Collectivist (C)	Assigned (A)	Constructivist (C)	C2 (CAC)

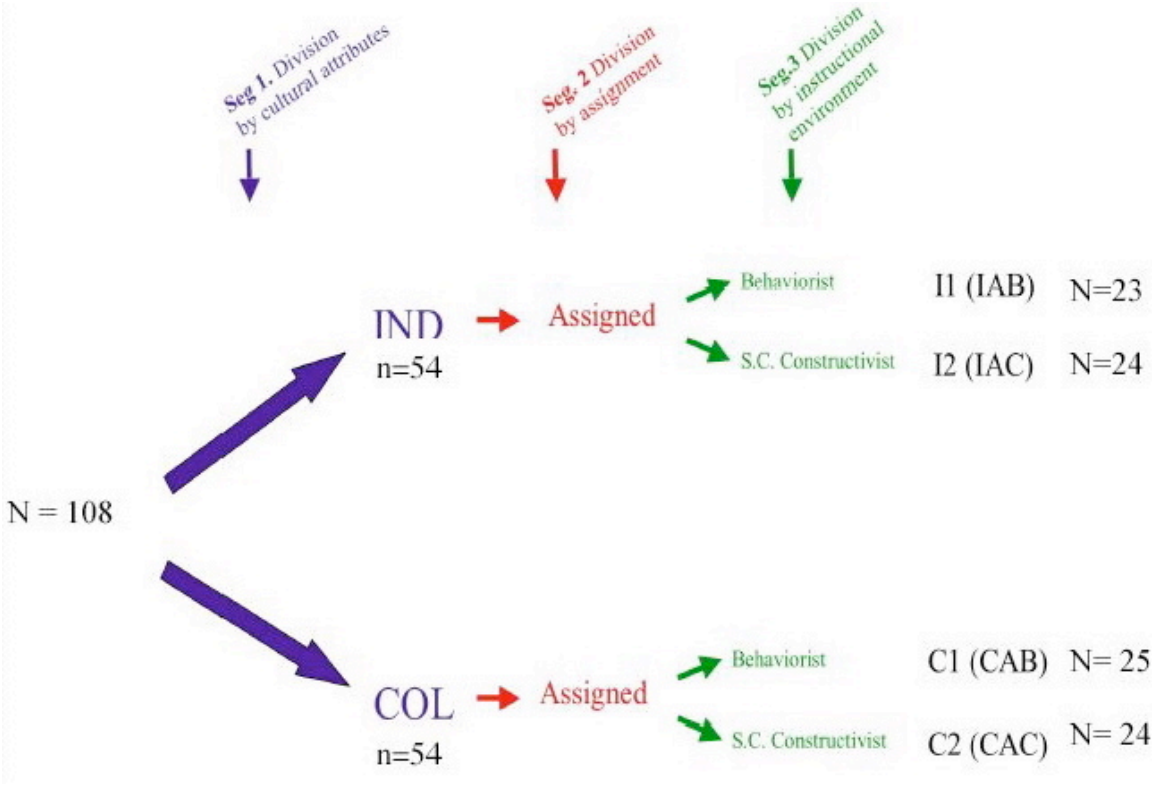

Figure 4 The divisions of groups by cultural dimension, assignment and instructional environment

It has been argued by some that effective collaborative groups should include between three and six members (Aronson, 1978; Burns, 1981; Johnson & Johnson, 1984: Sharan & Hertz-Lazarowitz, 1980). Therefore, the collaborative groups (C1, C2) were further subdivided into collaborative groups of four each for the purposes of alignment with socio cultural constructivist theory.

Variables of Interest

Independent Variables

Individualist/Collectivist

Participants were rated on their indication of individualist and collectivist attributes, as individualism and collectivism were independent variables in this study.

Behaviorist/Socio-Cultural Constructivist

Participants were assigned an instructional environment. The two instructional environments of behaviorism and socio cultural constructivism were also independent variables in this study.

Dependent Variables

Recall Test

The participants were measured on the quantity of knowledge they were able to recall in the study. Therefore a test of recall was used as a dependent measure. Participants were assessed on recall prior to and following participation in the intervention (see Appendix A, and B). Participants took the pretest and posttest in one setting. The electronically converted essay test was a single-webpage, fill-in-the-blank assessment similar to the one-sheet instrument originally used by Chandler and Mayer (2001). It took approximately six minutes to complete both the pre-test and posttest.

Transfer Test

The participants were assessed on the quantity of knowledge they were able to integrate and apply to open-ended questions in the study. Therefore a test of transfer of knowledge was used as a dependent measure. The electronically converted essay test

was a single-webpage, fill-in-the-blank assessment similar to the four-sheet instrument originally used by Chandler and Mayer (2001). It took 12 minutes to complete.

Learner Preferences Scale (LPSS)

The participants were rated on their attitudes towards collaborative and individualized learning in the study. Therefore a test of attitude and learner preference was used as a dependent measure. The electronically converted rating survey was the Learner Preference Scale (LPSS) developed by Owens and Barnes (1992). The LPSS consisted of two sets of scales that contained a set of statements. Each item was scored so that a high preference receives a score of 4 and a low preference receives a score of 1 for a minimum raw score of 12 and a maximum of 48. It took approximately 10 minutes to complete.

Participants

Participants were chosen from the entire graduate school population at a university in Southwestern Virginia. In order to participate in the study, the participants needed to have at least a basic understanding of computers. Some basic appreciation for the function of the mouse, keyboard and CPU was required. This familiarity was required because the participants needed to use the basic features of a computer to navigate in an online environment while completing the tasks.

Of the 96 participants in the study, the ages ranged from 18 to 60 years old. Participants between the ages of 24 to 29 amounted to 28% of the sample. Participants between the ages of 30 to 35 amounted to 17% of the sample. Participants between the ages of 36 to 41 amounted to 1% of the sample. Participants between the ages of 42 to 47 amounted to 3% of the sample. Participants between the ages of 48 to 53 amounted to

4% of the sample. Participants between the ages of 54 to 59 amounted to 1% of the sample. Participants 60 years old and older amounted to 1% of the sample. The majority of the participants were between the ages of 18 and 23 representing 42% of the sample.

There were six nationalities represented in the study. Nine percent of the participants were from China. Participants from India represented 9% of the sample as well. Participants from Argentina represented 1% of the sample. Participants from Germany represented 1% of the sample. Participants from Bahrain represented 1% of the sample. The majority of the participants were from the United States representing 77% of the sample.

The majority of participants were female. The 62 female participants represented 64% of the sample. There were 34 male participants who represented 35% of the sample.

Materials

The instruments for this experimental research included a modification of the Individualism-Collectivism (INDCOL) scale originally developed by C. Harry Hui, a meteorological filter test, a recall test, a transfer test, the Learner Preference (LPSS) Scale and the intervention, a multimedia presentation on developed by Mayer (2001). Each of the instruments was converted into an electronic format in order to maintain an exclusive distance-learning environment for the experiment.

Individualism-Collectivism Scale (INDCOL)

Participants were separated based on substantial measurements of either individualism or collectivism using the Individualism-Collectivism (INDCOL) Scale. C. Harry Hui (1988) was the first to use this scale as a measuring instrument specifically designed to tap the constructs of individualism and collectivism. The INDCOL scale is a

group-administered scale that covers beliefs, attitudes, behavioral intentions, and behaviors from a psychometric perspective. The original instrument consisted of 63 items that are divided across six subscales that examines the participant's beliefs about: spouse, parent, kin, neighbor, friend, and co-worker.

Triandis (1995a) has since modified the instrument (see Appendix E) to 32 questions. After a factor analysis it was found that those items with high commonalties (more than .30) should be added to the scale, and those with low commonalities (less than .35) were dropped. The Cronbach alpha reliabilities for the scales were as follows horizontal individualism (HI)– (.67), vertical individualism (VI)– (.74), horizontal collectivism (HC) – (.74), and vertical collectivism (VC)– (.68). The scales were reduced to 8 items per each dimension (VI, HC, VC, HI). In order to obtain a measurement that derives only two groups (individualist and collectivists), researchers (Fletcher & Olekains, 1996) have ignored the four dimensions of individualism and collectivism proposed by Triandis (1995), and focused only on two (VI and HC). Also, since the alpha reliabilities for horizontal individualism (HI) and vertical collectivism (VC) are not as strong as vertical individualism (VI) and horizontal collectivism (HC) and only the most extreme scores of individualism and collectivism are of interest to this researcher; this instrument was further modified to contain only 16 items that measured the dimensions of vertical individualism and horizontal collectivism. This test took approximately 10 minutes to complete. The total score for individualist were the lower scores from 16 to 80. The total score for collectivist was the higher scores from 16 to 80. The differentiations between the two categories of participants were based on these scores. Only the participants who showed a very substantial degree of collectivism and

individualism were allowed to participate. Minimum raw scores started from 16 to a maximum of 80.

Meteorological Filter Test

The current study was designed to evaluate the novice learner on knowledge of lightning formation. A 7-item meteorological filter test was utilized to assess familiarity with meteorology. The questionnaire developed by Mayer (2001) asked participants to indicate their level of meteorological experience. It was assessed by a 1-item self-rating and a 6-item checklist. The self-rating asked participants to "please put a check mark indicating your knowledge of meteorology (weather)" using a 5-point scale ranging from very little (1) to very much (5). The checklist contained the instruction to "Please place a check mark next to the items that apply to you" followed by a list of 6 items: "I regularly read the weather maps in the newspaper." "I can distinguish cumulus and nimbus clouds." " I know what a low pressure system is." "I can explain what makes the wind blow." "I know what this symbol means: [symbol for cold front]." "I know what this symbol means [symbol for warm front]." Scores on the survey from participants that indicate expert ratings were eliminated from the experiment. The meteorological filter test was converted into an electronic format in order to maintain an exclusive distance-learning environment of the experiment.

Recall Test

When attempting to gauge how much of the presented material the learner can remember, it is essential to use recall assessment. This type of evaluation was the primary focus of early behaviorist and is central to the behaviorist/individualist portion of

the study. Participants were assessed on recall prior to and following participation in the intervention.

Participants were given brief instructions on the web intervention in which they were told that they would be learning about "how lightning storms develop" and that afterward they would be given some questions to answer. The computer allowed the participant 15 minutes of practice (see Appendix A) before the recall test. There were three external scorers for the pretest, who were trained before the administering of the treatment. The investigator coached the scorers on the proper method of evaluating the pre and posttests. Accuracy was based on the occurrence of acceptable ideas in the participant's responses. To compute a score for a participant, recall was measured by the participant's ability to remember the following idea units in their pre and post test responses (Mayer 2001).

1. Air rises
2. Water condenses
3. Water and crystals fall
4. Wind is dragged downward
5. Negative charges fall to the bottom of the cloud
6. The leaders meet
7. Negative charges rush down
8. Positive charges rush up (p. 26)

Recall performance was expressed as the number of idea units remembered divided by the total possible (eight). The recall test was converted into an electronic format in order to maintain an exclusive distance-learning environment of the experiment.

Transfer Test

The instrument used for this study was an electronically modified transfer test originally designed by Mayer and Chandler (2001). The four-sheet test was converted into electronic form into a web page. The test sought to measure meaningful understanding in which participants are required to use the presented information in ways beyond what was presented (p. 393). The transfer test contained the following questions.

1. "What could you do to decrease the intensity of lightning storm?"
2. "Suppose you see clouds in the sky but no lightning. Why not?"
3. "What does air temperature have to do with lightning?"
4. "What causes lightning?"

Each question was graded by the use of a separate rubric (see Appendix B). In order for a participant's response to be considered as accurate, each rubric included specific ideas from each question that should have been included in the participant's response.

