Assessment of instructional methodologies and student information processing styles in a terrorism preparedness course

William James McCarthy
Louisiana State University and Agricultural and Mechanical College, wmccart@lsu.edu

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ASSESSMENT OF INSTRUCTIONAL METHODOLOGIES AND STUDENT INFORMATION PROCESSING STYLES IN A TERRORISM PREPAREDNESS COURSE

Dissertation
Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy in
The School of Human Resource Education and Workforce Development

by
William James McCarthy
B.A., Anna Maria College, 1987
M.P.A., Clark University, 1993
December 2004
ACKNOWLEDGMENTS

Very few significant undertakings are solo performances, and the time and effort to obtain a doctoral degree require the support, interest, and collaboration of many individuals. I wish to acknowledge those people who have guided me along this path of achievement.

I am eternally grateful to my dissertation committee, particularly Dr. Harrison, my original advisor, who worked tirelessly to serve as an advocate, mentor, and friend. Her patience will always be appreciated. Dr. Kotrlik, the co-chair of my committee, gave freely of his time and talents to help guide me during the writing of my dissertation.

I thank Dr. Burnett for serving as an expert on my committee while already burdened with running the department. I would also like to thank the other members of my committee, Dr. Redmann and Dr. Maxcy, for their invaluable suggestions and time.

A special thanks goes to my wife, Debora, for her conviction in supporting this entire effort. To my children, William II, Lauren, and James, who became experts at helping out at a moment's notice, thank you all.

I am grateful to everyone mentioned above, because without their collective efforts, the research and especially the dissertation would not have been possible.
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ABSTRACT

The focus of the research was the evaluation of two instructional methodologies for teaching terrorism preparedness at several universities in Louisiana. Participants were taught a curriculum for an audience who may work at a potential terrorist target.

The purpose of the research was to determine if processing styles based instruction improved learning. The objectives of the study were to: 1) Describe participant demographics: a) age, b) gender, c) credit hours, d) field of study; and e) preferred Strategic Information Processing Style (SIPS); 2) Determine if changes occur in knowledge of terrorism preparedness as measured by the Terrorism Awareness test; 3) Determine if there are differences in the test scores based on instructional methodology; 4) Determine if test scores differ by preferred Information Processing Style (IPS); and 5) Determine if selected variables explain a significant portion of the variability in the Terrorism Awareness Test scores.

The majority of students were female. The average age was 21 years, and the range was 17 - 52. The mean number of credit hours completed was 55.69. Students, for the most part (n = 141 or 45.8%), reported majoring in social sciences. Assessment of students’ Information Processing Style (IPS) revealed that two thirds (n = 210 or 68.2%) preferred the Analytical Processing Style. A Paired Samples t-test revealed that the student’s post-test score (M = 14.02) were higher than the pre-test score (M = 13.61). The Analysis of Covariance (ANCOVA) revealed that the students taught using traditional lecture style scored higher on the Terrorism Awareness Test then those taught using the learning style based method.

Regression analysis revealed that demographic variables did not explain a significant proportion of the variance. The model explains a moderate amount of the variance (25.5%). The instruction methodology variable by itself explains a low amount of variance. This study
suggests that this particular curriculum which was intended to focus on one dimension of learning styles based instruction appears to result in a small amount of decreased learning as measured by the Terrorism Awareness Test.
CHAPTER I: INTRODUCTION

Terrorism

The United States has experienced dramatic changes since the events of September 11, 2001. “Scholars, politicians, and the public have been reminded of the vulnerability of human societies to various kinds of threats, including environmental disasters, technological failures, and terrorist attacks” (Webb, 2002).

Today terrorism is dominated by several different trends and factors that in recent years has become increasingly intertwined with often unsettling consequences and ramifications (Hoffman, 1998). Successful terrorists choose technology to exploit the vulnerabilities of a particular society. Modern societies are particularly susceptible to weapons that are capable of killing many people at one time – weapons of mass destruction (WMD) (Stern, 1999).

Recently, a number of terrorist threats and attacks have occurred in the United States. The incidents have included the destruction of the World Trade Center in New York, the assault on the Murrah Federal Building in Oklahoma, and the use of biological weapons in Washington, D.C., and Florida. These horrific acts are the driving force behind several human resource education initiatives which seek to educate America’s workers in preparing for terrorist events. The Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction in its Annual Report to Congress (U.S. Department of Defense, 2000b) identified the need for training capabilities employees should possess as they prepare for, and work to prevent, terrorist incidents. While concerns about terrorism have grown, the U.S. Congress (1997) assigned the U. S. Department of Defense with the task of coordinating terrorism training by Federal agencies for state and local communities. The Federal Emergency Management Agency (2000) reported that “… an effective response to terrorist incidents
involves having employees recognize the unique characteristics of Nuclear, Biological and Chemical Weapons of mass destruction in order to protect themselves and the community” (p. 2).

As organizations develop their workforce strategies for the 21st century, new and dynamic educational efforts must be considered. Campbell (2002) stated the following:

The September 11th attacks were a turning point for many organizations, government and private, in recognizing the critical need to implement crisis planning, response and recovery procedures. The challenge organizations now face is to implement cost-effective, appropriate policies and procedures that enhance security while maintaining favorable relations with customers, employees and other stakeholders. (p. 3)

Educators need to provide their students with information about the threats posed by terrorism and the potential targets that exist in business, industry, academia, and government.

**Terrorism Education**

With present-day catastrophic terrorist acts targeting the nation’s sense of security and safety, organizations such as the oil industry, government, and business are beginning to examine their workforce development programs. The organizations are including a component about weapons of mass destruction (WMD) and the potential for a terrorist attack using nuclear, biological, or chemical weapons (NBC). Detection, diagnosis, and mitigation of illness and injury caused by biological and chemical terrorism is a complex process that involves numerous partners and activities. Meeting this challenge requires special emergency preparedness in all cities and states (Centers for Disease Control and Prevention, 2000). For domestic terrorism preparedness education to succeed, it is essential that educators strive to meet the demands of their customers.
**Initiatives**

The Federal government has made educational opportunities available to assist state and local communities with the information and skills needed to prepare for terrorism incidents involving weapons of mass destruction. The United States Congress passed legislation using the Nunn-Lugar-Domenici Amendment to the National Defense Authorization Act, Public Law No. 104-201 (U.S. Congress, 1997). It created mandates that were instrumental in directing funding toward educational programs (U.S. Department of Defense, Domestic Preparedness: Compendium of Weapons of Mass Destruction Courses, 2000a). By appropriating millions of dollars to various response agencies during the past five years, the government has demonstrated their efforts to sponsor educational projects for emergency management initiatives. The focus is to educate employees who may work at or near potential target facilities and other critical locations throughout the nation (Homeland Defense Program, 2000).

**Restructuring Terrorism Resources**

According to the U.S. Congress (1997), the Nunn-Lugar-Domenici Amendment, the U.S. Department of Defense and several other federal organizations (Departments of Energy, Justice, Transportation, and the Environmental Protection Agency) were required to design and develop educational courses to prepare the nation for various terrorist incidents involving weapons of mass destruction. These agencies and organizations took action and formed several focus groups consisting of academicians, researchers, and emergency response specialists. Their task was to identify the educational performance objectives needed by a variety of citizens who ranged from employees working at a potential terrorist target site to emergency response personnel and even to elected officials (Waeckerle, 2000). The focus groups developed 26 educational performance objectives for five levels of competency. These levels included: 1) Employee Awareness (see
The first 10 performance objectives for the awareness competency level are described in Table 1.

Table 1. Performance objectives for employee awareness level competencies for responding to a weapons of mass destruction incident

<table>
<thead>
<tr>
<th>Performance Objectives</th>
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<tbody>
<tr>
<td>1. Describe the potential for terrorist use of NBC weapons:</td>
</tr>
<tr>
<td>- what nuclear/biological/chemical (NBC) weapons substances are,</td>
</tr>
<tr>
<td>- their hazards, and risks associated with them,</td>
</tr>
<tr>
<td>- likely locations for their use,</td>
</tr>
<tr>
<td>- the potential outcomes of their use by terrorists</td>
</tr>
<tr>
<td>- indicators of possible criminal/terrorist activity involving such agents, and</td>
</tr>
<tr>
<td>- behavior of NBC agents.</td>
</tr>
<tr>
<td>2. Discuss the indicators, signs, and symptoms for exposure to NBC agents, and identify the agents from signs and symptoms, if possible.</td>
</tr>
<tr>
<td>3. Name relevant NBC response plans and SOP’s and your role in them.</td>
</tr>
<tr>
<td>4. Distinguish and outline the need for additional resources during a NBC incident.</td>
</tr>
<tr>
<td>5. State the proper notification and communicate the NBC hazard.</td>
</tr>
<tr>
<td>6. List:</td>
</tr>
<tr>
<td>- NBC agent terms, and</td>
</tr>
<tr>
<td>- NBC toxicology terms.</td>
</tr>
<tr>
<td>7. Outline individual protection at a NBC incident</td>
</tr>
<tr>
<td>- Use of self-protection measures, and</td>
</tr>
<tr>
<td>- Select and use proper protective equipment.</td>
</tr>
<tr>
<td>8. Describe protective measures, and how to initiate actions to protect others and safeguard property in an NBC incident.</td>
</tr>
<tr>
<td>9. Define CB decontamination procedures for self victims, site/equipment and mass casualties:</td>
</tr>
<tr>
<td>- detail &amp; implement.</td>
</tr>
<tr>
<td>10. Define a crime scene and evidence preservation at an NBC incident.</td>
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**Department of Defense Program.** The U.S. Department of Defense, Army Soldier and Biological Chemical Command (SBCCOM) was designated to provide oversight for the Domestic Preparedness Program and to coordinate, integrate, and execute a program which would enhance domestic preparedness for nuclear, biological, and chemical (NBC) terrorism.
The purpose of the program was to provide training to state and local communities to prepare for a terrorist incident. As a part of this effort, SBCCOM developed the NBC Domestic Preparedness Employee Awareness course which was intended to provide basic awareness education on a Weapons of Mass Destruction (WMD) incident to a diversified audience of employees at potential terrorist target facilities. The purpose of the course was intended to raise the level of awareness about the potential for a terrorist attack at a facility using NBC weapons. Employees at these facilities may have no official responsibilities in such a crisis; however, they might be the first to observe a terrorist NBC attack and they would need to know what to look for, and how to save themselves and others, if an attack were to happen.

According to the U.S. General Accounting Office (GAO) report (2000), actions were being taken to improve the federal government’s role in weapons of mass destruction training. Further, the GAO reported that federal training programs on WMD are not well coordinated and this has resulted in inefficiencies in the overall federal effort and has caused concern in various communities. In a 1998 GAO report assessing the terrorism training program, it was reported that efforts were underway to improve the efficiency of the U. S. Department of Defense (DoD) Domestic Preparedness Program. Since its initiation, the NBC course has been presented in over 105 non-military communities, nationwide, with over 3,000 participants. The course was a part of the comprehensive weapons of mass destruction installation preparedness program which was successfully piloted at Fort Bragg, North Carolina, and Pope Air Force Base, North Carolina. It significantly increased the installations’ weapons of mass destruction terrorism awareness and preparedness (Homeland Defense Program, 2000). Relatively little research has been done to determine the effectiveness of the SBCCOM’s program as it relates to participants. The U.S. General Accounting Office (1998) reported “… that training and equipment provided by the U.S.
Defense Department for the Domestic Preparedness Program have clearly increased communities awareness of and should better prepare them to deal with a terrorist attack involving chemical or biological weapons” (p. 3). The performance objectives for this course, as described in Table 1, were at the employee awareness level.

**Instructional Approaches.** Fischer (1996) contended that the new emphasis on antiterrorism education and awareness has demonstrated that the skills and energies of educators have been indispensable in confronting an international threat to American lives and properties. Waeckerle, Seamans, Whiteside, Pons, White, Burstein, and Murray (2001) acknowledged that the key goal of this awareness level education is to introduce terms, issues, and basic knowledge, so that this information is understood and remembered. Waeckerle et al., (2001) further stated, “… one of the most critical elements in this process is to identify and analyze specific learner needs for WMD training” (p. 598). As educators explore ways to prepare their students for terrorist incidents, the application of alternative instructional methodologies suggests that more research be done.

**Theoretical Framework**

A review of literature and related theory to determine why information processing styles based instruction may or should result in increased learning produced limited empirical data. The researcher began the investigation of the theoretical base of this study in an effort to establish a baseline for understanding the instructional strategies used to increase learning for students enrolled in terrorism awareness courses. The concept of applying learning styles methodology was generally addressed.

Sternberg (1997) stated that theories of learning styles deal with how and why people like to learn. The concept of educating people using learning style methods in a manner that
improves learning effectiveness was not found to be uncommon. Pressman and Dublin (1995) contended that a growing body of research addresses the question of how matching learning and teaching styles affects cognitive outcomes; several studies (e.g., Dunn & Dunn, 1999, & McCarthy, 1996) have verified that increased academic achievement and improved attitudes toward learning occurred when students’ learning styles were matched with appropriate methods or materials. Snow and Yallow (1982) contended that the success of education hinges on the adaptation of teaching to the learning differences among the students. Learning styles refer generally to the preferred ways in which students acquire or approach new cognitive/affective/psychomotor material in a learning setting. Learning styles of students often have been studied at four levels: personality, information processing, social interaction, and instructional methods (Claxton & Murrell, 1987). However in this study, the aspects of only two of these models will be addressed: information processing style and instructional methodology models. Cronbach and Snow (1977) contended that theoretically, cognitive and learning styles could be used to predict what kind of instructional strategies or methods would be most effective for a given individual and learning task.

Kolb, Rubin, and McIntyre (1979) recognized learning style strategies and methods as being critical for instructors and students. The basis for instructional learning style methods has been that individuals process, internalize, and evaluate information differently. Some individuals learn best by experience, others learn most effectively by manipulating objects, and still others prefer alternative learning approaches and opportunities. The theory has a more direct outcome, which is reflected in the following statement by Riding and Rayner (1998):

The significance of an awareness of style is its potential for enhancing and improving human performance in a variety of contexts. The fascinating and enduring appeal of style lies in its use as a 'conceptual framework' for individuality. It may be quite possible that
the continuing interest in the idea of style in so many different contexts reflects a basic human need to create a sense of identity, which is after all, the essence of individuality. (p. 5)

According to Ellis (2001), learning styles based education contends that individuals vary considerably in their preferences for learning. Dunn, Griggs, Olson, Beasley, and Gorman (1995) contend that learning style methodology is a way that individuals’ process, internalize, and retain new academic information.

Research and application of Kolb’s ideas for employing learning style methods in the classroom has been successful as cited in Langer (1997) and Howard (2000). The result has been that today’s successful employees are distinguished not so much by any single set of skills and abilities, but by their ability to adapt to, and master, the changing needs of their job and career, i.e., by their ability to learn (Kolb, 1995).

Learning Style Models

In the late 1970’s Bernice McCarthy (1987, 1996) created an instructional teaching/learning system, 4MAT, which was based upon brain studies and the work of such theorists as Dewey, Kolb, Jung, Lewin, Sperry, Gregorc, among others. The model has showed that individuals learn in different, yet identifiable ways, and that engagement with a variety of diverse learning sets result in higher levels of motivation and performance (McCarthy, 1996).

According to Scott (1994), 4MAT is an instructional learning model based on two theoretical constructs: Kolb’s model of learning styles and the concept of brain hemisphericity. It has been legitimatized through academic discussions, research, and widespread use of 4MAT concepts. Scott further states that the 4MAT model is capable of developing instructional units. According to Statt, Plummer, and Marinelli (2001), by adapting the 4MAT model, it can assist
an instructor in teaching to all members of the learning group. The 4MAT model focuses on both the perceiving and processing aspects of learning.