There were two external scorers assigned to grade the transfer test. Raters were trained before the administering of the treatment. The investigator coached the raters on the proper method of evaluating the rubrics. According to Mayer (2001) accuracy should not be based on the common knowledge that the learner possesses on the occurrence of acceptable ideas in the participant's responses. The transfer test contained four questions. The rubric contained four acceptable ideas per question. Each acceptable idea was given a point value. The most specific acceptable idea was given the highest points (3 points). Less specific acceptable ideas were given a lower score (2 points). Vague answers were given the lowest score (1 point). If an answer was considered unacceptable it was given a

score of zero. Students received credit for an answer if they expressed either of four categories of ideas provided in the rubrics regardless of writing style or use of terminology. Responses were graded according to a rubric (see Appendix B). Each participant's transfer performance is expressed as the number of acceptable answers generated divided by a total of 12. The transfer of knowledge test took approximately 12 minutes to complete.

Learning Preferences Scale (LPSS)

Another converted electronic instrument used for this study was a modification of the Learner Preference Scale (LPSS), originally developed by Owens and Barnes (1992) and used by Waldrip and Fisher (1997) to assess learner attitudes and preference while investigating interactions that occur within cross-cultural online instructional environments. It took approximately 10 minutes to complete. Participants were assessed on their preference for an instructional environment. Owens and Barnes (1992) developed this scale to assess how participants respond to different ways of learning. It aims at "providing systematic information on the attitudes of participants towards: cooperative, competitive, and individualized learning" (Owens & Barnes, 1992). The computer displayed the first page of the Learning Preferences Scale (LPSS) and instructed the participants "this questionnaire asks you to tell how you feel about some of the learning that went on in the study. This questionnaire is anonymous, and there are no right or wrong answers. There are 24 items in the questionnaire. Each item is a statement that someone has made about learning. You may agree or you may disagree; that is, it may be true for you or it may be false for you. Each person may have a different opinion. There are four possible answers. If the statement is completely true

for you, click beside the answer choice that is labeled “Completely True;” if the statement is completely false for you, click beside the answer choice that is labeled “Completely False;” if the statement is somewhat true for you, click beside the answer choice that is labeled “Somewhat True;” if the statement is somewhat false for you, click beside the answer choice that is labeled “Somewhat False.” Data from the responses were collected electronically and graded. After completion of the LPSS the participants were thanked for their participation.

The LPSS test was converted into an electronic format in order to maintain an exclusive distance-learning environment of the experiment. Reviews by Ferro (1993) reveal that the authors of the instrument recommend that the results be used to detect the attitudes of students on expressing preferences for these differing teaching methods and providing insight for improving communication among students, and teachers regarding matters related to learning preferences. The LPSS consisted of three sets of scales that contained of a collection of statements. Adding together the scores for statements in each of these groups provides three subscales representing preferences for cooperative, competitive, and-or individualized learning.

After reviewing the reliability of the subscales it was decided to give priority to the items that measure individualized learning and cooperative learning only. Intercorrelations between the cooperation and individualized learning subscales that were based on a number of different populations revealed that there was a moderate relationship between competitive and individualized learning preferences. There were however, negative correlations between cooperative and individualized learning preferences indicating a significantly opposed polar relationship. These correlations

suggest that the competitive subscale is independent of both the cooperative and individualized modes of learning and furthermore, has little to do with a student's preference of the learning environment and more to do with how he or she learns within that environment. Therefore, since the competition subscale does not show a significant correlation to the cooperative or individualized subscales, indicating its independence; the 12 items that measure competitive learning were dropped from the instrument. It was determined that the competition subscale was an independent measure, and did not show a significant correlation to the collaborative or individualized subscales. As a result the 12 items that measure competitive learning were dropped from the instrument. The alpha reliabilities before the competitive subscale was dropped. The overall intercorrelations between the cooperation-individualism subscales were negative for all populations tested (1978 (NSW) = -0.46, 1978 (WA) = -0.40, 1981 (USA) = -0.48, 1991 (England) = -0.44) (Owens, 1985). Items were appropriately reversed (2, 7, 8, 10, 13, 20, and 35). Minimum raw scores were from 12 to a maximum of 48.

Multimedia Presentation

The presentation was a 140-second narrated multimedia explanation of how lightning formed. It was originally designed by Richard E. Mayer (see Mayer, 2001). It was developed on a Macintosh G3 computer using Macromedia Director 6.0 and Soundedit 16 for the Macintosh. It contained narration that described the steps of lightning formation and animation that illustrated the concept. This presentation was chosen as a means to present instruction that would be effective in promoting understanding in learners. The presentation contained text, narration, slides with pictures and narration that, according to Mayer (2001) "provide a cause-and-effect account of how some system works (e.g., the formation of lightning)" (p. 390). The explanation was multimedia in form and buttons labeled "Click Here to Continue" appeared at the lower portion of the screen to allow for navigation capability.

The frames of the presentation can be seen in the Appendix section (see Appendix C). There were also pop-up screens given immediately after the presentation to allow participants to practice answers before testing. Participants were given opportunities to practice their responses before taking the posttest with practice multiple choice questions provided through pop-up screens (see Appendix A). These questions were non-gradable and included prompts, cues, feedback, and reinforcement that guided the participant to the correct response. The questions were based on the narration in the presentation. Feedback was provided with the practice questions at the end of the presentation. An example of informational feedback (see Figure 5) is given below.

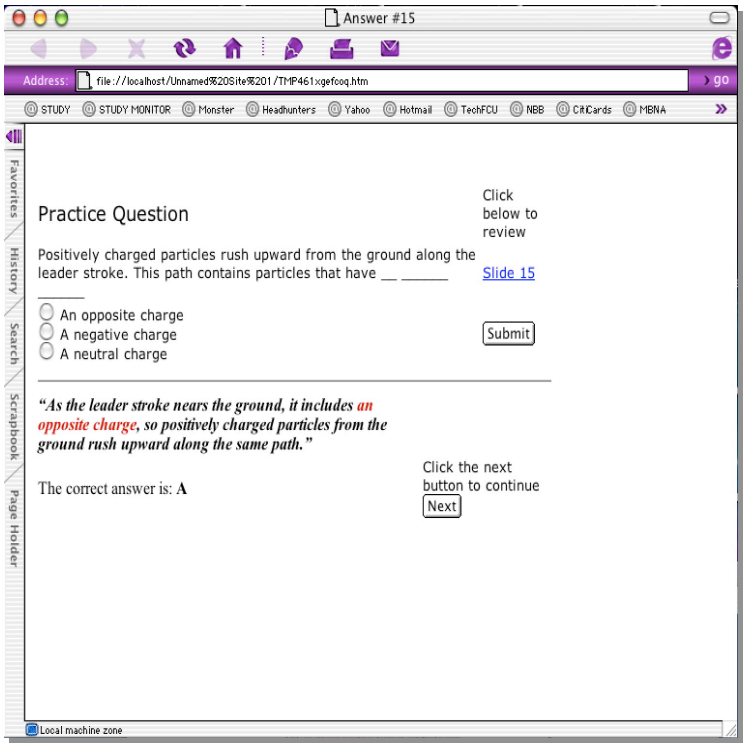

Figure 5 Informational Feedback Response

Once the subject was given feedback for his response he or she was allowed to proceed. The cues were links that contained the corresponding slide numbers in parentheses at the end of each question and when clicked upon, directed the participant back to the slide to receive the answer to the question. Once the participant reviewed the information there was a return button to go back to the question. An example of the pop-up screen is provided (see Figure 6) below.

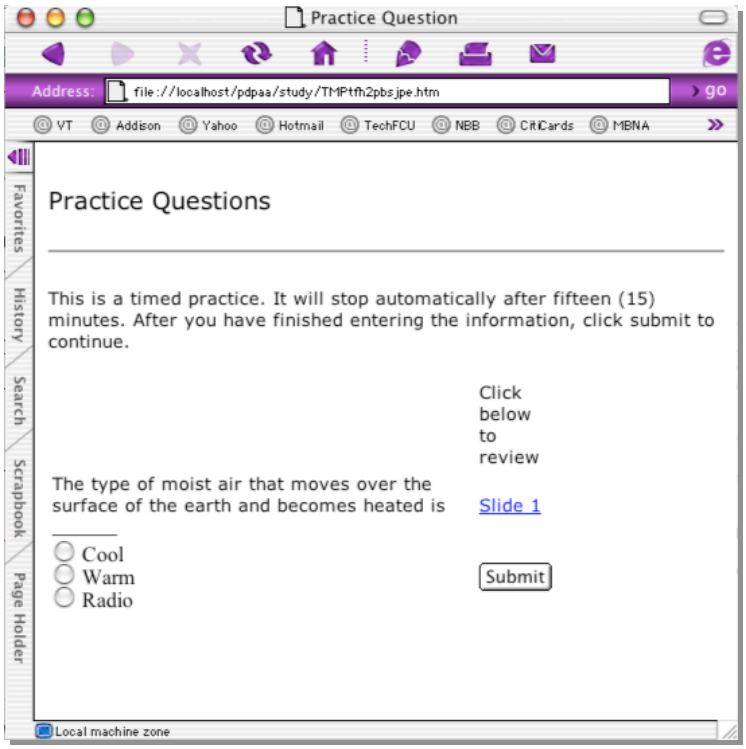

Figure 6 Example of Pop-Up Practice Question Screen.

The treatment incorporated the use of chat room software that allowed the participants to facilitate virtual conversations via the World Wide Web. This software afforded the students the ability to listen carefully and critically, take turns to speak, assist those group members who had difficulty understanding, justify responses, and debate while respecting each others responses (Hilke, 1990).

The investigator made the selection of relevant material easier by providing a summary on each slide. This was also a precaution for participants whose computer speakers may not have been turned on. See Appendix C for an example of how a summary for each slide was provided.

Pointer words such as “because of this” and “as a result” created causal links between the steps to be clearer to the learner (p. 154). See Appendix C for an example of how each text summary is organized numerically. To assist students in the integration of relevant material from the lightning passage, the slide presentation was animated with line drawings that correspond to each step. Further explanation of each of these processes is given the next section.

Behaviorist Treatment Attributes

This section will include how the individualist form of the treatment was designed in accordance with the aforementioned assumptions of behaviorist theory proposed by Ertmer and Newby (1993). It was described in the order of the assumptions, detailing how the attributes of the treatment are designed according to those five assumptions.

An emphasis on producing observable and measurable outcomes in participants

The outcomes predicted in this design were that participants would be able to explain the steps of lightning formation on the posttest. An objective was stated on the first slide of the presentation.

The presentation demonstrated the aspects of behaviorism by first including an introduction that included objectives and instructions on how to proceed. The introduction was as follows. “In a moment you will be learning about how lightning storms develop, afterward you will be given some questions to answer.” These instructions were included on the title page.

Pre-assessment of participants to determine where instruction should begin

Participants were given a filter test in meteorology at the beginning of the study. The questionnaire asked participants to indicate their level of meteorological experience.

Participants were assessed on their prior knowledge of lightning formation and weather related content to eliminate the possibility of experts in the subject. This elimination was conducted to ensure that all participants were performing at the novice level. The pretest on recall was used as a basis of comparison to the posttest on recall. The posttest on recall contained the same instructions and questioning as the pretest.

Emphasis on mastering early steps before progressing to more complex levels of performance

The presentation was a linear instructional sequence. At the end of the presentation, before participants began testing, the participants were guided through a series of pop-up screens that questioned their understanding of the information given with multiple-choice questions on the instructional material. They were allowed to return to previous screens as many times as it took to gain understanding. These questions had no bearing on the scores of the posttest but were used to reinforce understanding of the subject matter. The participants were directed to correct any incorrect answers on the pop-up screens through reinforcement and feedback. (See Figures 3 and 4) This process ensured student mastery of content before taking the posttest.

Use of reinforcement to impact performance and use of cues, shaping and practice to ensure a strong stimulus-response association

Participants were given opportunities to practice their responses before taking the posttest with practice multiple choice questions provided through pop-up screens (see Appendix A). These questions were non-gradable and included prompts, cues, feedback, and reinforcement that guide the participant to the correct response. The questions were

based on the narration in the presentation. This feedback occurred with the practice questions provided at the end of the presentation (see Figure 3).

The cues were links that contained the corresponding slide numbers in parentheses at the end of each question and when clicked upon directed the participant back to the slide to receive the answer to the question. These cues ensured strong stimulus-response association without consequence. Examples of practice questions can be found in the appendix section (see Appendix A).

Therefore, the characteristics of the Individually Prescribed Instruction program (IPI), and the attributes of the individualism were combined to create an instructional environment that contained traits that were respective of both behaviorism and individualistic characteristics (see Figure 7).

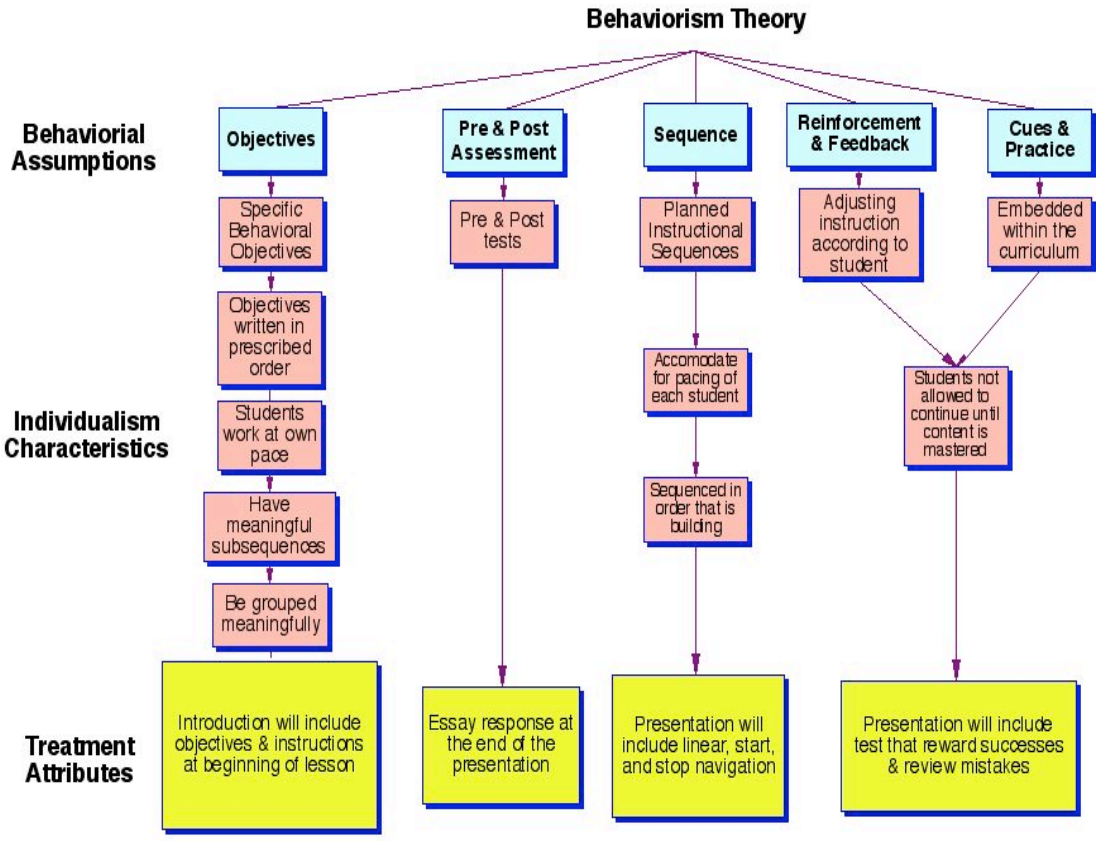

Figure 7 Chart illustrates the five basic assumptions of behaviorism theory

Socio Cultural Constructivist Treatment Attributes

This section will include how the collaborative form of the treatment is designed in according to the characteristics of social-cultural constructivism theory. It will also focus on the conditions for learning, and the elements of collaborative learning. It will be described in order, based on those five characteristics.

An emphasis on the identification of the context in which the skills will be learned and subsequently applied

The attributes that were created for this aspect of the treatment were based on the characteristics of anchored instruction. These experiential activities were consistent with

the assumptions of Ertmer and Newby (1993) and the conditions of constructivism proposed by Driscoll (2001). According to literature (Harris-Freedman, 1994) open-ended questions can be employed to tap into knowledge, comprehension, and recall skills. There are five general formats for open-ended questioning (description, comparison, analysis, problem solving, fiction and evaluation). Of the five formats, descriptive questioning has been found most effective at focusing on the skills of recall and comprehension. Harris-Freedman (1994) argues that observational writing allows the learner to draw heavily on the use of their five senses. Therefore, there were four open-ended practice questions provided for the constructivist instructional environment (see Appendix B), which encouraged the participants to collaborate with their team members to discuss the process of lightning formation via chat room software.

An emphasis on learner centeredness and the capability of the learner to construct knowledge, and the need for information to be presented with a variety of perspectives.

In keeping with the assumptions for constructivism proposed by Ertmer and Newby (1993) and the conditions for learning proposed by Driscoll (2000), the presentation included functionality that allowed the participants to revisit content matter at their leisure. If at any time in the course of solving the problem the students discovered that they did not possess the skill necessary to solve the problem (Nelson, 1999), they were allowed to access the presentation.

Collaborative Elements and Social Negotiation

In order to facilitate social negotiation, the groups were further divided into subgroups of at least five participants each. The treatment incorporated the use of chat

room software that allowed the participants to facilitate virtual conversations via the World Wide Web. This software affords the students to be able to listen carefully and critically, take turns to speak, assist those group members who have difficulty understanding, justify responses, and debate while respecting each others responses (Hilke, 1990).

Collaborative problem solving, according to Nelson (1999) is different than traditional approaches in that the instructor acts a resource, tutor/facilitator rather than simply a dispenser of knowledge. Furthermore, collaborative instructional environments allow learners to work in small groups for extended periods of time. In this study, students were encouraged to collaborate in small subgroups of five for the entire problem-solving process.

Assessment focused on transfer of knowledge and skills

In order to encourage student's selection of the most important pieces of information in the presentation, the first and second SOI techniques proposed by Mayer (1999) were incorporated onto the slide text of the presentation. To assist students in the selection and organization of relevant material from the lightning passage, the readers' attention was drawn toward the relevant material by providing a caption on each slide. See Appendix D for an example of how captions for each slide were provided.

In order to encourage student's activation of prior knowledge and create multiple representations of the material (integration), the third SOI technique proposed by Mayer (1999) was incorporated onto the slide text of the presentation. To assist students in the integration of relevant material from the lightning passage, the slide presentation was animated with line drawings that correspond to each step. This concrete representation

allowed the reader to be better able to connect the incoming words to his or her existing knowledge (Mayer, 1999). See Appendix D for an example of how line drawings and animation for each slide was provided. Participants' transfer of knowledge was then assessed by the use of a transfer of knowledge test originally used by Chandler and Mayer (2001).

Therefore, the characteristics of the transfer of problem solving SOI model of learning proposed by Mayer (1999), and the elements of collaborative learning proposed by Hilke (1990), were combined to create an instructional environment that contained traits that are respective of both social-cultural constructivism and collaborative characteristics (see Figure 8).

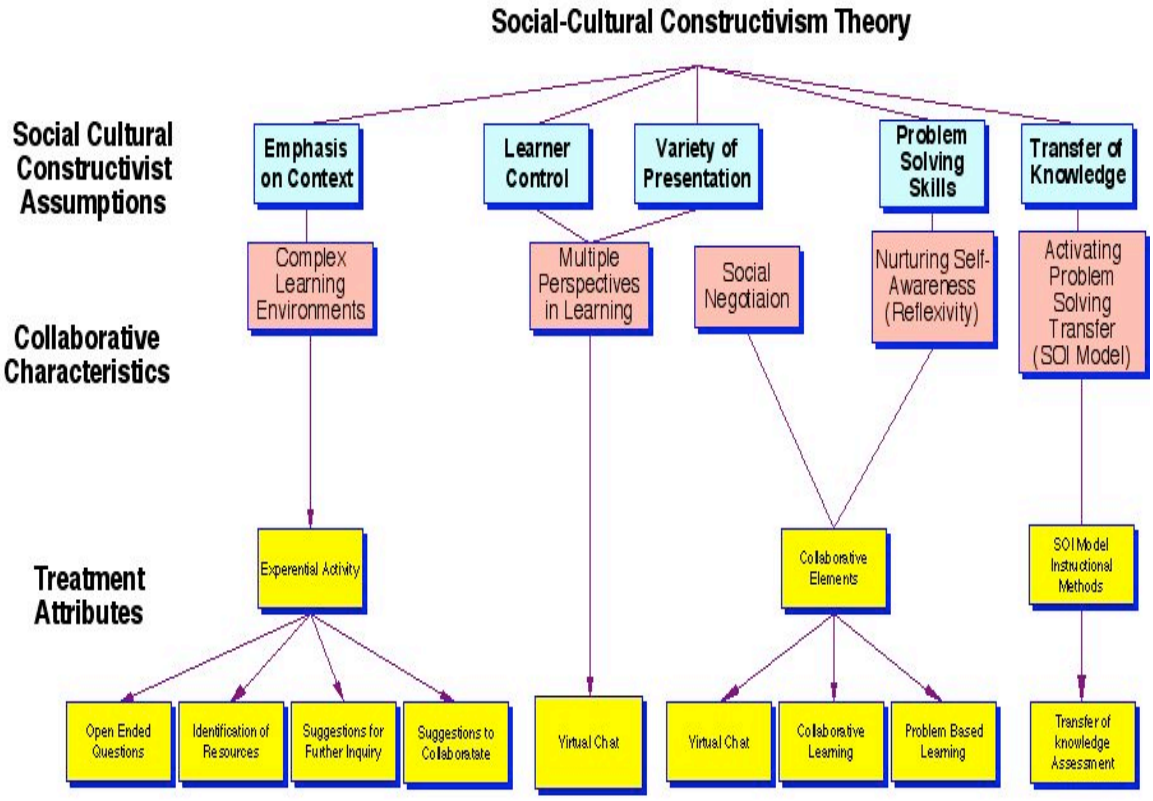

Figure 8 Chart illustrates the five basic assumptions of social-cultural constructivism theory

Procedure

Before beginning the process, the university's international student center was contacted and was consulted for contact information. Informed consent was obtained through the university's Internal Review Board; demographic data was collected on the school's international students. These processes were completed via the World Wide Web and electronic mail. The investigator began the study by converting the INDCOL into an online questionnaire in which the instrument was sent to the entire population of graduate students at a Southwestern Virginia University via electronic mail. The modified INDCOL scale was a 16-item test that took approximately 10 minutes to complete. Data was collected and stored in a database that was developed and

maintained with Cold Fusion software. Participants were separated based on substantial measurements of either individualism or collectivism using the Individualism-Collectivism (INDCOL) Scale. Only participants with substantial scores on the INDCOL were considered. Categories of individualism and collectivism were assigned. The investigator screened participants further for their knowledge on meteorology. This was done to create a more homogeneous group of novice participants in relation to meteorological knowledge. There were 99 participants who were filtered out. This was either because the participants had an above average knowledge of the weather, or because their scores on the INDCOL scale were not extreme enough to place them in a category as either individualists or collectivists.