**Information Processing Theory**

An extended view of the learning styles approach to instruction has been the concept of information processing styles. The importance of cognitive thinking has supported the notion that instructional approaches that help students reflect on their own learning processes are highly beneficial to their overall learning and tend to stimulate motivation so they improve as learners (Silver, Strong, & Perini, 2000).

The theoretical base has been described in more detail in the following statement by Wolfe (2001):

For the past several decades, the predominant model of memory has been an information processing model. Growing out of the information processing theory, it became popular at about the same time as, or perhaps as a result of, the invention of the computer. Many variations on this model are the result of new understanding gained from many fields, including neuroscience, cognitive psychology, and developmental psychology. (p. 76)

Miller (1956) developed two theoretical ideas that are fundamental to the framework for information processing. The first concept dealt with the capacity of short term (working) memory. The other focused on information processing which involves the manner in which the mind gathers, and represents information, holds information, and gets to the information when it’s needed. According to Craik and Lockhart (1972), stimulus information is processed at multiple levels simultaneously depending upon its characteristics. Hilgard and Bower (1975) stated that in order to facilitate this task, instructors would need to help learners develop information processing skills and apply them systematically in order to master the curriculum. Good and Brophy (1986) stated that information processing involves students actively processing, storing, and retrieving information; and that information processing emphasizes
cognitive structures built by the learner. Boyatzis, Cowen, and Kolb (1995) contended that
learning is a solitary act that occurs in a relationship with others. Through learning together, the
human community is created and recreated; however, the choice of when and what to learn is a
private one.

According to Kearsley (2001), cognitive styles refer to the preferred way individuals’
process information. Unlike individual differences in abilities, which describe peak performance,
styles describe a person's typical mode of thinking, remembering, or problem solving. Having
more ability is usually considered beneficial while having a particular cognitive style simply
denotes a tendency to behave in a certain manner. There are several different types or levels of
learning. The significance of these classifications is that different types of learning require
different types of instruction.

Assessment of Information Processing Style

Sternberg and Zhang (2001) stated that a student’s success in the classroom appears to be
dependent on his information processing style and the manner in which he utilizes his cognitive
resources. Research on styles has suggested that individuals tend to place themselves in, and
seek out, situations and tasks which will allow them to use their preferred modes for processing
new information into their cognitive structures. Knowledge about these styles has been a
fundamental new tool for teachers and has provided a more in depth view of the learner than
previously understood. It has a component of the basic framework upon which a stronger theory
and application of thinking, learning, and instruction may be developed.

A recent study was conducted in which the information processing styles of several
groups of undergraduate college students were measured using a new instrument. Farrell (2001)
designed an instrument that was based on the information processing theory. This self-
assessment tool is used to determine individual differences in strategical information processing styles, which are a measure of the strategies that individuals use to process information transmitted by the senses. Once students are aware of their preferred strategical information processing styles, they may become cognizant of the different types of strategies that are available for success in the academic environment.

Statement of the Problem

This study is crucial because incidents involving terrorism in the U.S. have increased and have threatened public safety and health. In view of these threats and vulnerabilities, educators have little or no information regarding the effectiveness of instruction based on processing styles in a terrorism preparedness course. This study assessed selected instructional methodologies for teaching terrorism preparedness awareness in a nuclear, biological and chemical terrorism preparedness course.

Purpose and Objectives of the Study

The purpose of this study was to determine if processing styles based instructional methodologies result in improved learning when compared to traditional instruction. The following research objectives were the focus of this study:

1. Describe students participating in the Terrorism Preparedness Course on the following selected demographic characteristics:
   a. age,
   b. gender,
   c. number of credit hours completed,
   d. major field of study, and
   e. preferred Strategic Information Processing Style (SIPS).
2. Determine if changes occur in knowledge of terrorism preparedness as measured by the differences in pre-test and post-test scores on the Terrorism Awareness Test (TAT) among students in a Terrorism Preparedness Course.

3. Determine if there are differences in the post-test scores of students participating in the Terrorism Preparedness Course based on instructional methodology, when controlling for pre-test scores.

4. Determine if Terrorism Awareness Test (TAT) post-test scores differ by preferred Strategic Information Processing Style (SIPS) when controlling for pre-test scores.

5. Determine if selected variables explain a significant portion of the variability in the Terrorism Awareness Test scores.

**Definition of Terms**

This section provides definitions for terms used in this research that seem to be unusual or may not be widely understood. It also provides special meaning to common terms within this study. When a reference is not cited for a definition, the definition was developed specifically for this study by this researcher.

**Domestic Terrorism:** This involves groups or individuals whose terrorist activities are directed at elements of the United States government or population without foreign direction (Fischer, 1996).

**Information Processing System Theory:** Derived from cognitive psychology and explains how individuals receive and process information for memory, storage, and retrieval (Craik & Lockhart, 1972).
**4MAT System**: An instructional design model employed to address and capitalize on the different learning styles of students using a framework applied to teaching strategies utilizing right and left mode brain hemispheric techniques (McCarthy, 1996).

**Learning Style Theory**: Learning style theory is based on research which demonstrates that as a result of heredity, upbringing, and current environmental demands, different individuals have a tendency to both perceive and process information differently (Kolb, 1984; McCarthy & St. Germain, 1998).

**Terrorism**: Defined as the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives (Fischer, 1996).

**Weapon of Mass Destruction**: Any destructive device that is intended or capable of causing death or serious injury to a large number of people through the release, dissemination, or impact of toxic or poisonous chemicals or their precursors, disease-causing organisms, radiation or radioactivity, or conventional explosives sufficient for wide spread lethality (Jones, Kowalk & Miller, 2000).

**Limitations**

The limitations of the study were that this researcher examined only college and university students enrolled in lower level sociology courses in Louisiana and therefore cannot be generalized to any other population. In addition, the short term time frame (one week) between the administration of the pre-test and the post-test, the study participants’ familiarity with the test information and the focus of the class may have also impacted the results of the study.
CHAPTER II: REVIEW OF LITERATURE

Presented in this chapter is a review of the literature as it related to terrorism education, learning models, and instructional methodologies. Sections of the chapter include: 1) terrorism, 2) preparedness education, 3) learning style foundations, and 4) information processing style.

Terrorism

The modern crisis in terrorism was identified worldwide during the 1960’s. It was highlighted by the hostage taking and killings at the 1972 Olympics. This act drew the attention of the worldwide audience. Throughout the years, the American people have seen commercial airplanes hijacked and explosions rock other parts of the globe.

During this time period (1970’s), college level courses on terrorism were integrated into existing curriculum which discussed the human element and the motivations of terrorists (Govea, 1980). A basic understanding of terrorism was also taught to high school students by social studies teachers (Ellington, 1982). The “Cold War” raised fears among Americans that technological weapons could be deployed against the United States. Totten (1986) reported the likelihood and probability of terrorist acts against nuclear power stations in the United States and abroad.

Throughout the 1980’s, institutions of learning continued to teach about the acts of terrorism. Some educators employed conceptual approaches which used the case study approach as a methodology (Kleg, 1986).

Simonsen and Spindlove (2000) stated that “… in order to stop the wake of terrorism that was sweeping over Europe against American targets in the mid 1980’s, the U.S. military took retaliatory military action” (p.59). While these challenges were occurring globally, terrorism education in the U.S. was limited. Fleming (1986) reported that a survey of history and social
studies textbooks revealed that a limited number offered students help in defining or understanding terrorism.

By the late 1980’s and early 90’s, terrorism was beginning to be examined in the classrooms across the nation. Contemporary terrorism was defined, some of its causes and strategies were explored, and there was some movement toward understanding its dimensions (Mitchell, 1989).

The awareness of terrorism changed for the United States in February 1993. The World Trade Center bombing was a “first alert” for Americans to the danger of modern terrorism (Simonsen & Spindlove, 2000). Kumamoto (1993) asserted that terrorism is a subject that is worthy of attention in the social studies classrooms. The study of international and domestic terrorism should clarify the issues, inform students about conflict, and help them in understanding the contemporary definitions.

Reid (1997) analyzed the evolution of knowledge in contemporary terrorism research and found that the development of the research area was influenced directly by knowledge producers such as the media and the U.S. government.

“The knowledge producers had major impacts on the definitions of terrorism, the selection of research problems, and marketing of ideas. Reid further stated that it resulted in the creation of invisible colleges of pro-western terrorism and generated a one sided perspective of terrorism on small insurgent groups” (Reid, 1997, p. 104).

As the country approached the mid-1990’s, terrorism education in academia had increased. Some institutions approached the subject of nuclear terrorism by modifying science courses (Shotwell, 1996). Others focused on national security and public safety measures and the terrorism fight as it related to airline security (Deming, 1997).
**Terrorist Threats in the U.S.**

Wilkinson (2000) contended that terrorism preparedness is not standardized across the globe and each conflict possesses its own dynamic challenges. In his 1999 book, Gaines referred to America as the sole remaining super power. This makes the United States a target for terrorists with a variety of grievances that range from foreign policy to socio-economic factors to fundamental Islamic society complaints.

The need for terrorism preparedness education for weapons of mass destruction (WMD) was recognized during the 1990’s in the United States. Fischer (1996), Stern (1999), and Laqueur (1999) established the need for researching terrorism preparedness awareness. Osterholm and Schwartz (2000) and Laqueur (1999) described the concept of terrorism preparedness as it was described in Stern’s *The Ultimate Terrorist* (1999).

The study by Stern (1999) characterized the nation’s threats and vulnerabilities in relation to Nuclear, Biological, and Chemical (NBC) terrorism. This included the ability to kill large numbers of people, the changing motivations of terrorists, the availability of weapons grade materials from the former Soviet Union and the accompanying expert personnel, nation states who sponsor and support terrorism, as well as advances in technology to disseminate the materials (Stern, 1999).

Hoffman (1998) revealed the importance of terrorism as a new and emerging concept in the following statement.

The growth of weapons of mass destruction terrorism as having compelling new motives, notably those associated with religious terrorism, coupled with increased access to critical information, leading to enhanced terrorist capabilities could portend an even bloodier and more destructive era of violence ahead than any we have seen before. (p. 205)
Simonsen and Spindlove (2000) claimed that the threat of a terrorist attack in many locations throughout the world has caused the U.S. to improve physical and personal programs for employees, and to develop safety programs with the private sector.

**Vulnerabilities**

Over the years, analysts of terrorism have focused on the vulnerability of our infrastructure and on the possibility of terrorist groups resorting to weapons of mass destruction. Kupperman (1995) agreed that future security is increasingly threatened.

The growing global interconnectivity of organized crime—with its vast resources and its ability to move money, share information, exploit and manipulate modern technology, and provide endless quantities of black market commodities—has forever changed the way terrorists do business. (p. 49)

**Related Research**

Ongoing research to investigate the terrorism preparedness developments include Falkenrath, Newman, and Thayer (1998) who identified the long-term security threats to the U.S. which involve accessibility, portability, and the lethality of nuclear, biological, and chemical weapons. Responding to the potential threats of a terrorist use of NBC weapons includes the development of a comprehensive plan that is cost effective and appropriate to the threat (Hoffman, 1999).

**Preparedness**

According to Keim and Kaufman (1999), current preparedness programs have not been comprehensive in their design because the contemporary model serves only as a planning framework for a community response against WMD. Furthermore, this approach, the Hazardous Materials Model, was only appropriate for situations involving certain toxic or chemical weapons exposures. It could not be applied as a standard for a community defending itself
against biological weapons because the dynamics of biological and nuclear weapons require alternative resources.

White (1998) stated the U.S. had undertaken efforts to prepare for technological terrorism. The main problem with technological terrorism, whether it is chemical, biological, or nuclear, has been the scale of the challenge. Psychologically, a whole nation can be devastated by a single attack. The casualties produced by technological terrorism create additional problems by taxing government services which may have been prepared for another type of disaster. An example of that would be the 1995 Tokyo attack that did not produce mass death, but it did produce mass casualties. Five thousand injured people overloaded a region’s hospital facilities. White (1998) adds that the U.S. would probably continue to experience such incidents, attacks, and events and some of them may involve nuclear explosions, poisonous gas, or biological contaminants to which the U.S. may not be prepared to respond.

**Training Programs**

According to Lake (2000), “… we need to intensify our prevention and preparedness efforts for dealing with WMD attacks on our soil” (p.62). Richardson (2002) has contended the federal government direct billions of dollars for equipment to prepare for emergencies prompted by WMD, however, very few dollars have been devoted to training the millions of people – emergency room workers, police, firefighters, etc. – who would be involved in these types of events.

According to the U.S. Department of Transportation and the Federal Emergency Management Agency (1998), as reported in their *Guidelines For Public Sector Hazardous Materials Training*, the benefits to be derived from training the general public include:

“… a greater understanding of and support for the jurisdiction’s emergency management system and capabilities; 2) improved citizen understanding of appropriate actions to take in hazardous materials emergency situations; 3) heightened cooperation with responders and prevention/mitigation personnel; and 4) enhanced citizen planning and preparedness for potential incidents in the home or neighborhood” (p. 66).

Furthermore, the U.S. Department of Transportation and the Federal Emergency Management Agency (1998) reported that one component of these guidelines involved
educational issues in response to Terrorism and the Illicit Use of Hazardous Materials which included an increased awareness of threats to personal and community safety (p. 179). Lewis (B. Lewis, personal communication, March 3, 2001) stated that “… due to a lack of consensus among response personnel, this program has been limited in its ability to function as the national standard. Therefore, an alternative program was needed and developed to address the terrorism awareness issue. The Department of Defense NBC Terrorism Awareness Program may fit that need”.

**Terrorism Awareness**

According to the U.S. Department of Defense (2000a), the Compendium of Weapons of Mass Destruction which was developed by the U.S. Army Soldier Chemical and Biological Command was designed as a Domestic Terrorism Preparedness Basic Training Program for a diverse audience. The awareness program focused on Nuclear, Biological and Chemical (NBC) Weapons of Mass Destruction (WMD). The concept used by the Homeland Defense Program (2000) was to have the participants: 1) comprehend that an NBC terrorist attack could happen; 2) recognize a potential NBC terrorist attack; and 3) describe what actions to take in the event of an NBC terrorist attack.

Eisenstadt (1998) has contended that the Department of Defense Domestic Preparedness Program is the cornerstone of the U.S. Government’s efforts to counter the threat posed by terrorism involving weapons of mass destruction. Eisenstadt further argued that the case should be made for a public education effort. In light of the above it appears that studying terrorism preparedness awareness would be a productive direction for research and could provide important outcomes for educating the workforce as it readies for a potential nuclear, biological or chemical terrorist attack.


**Awareness Challenges**

The Oklahoma City bombing presented substantial differences from the World Trade Center event in New York City. Careful analysis of these tragedies provided data to assist those involved in crisis and disaster management preparedness for future incidents and events related to conventional bombings, as well as for NBC attacks on Americans.

Hogan, Waeckerle, Dire, and Lillibridge (1999) acknowledged the United States has little experience with terrorist bombings. The lessons learned from bombings in foreign countries are often difficult to apply to a domestic response because of differences in the EMS system and medical care system.

Rohen (2000) contended that terrorism involving weapons of mass destruction will require leaders to think outside historical models used to confront counterterrorism and hazardous materials programs. “Weapons of Mass Destruction threats to the United States do exist and the only question is when and where the attacks will occur” (Rohen, 2000, p. 12).