After the initial meteorological screening, 108 participants were assigned to groups based on their cultural dimensions. These groups were individualists and collectivists. The intervention was presented in two different ways. It was presented as if it were taught in a behaviorist-learning environment and a social-cultural constructivist-learning environment. It was used as the independent variable to determine the effects of Hofstede's dimensions of individualism and collectivism on the dependent variables of recall, transfer of knowledge, and learner preference of participants in an online learning environment. This was considered part 1 of the study. Participants were told that they would be contacted as to when they could return to complete part 2 of the study. At that time, the researcher randomly assigned the participants to groups. The random assignment was computer driven. The participants were divided as described in the aforementioned participant selection process (see Research Design section). After the final segment of the participant selection process, there were four groups total; two were

individualist (I1 {IAB}, I2 {IAC}) and two were collective (C1 {CAB}, C2 {CAC}). The participants in Groups C1 {CAB}, C2 {CAC} were contacted by the researcher in order to confirm the times that they could return and begin chat sessions in order to complete the practice section via Java Internet Relay Chat room software. There were two groups of participants that were allowed to chat. They were the IAC group (n=24) and the CAC (n= 24) groups.

Upon returning, all groups received the pretest on recall. The participants were then exposed to the intervention. This took approximately three minutes (140 seconds) for an entire viewing. Once the participants completed viewing the multimedia presentation, the participants in the behaviorist groups (I1 {IAB}, C1 {CAB}) began the practice questions, while the participants in the social constructivist groups (I2 {IAC}, C2 {CAC}) began the chat sessions. There was a 15-minute time limit on practice and collaboration. Once the practice and collaboration time period was completed. The computer began the succession of tests. All groups completed the recall posttest (approximately six minutes), transfer of knowledge test (approximately 12 minutes), and the Learner Preference Scales (LPSS) (approximately 10 minutes) electronically via the World Wide Web. Total testing time ranged from 30- 45 minutes. Once all participants completed their tests, they were thanked for their participation and informed that they have completed the study.

ANALYSIS OF DATA

Data were collected in each stage of the experiment. The data were quantitative and text based in nature. Data were numeric scores and were categorized as interval for the purposes of analysis. The results of the treatment were based on the appropriate idea units, scales and rubrics for each test. Four analyses of variance and a point biserial correlational analysis were conducted based on the hypotheses and data collected.

The first and third analyses were a 2x2 repeated measures analysis of variance (ANOVA) with two between factors (individualism/collectivism, behaviorist/ socio cultural constructivism) and seven within subjects factor (pretest/posttest). The dependent measure was the pretest/posttest recall data obtained through the recall test. Hypothesis one covered a number of factors that could be accounted for across seven different hypotheses including hypothesis three. In all there were seven hypotheses that were covered and then compressed into what eventually became hypothesis 1. This analysis was used to assess the viability of hypothesis one (H_1) and hypothesis three (H_3).

The second analysis was a univariate analysis of variance. The dependent measures were the data obtained through the transfer of knowledge test. This analysis was used to assess the viability of hypothesis two (H_2).

The fourth analysis was a univariate analysis of variance. The dependent measures were the data obtained through the transfer of knowledge test. This analysis was used to assess the viability of hypothesis four (H_4).

The fifth analysis was a point biserial correlational analysis. The dependent measures were the data obtained through the Learner Preference Scale (LPSS) test. This analysis was used to assess the viability of hypothesis five (H_5).

All analyses were conducted at an alpha of .05. For the repeated measures ANOVAs the Geisser Greenhouse adjustment was used. For any needed comparison analysis, a Scheffé post hoc analysis was used.

A General Linear Model procedure was used to compute effect size index in this study. For repeated measures factors with more than two levels of scores, typically there also arises an issue of Sphericity. Sphericity is the assumption that the correlations between the scores for all possible pairs of measures are equal in size. This was addressed statistically using SPSS.

RESULTS

The current study employed a 2-between/1-within, 2 (individualism vs. collectivism) X 2 (behaviorist/socio-cultural constructivist) X 2 (pretest, posttest) mixed factor model. The study investigated the effects of the cultural dimensions (individualism and collectivism) and instructional environment on recall transfer of knowledge, and student preference.

The purpose of the study was to engage participants, who had been separated based on their cultural dimension, in instructional situations in order to assess their level of recall, transfer skills and learner preference. The study employed pre- and posttests that measured participants' knowledge of lightning formation. The study attempted to measure any changes in dependent variables once the participants were exposed to the intervention (a web-based shockwave presentation on the formation of lightning).

RESEARCH QUESTIONS

By incorporating the aforementioned research design, this current study sought to answer the following research questions concerning the relationship between instructional environments and cultural dimensions in an online management system.

1. How do instructional environments that are behaviorist or social cultural constructivist affect recall and transfer of knowledge?
2. How does an individual's cultural dimension affect his or her recall performance in behaviorist or socio-cultural constructivist instructional environments?
3. Does a participant's preference for an online instructional environment affect his or her attitude toward collaboration or individualized learning?

The experiment was designed to acquire data and conduct analyses to support the following hypotheses.

H_1: There will be no significant mean difference between pretest and posttest performance scores of recall for individualist and collectivist participants in behaviorist and the socio-cultural constructivist instructional environments.

H_2: There will be no significant mean difference between performance scores of transfer for individualist and collectivist participants in behaviorist and the socio-cultural constructivist instructional environments.

H_3: There will be no significant mean difference between pretest and posttest performance scores of recall for individualist and collectivist groups.

H_4: There will be no significant mean difference between performance scores of transfer for individualist and collectivist groups.

H_5: There will be no significant relationship between scores of cooperative and individualized learning for individualist and collectivist groups.

Four of the hypotheses were analyzed using an analysis of variance on the dependent variables. Hypothesis five was analyzed using a point biserial correlational analysis.

Descriptive Analysis

Variations were measured and assessed according to either the four different group names given during the acquisition of participants for pre and posttest data that measured levels of recall, and tests that measured transfer of knowledge skills, or the participants as they were separated by their scores on the INDCOL questionnaire. Group 1 (IAB- individualist assigned behaviorist) participated in the study as individualists, being matched by their scores on the INDCOL survey. Participants in Group 1 (IAB) experienced the practice questions using behaviorist instruction that was structured and sequential. Participants in this group viewed the presentation as individuals without any assistance from their peers. Group 2 (IAC- individualist assigned constructivist) participated in the study as collectivists being unmatched to their scores on the INDCOL survey. Participants in Group 2 (IAC) experienced the practice questions employing constructivist techniques that were open-ended and contextual. Participants in this group viewed the presentation alone, but were able to collaborate as they completed the practice questions. Group 3 (CAB- collectivist assigned behaviorist) participated in the study being unmatched to their scores on the INDCOL survey. Participants in this group viewed the presentation as individuals alone with no assistance. Participants in Group 3 (CAB) experienced the presentation using behaviorist instruction that was structured and sequential. Group 4 (CAC- collectivist assigned constructivist) participated in the study

as collectivists, being matched by their scores on the INDCOL survey. Participants in Group 4 (CAC) experienced the practice questions employing constructivist techniques that were open-ended and contextual. Participants in this group viewed the presentation alone, but were able to collaborate as they completed the practice questions.

The data collected included pre- and posttest scores on a one question essay test, a four essay question transfer of knowledge test, and a 24-item learner attitude questionnaire. Each item on the pre and posttest was scored by the use of idea units. Recall performance is expressed as the number of idea units remembered divided by the total possible (8). Students received credit for an answer if they expressed either of four categories of ideas provided in the rubrics regardless of writing style or use of terminology. There were sixteen possible acceptable answers across the four questions; each participant's transfer performance was expressed as the number of acceptable answers generated divided by 12 (the total possible). Each item on the third scale was scored from 1 (low) to 4 (high), giving a potential of a total score ranging from 12 to 48.

All data was stored in a database until the conclusion of the experiment at which it was downloaded and imported into SPSS for analysis and reporting. Among the type of analyses that were performed, a general descriptive analysis that reported the means and standard deviations for each group condition was reported (see Table 12).

Table 12

Means and Standard Deviations for Recall

		Pre	Post
Group 1			
(IAB; Matched/ Behaviorist; n= 23)			
	M=	0	.570
	SD=	0	.300
	Range=	0	1.00
Group 2			
(IAC; Unmatched/Constructivist; n= 24)			
	M=	.042	.430
	SD=	.100	.240
	Range=	.500	.870
Group 3			
(CAB; Unmatched/ Behaviorist; n= 25)			
	M=	.035	.530
	SD=	.110	.290
	Range=	.500	1.00
Group 4			
(CAC; Matched/Constructivist; n= 24)			
	M=	.036	.550
	SD=	.100	.320
	Range=	.375	1.00

Hypotheses One and Three

The first hypothesis, which measured any changes in recall for individualist and collectivist participants in behaviorist and the socio-cultural constructivist instructional environments, was analyzed using a repeated measures analysis of variance with a Greenhouse-Geiser adjustment to account for any potential violation of sphericity. All p-values, therefore, have been adjusted according to the Greenhouse-Geiser protocol. Hypothesis one covered a number of factors that could be accounted for across seven different hypotheses including hypothesis three. Elaborated findings for each variable appear on in the following sections.

Recall Between Individualist and Collectivist Groups in Behaviorist and Constructivist Environments

The ANOVA for recall did not find a significant difference in the between subjects main effects analysis for behaviorist and constructivist environments $F(1, 92) = .208$, $p = .649$. The ANOVA for recall did not find a significant difference in the between subjects main effects analysis for the cultural dimension (individualism vs. collectivism) $F(1, 92) = 1.374$, $p = .244$. The ANOVA for recall did not find a significant interaction in the between subjects main effects analysis for behaviorist and constructivist environments and the cultural dimension (individualism vs. collectivism) $F(1, 92) = 1.279$, $p = .261$.

The within subjects analysis of main effects found significance in recall $F(1,92) = 237.114$, $p = .000$; however, the interaction of recall and instructional environment did not reveal a significant difference $F(1,92)= 1.527$, $p = .220$. The within subjects analysis of main effects also did not reveal any significant interaction of recall and cultural

attribute (individualism vs. collectivism) $F(1,92) = .000$, $p = .990$, nor did the interaction of recall and instructional environment and cultural attribute (individualism vs. collectivism) reveal a significant difference $F(1,92)= 1.921$, $p = .169$ (see Table 14).

The analyses of variance, therefore, indicated that the treatment did have a significant effect on recall, just not across the cultural dimensions targeted. Nor did the treatment have a significant effect on the levels of achievement in recall for the participants that were divided by instructional environment in the between subjects or within subjects approach.

The analyses of variance additionally indicated extremely small effect sizes and extremely low power (see $\square^2$ and *power*, Table 13). The *post hoc* analysis on power and effect size provided insight into the analyses as the low statistics indicate a reduced likelihood of finding any significant differences in the data. According to Cohen (1992), in order to find small effects, such as are illustrated in the following analysis, the current experimental design would require a sample size of 274 participants per cell. However, in order to find a medium effect, 45 participants per cell would be needed, while a large effect would require only 18 participants per cell.

Table 13

Analysis of Variance of Cultural Dimension for Recall by Instructional Environment

Source	*df*	*F*	*p*	η^2	*Power*
		Between Subjects			
Instructional Environment	1	.208	.649	.002	.074
Cultural Dimension	1	1.374	.244	.015	.213
Cultural Dimension x Instructional Environment	1	1.279	.261	.014	.201
Error	92	(5.541)			
		Within Subjects			
Recall	1	237.114	.000	.720	1.000
Recall x Instructional Environment	1	1.527	.220	.016	.231
Recall x Cultural Dimension	1	.000	.990	.000	.050
Recall x Instructional Environment x Cultural Dimension	1	1.921	.169	.020	.279
Error (Recall)	92	(4.456)			

Note. Values in parentheses represent mean square errors.
*p<. 05, **p<.01

Hypothesis Two

The second hypothesis, which measured any changes in performance scores of transfer for individualist and collectivist participants in behaviorist and the socio-cultural constructivist instructional environments, was analyzed using a univariate analysis of variance with a Greenhouse-Geiser adjustment to account for any potential violation of sphericity. All p-values, therefore, have been adjusted according to the Greenhouse-Geiser protocol. The finding for the variable is elaborated on in the following section.