**Terrorism Awareness Knowledge.** In the literature, this researcher found only limited empirical research on terrorism awareness knowledge. Since the threat of nuclear, biological and chemical terrorism is relatively new to the United States, the number of studies dealing with this phenomenon is basically limited in scope. Terrorism awareness studies in the past have generally concentrated on two types of subjects, members of the military and those working on military bases. However, due to the most recent terrorist attacks against non military targets, the nature of terrorism awareness knowledge is changing. It is the intention of terrorism awareness educators to increase the knowledge of all people by providing an understanding of security and safety measures for people, places, and things (Simonsen & Spindlove, 2000). Therefore, this is a topic that in the opinion of the researcher clearly needs to be addressed.
The relationship between terrorism awareness knowledge and learning styles has practical implications in the field of education. The possibility of being effected by a terrorist incident has increased and by having the needed knowledge to reduce its impact may be improved by applying learning style methods to the training. The concept of terrorism awareness knowledge and learning styles methodology may have its roots in the public health sector’s educational experience of preparing the medical community for disasters, major accidents, and virus outbreaks, but it may also be due to a lack of understanding or effort on the part of the communities.

The need for continuing education in the United States in the area of terrorism awareness became evident after the 9/11 attacks (Rose & Larrimore, 2002). Lillibridge, Bell and Roman (1999) defined knowledge and terrorism awareness as a comprehensive public health issue. Knowledge includes being able to describe and discuss the signs and symptoms of a biological, chemical or nuclear attack. Employees need to consider more than just the physical signs and symptoms of domestic terrorism. Tucker (2002) explained that consideration must be given to the actions workers must take to avoid exposure to toxic materials. It is a widely held belief that workers at potential terrorist target sites must have an awareness of a terrorist attack. Rose and Larrimore examined the need for responsible professionals to be proactive in gaining knowledge and skills in NBC terrorist incidents.

Lillibridge, et al, stated that preparedness planning and readiness assessment is currently being undertaking across the U.S. in which health care organizations are establishing terrorism awareness criteria to strengthen the country’s infrastructure to deal with potential terrorist events. This effort enhances the movement described by Simonsen and Spindlove (2000) in that adopting training measures will prevent or reduce the effects of all kinds of terrorisms actions.
Healthcare facilities already have placed a great deal of emphasis on terrorism awareness and now with the recent attacks involving NBC materials effective communications become a factor in the amount of knowledge and awareness a worker at a potential terrorist target site should possess.

Understanding the manner in which people learn (learning style concepts) and process information about terrorism awareness could provide pertinent information for educators to better prepare and support communities in the US for future terrorist attacks. Several researchers examining selected characteristics of undergraduate college students (the next generation of workers and leaders) have found that age, gender, major field of study and completed credit hours are associated with achievement and knowledge (Ray, Garavalia, & Gredler, 2003). Researchers examined what effect these variables had on predicting achievement and knowledge. It would be beneficial to educators to find out what potential variables/factors explain terrorism knowledge.

**Learning Style Theories**

Miller (2001) contended that student motivation and performance improves when instruction is adapted to learning preferences and styles. Additionally, he contends that educators have a responsibility to understand the diversity of their students and to present information in a variety of ways in order to accommodate all learners’ preferences. Greive (1990) asserted that some people have a specific manner in which they learn about a subject, others have a preferred or dominant style, while others are more flexible in their approach to internalizing this information. Messick and Associates (1976) found that “…historical research has shown that the amount of knowledge students acquire by different teaching methods tends to be related to their cognitive styles” (p. 61). Cross (1976) and Kolb (1984) reported that student
learning styles are based upon the theory that there are differing methods for gathering, organizing, and evaluating information.

**Foundations in Learning Styles**

Pressman and Dublin (1995) depicted the effort to describe the varied categories of learning style methodologies in education as “complicated”. Hativa and Birenbaum (2000) suggested that students with different approaches to learning are likely to define good teaching in ways that reflect those approaches. Spoon and Schell (1998) reported that “… teaching and learning styles develop over time, tend to change slowly, and reflect other characteristics of the person. This is related to the teaching style associated with various identifiable sets of classroom teaching behaviors”. Paris and Winograd (1990) stated that it is “… unreasonable to assume that one instructional technique (i.e., direct explanation) can be used with equal effectiveness for all kinds of tasks, all kinds of texts, and for all kinds of students” (p. 22).

The above concept is reflected in the following statement by Gallaher and Nunn (1998):

For the last twenty years or more, educators have been aware that each individual learns in a unique way. An individual’s learning style is as unique as his or her fingerprint. More important than all this documentation is the fact that knowing learning styles provides clear directions for how to teach individuals by using the right styles, or how to teach them to teach themselves by capitalizing on their personal strengths. And when we can do that, we reduce stress and increase learning. (p. 65)

**Historical Context**

A number of issues and concerns surrounded the early development and expansion of learning styles. The issues that seem to dominate the literature are briefly described below. The descriptions demonstrate the central ideas and concepts that were critical to the initiative of how people learn. The historical background establishes a foundation for understanding the dynamic process of effective learning.
At the beginning of the twentieth century, John Dewey’s research (as cited by Ellis & Fouts, 1993) reported that experience is created by interactions between external conditions (what goes on outside of one’s skin) and an individual’s “personal needs, desires, purposes, and capacities” (p. 42). Merriam and Brockett, 1997, stated that from Dewey and others emerged a philosophy of education, the major principles of which found expression in adult education. Dewey’s principles included a “… focus on learners and their needs and experiences rather than on predetermined content and education as an instrument of social action and social change” (Merriam & Brockett 1997, p. 36).

Herr and Cramer (1996) stated that Piaget theorized that there are stages of cognitive development. In order to learn, he believed the holistic approach was ideal for normal children. Herr and Cramer (1996) concluded that the views of Piaget and Dewey suggest the content of guidance or education would be most effective when it accommodated the natural thought patterns of a person at a specific stage of development. Further, Herr and Cramer believe that in this century, Piaget, Vygotsky, and Kelly have advanced constructivist thought based more on empirical data than on philosophical speculation. Though they came to their research from different fields (psychology, biology, and education), their ideas about how people know and understand have notable similarities.

Taylor, Marineau, and Fiddler (2000) suggested that the ideas of learning that focus on the learner’s discovery and creation of meaning owe much to constructivist ideas about knowledge. Ellis and Fouts (1993) described the research conducted by Kurt Lewin in the 1930’s where he developed an idea called field theory which said, in essence, that a group is actually a “dynamic whole” rather than a mere collection of individuals. Lewin’s (1964) research demonstrated that learning is most effective when conflict arises between a concrete
experience and a detached analysis by the learner. Lewin’s cycle of learning is a component for Kolb’s experiential learning theory. As cited by Ellis and Fouts (1993), Slavin (1986) stated, “A long tradition of research in social psychology has established that group discussion, particularly when group members must publicly commit themselves, is far more effective at changing individuals’ attitudes and behaviors than even the most persuasive lecture” (p. 276).

Integration of Models

Taylor et al. (2000) concluded that the attributes of meaning-making, an essential element of adults’ development, emerge in a progressively higher-order process. Kolb (1984) synthesized three models of learning as described below:

From Lewin, Dewey, and Piaget - recognized that all three described learning as emerging from the resolution of conflicting ways of dealing with the world. For Lewin, the conflicts are between experiencing something concretely and conceptualizing abstractly, and between observing and acting. For Dewey, the conflict is between the impulse that gives ideas their moving force and reason that gives direction to desires. And finally, for Piaget it is the tension between accommodating ideas to an external world and assimilating experience into an individual’s existing conceptual structures that drives experiential learning and cognitive development. (p. 337)

McCarthy (1996) theorized that wholeness and balance is the result if learners learn to function well in all parts of the cycle. “The ultimate worth of a model is the way users adapt it and modify it to suit their needs. As they use it, it becomes more and more theirs, and so it becomes different” (p. 239). The above listed concepts were directly incorporated into the 4MAT model designed and developed by Bernice McCarthy.

Learning Process

According to Riding and Rayner (1998), the learning-centered process can be defined simply as focusing on the learning process. Many models of style have been developed and are susceptible to change. “Criticism of the approach reflects a concern for construct validity, poor
verifiability, over-reliance on self-report in measurement, and uncertainty about the relationship between learning style, learning strategy, and cognition” (Riding & Rayner, 1998, p. 78).

Grigerenko and Sternberg (1995) suggested

“… the learning process models have several limitations if each is to be regarded as a measure of learning style. First, they reflect a construct that is by definition not stable because it is grounded in process and is therefore susceptible to rapid change. Second, they do not describe a developmental rationale for the concept of learning style nor easily correspond to other models of assessment, thereby suggesting a problem for conceptual validity. Third, they have attracted a good deal of criticism for lacking psychometric rigour and a systematically developed theory supported by empirical evidence” (p. 214).

Kolb et al., (1979) stated that “… by combining the characteristics of learning and problem solving and conceiving of them as a single process, persons can come closer to understanding how it is that people generate from their experience concepts, rules, and principles to guide their behavior in new situations, and how they modify these concepts in order to improve their effectiveness. This process is both active and passive, and both concrete and abstract” (p. 179). McCarthy (1980) asserted that this concept was reflected in the 4MAT model. The concept was a part of the four-stage cycle which included: (1) concrete experiences are followed by observation and reflection, which then lead to (2) the formation of abstract concepts and generalizations, which then leads to (3) hypotheses to be tested in future action, which in turn leads to (4) developing new learning experiences.

Individual Perspectives

According to Gremli (1996), “… an individual’s learning is the way that a person begins to process, internalize and concentrate on new material. Each person learns in a unique way and there are similarities of course, but every person has a learning style—it is as individual as a fingerprint. Research supports that students learn easier when they receive information in the same manner as they process information” (p. 108).
Shaughnessy (1998) stated that a person’s learning style is the way that he or she concentrates on, processes, internalizes, and remembers new and difficult information and skills. Shaughnessy further indicated that styles often vary with age, achievement level, culture, global versus analytic processing preference, and gender.

Green (1999) stated that each student possesses and absorbs information in a different way. Identifying learning styles and teaching to those learning styles can increase academic achievement and improve attitudes toward learning. Further, uniform teaching practices will invariably deny many students of success in the classroom.

Shaughnessy (1998) stated that teachers must acknowledge the individual learning styles of his or her students and argues that practitioners throughout the United States have reported statistically higher test scores and/or grade point average for students whose teachers changed from traditional teaching to learning-style teaching at all levels—elementary, secondary, and college.

Griggs and Dunn (1995) reported that the learning styles of underachieving students differ from the learning styles of high achievers. They reported that teaching these underachieving students congruently with their learning-style preferences results in increased test scores and a positive outlook on learning. Dunn (1990) wrote that students can learn almost any subject matter when they are taught with methods and approaches responsive to their learning style strengths. These same students fail when they are taught in an instructional style dissonant with their strengths.

**Application of Learning Styles**

McCarthy’s 4MAT System Model (1987; 1996) developed over the years, in part, from Kolb’s learning theory. It draws upon research from the work of Jung, Dewey, Piaget, Sperry,
Lewin, Bruner, and others. The 4MAT system defines the different parameters for approaching learning. The 4MAT Model takes information that has grown from the past research to the most recent brain hemispheric studies dealing with the left-brain and right-brain modes of processing (McCarthy & St. Germain, 1998). Inherent in the 4MAT System are two major premises: “… people have major learning styles and hemispheric (right-mode/left-mode) processing preferences; and designing and using multiple instructional strategies in a systematic framework to teach to these preferences can improve teaching and learning” (McCarthy, 1987, p. 42).

**Learner Preferences**

McCarthy (1997) defined learning as an individual making meaning by moving through a natural cycle, a movement from feeling to reflecting to thinking, and, finally, to acting. McCarthy developed the 4MAT system to describe this cycle of learning. The 4MAT system is based on the belief that different individuals perceive and process experience in different preferred ways. These preferences comprise an individual’s unique learning style. The four learning styles/types identified by McCarthy are: 1) Type 1: Innovative Learners are interested in personal meaning and need to have a reason for learning; 2) Type 2: Analytic Learners are interested in acquiring facts in order to deepen their understanding of concepts and process; 3) Type 3: Common Sense Learners are interested in how things work; and 4) Type 4: Dynamic Learners are interested in self-directed discovery. Along with learning styles, the 4MAT System also incorporates elements of brain research (Left Brain versus Right Brain). The System continues to evolve – change has been constant in this System for over three decades. As new information is known and research evidence evolves, McCarthy has maintained the foundation for the System and improves the process of learning acquisition. In order to improve the ability
of students to learn, Riding and Rayner (1998) stated that there is an urgent need to move forward with the conceptualization and utilization of learning style theories.

**Information Processing Theory**

Information processing theory differs from learning styles theory in that learning styles theory focuses on both perceiving and processing information while information processing styles focuses on processing the information that’s presented to the individual. Information processing theorists believe that internal changes in cognitive processing are a result of physiological maturation, environmental events, and the individual’s own shaping of cognitive processes (Sternberg & Ben-Zeev, 2001). Miller (1956) identified two theoretical ideas that are fundamental to cognitive psychology and the information processing framework. The first concept is chunking and the capacity of short term memory. The second concept is Test-Operate-Test-Exit (TOTE) which should replace the stimulus response as the basic unit of behavior. The TOTE concept has provided the basis for many subsequent theories of problem solving.

Craik and Lockhart (1972) conducted research on the various levels of processing information. This framework was an alternative to the theories on memory that categorized the different stages for sensory, working, and long-term memory. Cermak and Craik (1979) contended that the focus of the levels of processing information framework has been applied to other forms of learning. Gagne and Driscoll (1988) stated “the three stages under consideration include the sensory registry which considers sight and sound; the short term memory which places input into subsets; and long term memory which is where information for future reference is stored” (p. 10). Gagne (1989) asserted that both educators and students would benefit from a valid and reliable assessment tool that could determine a student’s strategical information
processing style. The educators would understand the individual differences in the students’
processing styles. And the students’ awareness of their style would assist them in their
performance in the classroom.

Jonassen and Grabowski (1993) stated that cognitive style as a subject includes several
aspects of differential psychology, that which is associated with various individual differences in
the individual learner and the learning environment. Riding and Rayner (1998) stated that the
importance of having an understanding about cognitive style should be self-evident. However, it
is equally evident that, in general, its inclusion in approaches to Pedagogy is fragmented and
does not always flow smoothly. Further, Riding and Rayner have contended that there is a
critical need for more research and development in the field of individual differences and styles.

Theoretical Base - Information Processing Style

Sternberg and Kaufman (1998) summarized that the theories of cognitive development
contribute to the ongoing process of understanding the way we think. Earlier, Craik & Lockhart
(1972) theorized that “… the deeper the processing, the more that will be remembered. For
example, information that involves strong visual images or many associations with existing
knowledge, will be processed at a deeper level” (p. 671).

Information Processing Theory has become a general theory of human cognition. Lyon
and Krasnegor (1996) contended that the study of attention, memory, and executive function has
expanded considerably in recent years. Investigators from the diverse disciplines
(neuropsychology, information processing or cognitive psychology, and behavior analysis) share
a common interest in these ability domains. Taylor (1996) asserted that there is a growing
consensus which focuses on a more careful analysis of component processes within each of these
abilities, more highly specified theoretical formulations, and greater attention to construct
validity and measurement issues.

Baddeley (1992) contended that the information processing system is used to understand
the way in which brain mechanisms operate. Massaro and Cowan (1993) described the
information processing model as being similar to a computer; the human mind takes information,
organizes it, stores it for later use, and then retrieves it when necessary. The model consists of
several stages of processing which includes attention, sensory memory, working memory, and
long term memory.

According to Torgesen (1996), the most efficient way to characterize and organize the
human memory system is to present it in a functional manner rather than a structural. In his
article, Torgesen explained that learning is to a significant degree the task of understanding how
the contents of long term memory are changed by various kinds of experiences. The conceptual
base for a component of this research, as presented, rests largely on the work of Torgesen and the
modification of his model by Farrell (2001). The model is illustrated in Figure 1. While
conducting field research on Torgesen’s information processing model, Farrell (2001) identified
some concerns about the model. These concerns focused on the difficulties related to both
information processing styles and individual preferences which is limited to assessments based
on abilities instead of individual styles. Farrell (2001) hypothesized that when individuals
process information, there were five different strategical styles the individual would use.