Transfer of Knowledge Between Individualist And Collectivist Groups in Behaviorist and Constructivist Environments

The ANOVA for transfer of knowledge did not find significance in the between subjects main effects analysis for any instructional environment $F(3, 92) = 1.865$, $p = .141$ (see Table 14). The analyses of variance, therefore, indicate that the treatment had no significant effect on the skill levels of transfer of knowledge for the participants that were divided by instructional environment in the between subjects approach. This lack of significance may be at least partially due to undersized effect sizes and statistical power.

Table 14

Analysis of Variance of Transfer of knowledge skills by Instructional Environment

Source	*df*	*F*	*p*	$\square^2$	*Power*
Between Subjects					
Instructional Environment	3	1.865	.141	.057	.469
Error	92	(6.168)			

Note. Values in parentheses represent mean square errors.
*p<.05, **p<.01

Hypothesis Four

The fourth hypothesis, which measured any performance scores of transfer for individualist and collectivist groups, was analyzed using a repeated measures analysis of variance with a Greenhouse-Geiser adjustment to account for any potential violation of sphericity. All p-values, therefore, have been adjusted according to the Greenhouse-Geiser protocol. The findings for each variable are elaborated on in the following sections.

Transfer of Knowledge Between Individualist And Collectivist Groups

The analysis of variance for transfer found significance in the between subjects main effects analysis for cultural attribute (individualism and collectivism) $F(1, 94) = 4.50$, $p = .037$. This finding indicates that the treatment did, in fact, influence participant's levels of transfer of knowledge skills (see Table 15) based upon the cultural dimension targeted.

Table 15

Analysis of Variance for Transfer of knowledge skills by Cultural Dimension

Source	*df*	*F*	*p*	$\square^2$	*Power*
Between Subjects					
Cultural Dimension (Ind vs. Coll)	1	4.50	.037	.046	.550
Error	94	(6.111)			

Note. Values in parentheses represent mean square errors.
*p<.05, **p<.01

Hypothesis Five

The fifth hypothesis, which measured subscale scores for learner preference of either individualized or cooperative learning for individualist and collectivist groups, was analyzed using a point biserial correlation. The finding for each variable is elaborated on in the following section.

Learner Preference Relationship to Individualist And Collectivist Groups

The correlational analysis indicated that significance was found at the alpha = .05 level for the correlation between INDCOL scores of individualist participants and individualized learning subscale scores on the learner preference scale (LPSS), $r_{pb}(95) = -.212$, $p < .05$. Additionally, significance for the correlation between INDCOL scores of collectivists participants and collaborative learning subscale scores on the learner preference scale (LPSS) was also detected, $r_{pb}(95) = .209$, $p < .05$.

The correlation reveals a negative relationship between INDCOL scores and LPSS individualized subscale scores. The -.285 score for the LPSS individualized subscale indicate that low scores on the INDCOL tend to be associated with high scores on the individualized subscale scores of the LPSS. These findings indicate that participants who reveal an individualist cultural dimension (lower scores on the INDCOL) prefer individualized instructional methods (higher scores on the LPSS individualized subscale). The .284 score for the LPSS cooperative subscale indicate that high scores on the INDCOL tend to be associated with high scores on the collaborative subscale scores of the LPSS. These findings indicate that participants who reveal a collectivist cultural dimension (higher scores on the INDCOL) prefer collaborative instructional methods (higher scores on the LPSS collaborative subscale).

The results of this analysis indicate that a learner's cultural dimension does, in fact, correspond to their preference for instructional method and that the cultural dimensions proposed by Hofstede (1980) correspond to characteristics within the two chosen learning theories reviewed in the study. While these findings are significant in terms of answering the research questions posed in this study, they also add to current literature as they corroborate results that have been found by previous researchers who have attempted to investigate the links between cultural differences and achievement (Owens, 1985) (see Table 16).

Table 16

Correlational Analysis of Scores on the INDCOL Questionnaire and Scores on the Learner Preferences Scale (LPSS)

	Scores on the INDCOL	Scores on the Individualized Subscale (LPSS)	Scores on the Cooperative Subscale (LPSS)
Scores on the INDCOL	-----	-.285*	.284*
Scores on the Individualized Subscale (LPSS)		-----	-.434*
Scores on the Cooperative Subscale (LPSS)			-----

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

DISCUSSION

Background

The study employed the constructs of the four dimensions of cultural differences, which have been shown to impact student's achievement and motivation, computer usage, and preference for an instructional environment (see Hofstede, 2001; James & Eisenburg, 1999; Morgan, 2000; Owens, 1985; Triandis, 1995). The study based its foundation for the use of the dimensions of culture on Hofstede's (1980) study in which the four dimensions of culture were found to be empirically evident. The dimension used in this study was individualism vs. collectivism.

The intervention involved participants in a learning process that provided a web-based multimedia presentation that included material for instruction in order to promote understanding in learners. The independent variables of the *cultural attribute (individualism vs. collectivism)* and *instructional environments (behaviorism and socio cultural constructivism)* were manipulated in order to assess the recall, transfer of knowledge and learning preference measures in subjects. The effect of these attributes and environments on the recall and transfer of knowledge was then assessed. The discussion of the findings will be based on results from statistical analyses, while the discussion on extending the findings will be based on several questions posed within the literature specifically as the study pertains to Mayer (2000) and questions of fostering deeper understanding through a multimedia presentation. The discussion will also address concerns voiced in cross cultural literature, specifically as the research pertains to Hofstede (1986, 2001) Triandis (1995) distance learning questions toward cross-cultural online course adaptation through the modularization of learning objects proposed by

Dunn and Marinette (2002). Finally, the relationship of these cultural dimensions toward the learner's preference for an instructional environment also will be discussed.

Discussion of Results

All five hypotheses posed by the research study were analyzed statistically to attempt to isolate the possible significance of the treatment computer based variable on the dependent measures of recall transfer of knowledge and learner preference.

Hypotheses one and three that attempted to analyze any changes of achievement over time were analyzed by performing repeated measures analysis of variance on the dependent variable of recall. The analyses performed on the dependent measure of recall revealed no significant differences toward the cultural dimensions targeted. This finding indicates that although the electronic multimedia presentation had no effect on participants' levels of recall from pre test to post-test across cultural dimension, there was an effect on learning.

Hypotheses two that attempted to analyze deep understanding of instructional material across instructional environments, was analyzed by performing univariate analysis of variance on the dependent variable of transfer of knowledge. The analysis performed on the dependent measure of transfer revealed no significant differences between individualist and collectivist groups in behaviorist and socio cultural constructivist instructional environments. This finding indicates that the electronic multimedia presentation had no effect on participants' levels transfer of knowledge skills across instructional environment or the cultural dimension targeted.

Hypothesis four that attempted to analyze deep understanding of instructional material across cultural dimension was analyzed by performing univariate analysis of

variance on the dependent variable of transfer of knowledge. The analysis performed on the dependent variable of transfer of knowledge indicated a level of significance for the cultural dimension independent variable. This finding indicated that participants whose INDCOL scores revealed a cultural dimension of collectivism scored higher on transfer of knowledge tests than participants whose INDCOL scores revealed a cultural attribute of individualism.

Hypothesis five that attempted to analyze learner preference for instructional method across cultural dimension was analyzed by performing a point biserial correlation. The analysis performed on the dependent variable of subscale scores of individualized and cooperative learning revealed significant differences.

The lack of significance in recall between individualists and collectivists in behaviorist and socio-cultural constructivist instructional environments is not pertinent to this study. What was more important was how participants, when divided into groups based on their cultural dimension, understood the material once they were matched to different instructional environments. Therefore, in order to examine a learner's deep understanding of the material, transfer of learning was used as a dependent measure as well.

The transfer of knowledge test in the Mayer's (2000) study was used to investigate whether learners who experience less cognitive load were better able to mentally organize presented material and relate it with prior knowledge. In this study, however, it was used to determine if deeper understanding of instructional materials could be found in participants who were randomly assigned to instructional environments based on their cultural dimension.

Extending the Results

The findings of the study reveal that there were no differences in significance in recall scores for individualist and collectivist participants who were assigned to instructional environments. This finding is consistent with Mayer (2001) who states that recall, when used alone, is not as reliable a method of evaluating deep understanding of material presented through multimedia formats.

Triandis (2001) suggests that it is wrong to assume that just because one is from an individualistic culture he/she is solely individualistic. The same can be said for someone from a collective culture. It is also important to note that from the beginning, this study includes statements that describe cultures and the central tendencies of its individuals. The results of the data that have been researched represent the *average* person (which is a non-entity), or the average representation of the responses from a collection of individuals from a particular culture.

The findings of this study reveal significant differences for the transfer of knowledge measure between cultural dimensions. Findings suggest that a discrepancy exists in the fostering of deep understanding of instructional materials due to the cultural dimension of individualism vs. collectivism. These findings are consistent with researchers (James & Eisenburg, 1999) who argue that improved performance for students with different cultural values is a result of congruence between situational factors and pedagogy.

These findings also corroborate the literature that collectivists will try to reach higher externally set goals than individualists (Triandis, 1995). Results further indicated that participants whose scores revealed a collectivist cultural attribute fostered a deeper

level of understanding of instructional materials, taking what they learned and applying it to a novel context. This finding is consistent with Triandis (1995) contention that collectivist (allocentrics) tend to think globally about themselves and the interconnectedness they share with the community and the world at large. This demonstrates clearly that collectivists also use collaboration as a means of sharing outcomes, and non-material resources (such as time and effort) (Hui, 1988) to the point of creating harmony in learning situations (Hofstede, 1986). This harmonious relationship leads to extrinsic motivation within the in-group that eventually leads to achievement of a collectively higher set goal (Eisenberg, 1999). The findings revealed for the transfer of learning measure are consistent with Fletcher & Olekains (1996) who state that social obligation is viewed differently and is more important to collectivist than with individualists, in this study it was documented that the disparities between individualists and collectivists have an influence on a student's educational achievement as well as Eisenburg (1999) who stated that cultural variables play a significant role in student performance.

This finding is also consistent with Mayer (2001) who discussed transfer of learning to be a better measure than recall when the goal is to assess how well participants understand material from a multimedia presentation.

Within their discussion on online course adaptation, Dunn and Marinette (2002) attempt to meet the needs of a culturally diverse audience, by describing the specific components that are necessary to modularize online learning toward this audience. This adaptation includes customizing courses to suit the needs of multi-cultural learners. The significance in the correlations evident in hypothesis five indicates that learners desire to

have a consistency between their culture and the way they are taught. The findings are consistent with the presumption that there is a relationship between Hofstede's dimensions of culture and the learning theories reviewed in this document. Furthermore it is evident that related to the body of literature on cross-cultural psychology (Eisenburg, 1999; Hofstede, 1980, 1986, 1997, 2001; Triandis, 1986, 1995, 1995a, 1997, 2001) and the discussions of the popular learning theorists reviewed (Driscoll, 2000; Duffy & Cunningham, 2001; Grabinger, 2001; Shipman, 1985; Vygotsky, 1978) the findings of hypothesis five indicate that participants whose scores on the INDCOL reveal an individualist dimension will prefer instructional environments as suggested by Ertmer and Newby (1993) that have:

1. An emphasis on producing observable and measurable outcomes in students (behavioral objectives, task analysis, criterion-referenced assessment)
2. Pre-assessment of students to determine where instruction should begin (learner analysis)
3. Emphasis on mastering early steps before progressing to more complex levels of performance (sequencing of instructional presentation, mastery learning)
4. Use of reinforcement to impact performance (tangible rewards, informative feedback)
5. Use of cues, shaping and practice to ensure a strong stimulus-response association (simple to complex sequencing of practice use of prompts) (p. 56).

Moreover, participants whose scores on the INDCOL revealed a collectivist dimension prefer environments that have:

1. An emphasis on the identification of the context in which the skills will be learned and subsequently applied (anchoring learning in meaningful context)
2. An emphasis on learner control and the capability of the learner to manipulate information (actively using what is learned)
3. The need for information to be presented in a variety of different ways (revisiting content at different times, in rearranged contexts, for different purposes, and from different conceptual perspectives)
4. Supporting the use of problem-solving skills that allow learners to go "beyond the information given" (developing pattern-recognition skills, presenting alternative ways of representing problems)
5. Assessment focused on transfer of knowledge and skills (presenting new problems and situations that differ from the conditions of the initial instruction) (p. 65-66).

A representation of the relationship between the two learning theories and the cultural dimensions of individualism vs. collectivism based on the findings in this study are illustrated in the tables on the following pages.

Table 17

Instructional Environments Based On Behaviorism Theory

BEHAVIORISM THEORY			
Structured logical presentation of content Instruction utilizes consequences and reinforcement of learner behaviors			
Instructional Environment Characteristics	Emphasis on Behavioral Objectives, task analysis, CRTs Learner Analysis Sequencing of Instructional presentation	Tangible rewards, informative feedback Simple to complex sequencing of practice cues of prompts Teaching Methods: Drill and Practice Mastery Learning	Teaching Methods: Programmed Instruction Direct Instruction Teaching Methods: Simulations Online Instructional Environment Example: The Open University

Table 18

Instructional Environments Based On Socio-Cultural Constructivism Theory

SOCIAL CULTURAL CONSTRUCTIVISM THEORY			
Unstructured learning, engaging learner in actual use of tools in real world context Instruction utilizes is a process of supporting knowledge construction			
	Anchoring learning in meaningful context	Developing pattern recognition skills, alternative problem representation	Teaching Method: Cognitive Flexibility Hypertexts
Instructional Environment Characteristics	Anchoring learning in meaningful context	Assessment focused on transfer of knowledge skills	Teaching Method: Micro Worlds Object-based Learning
	Rearranging contexts from different perspectives	Teaching Methods: Collaborative Learning Hypermedia Apprenticeships	Online Instructional Environment Example: Dynamic Learning Communities

By utilizing learning theories grounded in the literature, and the findings in this study, the potential exist for comparisons to be made that allow instructional designers and faculty to modify instructional environments toward a learner's cultural characteristics. Also, they can more effectively implement the effective design

methodologies of online course cultural adaptation similar to those proposed by Dunn and Marinette (2002).

Limitations of the Study

Research studies conducted on distance learning cannot approach true experimental conditions and therefore contain limitations within the research design that hinder the researcher's ability to generalize results to populations other than those being studied. These limitations are factors in the experimental design, such as a participant's culture that are not under the control of the researcher. The choice of the research design was based on attempts to minimize the effect of uncontrollable intervening variables on the outcomes of the study.

The spread between the cultural groups was not as extreme as it could have been in order to generate a significant effect. This was due to a lack of participation, therefore, the participants were divided based on the nearest substantial measure.

Inter rater reliabilities showed little relationship across two of the external raters for the recall and the transfer test that were administered in the study. Inter rater reliabilities for the pretest of recall between judges was significant r =.801, p = .000 showing a strong relationship between judges. However, inter rater reliabilities for the posttest of recall between judges was significant but showed a moderate relationship r = . 470, p = .027. The inter rater reliability for the transfer test between judges was also significant but moderate r =.640, p = . 001. All Pearson correlation were conducted at the p= .05 level. The scores are indicated in Table 20 below.

Table 19

Correlations Among Judges of the Recall Pretest, Posttest And Transfer Test (n = 22)

	Judge 2 pre test	Judge 2 post test	Judge 2 transfer test
Judge 1 pre test	.801*	---	---
Judge 1 post test	---	.470*	---
Judge 1 transfer test	---	---	.640*

* Correlation is significant at the 0.05 level (2-tailed).

Other limitations were technical in nature. These factors were caused by the unpredictability of the technology used. The Java Internet Relay Chat (JIRC) application that was used to create the collaborative learning environment for the constructivist groups faced frequent malfunctions, which caused the chat room to appear idle. Possible reasons for these malfunctions could have stemmed from any number of probable causes or combination of causes. Some causes include incompatible browser java runtime environment (JRE) version, and/or operating system. Another cause may have been the fact that the java applet was installed incorrectly. When considering the myriad of different computers that participants may have used, combined with the number of different browsers and operating systems, it is important to point out how these occurrences, although unforeseen, proved also to be unavoidable. However, the majority of students were able to successfully log on and collaborate during the assigned chat session, unfortunately their chat logs were unable to be saved for later viewing.

Due to the limitations of the online database individual item analyses were not possible. Therefore, Alpha reliabilities for INDCOL and LPSS scales were not conducted.

The Web-based database encountered errors during utilization that blocked participants from returning to the study, this could account for levels of disregard or apathy in participant experiences. The errors encountered during the treatment involved (a) participants being blocked from re-entering the welcome page, and (b) participants not being able to meet and chat at the same time on occasion. Of the 108 participants that were randomly assigned, 12 participants from both the IAC and CAC groups were unable to return to the study. During the implementation process, these participants emailed the researcher noting that they had received a computer-generated error message that they had to enter a valid email and password in order to re-enter the study. This error prohibited them from being able to complete all or parts of the study and in some cases could have caused participants to not return. This may have caused frustration and could have lead to a decreased level of motivation to return and complete the study. Participants also noted an occasional regeneration of the same practice question screen on the behavioral portion of the instructional environment, which caused some to lose interest and log off. For others, who decided to continue, it could have diluted the potential for recall of information in the lightning presentation.

In retrospect, there were a number of considerations that could have been implemented to make the design of this model more effective. It would have been prudent to include a longer testing time for the pilot. There were unforeseeable circumstances that prematurely interrupted the acquisition of data for the pilot test. Internal consistency for both the INDCOL and LPSS scales could have been acquired if during the pilot test, a means of cataloging individual test items could have been taken

electronically. Design considerations such as the incorporation of a more effective management tool for online chat groups to allow for more participants in collaborative cells should have been implemented. Data acquisition could have been more efficient for the CAC group members if there were an automated email system incorporated into the online model. This automation would have informed them of when to return to the study to chat in their collaborative groups. This functionality would have decreased participant attrition through conflicting scheduling.

Power and Effect

According to Cohen (1992) the specifications necessary to give an effect size (ES) of .80 for this study are: $a_2 =$. 05, u = 4, f= .40, power=. 80. The current study had at least 23 participants per group. Under the desired conditions, this researcher's sample size per group would have needed to be at least 18 participants to generate a power of 0.80. The limitations in terms of power and effect, therefore, can be interpreted by not having had enough participants to account for the small effect and not having a design that could have produced a larger effect. Further studies that either (a) elicit a larger population or (b) incorporate a design that would yield a larger effect might result in significance in the future. Further analyses on effect size should be conducted *a priori* to determine what effect sizes could be anticipated.

Areas of Future Research

Based on issues raised by Hofstede (1986) additional research could be conducted on the cultural differences that are found between teachers and students. According to Hofstede, the burden of adapting cross-cultural learning situations belongs to the instructor. Further research could be carried out to investigate the most effective use of

current and leading edge web-based technologies to capture what Dunn and Marinetti (2002) call the "value orientations" of learners (p. 5). These value orientations may highlight empirically valid cultural dimensions in learners, which once identified, can be used in online cross-cultural course adaptation by faculty and instructional designers. Creative design considerations toward cultural online course adaptation could allow faculty to map the intrinsic cultural elements that are pertinent to a learner's specific culture.

Further research that integrates instruments that use multi-method approaches in the analysis of cultural constructs such as individualism vs. collectivism could prove to illuminate this dimension of culture more clearly. The combined use of current literature on cross-cultural psychology and emerging online technologies could supply the groundwork for highly effective intercultural exchange and productive learning experiences.

Research on the incorporation of learning objects combined with the use of cultural questionnaires, such as those proposed by Dunn and Marinetti (2002) and Triandis (1995a) could be used to "tailor learning experiences to the cultural expectations of the learner" (p. 7). This would encourage learning within meaningful contexts that are customized for the needs of learner.

Finally, further research that investigates the relationship between culture and learner preference as it applies to the behavioral sciences would provide a firm foundation for the improvement of curriculum and instructional delivery toward a global audience of learners.

Summary

In conclusion, the findings of this study present to the current disciplines of distance learning, cross-cultural psychology and the behavioral sciences empirical significant measurements that can be used for future research. These disciplines will benefit from the investigations proposed in this document.

It can be further noted that there are implications for the design of cross-cultural online instructional environments that warrant further research. When faculty, administrators, and instructional designers give proper consideration to these implications, only then can the needs of the target audience's culture be met and this will ensure higher levels of success for multi-cultural learners in web-based classrooms.

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Appendix

APPENDIX A: Practice Questions for Individualist Task and Cues

(Chandler and Mayer, 2001)

Practice Question	Cue
1. "The type of moist air that moves over the surface of the earth and becomes heated is _____" A. Cool B. Warm C. Hot	(Slide 1)
2. "At what speed does warmed moist air near the earth's surface rise?" A. Slowly B. Rapidly C. None	(Slide 2)
3. "Water droplets, which are produced from the water vapor of cooling updrafts in the air condense to form a_____" A. Cloud B. House C. Hailstorm	(Slide 3)
4. "Tiny __ _____ compose the top of the cloud's upper portion after extending its upper portion above the freezing level." A. Ice crystals B. Pebbles	(Slide 4)

C. Raindrops

5. "Over time, water droplets and ice crystals become to heavy. (Slide 5)
_____ are no longer able to support the additional weight."

   A. Updrafts

   B. Hail

   C. Steam

6. "As a result of the additional weight, downdrafts are produced (Slide 6)
from the raindrops and ____ _____ fall through the cloud;
they drag some of the air downward."

   A. Hot air

   B. Ice crystals

   C. Cloud formations

7. "The gusts of cool wind people feel just before the start of rain (Slide 7)
are the result of downdrafts _____ _____ in all directions on the
ground."

   A. Falling hard

   B. Spreading out

   C. Laying still

8. "Electrical charges in clouds are caused by air currents (Slide 8)
that_____."

   A. Push and pull

   B. Rise and fall

   C. Heat and cool

9. “The collision of the cloud’s rising water droplets against heavier, falling pieces of ice results in a _____.” (Slide 9)

    A. Lightning

    B. Charge

    C. Thunder

10. “As positively charged particles rise to the top of the cloud these types of particles fall to the bottom.” (Slide 10)

    A. Positively charged

    B. Negatively charged

    C. Neutrally charged

11. “The negative charged particles move toward the ground in a series of steps otherwise known as a _____ _____.” (Slide 11)

    A. Cold front

    B. Kinetic chain

    C. Stepped leader

12. “Objects such as trees and buildings are carriers for these types of particles.” (Slide 12)

    A. Positively charged

    B. Negatively charged

    C. Neutrally charged

13. “Positive and negatively charged particles meet on their leaders this far above the ground.” (Slide 13)

    A. 165-feet

    B. 2 inches

    C. 200 miles

14. “The leaders provide a path for negatively charged particles to rush down from the cloud. This rushing motion produces a light that is _____ _____ ” (Slide 14)

    A. Not Real lightning

    B. Not Very hot

    C. Not Very bright

15. “Positively charged particles rush upward from the ground along the leader stroke. This path contains particles that have __ _____ _____. ” (Slide 15)

    A. An Opposite charge

    B. A Negative charge

    C. A Neutral charge

16. “As a result of this upward motion of the current, there is a bright light, this is called __ ____ ____ _____.” (Slide 16)

    A. A flash of lightning

    B. A thunderstorm

    C. A hurricane

APPENDIX B: Practice Questions for Socio Cultural Constructivist Treatment

1. What is the role of air temperature in the initial stages of the formation of lightning?
2. How do water droplets when combined with air currents produce conditions that are favorable for the formation of lightning?
3. Explain how the creation of electrical charges combine to form lightning.
4. It is believed that lightning strikes downward from the clouds, based on this presentation, is this true? Explain why or why not.