However, upon additional research and based on the empirical evidence gathered by Farrell, four
strategical information processing styles (visuospatial, analytical, social, and categorical) were
verified as constructs. Therefore, Farrell developed an assessment instrument to determine the
preferred strategical information processing styles of college students.
The Strategical Information Processing Styles (SIPS) assessment was modeled after Kolb’s (1985) Learning Style Inventory (LSI) which was designed to describe the ways an individual learns and deals with day to day situations. The SIPS was designed to determine the preferred strategical information processing styles of college students. Farrell (2001) further contended that the vast amount of research dealing with information processing styles and individual preferences is limited to assessments based on abilities instead of individual styles. Therefore, Farrell developed a valid and reliable instrument to determine an individual’s preferred information processing style.

The Farrell (2001) Assessment of Strategic Information Processing Styles (ASIPS) consists of the following four constructs:
- An individual with a visuo-spatial preference processes information selectively and attends to the global characteristics of stimuli that involve imagery.
- An individual with an analytical preference will process information selectively and will attend to stimuli that are presented in a logical order.
- An individual with a social preference will attend to global stimuli that involve relationships and emotions.
- An individual with a categorical preference is attentive to tasks that require detailed organized strategies. (p. 7-8)

Parker (1993) contended that methods of applying information processing theory to lecturing could enhance long-term memory and address individual differences in cognitive styles. In the intent of instructional design, Blanton (1998) contended that the cognitive theory is relevant “to the design of effective learning” (p. 171).

Sprenger (2002) reported that extensive research has been completed on the way people learn. Curry (1997) described an analogy between the ways in which models of style may be categorized and the layers of an onion as a way of clarifying the differences between the varied approaches to style. Curry suggested that the onion should represent the model of learning style by having it divided into three levels. This would include a central core made up of personality-centered models, a second stratum of information processing models, and an outer layer of instructional preference models for learning styles.

**Variables Potentially Related To Terrorism Awareness Achievement**

This section contains related research in which certain variables (age, gender, number of credit hours and major field of study) were found to be related to achievement and were then extracted to assist in the development of the research questions. In a 1991 study conducted by
Thompson and O’Brien the relationships between age and the effectiveness of learning styles, it was found that a pattern existed between teaching styles and age group. The results of the study indicated that teaching style, age, and gender had significant interactions with achievement.

A study conducted by Land and Haney (1990) provided insight into the relationship between academic achievement of college students and learning strategies. The results indicated that only student age was found to be significantly related to academic performance.

In Christian’s study (2000), entitled “Traditional versus Non-Traditional University Students: Does age determine learning,” focused on comparing the performance of the students. Overall classroom performance indicated no significant difference based on the age of the students. Creighton and Kilcoyne (1997) pointed out that upon analysis the relationship between age, gender, race, and grades were found to have a positive correlation. But there was no relationship between gender and age.

A study conducted by Yang (2000) investigated college student achievement by comparing variables such as gender, ethnicity, and age. The results indicated that gender and age did not predict achievement. The achievement was significantly related to student grade point average.

A second variable under consideration for predicting achievement in this study was gender. Ray, Garavalia, and Gredler (2003) conducted a study which examined the effects of gender and aptitude on college students in relation to learning strategies and achievement. Results found gender differences in achievement, with females receiving higher academic grades than males. A study conducted by Ruban, McCoach, and Reis (2002) provided further insight into the relationship between gender and undergraduate students. The study examined gender
differences and academic achievement along with motivation and self regulation, although the research did not find differences between the genders and achievement.

A study conducted by Schram (1996) found that in undergraduate psychology, education, and business courses, male students scored higher than females during a series of examinations. However, female students scored higher than males when considering the entire course performance. In a study, which reviewed the literature on factors affecting college student performance, Zimmer and Fuller (1996) reported that when gender is employed as a predictor for performance, the results are ambiguous. This supported the work by Schram which indicated that gender differences in achievement are related to examination grades and course grades.

A third consideration involves the college and university credit system. This concept employs time as the determining factor as to when a student graduates with a bachelors degree. Harris (2002) suggested that the nation’s past secondary education system could not function if the present classification of credits were not employed. In Johnson’s (1998) study of achievement college credit hours, he found that participants in a Police Academy with 60 or more credit hours scored higher on reading comprehension and civil service examination than the other groups with either 0 college credit hours or 1-59 college credit hours.

A study conducted by Van de Water and Augenblick (1987) provided insight into the relationship between academic performance and number of credit hours. The results indicated that a student’s grades did not have a strong relationship to the number of credit hours earned or even attempted.

**Summary of Terrorism Awareness Variables**

During the next decade, terrorism preparedness education will face critical challenges. Threats and vulnerabilities to our nation’s safety and health will continue to be at the forefront of
our lives. Recognizing the value of learning styles and the focus of information processing styles on instructional methodology is expected to enhance the total learning process for individuals. This study was designed to address whether processing styles based instructional methodologies can make a positive contribution to the terrorism awareness levels of university students.
CHAPTER III: METHODOLOGY

This methodology chapter has been divided into four sections. The sections include the following: 1) population and sample, 2) research design, 3) instrumentation, and 4) data analysis.

Population and Sample

The target population for this study was undergraduate students from colleges and universities in the southeast. The accessible population was undergraduate students enrolled in sociology courses from both public and private colleges and universities in Louisiana. A convenience sample of undergraduate students enrolled in existing sociology courses from Louisiana State University, Northwestern State University, Our Lady of the Lake College, University of New Orleans, and McNeese State University was obtained. The sample included all students enrolled in a total of 10 sociology courses; two classes from each of the five selected colleges and universities during the 2002 spring and summer semesters. These institutions were chosen because the researcher had access to a large number of sociology students and the willingness of the instructors to allow their students to participate in the study. The number of subjects in the student sample was 391. Seventy of the 391 student subjects provided incomplete instrument responses and were not included in the final data analysis. This was due in part to some students not being present for the pre-test, only completing the pre-test and or being absent for the post-test, not attending the class when the treatment was given, and or not fully participating in the study. The number of students with completed assessments was 321 (82%). A summary of the sample size and student completion rate is presented in Table 2. The student completion rate is further discussed in the research design section.
Research Design

This study employed the non-equivalent control group design, which involves a control group and an experimental group both given a pre-test and a post-test, but in which the control group and the experimental group do not have pre-experimental sampling equivalence (Ary, Jacobs, & Razavieh, 1996; Campbell & Stanley, 1963). The classes were randomly assigned to either the experimental group or the control group. One was designated the control group and the other was designated the experimental group. Both classes were taught about terrorism awareness using different instructional methods (traditional instruction versus processing styles based instruction). A different instructional method was used for each group. Both groups used the same assessment instruments.

Table 2. Summary of schools, courses, and number of students participating in Terrorism Preparedness Course

<table>
<thead>
<tr>
<th>School</th>
<th>Course Number</th>
<th>in Class</th>
<th>Students with Completed Assessments</th>
<th>% Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louisiana State University</td>
<td>SOCL 3501-1</td>
<td>71</td>
<td>58</td>
<td>82</td>
</tr>
<tr>
<td>Louisiana State University</td>
<td>SOCL 3501-2</td>
<td>51</td>
<td>43</td>
<td>84</td>
</tr>
<tr>
<td>Northwestern State University</td>
<td>SOC 1010-1</td>
<td>24</td>
<td>17</td>
<td>71</td>
</tr>
<tr>
<td>Northwestern State University</td>
<td>SOC 1010-3</td>
<td>19</td>
<td>15</td>
<td>79</td>
</tr>
<tr>
<td>Our Lady of the Lake College</td>
<td>SOCI 100-1</td>
<td>13</td>
<td>12</td>
<td>92</td>
</tr>
<tr>
<td>Our Lady of the Lake College</td>
<td>SOCI 100-2</td>
<td>18</td>
<td>16</td>
<td>89</td>
</tr>
<tr>
<td>University of New Orleans</td>
<td>SOC 1100</td>
<td>38</td>
<td>31</td>
<td>82</td>
</tr>
<tr>
<td>University of New Orleans</td>
<td>SOC 1101</td>
<td>42</td>
<td>34</td>
<td>81</td>
</tr>
<tr>
<td>McNeese State University</td>
<td>SOC 324</td>
<td>71</td>
<td>59</td>
<td>83</td>
</tr>
<tr>
<td>McNeese State University</td>
<td>SOC 326</td>
<td>44</td>
<td>36</td>
<td>82</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>391</strong></td>
<td><strong>321</strong></td>
<td></td>
<td><strong>82%</strong></td>
</tr>
</tbody>
</table>

*Note.* The number in the “# in Class” column represents the number of students that attended class on this date, not the number of students enrolled in the course.
**Independent Variables**

The independent variables in this study include: 1) the method of instruction with two levels (traditional instruction and processing styles based instruction); 2) the preferred Strategical Information Processing Style (SIPS) with four dimensions (visuo-spatial, social, analytical, and categorical); and 3) the demographic characteristics of age, gender, number of credit hours completed, and major field of study.

**Dependent Variable**

The dependent variable focused on the knowledge of terrorism preparedness. The dependent variable in this study was the Terrorism Awareness Test (TAT) post-test score. The TAT was modified by the researcher and administered to both the control and experimental groups as the pre-test and the post-test.

**Demographics**

The literature review revealed that the following factors were potentially related to the effectiveness of processing style based instruction on achievement: age, gender, number of credit hours completed, and major field of study. These variables were incorporated into the study (see Table 3).

Table 3. Sources of demographic characteristics related to the effectiveness of processing style based instruction and achievement

<table>
<thead>
<tr>
<th>Variables</th>
<th>Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Creighton &amp; Kilcoyne (1997), and Yang (2000).</td>
</tr>
<tr>
<td>Major Field of Study</td>
<td>Farrell (2001).</td>
</tr>
</tbody>
</table>
Control Level of the Treatment

The U.S. Department of Defense NBC Terrorism Preparedness Awareness course utilized a traditional based instructional methodology. This included a lecture and video presentation. The Terrorism Preparedness Awareness course was presented as recommended by the U.S. Department of Defense (see Appendix A). This was the focus for the control group. The awareness course as prepared by the U.S. Department of Defense was comprised of four parts. The objectives of the course stated that “… upon completion of the course the participant should be able to: 1) discuss a nuclear, biological and chemical (NBC) terrorist attack and describe how it could happen; 2) list the signs and symptoms associated with an NBC terrorist attack; and 3) describe what personal actions to take in the event of such an NBC terrorist attack” (U.S. DoD, 2001, p. 1).

During Part I of the course the instructor 1) discussed the general topic of terrorism; 2) introduced the definition of terrorism and the use of NBC materials to the participants; and 3) provided some frequently asked questions to the participants. The questions were followed by facts, figures, and some brief explanations prescribed by the Department of Defense.

During Part II of the course the instructor 1) discussed NBC terrorist materials; 2) presented a segment of a video tape which describes how these materials affect people; and 3) discussed how NBC materials enter the body and the indicators of an NBC attack.

During Part III of the course the instructor 1) discussed the potential of terrorism, who the terrorists are, and what some of their objectives and targets entail; 2) presented the final segment of the video tape which discussed how a terrorist might disseminate NBC materials; and 3) provided the participants with some frequently asked questions and suggested responses.
During Part IV of the course the instructor 1) introduced the personal action steps an individual can take to save his or her life and that of others; 2) described observations to be made at their place of employment; and 3) discussed organization policies, procedures, and notification steps. A comparison matrix of the control group and the experimental group lesson plans and instructor’s notes may be found in Appendix A.

**Experimental Level of the Treatment**

The experimental group was also given the U.S. Department of Defense NBC Terrorism Preparedness Awareness course; however, it utilized a learning styles based instructional methodology (see Appendix A). This included group activities, a lecture, and an application of the concepts which was adapted from the 4MAT System, an instructional design model, which addresses the diverse learning styles of students. This was presented as a single instructional module. The reason for using the 4MAT system model was mainly because it was research based and could fit into existing curricula. The existing U.S. Department of Defense, Nuclear, Biological, and Chemical Terrorism Preparedness Awareness curriculum was modified using the 4MAT model. The U.S. Department of Defense curriculum model was adapted to include both right and left brain based entities of the learning cycle included in the 4MAT system. No new content information was added to the information covered in the U.S. Department of Defense course (the one used in this researcher’s study).

The focus for the experimental group was on instructional delivery of the existing curriculum to the participants in the course. The 4MAT System developed by McCarthy (1987; 1996) draws upon years of research from many sources. The System defines the different parameters needed to enhance learning. Additionally, left-brain and right-brain modes of processing are addressed. This allows the instructor/presenter to address both right and left brain
aspects of four approaches to learning. This focus was created for the four-quadrant system and encompasses the perceiving and processing dimensions of learning.

Once the 4MAT model was applied to the U.S. Department of Defense Nuclear, Biological, and Chemical (NBC) Terrorism Preparedness Awareness course, a 4MAT model specialist/consultant reviewed the material. A nationally recognized and certified 4MAT corporate consultant with over 20 years experience in the field of research, application of learning, and instructional methodology evaluated whether all participant processing styles had been generally addressed and their respective learning needs incorporated into the instructional design (Appendix B).

In summary, the participants could ask questions and talk about the subject of terrorism and how to prepare for these types of incidents. However, this was not included in the measurement. The role and responsibility of the instructor/presenter for the NBC Terrorism Preparedness Awareness course control group was limited to introducing the video and describing some issues related to the topic. McCarthy (1996) reported that with a 4MAT System Model, the instructor helps students achieve personal growth in a systematic way of 1) organizing work, 2) encouraging feedback about course goals, 3) assessing perceptions about and processing of the objectives, and 4) making application and describing the need for future learning opportunities (reflected in Appendix A).

**Instrumentation**

Two instruments, the Strategic Information Processing Style (SIPS) Assessment and the Terrorism Awareness Test (TAT) were used in this study. The instruments addressed the objectives of the study.
Assessment of Strategic Information Processing Style

An instrument (Appendix C), the Farrell Assessment of Strategical Information Processing Styles (SIPS) was developed through a review of existing research and based on the theoretical model presented in chapter 1. The instrument was selected because it addressed several objectives in the study. The questionnaire which consisted of two sections and was designed to measure the participant’s preferred information processing style was configured into a booklet format. Since preferred styles were being investigated, questions in section two were rated using a five point anchored scale with numerical ratings as follows:

**Level of Preference Scale**

5 = Most often prefer
4 = More often prefer
3 = Prefer
2 = Seldom Prefer
1 = Least Prefer

The scale uses multiple responses to assess or identify the individual’s preferred strategies for processing information.

- Section 1 contains six items designed to collect pertinent demographic information regarding the students participating in the study. The questions in this section focus on the current status of the participants with regard to enrollment in higher education.
- Section 2 contains 13 items focusing on the concept of information processing style. This section uses multiple responses to assess or identify the individual’s preferred strategies for processing information. This is accomplished by
presenting five possible solutions measured with an anchored scale. The situations and the solution items which compose the instrument, evaluate individual differences in the four strategical processing information styles.

A request was made to use the instrument that was developed by Dr. Beverly Farrell. Permission was granted to use the instrument and it was obtained from Dr. Farrell (see Appendix D).

Several assessment tools have been used for measuring learning styles, e.g., the Myers-Briggs Type Indicator, the Kolb Learning Style Inventory, the Gregorc Style Delineator, and the Dunn Instrument (Dunn, Debell, Brennan, & Murrain, 1981; Kaplan & Kies, 1993). This study is not measuring learning styles. It is measuring the participant’s preferred information processing style. The Farrell (2001) assessment of Strategical Information Processing Style (SIPS) was used in this study because it is one if not the best instrument available to measure SIPS. One of the other available instruments includes the Learning Style Instrument (LSI) which was only designed to describe the ways an individual learns and deals with day-to-day situations.

Farrell’s (2001) instrument meets the needs of this study because it measures the manner in which individuals prefer to process information. It is a self-assessment test that is complete with instructions for an individual to follow and can be administered in 15 minutes.

Farrell (2001) reported that the instrument was evaluated using a sample of 514, which was split into two groups. An exploratory factor analysis was performed on the first group \(n = 325\) to develop a model. The model was confirmed using the second group \(n = 189\). The confirmatory factor analysis of the final model revealed acceptable convergent and discriminant validity with composite reliabilities ranging from .60 to .81. The model was confirmed indicating that the theoretical model provided a fit to the data that was the same as the
measurement model. The SIPS model incorporated much of the 4MAT system by McCarthy. This was a consideration of this study with regard to instructional methodology and curriculum concepts.

Although limited to the participants in Farrell’s (2001) study, gender differences were the most influential factor with regard to the strength of preference of strategical information processing styles. Females showed a stronger preference for the analytical, social, and categorical styles. The male gender was a significant predictor of the visuo-spatial style (Farrell, 2001).

**Terrorism Awareness Test**

An instrument was obtained to measure knowledge of terrorism preparedness (see Appendix E) and permission was granted (see Appendix F) by the National Emergency Response and Rescue Training Center (NERRT) at Texas A&M University (2002) to use their awareness achievement test. The awareness test was developed to measure a students’ knowledge of nuclear, biological, and chemical terrorism awareness. The test consisted of statements about knowledge of terrorism preparedness for individuals and organizations.

Content validation was performed by NERRT through processes which involved a panel of 25 experts in the fields of emergency response and planning. The panel reviewed and critiqued the 40-item instrument (J. Swain, personal communication, October 10, 2001). Swain further explained that there have been 4,138 persons who have been administered this test. Refinement of the instrument was reported as ongoing.

**Modification of Instrument**

The NEERT Terrorism Awareness Test was field tested for this study. This researcher administered the instrument with 40 items to 200 students. This assessment was performed to
improve the design of the instrument and to perform an item analysis which examines item
difficulty and the effectiveness of distracters. As a result of the first assessment, the questions on
the instrument were modified to standardize the question stem and the response alternatives. The
original instrument did not provide a valid basis for assessing a measure of achievement and
several concerns about the instrument was found (i.e., the wording of the sentences were
confusing to some students). Based on the curriculum for this specific study, the items were
modified from the basic concepts of the NERRT Awareness Test. Specific questions were
adapted and modified based on the course on NBC Terrorism Preparedness Awareness used in
this research study. The original instrument lacked the necessary components to adequately
measure the knowledge from the U.S. Department of Defense Program. Therefore, the
instrument was modified to focus specifically on the U. S. Department of Defense Terrorism
Preparedness program’s course of study.

The Modified Terrorism Awareness Test (see Appendix G) was a multiple choice 30 item
instrument. The questions were matched with the performance objectives that were
of Mass Destruction Courses” for employee awareness competencies in preparing for a weapon
of mass destruction terrorist incident (see Appendix H).

The second assessment sampled 189 students. A second item analysis was performed to
assess the 30 questions and rewrite the instrument as needed. This researcher conducted a third
assessment of the instrument with 43 subjects and administered the Modified Terrorism
Awareness Test. The results of the item analysis can be found in the Item Analysis of the
Modified Terrorism Awareness Test Chart (Appendix I) which provides data supporting the
modification decisions. The instrument used had 30 questions and 25 of those were identified as being suitable items for use in the final Terrorism Awareness Test (Appendix J).

In order to establish test/retest reliability, a pilot test was conducted with 22 lower division undergraduate students enrolled in an introduction to sociology course at Louisiana State University in Baton Rouge. The students completed the instrument twice (at a 14 day interval). Pearson Correlations were significant at the .01 level and the overall coefficient for the two administrations of the instrument was .803. According to Siegle (2004), test-retest correlation coefficients above .70 are acceptable, although higher coefficients are desirable.

Content validity of the final Terrorism Awareness Test (TAT) was established through a review by a panel of experts consisting of representatives of each of the following groups:

1. Emergency management educators;
2. Current and/or former staff members of the Academy of Counter Terrorism Education at Louisiana State University; and
3. Individuals who have expertise in the area of instrument design.

All instruments revisions cited above were based on the suggestions provided by members of the validation panel. It was then prepared for distribution to the participants of the research sample. A copy of the final Terrorism Awareness Test can be found in Appendix J.

**Data Collection**

Data for the study were collected during the spring and summer semesters of 2002 using the following procedures.

1. Administer two instruments one week before the lesson is presented. This includes the Assessment of Strategical Information Processing Styles (see Appendix C) and the final Terrorism Awareness Test (see Appendix J) as the pre-test.
2. Conduct the NBC Terrorism Preparedness course with the control group receiving the traditional based instruction and the experimental group receiving the information processing emphasis by way of learning styles based instruction.

3. Administer the post-test one week after the lesson is presented. The post-test is the final Terrorism Awareness Test.

4. The instructional period was in accordance to the class schedule. The same instructor conducted all of the instructional sessions. Each of the sessions at the five universities was observed by the regularly assigned professor at each of the particular higher education schools. The participants were given about 15 minutes for each administration of the instruments. This instruction was done so that the same exact information was used and only the techniques for instruction or delivery of the information would be different.

Data Analysis

The data were analyzed for each objective as described below.

Research Objectives

Objective One

This objective sought to describe students participating in the Terrorism preparedness course on the following selected demographic characteristics: a) age; b) gender; c) number of credit hours completed; d) major field of study; e) preferred Strategic Information Processing Style (SIPS). Objective one was accomplished by using descriptive statistics. The demographic variables of interest in this study were measured through the use of frequencies, percentages, means, and standard deviations. The variables gender and major field of study were measured on categorical (nominal and ordinal) levels and summarized using frequencies and percentages.
The variables age, number of credit hours completed, and preferred strategic information processing style were measured on interval or higher scales of measurement and were summarized using means and standard deviations. One scale, The Assessment of Strategic Information Processing Style, examined each student’s preferred strategies for processing information and was measured by examining means, frequencies, and percentages.

**Objective Two**

This objective sought to determine if changes occur in knowledge of terrorism preparedness as measured by the differences in pre-test and post-test scores on the Terrorism Awareness Test (TAT) among students in a Terrorism Preparedness Course. Objective two was accomplished by comparing the difference between the pre-test and post-test scores of the control group and the experimental group. To determine if the differences between the pre- and post-test Terrorism Awareness Tests were greater than would be expected by chance, the \( t \)-test procedure was employed to statistically compare the scores on both of the knowledge tests.

**Objective Three**

This objective sought to determine if there are differences in the post-test scores of students participating in the Terrorism Preparedness Course based on instructional methodology, when controlling for pre-test scores. Objective three was accomplished by using Analysis of Covariance (ANCOVA); the independent variable used was instructional methodology (traditional instruction vs. learning styles based instruction). The dependent variable was the Terrorism Awareness Test (TAT) post-test scores. The covariate utilized was the pre-test scores.

**Objective Four**

This objective sought to determine if Terrorism Awareness Test (TAT) post-test scores differ by preferred Strategic Information Processing Style (SIPS) when controlling for pre-test
scores. Objective four was accomplished by using Analysis of Covariance (ANCOVA). The four dimensions (visuo-spatial, categorical, social, and analytical) of the Strategic Information Processing Style Model were treated as the independent variables. The four dimensions of the categorical independent variables were dummy coded with only one of the dimensions being coded as the dominant Strategic Information Processing Style. The dependent variable was the Terrorism Awareness Test post-test scores. The covariate utilized was the pre-test scores.

**Objective Five**

This objective sought to determine if selected variables explain a significant portion of the variability in the Terrorism Awareness Test scores. A regression procedure was used to achieve objective five with the Terrorism Awareness post-test score as the dependent variable. The other variables [age, number of credit hours completed, gender, major field of study, preferred strategic information processing style, and instructional methodology (traditional based or learning style based)] were treated as independent variables. The categorical variables in the regression analysis were dummy coded. In this regression equation, variables were added that increased the explained variance by one percent or more as long as the regression equation remained significant.
CHAPTER IV: FINDINGS

The purpose of this study was to determine if learning styles based instruction resulted in improved learning for undergraduate students participating in a terrorism preparedness program. The findings presented in this chapter are organized by the objectives of the study. The research objective is stated and then followed by a discussion of what the respective statistical procedures indicate. The appropriate tables are then presented.

Data consisted of 1) selected demographic and personal characteristics of undergraduate students surveyed, 2) dominant information processing style scores derived from the Assessment of Strategic Information Processing Styles (ASIPS), and 3) the achievement scores on the Terrorism Awareness Test which were obtained prior to the treatment and after the treatment. Only students who completed the Farrell (2001) Assessment of Strategic Information Processing Styles (ASIPS) and both the pre- and post-tests were used in the study. The Farrell ASIPS, the pre-test, and the post-test were completed on two separate days. Students that missed one of those two days were removed from the study. The number of students that were removed was 8, reducing the sample size to 313.

In regards to ASIPS scores, there were five subjects who obtained tied scores on the ASIPS (i.e., when two dimensions had equal scores and a single preferred dimension could not be determined). Data with tied scores (five students in the study) were not utilized due to the inability to interpret the dominant preferred information processing style (i.e., check marks were used instead of weighted scores or lines of data were left blank). Therefore, the final number of subjects included in this study was 308.
Findings by Objective

The findings of the study are presented in this section and are organized by each research objective. A discussion of the statistical procedures and the results follows below.

Research Objective One

Objective one sought to describe student participants in the Terrorism Preparedness Course on selected personal and demographic characteristics. Undergraduate student participants were asked to provide information in the following areas: a) age, b) gender, c) number of credit hours completed, d) major field of study, and e) preferred strategic information processing style (SIPS). Descriptive statistics were used to describe the sample.

The undergraduate students participating in the study were asked to indicate their age on the day that the survey was completed. The mean age for the students in the sample was 21.34 years (SD = 4.6), the youngest students were 17 years old and the oldest student was 52. Table 4 provides a summary of the age distribution by school.

Based on the summary in Table 4, the largest group of undergraduate student participants were from Louisiana State University (n = 99 or 32.1%) and the smallest group was from Our Lady of the Lake College (n = 20 or 6.5%). Regarding gender of the undergraduate student participants in the Terrorism Preparedness Course, the majority were female (n = 216 or 70.1%). The remaining students were male (n = 92 or 29.9%).

The 308 students were asked to designate the number of undergraduate credit hours they had completed to date. The mean number of credit hours was 55.69 (SD = 38.5). The number of credit hours ranged from 0-172 (See Table 5).
Table 4. Undergraduate student age distribution by school of students participating in Terrorism Preparedness Course

<table>
<thead>
<tr>
<th>Age</th>
<th>LSU</th>
<th>MSU</th>
<th>OLOL</th>
<th>NWSU</th>
<th>UNO</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td></td>
<td>f</td>
<td>f</td>
<td>f</td>
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<tr>
<td><strong>Totals</strong></td>
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<td><strong>94</strong></td>
<td><strong>20</strong></td>
<td><strong>32</strong></td>
<td><strong>63</strong></td>
<td><strong>308</strong></td>
</tr>
</tbody>
</table>

*Note.* LSU (Louisiana State University), MSU (McNeese State University), OLOL (Our Lady of the Lake), NWSU (Northwestern State University) and UNO (University of New Orleans). \( M = 21.34, SD = 4.6 \).

Table 5. Number of credit hours completed by undergraduate students participating in the terrorism preparedness course

<table>
<thead>
<tr>
<th>Completed Credit Hours</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 Credit Hours or less</td>
<td>104</td>
<td>33.8</td>
</tr>
<tr>
<td>31 to 60 Credit Hours</td>
<td>62</td>
<td>20.1</td>
</tr>
<tr>
<td>61 to 90 Credit Hours</td>
<td>76</td>
<td>24.7</td>
</tr>
<tr>
<td>91 Credit Hours or more</td>
<td>66</td>
<td>21.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>308</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*Note.* \( M = 55.69, SD = 38.5, \text{Range} = 0\text{-172} \).
The students were asked to report their major field of study in an open-ended question format to account for different program names across schools. Of the 308 respondents who completed the survey, 14 reported undecided as their major field of study. Originally the researcher intended to utilize the "Classification of Instructional Programs (CIP): 2000 Edition." (U.S. Department of Education, 2002), which is a taxonomic coding scheme that contains titles and descriptions of instructional programs, at the postsecondary level for the reporting of degrees by major field of study. However, due to the vast number of major classifications and to manage the data, the researcher grouped the reported majors into areas of study. The fields that were demonstrably closely related were combined for summary purposes. For example, sociology, criminal justice and psychology were combined into a category called social sciences. Based on this summary, the largest group \(n = 141\) or 45.8\% of the reported majors were in the social sciences area, and the next largest group \(n = 83\) or 26.9\% of the reported majors were in the health professions. Areas of study reported by the undergraduate students are presented in Table 6. Additionally, a complete listing of all major fields of study exactly as reported by the undergraduate students is presented in Appendix K.

Table 6. Major areas of study as reported by students participating in the terrorism preparedness course

<table>
<thead>
<tr>
<th>Major Area of Study</th>
<th>(f)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Sciences</td>
<td>141</td>
<td>45.8</td>
</tr>
<tr>
<td>Health Professions</td>
<td>83</td>
<td>26.9</td>
</tr>
<tr>
<td>Business Management</td>
<td>57</td>
<td>18.5</td>
</tr>
<tr>
<td>Education</td>
<td>12</td>
<td>3.9</td>
</tr>
<tr>
<td>Undecided</td>
<td>14</td>
<td>4.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>307</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Note. One participant did not respond to this item.

**Information Processing Style and Course Participants**

Also to accomplish objective one the researcher sought to describe the information processing style of the undergraduate student participants through the use of Farrell’s
Assessment of Information Processing Style instrument. The two dominant preferences of information processing styles among undergraduate student participants were the Analytical Information Processing Style and the Categorical Information Processing Style. Table 7 shows the reported dominant preferred information processing style among student participants in the study. More than two thirds ($n = 210$ or 68.2\%) of the participants preferred the Analytical Processing Style.

Table 7. Dominant information processing styles of undergraduate students participating in the terrorism preparedness course

<table>
<thead>
<tr>
<th>Dominant Information Processing Style</th>
<th>$f$</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical</td>
<td>210</td>
<td>68.2</td>
</tr>
<tr>
<td>Categorical</td>
<td>51</td>
<td>16.6</td>
</tr>
<tr>
<td>Social</td>
<td>13</td>
<td>4.2</td>
</tr>
<tr>
<td>Visuo-Spatial</td>
<td>34</td>
<td>11.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>308</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Research Objective Two

Through objective two the researcher sought to determine if changes occur in knowledge of Terrorism Preparedness as measured by the differences in pre- and post-test scores on the Terrorism Awareness Test among undergraduate students participating in a Terrorism Preparedness course. The pre-test was administered; the 1.5 hour treatment followed the next week, and the post-test was administered one week later. The 25 questions on each of the two tests were scored +1 for a correct response and 0 for an incorrect response. Answers were summed for a total score (possible range = 0 to 25).

A Paired Samples $t$-test was used to examine the data. The alpha level for the study was set a` priori at .05. Table 8 displays students’ pre- and post-test correct score means. It was found that the post-test mean score ($M = 14.02$) was higher than the pre-test mean score ($M = 13.61$). The post-test scores were higher than pre-test scores, as expected.
Table 8. Summary of pre-test and post-test mean scores on the terrorism awareness test

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>N</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>13.61</td>
<td>308</td>
<td>2.7</td>
</tr>
<tr>
<td>Post-test</td>
<td>14.02</td>
<td>308</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Table 9 shows the results of the Paired $t$-test, and it presents results which describe the differences between the pre-test and post-test groups ($M = -.41$). The probability that the $t$ score of 2.35 was obtained by chance is .019.