APPENDIX C: Scoring Rubrics For Transfer Test

(Chandler and Mayer, 2001)

Question: "What could you do to decrease the intensity of lightning of a lightning storm?"

Answer A	Answer B	Answer C	Answer D
3 points	**2 points**	**1 point**	**1 point**
"Reduce the amount of positively charged particles have not rushed upward along the path left by the negatively charged particles."	"Removing positive particles from the earth's surface."	"Place positive particles near the cloud."	"Adjust the surface temperature."

Question: "Suppose you see clouds in the sky but no lightning. Why not?"

Answer A	Answer B	Answer C	Answer D
3 points	**2 points**	**1 point**	**1 point**
"Positively charged particles (plusses) have not rushed upward along the path left by the	"Negative charges (minuses) have not fallen to the bottom of the cloud."	"The top of the cloud may not be above the freezing level."	"No ice crystals have formed."

negatively charged particles (minuses)."			

Question: "What does air temperature have to do with lightning?"

Answer A	**Answer B**	**Answer C**	**Answer D**
3 points	**2 points**	**1 point**	**1 point**
"Cooler air is heated over the surface of the Earth, causing wind motion, in turn causing electrical particles to meet"	"The top of the cloud is above the freezing level, and the bottom of the cloud is below the freezing level."	"Different air temperatures create thunderclouds. These clouds contain electrical charges that cause lightning"	"The earth's surface is warm and the oncoming air is cool"

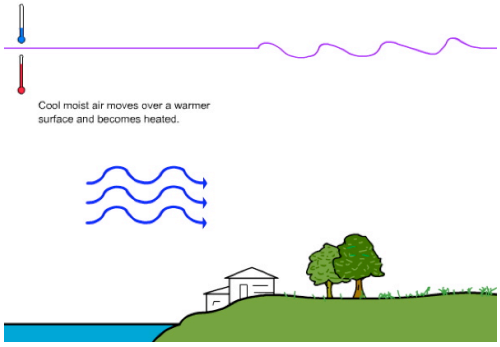
Question: "What causes lightning?"

Answer A	**Answer B**	**Answer C**	**Answer D**
3 points	**2 points**	**1 point**	**1 point**
"Air of different temperatures meet and rush up into the higher freezing	"Air motion creates opposite charges that have fallen to the bottom of the clouds.	"A difference in electrical charges within a cloud. A difference in air	"Different temperatures, wind motion, opposite particles

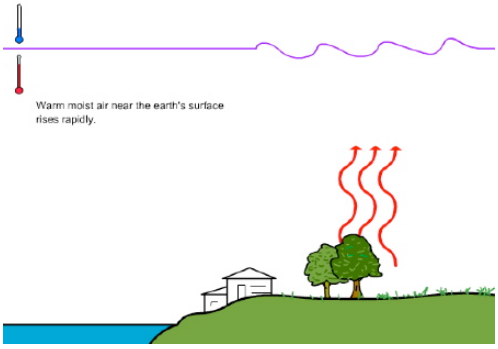
levels of air, ice crystals fall to the bottom of the cloud. These ice crystals carry negatively charged particles (minuses). The negative particles (minuses) meet positive particles (plusses) near the surface. When they collide an upward strike of light is what causes lightning”	These charges meet positive charges (plusses) on the ground, when they meet lightning strikes upward”	temperature within a cloud.”	of electricity.”

APPENDIX D: Multimedia Presentation with Corresponding Narration for Explanation on Lightning Formation

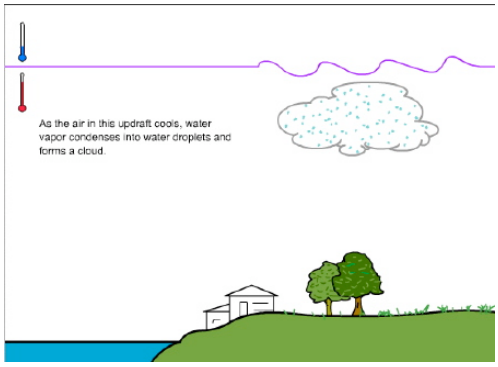
(Chandler & Mayer, 2001)



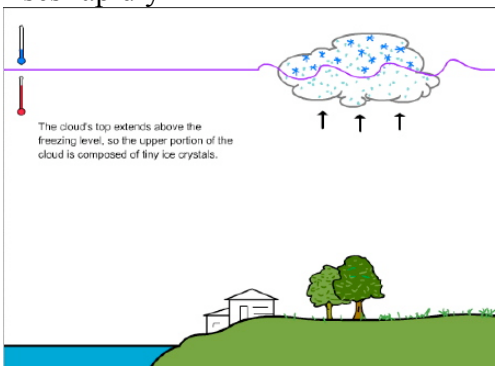
"Cool moist air moves over a warmer surface and becomes heated"



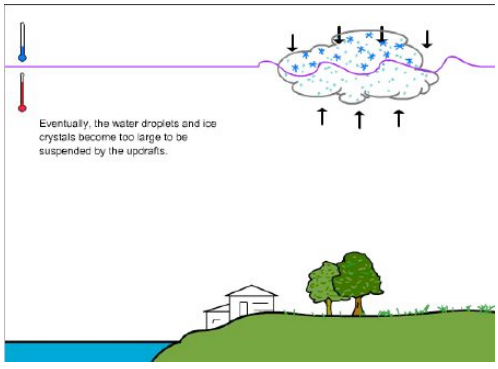
"Warmed moist air near the earth's surface rises rapidly"



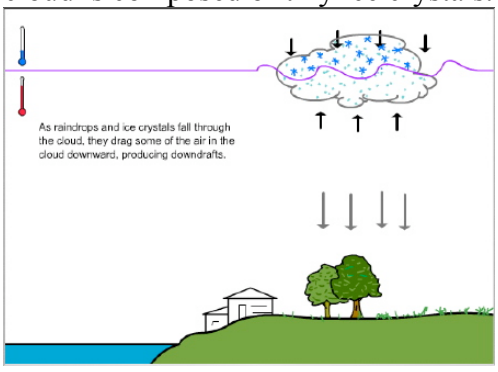
"As the air in this updraft cools, water vapor condenses into water droplets and forms a cloud"



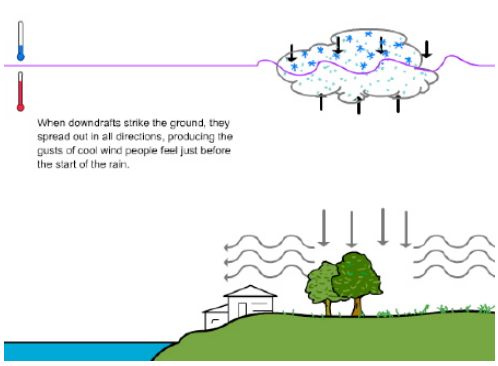
"The cloud's top extends above the freezing level, so the upper portion of the cloud is composed of tiny ice crystals."



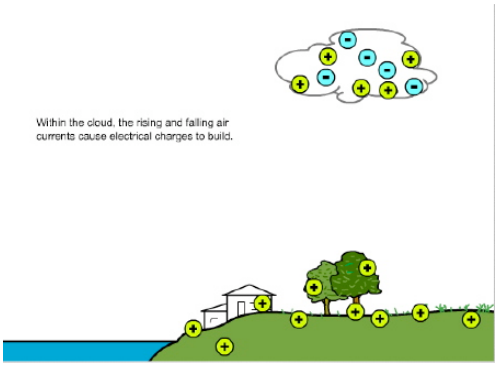
"Eventually, the water droplets and ice crystals become too large to be suspended by the updrafts."



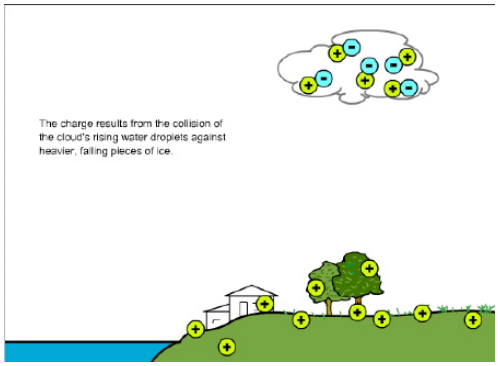
"As raindrops and ice crystals fall through the cloud, they drag some of the air in the cloud downward, producing downdrafts."



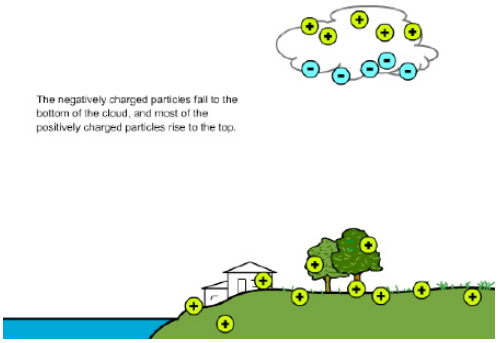
"When downdrafts strike the ground, they spread out in all directions, producing the gusts of cool wind people feel just before the start of the rain."



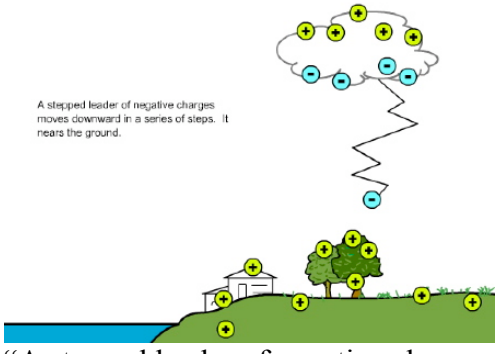
"Within the cloud, the rising and falling air currents cause electrical charges to build."



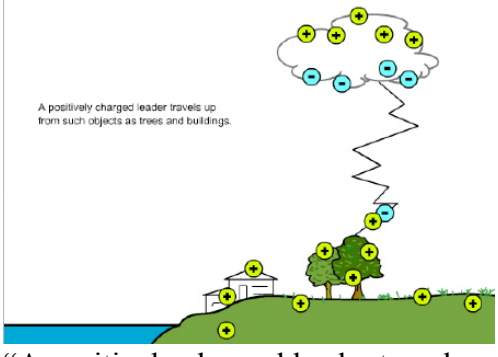
"The charge results from the collision of the cloud's rising water droplets against heavier, falling pieces of ice."



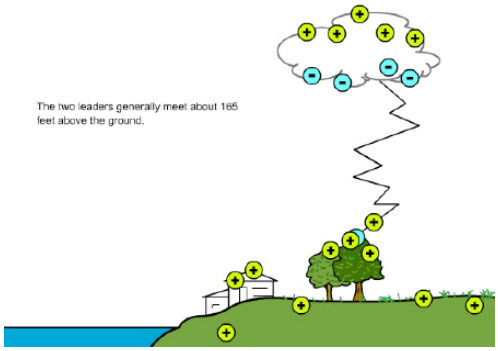
"The negatively charged particles fall to the bottom of the cloud, and most of the positively charged particles rise to the top."



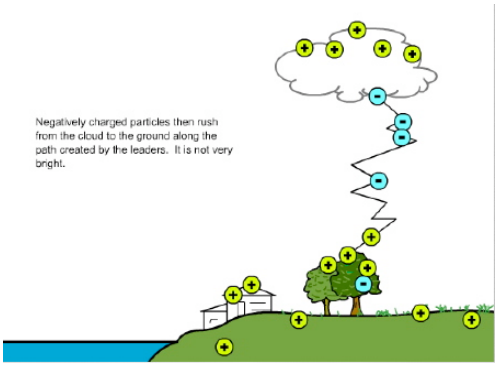
"A stepped leader of negative charges moves downward in a series of steps. It nears the ground."