Table 9. Paired $t$-test for pre-test and post-test scores on the terrorism awareness test

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>$t$</th>
<th>df</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test – Post-test</td>
<td>-.41</td>
<td>3.0</td>
<td>2.35</td>
<td>307</td>
<td>.019</td>
</tr>
</tbody>
</table>

Research Objective Three

Through objective three the researcher sought to determine if there were differences in the post-test scores of students participating in the Terrorism Preparedness Course based on instructional methodology, when controlling for pre-test scores. This objective was accomplished by using Analysis of Covariance (ANCOVA). Hinkle, Wiersma, and Jurs (1998) stated that ANCOVA allows for partitioning out the variation attributed to the covariate. The independent variable used was instructional methodology (traditional instruction vs. learning styles based instruction). The dependent variable was the Terrorism Awareness Test (TAT) post-test scores. The covariate utilized was the pre-test scores. Table 10 summarizes the pre-test mean score statistics for both groups. The experimental group ($M = 13.77$) scored higher than the control group ($M = 13.48$) on the pre-test.
Table 10. Pre-test mean scores on terrorism awareness test, according to instructional methodology group

| Section (Control and Experimental Group) for Pre-test Scores by Group |
|--------------------------|-------|-------|
|                         | \(N\) | \(M\)  | \(SD\) |
| Control                 | 171   | 13.48 | 2.6    |
| Experimental            | 137   | 13.77 | 2.8    |

Post-test scores on the Terrorism Awareness Test (TAT) compared by treatment group are presented in Table 11. Results from the ANCOVA \(F(1,305) = 8.289\) indicated that the group’s terrorism awareness post-test scores were different. This difference is shown in the adjusted post-test means. These means revealed that the control group had higher mean terrorism awareness scores (adjusted \(M = 14.40\)) than that of the experimental group (adjusted \(M = 13.54\)) when pre-test scores were used as a covariate.

Table 11. Analysis of covariance for differences between the experimental and control groups on terrorism awareness post-test scores

<table>
<thead>
<tr>
<th>Tests of Between-Subjects Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Type II</td>
</tr>
<tr>
<td>(SS)</td>
</tr>
<tr>
<td>Pre-test Instructional Methodology</td>
</tr>
<tr>
<td>Error</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Note. Computed using \(\alpha = .05\). Post-test unadjusted means of control and experimental group of participants in Terrorism Course are: Control = 14.34 and Experimental = 13.61. Post-test adjusted means of control and experimental group are: Control = 14.40 and Experimental = 13.54.

The results indicate that the control group scored significantly higher than the experimental group \((p = .004)\). This difference equates to about one test question between the two groups. The students in the control group actually did better on the post-test. Basically what this demonstrates is that traditional based lecture instruction, which is what the students are used to, resulted in better scores.
**Research Objective Four**

Through objective four the researcher sought to determine if Terrorism Awareness Test (TAT) post-test scores differ by preferred Strategic Information Processing Style (SIPS) when controlling for pre-test scores. This objective was accomplished by using Analysis of Covariance (ANCOVA). The four dimensions (visuo-spatial, categorical, social, and analytical) of the Strategic Information Processing Style Model were treated as the independent variables. The four dimensions of the categorical independent variables were dummy coded with only one of the dimensions being coded as the dominant Strategic Information Processing Style. The Terrorism Awareness Test post-test score was the dependent variable. The covariate utilized was the pre-test score.

The comparison of the four groups is presented in Tables 12 through 16. The first step was to perform an exploratory analysis and determine if each of the four information processing dimensions were meaningful for the analysis. Table 12 summarizes the pre-test mean score statistics for the four information processing style groups. The social group ($M = 14.38$) scored higher than the other groups (categorical $M = 13.49$, visuo-spatial $M = 13.71$, and analytical $M = 13.58$) on the pre-test.

Table 12. Pre-test mean scores on terrorism awareness test, according to information processing style group

<table>
<thead>
<tr>
<th>Information Processing Style (IPS) for Pre-test Scores by Group</th>
<th>$N$</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Categorical</td>
<td>51</td>
<td>13.49</td>
<td>2.7</td>
</tr>
<tr>
<td>Visuo-spatial</td>
<td>34</td>
<td>13.71</td>
<td>2.7</td>
</tr>
<tr>
<td>Analytical</td>
<td>210</td>
<td>13.58</td>
<td>2.7</td>
</tr>
<tr>
<td>Social</td>
<td>13</td>
<td>14.38</td>
<td>2.8</td>
</tr>
</tbody>
</table>

Each variable was entered one at a time into the analysis and only the social information processing dimension was found to be significant. The other three information processing style variables in the ANCOVA model had statistically non-significant values. Results of the
ANCOVA for the categorical dimension ($F_{(1,305)} = .579$) indicated that the group’s scores were not different (See Table 13). Results of the ANCOVA for the visuo-spatial dimension ($F_{(1,305)} = .232$) indicated that the group’s scores were not different (See Table 14). Results of the ANCOVA for the analytical dimension ($F_{(1,305)} = 1.796$) indicated that the group’s scores were not different (See Table 15).

Table 13. Analysis of covariance for differences between the categorical information processing group on terrorism awareness post-test scores

<table>
<thead>
<tr>
<th>Type III</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>$F$</th>
<th>$p$</th>
<th>Partial $\eta^2$</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>460.303</td>
<td>1</td>
<td>460.303</td>
<td>66.263</td>
<td>&lt;.001</td>
<td>.178</td>
<td>1.000</td>
</tr>
<tr>
<td>Categorical</td>
<td>4.020</td>
<td>1</td>
<td>4.020</td>
<td>.579</td>
<td>.447</td>
<td>.002</td>
<td>.077</td>
</tr>
<tr>
<td>Error</td>
<td>2118.729</td>
<td>305</td>
<td>6.947</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2584.919</td>
<td>307</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Computed using $\alpha = .05$.

Post-test unadjusted means of Categorical = 13.71, not-Categorical = 14.08.


Table 14. Analysis of covariance for differences between the Visuospatial information processing group on terrorism awareness post-test scores

<table>
<thead>
<tr>
<th>Type III</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>$F$</th>
<th>$p$</th>
<th>Partial $\eta^2$</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>461.426</td>
<td>1</td>
<td>461.426</td>
<td>66.349</td>
<td>&lt;.001</td>
<td>.179</td>
<td>1.000</td>
</tr>
<tr>
<td>Visuospatial</td>
<td>1.616</td>
<td>1</td>
<td>1.616</td>
<td>.232</td>
<td>.630</td>
<td>.001</td>
<td>.077</td>
</tr>
<tr>
<td>Error</td>
<td>2121.133</td>
<td>305</td>
<td>6.955</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2584.919</td>
<td>307</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Computed using $\alpha = .05$.


Table 15. Analysis of covariance for differences between the analytical information processing group on terrorism awareness post-test scores

<table>
<thead>
<tr>
<th>Dependent Variable: Post-test Correct for Analytical</th>
<th>Type III</th>
<th>Partial Eta $^2$</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SS</td>
<td>df</td>
<td>MS</td>
</tr>
<tr>
<td>Pre-test</td>
<td>464.798</td>
<td>1</td>
<td>464.798</td>
</tr>
<tr>
<td>Analytical</td>
<td>12.429</td>
<td>1</td>
<td>12.429</td>
</tr>
<tr>
<td>Error</td>
<td>2110.320</td>
<td>305</td>
<td>6.919</td>
</tr>
<tr>
<td>Total</td>
<td>2584.919</td>
<td>307</td>
<td></td>
</tr>
</tbody>
</table>

Note. Computed using $\alpha = .05$.


The comparison of terrorism awareness post-test scores by social information processing style group is presented in Table 16. Results of the Analysis of Covariance ($F_{(1,305)} = 6.101$) indicated that the social information processing style group’s terrorism awareness post-test scores were different. The nature of this difference can be seen in the adjusted terrorism awareness post-test means. These means revealed that the social information processing style group (adjusted $M = 12.26$) post-test scores were lower than the not social information processing style group (adjusted $M = 14.09$) when terrorism awareness pre-test scores were used as a covariate.

Table 16. Analysis of covariance for differences between the social information processing group on terrorism awareness post-test scores

<table>
<thead>
<tr>
<th>Dependent Variable: Post-test Correct</th>
<th>Type III</th>
<th>Partial Eta $^2$</th>
<th>Observed Power</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SS</td>
<td>df</td>
<td>MS</td>
</tr>
<tr>
<td>Pre-test</td>
<td>477.167</td>
<td>1</td>
<td>477.167</td>
</tr>
<tr>
<td>Social</td>
<td>41.632</td>
<td>1</td>
<td>41.632</td>
</tr>
<tr>
<td>Error</td>
<td>2081.117</td>
<td>305</td>
<td>6.823</td>
</tr>
<tr>
<td>Total</td>
<td>2584.919</td>
<td>307</td>
<td></td>
</tr>
</tbody>
</table>

Note. Computed using $\alpha = .05$. $R^2 = .195$ (Adjusted $R^2 = .190$).

Post-test unadjusted means of Social = 12.62, not Social = 14.08.
Research Objective Five

In objective five, multiple regression analysis was used to determine if selected variables explained a significant proportion of the variance in the Terrorism Awareness Test scores. The mean of the Terrorism Awareness post-test score was used as the dependent variable. Dichotomous variables were dummy coded for use in the regression analysis (0=no, 1=yes). Eight variables were used as potential explanatory variables: the age of students participating in the Terrorism Awareness class (ages 17-52), the number of completed college credit hours (0-172), the gender of the student participants (0=male, 1=female), the major field of study (five categorical variables, dummy coded 1=yes or 2=no by whether the student was majoring in one of the following fields: health professions, social sciences, education, business, or if the student was undecided). To enter the variable preferred Strategic Information Processing Style (SIPS) into the regression analysis the measurements of the four dimensions of the SIPS as established previously were used (recoded as 1 = the specific dimension or not that specific dimension = 0). Dummy coding was also used for the variable instructional methodology (1 = traditional lecture based, and 2 = learning styles based). The use of eight potential explanatory variables in this multiple regression analysis is supported by Hair, Anderson, Tatham and Black (1998) who indicated that the ratio of observations per independent variable should never fall below 5 to 1.

Demographic and personal variables were entered into the regression model as a block: age, gender, completed credit hours, major field of study and preferred information processing style. Instructional methodology was added to the model last to determine if this variable explained a significant proportion of the variance in addition to the variance explained by the demographic and personal variables.

The multicollinearity assessment revealed that some multicollinearity did exist in this regression analysis. Hair, Tatham, Anderson, & Black (1998) indicated that “The presence of
high correlations (generally, .90 and above) is the first indication of substantial collinearity” (p. 191). The highest correlation between any two independent variables was \( r = .56 \) (both variables were major fields of study: social sciences and health studies), which is substantially lower than the .90 criterion. Hair et al. (1998) also indicated that “Two of the more common measures for assessing both pairwise and multiple variable collinearity are (1) the tolerance value and (2) its inverse—the variance inflation factor (VIF). . . . Thus any variables with tolerance values below .19 (or above a VIF of 5.3) would have a correlation of more than .90” (p. 191, 193). For this study, all five tolerance values observed in the variable for major field of study were below .19 and the corresponding VIF values were all above 5.3. Therefore, it was determined that substantial multicollinearity existed in this analysis. Because these five field of study variables had a high level of multicollinearity and none of the five field of study variables were significantly correlated with the dependent variable, the five field of study variables were removed from the regression analysis. There was also evidence of multicollinearity between the information processing style variables. The categorical and the analytical variables had the highest intercorrelation \( (r = -.652) \). Of these two, the categorical variable had the lowest correlation \( (r = .04) \) with the dependent variable (TAT post-test score). To eliminate multicollinearity, the categorical variable was omitted from the analysis. Davis (1971) and other researchers have developed ways to discuss and interpret coefficients beyond mere numbers. Several have devised conventional terms to help express the strength of associations, also called effect size.

The results of the correlation procedure are presented in Table 17. Seven of the personal, demographic, and pre-test variables were entered as a block into the test procedure.
revealed low correlations with credit hours completed and the social information processing style. There was a moderate correlation between the pre-test score and the post-test score.

Table 17. Correlations between the terrorism awareness post-test and selected demographic variables

<table>
<thead>
<tr>
<th>Demographic Variables</th>
<th>Terrorism Awareness Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r</td>
</tr>
<tr>
<td>Age</td>
<td>-.02</td>
</tr>
<tr>
<td>Gender</td>
<td>.09</td>
</tr>
<tr>
<td>Credit Hours</td>
<td>.13</td>
</tr>
<tr>
<td>Visuo-spatial</td>
<td>.03</td>
</tr>
<tr>
<td>Social</td>
<td>-.10</td>
</tr>
<tr>
<td>Analytical</td>
<td>.06</td>
</tr>
<tr>
<td>Pretest Score</td>
<td>.43</td>
</tr>
<tr>
<td>Instructional Method</td>
<td>-.12</td>
</tr>
</tbody>
</table>

Note. Interpretations according to Davis’s (1971) descriptors: .01 - .09 (negligible), .10 - .29 (low), .30 - .49 (moderate), .50 - .69 (substantial), .70 - .99 (very high), and

The results of the regression analysis are presented in Table 18. First, all eight of the personal, demographic, and pre-test variables were entered as a block and explained, 23.7% of the variance in Terrorism Awareness Test post-test scores. Based on Cohen’s (1988) standards for interpreting effect sizes in multiple regression, this model represents a moderate effect size. However, the variable of interest in this study, whether the instruction was delivered via processing styles based or traditional lecture based, explained an additional 1.8% of the variance ($R^2 = .018$). The instruction methodology variable by itself does not explain a low amount of variance according to Cohen’s standards. The total model explains a moderate amount of the variance ($R^2 = .255$, or Cumulative 25.5).
Table 18. Multiple Regression Analysis of Terrorism Awareness Test Scores on Selected Variables

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>Df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>659.299</td>
<td>8</td>
<td>82.412</td>
<td>12.754</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Residual</td>
<td>1925.620</td>
<td>298</td>
<td>6.462</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2584.919</td>
<td>306</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variables in the equation</th>
<th>B</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1: Personal &amp; Demographic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-.07</td>
<td>.195</td>
</tr>
<tr>
<td>Gender</td>
<td>.15</td>
<td>.108</td>
</tr>
<tr>
<td>Completed credit hours</td>
<td>.13</td>
<td>.026</td>
</tr>
<tr>
<td>Visuo-spatial style</td>
<td>.03</td>
<td>.459</td>
</tr>
<tr>
<td>Social style</td>
<td>-.11</td>
<td>.198</td>
</tr>
<tr>
<td>Analytical style</td>
<td>.03</td>
<td>.545</td>
</tr>
<tr>
<td>Pre-test Correct</td>
<td>.45</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Model 2: Personal &amp; Demographic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable Block Plus: Instructional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>-.13</td>
<td>.008</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model Summary</th>
<th>Additional $R^2$</th>
<th>SE</th>
<th>$R^2$Cumulative</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.237</td>
<td>2.568</td>
<td>.237</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>2</td>
<td>.018</td>
<td>2.542</td>
<td>.255</td>
<td>.008</td>
</tr>
</tbody>
</table>
CHAPTER V: SUMMARY AND CONCLUSIONS

Summary of Purpose and Objectives

The purpose of this study was to determine if learning styles based instructional methodologies result in improved learning when compared to traditional lecture based instruction in a Terrorism Preparedness course as presented to undergraduate students. The experimental group received the learning styles based instructional approach. The control group received the traditional lecture based approach that followed the teaching suggestions in the U.S. Department of Defense’s Domestic Terrorism Preparedness Program Guidebook. This chapter provides a discussion of the analyses for each of the five research questions along with implications and recommendations for further research. The five specific research objectives of the study were to:

1. Describe students participating in the Terrorism Preparedness Course on the following selected demographic characteristics: a) age; b) gender; c) number of credit hours completed; d) major field of study; e) preferred Strategic Information Processing Style (SIPS). These variables were analyzed using frequencies, percentages, means, and standard deviations.

2. Determine if changes occur in knowledge of terrorism preparedness as measured by the differences in pre-test and post-test scores on the Terrorism Awareness Test (TAT) among students in a Terrorism Preparedness Course. This objective was accomplished by comparing the difference between the pre-test and post-test scores of the control group and the experimental group. The t-test procedure was employed to statistically compare the scores on both the pre- and the post-test of the Terrorism Awareness Test.
3. Determine if there are differences in the post-test scores of students participating in the Terrorism Preparedness Course based on instructional methodology, when controlling for pre-test scores. This objective was accomplished by using Analysis of Covariance (ANCOVA); the independent variable used was instructional methodology (traditional instruction vs. learning styles based instruction). The dependent variable was the Terrorism Awareness Test (TAT) post-test scores. The covariate utilized was the pre-test scores.

4. Determine if Terrorism Awareness Test (TAT) post-test scores differ by preferred Strategic Information Processing Style (SIPS) when controlling for pre-test scores. This objective was accomplished by using Analysis of Covariance (ANCOVA). The four dimensions (visuo-spatial, categorical, social, and analytical) of the Strategic Information Processing Style Model were treated as the independent variables. The four dimensions of the categorical independent variables were dummy coded with only one of the dimensions being coded as the dominant Strategic Information Processing Style. The dependent variable was the Terrorism Awareness Test post-test scores. The covariate utilized was the pre-test scores.

5. Determine if selected variables explain a significant portion of the variability in the Terrorism Awareness Test scores. A regression procedure was used to achieve this objective with the Terrorism Awareness post-test score as the dependent variable. The other variables [age, gender, number of credit hours completed, major field of study, preferred strategic information processing style, and instructional methodology (traditional lecture based or learning style based)] were treated as independent variables.
In this regression equation, variables were added that increased the explained variance by one percent or more as long as the regression equation remained significant.

Summary of Theoretical Base

A review of literature and related theory to determine why learning styles based instruction may result in increased learning produced limited empirical data. The researcher began the investigation of the theoretical base of this study in an effort to establish a baseline for understanding the instructional strategies used to increase learning for students enrolled in terrorism awareness courses. The concept of applying learning styles methodology was addressed. Sternberg (1997) stated that theories of learning styles deal with how and why people like to learn. The concept of educating people using learning styles methods in a manner that improves learning effectiveness was not found to be uncommon. Pressman and Dublin (1995) contended that a growing body of research addresses the question of how matching learning and teaching styles affects cognitive outcomes. Several studies (e.g., Dunn & Dunn, 1999; & McCarthy, 1996) have verified that increased academic achievement and improved attitudes toward learning occurred when students’ learning styles were matched with appropriate methods or materials. Learning styles refer generally to the preferred ways in which students acquire or approach new cognitive/affective material in a learning setting. Learning styles of students often have been studied at four levels: personality, information processing, social interaction, and instructional methods (Claxton & Murrell, 1987). In this study, only two aspects of these levels were addressed: information processing style and instructional method. The literature to date demonstrates that research on this problem is ongoing and there have been limited identified robust relationships between these variables.
Summary of Methodology

This study utilized a convenience sample of 391 student subjects, which included all students enrolled in a total of 10 sociology classes; two classes from each of five selected public or private colleges or universities in Louisiana during the 2002 spring and summer semesters. Seventy of the 391 student subjects provided incomplete instrument responses and were not included in the final data analysis. The exact number of students with completed data assessments was 321 (82%). This study employed the non-equivalent control group design. The classes were randomly assigned to either the experimental group or the control group. Both groups were educated about terrorism awareness using different instructional methods.

A different instructional method was used for each group. Both groups used the same assessment instruments. The Strategic Information Processing Style (SIPS) Assessment is a 13 item instrument each with five possible solutions measured with a five-point anchored scale with 65 variables employed with absolute ranking scale it is designed to measure the respondent’s preference of information processing style. The Terrorism Awareness Test (TAT) is a 25 question multiple choice instrument which was developed to measure a students’ knowledge of nuclear, biological, and chemical terrorism awareness. The test consisted of statements about knowledge of terrorism preparedness for individuals and organizations. Data for the study were collected using the following procedures.

1. Administer the two instruments one week before the lesson is presented.
2. Conduct the NBC Terrorism Preparedness course with the control group receiving the traditional based instruction and the experimental group receiving the learning styles based instruction.
3. Administer the post-test one week after the lesson is presented. The same instructor conducted all of the instructional sessions. This instruction was done so that the same exact information was used and only the techniques for instruction or delivery of the information would be different.

**Summary of Findings**

The first objective of this study focused on selected demographic characteristics (age, gender, number of credit hours completed and major field of study) of undergraduate students enrolled in sociology classes at selected universities. The analysis of the sample (N=308) yielded that the majority of students were between 17 and 24 years of age. The mean age was 21, the youngest was 17 and the oldest was 52. The majority (70.1%) of the participating students were female. The mean number of college credit hours completed was 55.69. The participating students for the most part (n = 141 or 45.8%) reported to be majoring in the social sciences area. An assessment of the students’ Information Processing Style (IPS) revealed that two thirds (n = 210 or 68.2%) of the participants preferred the Analytical Processing Style.

The second objective of this study focused on determining if changes occur in knowledge of terrorism preparedness as measured by the differences in pre-test and post-test scores on the Terrorism Awareness Test (TAT) among students in a Terrorism Preparedness course. This objective was accomplished via an examination of means and standard deviations of the post-test scores of the Terrorism Awareness Test. The Paired Samples $t$-test was used to examine the pre-test and posttest data which revealed that the post-test mean score ($M = 14.02$) was larger than the pre-test mean score ($M = 13.61$). The post-test scores were higher than pre-test scores, as expected. The results indicate the difference ($M = -.41$) between the pre-test and post-test student groups were significant.
The third objective of this study explored if differences existed in the post-test scores of students participating in the Terrorism Preparedness course based on instructional methodology. This objective was accomplished by using Analysis of Covariance (ANCOVA), and the control group ($M = 14.34$) scored higher than the experimental group ($M = 13.61$) on the post-test. Significant differences were found to exist for instructional methodology. The means revealed that the control group had higher mean terrorism awareness scores (adjusted $M = 14.40$) than that of the experimental group (adjusted $M = 13.54$) when pre-test scores were used as a covariate. This difference equates to about one test question between the two groups. The students in the control group actually did better on the post-test. Basically what this demonstrates is that traditional based lecture instruction, which is what the students are used to, resulted in better scores.

The fourth objective of this study focused on determining if Terrorism Awareness Test (TAT) post-test scores differ by preferred Strategic Information Processing Style (SIPS). This objective was accomplished by using Analysis of Covariance (ANCOVA) to examine if significant differences existed between the four dimensions (visuo-spatial, categorical, social, and analytical) of the Strategic Information Processing Style Model in relation to the Terrorism Awareness Test post-test scores. Analysis of covariance revealed that three of the four information processing style variables in the procedure had statistically insignificant values. Further, ANCOVA indicated that there was a significant difference in the Terrorism Awareness Test posttest scores by the social preferred information processing style. The social dimension was significant (Partial $\eta^2 = .02$) which amounts to 2% of variance explained.
The fifth objective of this study was to determine if selected variables (age, number of credit hours completed, gender, major field of study, preferred strategic information processing style, and instructional methodology) explain significant portions of variance regarding the post-test scores. This objective was accomplished by using multiple regression analysis which revealed all eight of the personal, demographic, and pre-test variables were entered as a block and explained, 23.7% of the variance in Terrorism Awareness Test post-test scores. The variable, instructional methodology explained an additional 1.8% of the variance ($R^2 = .018$). The total model explains a moderate amount of the variance ($R^2 = .255$, or Cumulative 25.5%).

**Conclusions and Implications**

The following conclusions and implications were derived from the findings of the study: Caution should be observed when interpreting the conclusions of this study because of the limitations of this study, relative content of the course, and the limited selection of instructional techniques and tools that were used with each of the groups included in this study. An additional concern would include the fact that the presenter only provided approximately 1.5 hours of instruction and the students may have perceived the presentation as a novelty.

Some students were told by their regular class instructor that their course grade would not be affected by the score they received on the Terrorism Awareness Test, whereas other regular class instructors stated that the students’ semester grade would be affected by the Terrorism Awareness Test. Also the same person presented the content materials to both the control group and the experimental group. For some, this may have been the first time the students were presented content employing information processing styles which may not have provided the students with the time to become comfortable with the methodology. Finally, this researcher was
able to develop a model which can explain a moderate amount of variance in the Terrorism Awareness Test post-test scores.

Objective One

The undergraduate student respondents are more likely to be under 25 years of age and female, having completed half the credit hours needed for the typical undergraduate degree program, majoring in social sciences /liberal arts and process information analytically which was expected because the population was drawn from social science courses.

This conclusion is based on the findings that the average age of the student was 21 years, and the range was 17 - 52; 70.1% in the study were female; had completed an average of 55.69 credit hours; almost 46% of the respondents were Social Science/Liberal Arts majors, and 68.2% of the participants preferred the Analytical Information Processing Style. The age is typical of young undergraduates in the universities. This study is in agreement with the U.S. Department of Education (2003) report which found that a majority of 1999-2000 College undergraduates were women (57 percent). About half (49 percent) of the students who completed a bachelor’s degree in 1999-2000 did so by age 22. Nine percent were ages 30-39, and seven percent were age 40 or older. One could expect enrollment in sociology courses to be Social Science majors. In some instances, these courses could be thought of as fertile ground for recruiting to the sociology field. Historically, college students have followed a learning path focused on lectures/lab instructional methodology. This is generally more analytical in process.

Objective Two

The undergraduate student respondents who participate in the Terrorism Preparedness course will score higher on the Terrorism Awareness Test post-test than on the pre-test. This conclusion is based on the finding that there is a significant difference between pre- and post-test
scores. The results of the analysis indicated that overall, the students scored significantly higher on the post-test Terrorism Awareness Test (TAT) than on the pre-test. These results were not unexpected.

**Objective Three**

The undergraduate student respondents taught using traditional lecture based instruction will score higher on the Terrorism Awareness Test than the students taught using the learning style based method. This conclusion is based on the finding that significant differences were found to exist for instructional methodology. The results indicate that the students in the learning styles based (experimental) group scored slightly lower than the traditional lecture based (control) group ($p = .004$). This difference equates to about one test question between the two groups. The students in the control group actually did better on the post-test. For this audience, this demonstrates that traditional based lecture instruction, which is what the students are accustomed to, resulted in better scores.

An implication of this conclusion is that there exists a possibility that insufficient instruction was allotted for the course. There should have been a greater time lapse between the pre- and post-test. This is based on the finding that only 1.5 hours of instruction was delivered with content that was unfamiliar to some of the students and that only one week after the presentation was a posttest administered, which may have confounded the results. Pre-test and post-test scores are not likely to be significantly different when minimum instructional time is provided and when the pre-test and post-test have a short time span.

**Objective Four**

A factor that contributes to a difference in the Terrorism Awareness posttest scores is the preferred social information processing style. This conclusion is based on the results of the
ANCOVA procedure which indicated that the social information processing style did differ significantly between the information processing style dimensions on Terrorism Awareness posttest scores. These means revealed that the social information processing style group (adjusted $M = 12.26$) post-test scores were lower than the not social information processing style group (adjusted $M = 14.09$). Thus, the analytical, visuo-spatial, and categorical processing style dimensions all scored about the same. However, those students who preferred the social information processing style scored lower. The processing style you prefer doesn’t make much of a difference in what your pre-test / post-test differences scores are unless the students has a social preferred information processing style. Research indicates that learning styles do improve achievement (Appell, 1991; McCarthy, 1996; Ursin, 1995). The learning style model developed by Bernice McCarthy and employed in this study addresses all four learning styles during the instructional period. Further research indicates that the preferred social information processing style students need time to learn and the Terrorism Preparedness content provided in this study does not lend itself to this type of style/content (1.5 hours of instruction).

**Objective Five**

A model which includes selected personal and demographic variables, plus the pre-test score and instructional method, can explain a moderate amount of variance in the Terrorism Awareness Test post-test scores. However, instructional method alone (traditional instruction versus learning styles based instruction) does not explain even a low amount of the variance in learning as measured by the Terrorism Awareness Test. This conclusion is based on the finding that revealed that the variables controlled in the block of demographic and personal variables explained 23.7% of the variance in the Terrorism Awareness post-test scores and the variable instructional methodology explained an additional 1.8% of the variance.
The data indicates that the people taught with traditional lecture based instruction had significantly higher level of knowledge about Terrorism Awareness than those taught using learning styles based instruction, although the difference is not practically significant. Learning styles based instruction appears to result in a small amount of decreased learning as measured by the Terrorism Awareness Test, when compared to traditional instructional procedures.

**Recommendations**

1. This study should be replicated with an extension of instructional delivery time of at least seven hours of content classroom instruction at least a five week time lapse for statistical comparison of the Terrorism Awareness post-test.

2. The findings of this study were generalized only to this group of subjects; therefore, it should be replicated with 1) other undergraduate students; 2) undergraduate students in other states; and 3) other subject areas besides sociology.
REFERENCES


80


Yang, F. (2000). Using survival analysis to analyze and predict students’ achievement from their status of developmental study. Paper presented at the meeting of the Association for International Research, Cincinnati, OH.