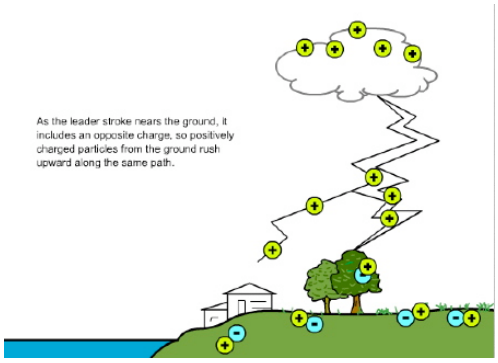
"A positively charged leader travels up from such objects as trees and buildings."



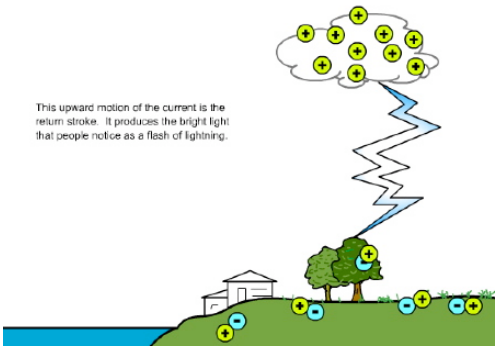
"The two leaders generally meet about 165-feet above the ground."



"Negatively charged particles then rush from the cloud to the ground along the path created by the leaders. It is not very bright."



"As the leader stroke nears the ground, it includes an opposite charge, so positively charged particles from the ground rush upward along the same path."



"This upward motion of the current is the return stroke. It produces the bright light that people notice as a flash of lightning."

APPENDIX E: Modified Individualism/Collectivism test (INDCOL) taken from Attributes Questionnaire

(Triandis, 1995a)

In this questionnaire we wish to help you find out for yourself if you are a collectivist or an individualist. We will help you find out where you stand on these tendencies by summing "points."

There are 16 items in the questionnaire. Please follow the instructions carefully and faithfully, so you will get an accurate estimate of your individualism and collectivism. This questionnaire is anonymous, and there are no right or wrong answers. There are five possible answers. We want to know if you strongly agree or disagree with some statements. If you strongly agree click beside the answer choice that is labeled "Strongly Agree;" if you strongly disagree, click beside the answer choice that is labeled "Strongly Disagree;" if you are unsure, click beside the answer choice that is labeled "No Opinion." Also if you think a question does not apply to you click beside the answer choice that is labeled "No Opinion."

1. My happiness depends very much on the happiness of those around me

Strongly Agree Agree No Opinion Disagree Strongly Disagree

2. Winning is everything

Strongly Agree Agree No Opinion Disagree Strongly Disagree

3. It annoys me when other people perform better than I do

Strongly Agree Agree No Opinion Disagree Strongly Disagree

4. It is important for me to maintain harmony within my group

Strongly Agree Agree No Opinion Disagree Strongly Disagree

5. It is important to me that I do my job better than others

Strongly Agree Agree No Opinion Disagree Strongly Disagree

6. I like sharing little things with my neighbors

Strongly Agree Agree No Opinion Disagree Strongly Disagree

7. I enjoy working in situations involving competition with others

Strongly Agree Agree No Opinion Disagree Strongly Disagree

8. The well-being of my co-workers is important to me

Strongly Agree Agree No Opinion Disagree Strongly Disagree

9. If a relative were in financial difficulty, I would help within my means

Strongly Agree Agree No Opinion Disagree Strongly Disagree

10. Competition is the law of nature

Strongly Agree Agree No Opinion Disagree Strongly Disagree

11. If a co-worker gets a prize I would feel proud

Strongly Agree Agree No Opinion Disagree Strongly Disagree

12. To me, pleasure is spending time with others

Strongly Agree Agree No Opinion Disagree Strongly Disagree

13. When another person does better than I do, I get tense and aroused

Strongly Agree Agree No Opinion Disagree Strongly Disagree

14. Without competition it is not possible to have a good society

Strongly Agree Agree No Opinion Disagree Strongly Disagree

15. I feel good when I cooperate with others

Strongly Agree Agree No Opinion Disagree Strongly Disagree

16. Some people emphasize winning; I am not one of them

Strongly Agree Agree No Opinion Disagree Strongly Disagree

APPENDIX F: Modified Learner Preferences Scales (LPSS)

Learner Attitude Survey

(Barnes & Owens, 1992)

This questionnaire asks you to tell how you feel about some of the learning that went on in the study. This questionnaire is anonymous, and there are no right or wrong answers.

There are 24 items in the questionnaire. Each item is a statement that someone has made about learning. You may agree or you may disagree; that is, it may be true for you or it may be false for you. Each person may have a different opinion.

There are four possible answers. If the statement is completely true for you, click beside the answer choice that is labeled "Completely True;" if the statement is completely false for you, click beside the answer choice that is labeled "Completely False;" if the statement is somewhat for you, click beside the answer choice that is labeled "Somewhat True;" if the statement is somewhat false for you, click beside the answer choice that is labeled "Somewhat False."

1. Working in a group leads to a poor result.

Clearly True Somewhat True Somewhat False Clearly False

2. A teacher can help most by working with students in groups.

Clearly True Somewhat True Somewhat False Clearly False

3. I prefer to work by myself so I can go as fast as I like.

Clearly True Somewhat True Somewhat False Clearly False

4. It is helpful to put together everyone's ideas when making a decision.

Clearly True Somewhat True Somewhat False Clearly False

5. When a group or class needs something important done, I can help most by working it out on my own.

Clearly True Somewhat True Somewhat False Clearly False

6. Working in a group scares me.

Clearly True Somewhat True Somewhat False Clearly False

7. I do not like working by myself.

Clearly True Somewhat True Somewhat False Clearly False

8. In a group discussion we never get on to important things.

Clearly True Somewhat True Somewhat False Clearly False

9. I like to work in a group at school.

Clearly True Somewhat True Somewhat False Clearly False

10. I like to be able to use the ideas of other people as well as my own.

Clearly True Somewhat True Somewhat False Clearly False

11. If I work by myself most of the time, I become lonely and unhappy.

Clearly True Somewhat True Somewhat False Clearly False

12. We get the work done faster if we all work together.

Clearly True Somewhat True Somewhat False Clearly False

13. I do better work by myself.

Clearly True Somewhat True Somewhat False Clearly False

14. I like to help other people do well in a group.

Clearly True Somewhat True Somewhat False Clearly False

15. If I work by myself now I will manage better later.

Clearly True Somewhat True Somewhat False Clearly False

16. I work badly when I know I have to do it all by myself.

Clearly True Somewhat True Somewhat False Clearly False

17. I like my work best if I do it myself without anyone's help.

Clearly True Somewhat True Somewhat False Clearly False

18. Other students don't need to know what I do at class.

Clearly True Somewhat True Somewhat False Clearly False

19. Working in a group now helps me work with other people later.

Clearly True Somewhat True Somewhat False Clearly False

20. I like to keep my ideas to myself

Clearly True Somewhat True Somewhat False Clearly False

21. The teacher can help most by choosing work that is right for each student.

Clearly True Somewhat True Somewhat False Clearly False

22. Other students like to help me learn.

Clearly True Somewhat True Somewhat False Clearly False

23. I like to work on my own without paying attention to other people.

Clearly True Somewhat True Somewhat False Clearly False

24. I do not like working with other people.

Clearly True Somewhat True Somewhat False Clearly False

APPENDIX G: Meteorological Filter Test (Mayer, 2001)

Directions: This questionnaire is anonymous. There are five possible answers. We will use a 5-point scale ranging form very little (1) to very much (5) If you feel very knowledgeable the question click beside the answer choice that is labeled "Very Much;" if you know very little about a question, click beside the answer choice that is labeled "Very Little."

Please indicate your knowledge of meteorology (weather).

1 (very little)	2	3	4	5 (very much)

Directions: Please place a check mark next to the items that apply to you:

1. I regularly read the weather maps in the newspaper.
2. I can distinguish cumulus and nimbus clouds.
3. I know what a low pressure system is.
4. I can explain what makes the wind blow.
5. I know what this symbol means: 
6. I know what this symbol means: 

Forrest McFeeters

Curriculum Vitae

ACCOMPLISHMENTS

Proven determination to improve specialized aptitudes by completing two undergraduate Baccalaureate degrees and a Graduate Masters degree.
Evaluated as essential and well suited on the TPAI performance instrument for North Carolina teachers.
Member Kappa Delta Pi Honor Society

COURSES TAUGHT

Introduction to Microsoft Office Basics
Digital Audio

EDUCATION

Virginia Polytechnic Institute and State University
Ph. D May 2003
Major: Instructional Technology

North Carolina Agricultural and Technical State University, Greensboro, North Carolina
M. S. July 1998 to May 2000
Major: Instructional Technology

Winston-Salem State University, Winston-Salem, North Carolina
B. S. Jan 1993 to Dec 1995
Major: Elementary Education

Winston-Salem State University, Winston-Salem, North Carolina
B.A. Aug 1986 to May 1990
Major: Business Administration
Minor: Commercial Music

EXPERIENCE

2003 to Present Intern, Sunset Learning Incorporated, Instructional Systems Technologist

2001 to 2002 Institute for Distance and Distributed Learning, Virginia Polytechnic Institute and State University
Course Developer

2000 to 2001 North Carolina Agricultural and Technical State University, Greensboro, North Carolina
Associate Director of Instructional Design

2000 to 2000 North Carolina Agricultural and Technical State University, Greensboro, North Carolina
Instructional Designer

1995 to 2000 Winston-Salem Forsyth County Schools, Winston-Salem, North Carolina
Regular Classroom Teacher

1997 to 1998 Winston-Salem Parks and Recreation, Reynolds Park Recreation Center
Computer Instructor

1991 to 1994 YMCA Greater Winston-Salem, Winston-Salem, North Carolina
Counselor

TECHNICAL EXPERIENCE

1987 to Present Renaisoft Interactive, Co-Founder, Producer
2001 Winston-Salem State University, Consultant-Virtual Campus CDROM
2001 North Carolina Agricultural and Technical State University, Consultant- Praxis I CDROM

ACADEMIC APPOINTMENTS

Virginia Polytechnic Institute and State University
Graduate Assistant for the Malawi/UPIC Project
Sept 2001 to Present

North Carolina Agricultural and Technical State University
CDL Web Designer
Jan 2001 to June 2001

North Carolina Agricultural and Technical State University
Chairman, CDROM Committee
July 2000 to June 2001

North Carolina Agricultural and Technical State University
Academic Intern Site Supervisor
Dec 2000 to May 2001

North Carolina Agricultural and Technical State University
STEA Web designer
March 2000 to Aug 2000

RESEARCH INTERESTS (GRANT PROPOSALS)

Kelly, P., Niles, J., and Tlou, J. $2,200,000
Development of A Bachelor of Education Program with a Specialization in Primary Education in Malawi, Africa
Funded by USAID.
Role: Graduate Research Assistant

Smith, Wanda J., Belanger, F., and Harrington, V.
Collaborative Research: Resilience of Minorities in Information Technology: Persistence in Educational Programs and Transition to the Workplace
Role: Graduate Research Assistant

Tlou, J.
Evaluation of partnership grants between universities in the United States and abroad
Funded By American Liaison Committee, Assistant Liaison Offices For University Cooperation And Development.
Role: Grant Evaluator

PAPERS AND PRESENTATIONS

Paper accepted as Full Paper: Conceptual & Empirical Study "Meeting The Needs Of Multi-Cultural Students Through Course Adaptation Using Hofstede's Four Dimensional Model Of Culture And The Learning Theory" ED-MEDIA June 23-28, 2003, World Conference on Educational Multimedia, Hypermedia & Telecommunications, Honolulu, Hawaii, USA, Organized by Association for the Advancement of Computing in Education (AACE)

CERTIFICATIONS

Certificate in Distance Education, Indiana University, School of Continuing Studies
FrontPage 2000, Intro, Basic, Advanced, N.C. State Univ.
Advanced Macintosh Troubleshooting Clinic, CompuMaster
Macromedia flash 5 Basics, Interactive Fun!

REFERENCES

Available by Request