APPENDIX A: LESSON PLANS AND INSTRUCTOR’S NOTES FOR CONTROL AND EXPERIMENTAL GROUP

*Bold type in the Experimental Group column indicates components in the instructional delivery method for the Experimental Group that do not exist or are different in the Control Group.*

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<thead>
<tr>
<th>Section</th>
<th>Control Group</th>
<th>Experimental Group</th>
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<tbody>
<tr>
<td>Instructor’s Notes</td>
<td>This U.S. Department of Defense Nuclear, Biological, and Chemical (NBC) Domestic Terrorism Preparedness Awareness course, has been designed and developed to transfer the meaning, concepts, and ideas associated with preparing an individual to: 1) understand that an NBC terrorist incident could happen, 2) be able to recognize an NBC attack, and 3) know how to make proper notification about the hazardous materials. The learning styles of all the class participants have been addressed. As the instructor, you will act as a facilitator/guide to stimulate learning. Throughout the program, you should allow learners to work through exercises and at times act as a coach, rather than just a lecturer. Before you begin teaching, study the entire course – including the videotape presentation, the objectives for the course/module and the questionnaire. It is recommended that you practice presenting the course before your first class to become more familiar with the material and format. During the instructional process, watch for verbal and non-verbal communication signals from your audience. Check to see if participants are following an instructional point, if they need more clarification, or if they disagree with a point that has been discussed. If you sense disagreement, encourage participants to speak up, so the point can be discussed in class rather than among peers after class. When someone in the class asks a question, you may repeat the question so that the entire class can hear it. At regular intervals, check the atmosphere in the classroom, ensure that the students are receiving some feedback and encourage participation. The discussion activities are extremely important. As the instructor, you should encourage participants to look beyond the short and quick answer. At the end of the class, make notes about sections you thought went well and a list of areas that could be improved.</td>
<td>This U.S. Department of Defense Nuclear, Biological, and Chemical (NBC) Domestic Terrorism Preparedness Awareness course, has been designed and developed to transfer the meaning, concepts, and ideas associated with preparing an individual to: 1) understand that an NBC terrorist incident could happen, 2) be able to recognize an NBC attack, and 3) know how to make proper notification about the hazardous materials. The learning styles of all the class participants have been addressed. As the instructor, you will act as a facilitator/guide to stimulate learning. Throughout the program, you should allow learners to work through exercises and at times act as a coach, rather than just a lecturer. Before you begin teaching, study the entire course – including the videotape presentation, the objectives for the course/module and the questionnaire. It is recommended that you practice presenting the course before your first class to become more familiar with the material and format. During the instructional process, watch for verbal and non-verbal communication signals from your audience. Check to see if participants are following an instructional point, if they need more clarification, or if they disagree with a point that has been discussed. If you sense disagreement, encourage participants to speak up, so the point can be discussed in class rather than among peers after class. When someone in the class asks a question, you may repeat the question so that the entire class can hear it. At regular intervals, check the atmosphere in the classroom, ensure that the students are receiving some feedback and encourage participation. The group activities are extremely important. As the instructor, you should encourage participants to look beyond the short and quick answer. At the end of the class, make notes about sections you thought went well and a list of areas that could be improved.</td>
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</table>

| Learner’s objectives | At the end of this course the learner will be able to:  
- Discuss an NBC terrorist attack and describe how it could happen.  
- List the signs and symptoms associated with an NBC terrorist attack.  
- Describe what actions to take in the event of an NBC terrorist attack. | At the end of this course the learner will be able to:  
- Discuss an NBC terrorist attack and describe how it could happen.  
- List the signs and symptoms associated with an NBC terrorist attack.  
- Describe what actions to take in the event of an NBC terrorist attack. |
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<th>Section</th>
<th>Control Group</th>
<th>Experimental Group</th>
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</table>
| Material Needed  | For the Instructor: 1. NBC Instructor’s Guide  
|                  | • Video  
|                  | • Achievement Instrument  
|                  | • ASIPS  
|                  | 2. Multimedia projector, TV, and VCR  
|                  | For each Learner: 1. Learner’s Information Sheet  
|                  | 2. Achievement Instrument and ASIPS  
|                  | 3. Pen or Pencil                                                               | For the Instructor: 1. NBC Instructor’s Guide  
|                  | • Video  
|                  | • Achievement Instrument  
|                  | • ASIPS  
|                  | 2. Multimedia projector, TV, VCR, and computer  
|                  | 3. Lecture notes, FAQ’s, poster board, and group procedures.                   |
| Using the Learner’s Packet | Distribute the Employee Awareness Pamphlet at the beginning of class. Information in the packet includes a two page review of the signs and symptoms associated with an NBC materials attack, and the action steps an individual should take to protect themselves and others. | Each learner should have a packet of information to maximize his/her retention of the material. Each participant packet includes: A copy of the PowerPoint Presentation slides, and questions for the group discussion. The group will be presented with a variety of scenarios in which the participants will be asked their thoughts about how they would prepare for a similar situation in their community. |
| Instruction Component – Section 1 |                                                                                   |                                                                                     |
| Instructor Objectives | Discuss the general topic of terrorism. Discuss current problems related to terrorist attacks. Identify the terms used in terrorism preparedness. | Discuss the general topic of terrorism. Discuss current problems related to terrorist attacks. Identify the terms used in terrorism preparedness. |
| Strategy          | Introduce and review the definition of terrorism. Discuss terrorism using nuclear, biological and chemical (NBC) materials. Begin the video presentation, play it for 10 minutes. Discuss recent terrorist events. 15 minutes. | Introduce the course to participants. As a group, watch the 10 minute video presentation dealing with the preparation for a potential NBC terrorist attack. This will be accomplished through a terrorism video. In groups of 5-7 participants, categorize and classify the terms used in domestic terrorism preparedness awareness specifically dealing with NBC materials. Break the class into 2-3 groups and have each group select a leader. 15 minutes. |
| Evaluation        | Participants will be asked to answer some Frequently Asked Questions:  
|                  | 1. What is Terrorism?  
|                  | 2. How is NBC terrorism different from a conventional act of terrorism?  
|                  | 3. What are some recent terrorist events?  
|                  |参与者将被问及一些常见的问题：  
|                  | 1. 什么是恐怖主义？  
|                  | 2. NBC恐怖主义与传统恐怖袭击有何不同？  
|                  | 3. 近期恐怖袭击事件有哪些？  
|                  | 参与者将被问及一些常见的问题：  
|                  | 1. 什么是恐怖主义？  
|                  | 2. NBC恐怖主义与传统恐怖袭击有何不同？  
|                  | 3. 近期恐怖袭击事件有哪些？  | Participants will voice their personal feelings, fears, and concerns following the video experience. What did they visualize or imagine? Have the participants use large sheets of paper and markers to record the lists from the classifying activity. |
| Learning Style Addressed | 4MAT Quadrant 1R, Right Brain: connect.  
|                  | 4MAT Quadrant 2L, Left Brain: define. | 4MAT Quadrant 1R, Right Brain: connect.  
<p>|                  | 4MAT Quadrant 1L, Left Brain: examine. |</p>
<table>
<thead>
<tr>
<th>Section</th>
<th>Control Group</th>
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<tbody>
<tr>
<td><strong>Instruction Component – Section 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Instructor Objectives</strong></td>
<td>Discuss NBC terrorist materials. Compare the known with the possibility of terrorist attacks. Discuss current problems related to terrorist attacks. Detail terrorist motivations, potential attacks from NBC materials, public concerns.</td>
<td>Discuss NBC terrorist materials. Compare the known with the possibility of terrorist attacks. Discuss current problems related to terrorist attacks. Detail terrorist motivations, potential attacks from NBC materials, public concerns.</td>
</tr>
<tr>
<td><strong>Strategy</strong></td>
<td>Show second 15 minutes of video, introduce the topic, and discuss how NBC materials affect people. 20 minutes.</td>
<td>Review student lists with known data from the experts in the field of terrorism preparedness and emergency management. Brief lecture describing protective action steps in the event of an NBC terrorist incident. 20 minutes.</td>
</tr>
<tr>
<td><strong>Evaluation</strong></td>
<td>Ask participants to describe to the other participants where NBC materials come from, how they enter the body, and what are the indicators of an NBC attack.</td>
<td>Students see the interrelationships of the concepts which focus on potential attacks and terrorist motivations. Can they articulate the differences and possibly describe some analogies. Questions &amp; Answers.</td>
</tr>
<tr>
<td><strong>Learning Style Addressed</strong></td>
<td>4MAT Quadrant 2R, Right Brain: image. 4MAT Quadrant 2L, Left Brain: define.</td>
<td>4MAT Quadrant 2R, Right Brain: image. 4MAT Quadrant 2L, Left Brain: define.</td>
</tr>
<tr>
<td><strong>Instruction Component – Section 3</strong></td>
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<tr>
<td><strong>Instructor Objectives</strong></td>
<td>Discuss the potential of terrorism; who the terrorists are; what are some of their objectives; what are their targets. Student explores potential threats from nuclear, biological, and chemical materials. Apply principles regarding appropriate nuclear, biological, and chemical terrorism preparedness actions.</td>
<td>Discuss the potential of terrorism; who the terrorists are; what are some of their objectives; what are their targets. Student explores potential threats from nuclear, biological, and chemical materials. Apply principles regarding appropriate nuclear, biological, and chemical terrorism preparedness actions.</td>
</tr>
<tr>
<td><strong>Strategy</strong></td>
<td>Show the remaining 4 minutes of the video and discuss how a terrorist might disseminate NBC materials. Review and discuss the terrorist threats, and objectives. The following questions will be used to lead this discussion: 1. Where NBC materials come from. 2. How they enter the body. 3. What are the signs and symptoms? 4. What are the indicators of an NBC attack? 15 minutes.</td>
<td>Participants are provided a worksheet which will give them the opportunity to explore and practice their new learning. The exercise was designed to use information on terrorism involving NBC materials. Participants are asked to devise a community plan to prepare for an NBC terrorist attack. The learner should see this information as having a personal usefulness. Worksheet Questions: 1. Describe how an NBC attack is different from other emergencies you prepare for. 2. How would you know an NBC attack had happened here? 3. What are the signs and symptoms of an NBC attack? 4. What are some ways to disseminate the NBC materials? 15 minutes.</td>
</tr>
<tr>
<td><strong>Evaluation</strong></td>
<td>Participants will be asked to answer some Frequently Asked Questions: 1. How can terrorist get NBC materials? 2. Are biological agents contagious? 3. Are medical treatments available?</td>
<td>Participants will complete the worksheet (questions listed above). Participants will draft a community response plan.</td>
</tr>
<tr>
<td><strong>Learning Style Addressed</strong></td>
<td>4MAT Quadrant 2R, Left Brain: image. 4MAT Quadrant 2L, Right Brain: define.</td>
<td>4MAT Quadrant 3L, Left Brain: try. 4MAT Quadrant 3R, Right Brain: extend.</td>
</tr>
<tr>
<td>Section</td>
<td>Control Group</td>
<td>Experimental Group</td>
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<tr>
<td>Instructor Objectives</td>
<td>Introduce the personal action steps you can take to save your life and others.</td>
<td>Introduce the personal action steps you can take to save your life and others.</td>
</tr>
<tr>
<td>Strategy</td>
<td>Participants will observe their surroundings in their own facility.</td>
<td>Identify key concepts and future needs. Apply information learned to individual, family, and community.</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Participants will discuss their organization’s emergency procedures; and describe their organization’s policy on emergency notification. 10 minutes.</td>
<td>Group leaders will chart a list to review process. Compare gains and have participants aid each other in identifying (+) (-) for which additional refinements needed. Share and celebrate the pluses and minuses of individual learning experience. Participants will be asked to critique the presentation, tell about the most important information learned today, or ask for some clarifications. 10 minutes</td>
</tr>
<tr>
<td>Learning Style Addressed</td>
<td>4MAT Quadrant 1L, Left Brain: examine. 4MAT Quadrant 1R, Right Brain: connect.</td>
<td>4MAT Quadrant 4L, Left Brain: refine. 4MAT Quadrant 4R, Right Brain: integrate.</td>
</tr>
</tbody>
</table>
APPENDIX B: LETTER FROM A 4MAT CONSULTANT

To: Whom It May Concern

From: Betty C. Harrison, Ph.D., Consultant
       About Learning Corporate Consultant Program

Date: May 17, 2004

Re: Review of Instructional Lesson Plan (included in dissertation preparation)

I have reviewed the lesson plan which William McCarthy will use to teach the experimental group included in his dissertation. The plan is a good general example of a lesson plan using the 4MAT System model. As I understand Mr. McCarthy’s research, the focus is mainly on processing style, one dimension of learning style. The activities suggested will allow opportunity for all the students to perceive and process the information.

Betty C. Harrison, Ph.D., Consultant
About Learning Corporate Consultant Program
APPENDIX C: STRATEGICAL INFORMATION PROCESSING STYLE INSTRUMENT (ASIPS)

ASSESSMENT OF STRATEGICAL INFORMATION PROCESSING STYLE

Instruction Sheet

Directions: Different people process information in different ways. How people process information is related to individual differences in the learning process. Knowing your own strategical information processing style improves your self-awareness as a learner and can enhance your success as a student. Please complete the sentences based on the way that you prefer to handle information when it is presented to you.

◆ You must rank each item in the question on a scale from most preferred (5) to least preferred (1). Numbers can be used more than once per question.
◆ All answers are valuable, so answer all questions.
◆ No correct or incorrect responses exist in the instrument.
◆ Your answers will be treated confidentially. The results of the assessments will be evaluated as a group. The last four digits of your social security number are requested and are critical for the purpose of matching test-retest results.

Your age today: ____________________

Last four digits of SS#: ____________

Gender: (✓ Check one)
□ male
□ female

Your Major: ____________________

Ethnic background: (✓ Check one)
□ Black or African American
□ Asian
□ Hispanic
□ Native American
□ White
□ Other (specify: ____________________)

Undergraduate Credit Hours completed to date: ____________________

Thanks!

EXAMPLE QUESTION

DIRECTIONS

For handling each situation listed below, five strategies are provided. Using the scale below, indicate your level of preference for using each strategy in each situation. Each response (number) can be used more than once for each situation.

Level of Preference Scale
5 = most often prefer
4 = more often prefer
3 = prefer
2 = seldom prefer
1 = least prefer

1. When I am presented with a new concept in one of my courses, I

3 a. Verbalize the concept.  1 b. Write down every detail.  4 c. Interact with discussion and questions.  5 d. Visualize the concept.  1 e. Analyze the concept.

In the above example, number ‘5’ is used for item d. This means that ‘visualize the concept’ is my most often preferred strategy. ‘Write down every detail’ and ‘analyze the concept’ are my two least preferred strategies. In this example nothing was rated as preferred.

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### STRATEGICAL INFORMATION PROCESSING STYLES (SIPS)

#### DIRECTIONS

For handling each situation listed below, five strategies are provided. Using the scale below, indicate your level of preference for using each strategy in each situation. **Each response (number) can be used more than once for each situation.**

**Level of Preference Scale**
- 5 = most often prefer
- 4 = more often prefer
- 3 = prefer
- 2 = seldom prefer
- 1 = least prefer

1. **When studying for a written exam in one of my courses, I:**
   - a. Become overwhelmed if there is too much to learn.
   - b. Outline the information.
   - c. Group the information into categories.
   - d. Relate my experiences to the new information.
   - e. Use pictures and images to clarify the information.

2. **When considering how I act on information presented in my courses, I am:**
   - a. An outliner.
   - b. Amazed.
   - c. Inventive.
   - d. Anxious.
   - e. A risk-taker.

3. **If I am taking a test and the answer to a question just pops into my head, I:**
   - a. Rely on the answer because I trust my gut feelings.
   - b. Rely on the answer after using a step-by-step procedure to determine its correctness.
   - c. Rely on the answer after outlining the information.
   - d. Rely on the answer if I can mentally picture the solution.
   - e. Get nervous when I am not sure of the answer.

4. **When considering how I act on information presented in my courses, I am:**
   - a. A summarizer.
   - b. Creative.
   - c. A planner.
   - d. Overwhelmed.
   - e. Unpredictable.

5. **When answering a discussion question on an exam about a concept, such as democracy, I:**
   - a. Make an outline before answering the question.
   - b. Use a chart or diagram to explain the concept.
   - c. Use drawing and images to explain the concept.
   - d. Use precise details to explain the concept.
   - e. Use past experiences to explain the concept.
6. When I want to remember directions to a new friend's apartment, I:
   a. Picture the directions in my mind.  
   b. Write down the directions.  
   c. Follow the directions in a step-by-step format.  
   d. Use a map to outline the directions.  
   e. Get nervous because I usually get lost.

7. When considering how I act on information presented in my courses, I am:
   a. Orderly.  
   b. Excitable.  
   c. Organized.  
   d. Impatient.  
   e. Astonished.

8. If I were teaching a course, I would:
   a. Use overheads with lots of words to present information.  
   b. Use games and group projects to present the information.  
   c. Use tables and/or charts to present information.  
   d. Use my experiences to present the information off the top of my head.  
   e. Use a systematic structured approach to present the information.

9. When I act on the lecture information given in one of my courses, I:
   a. Outline the information.  
   b. Take detailed notes.  
   c. Ask questions to clarify the information.  
   d. Use pictures to illustrate the information.  
   e. Group the information into categories.

10. When I am required to perform a mathematical calculation in my head, I:
    a. Get nervous if I am uncertain of the answer.  
    b. Use a step-by-step method to calculate the answer.  
    c. Give the answer off the top of my head.  
    d. Use an organized process to calculate the answer.  
    e. Picture the steps in my mind as I calculate the answer.

11. When considering how I act on information presented in my courses, I am:
    a. Nervous.  
    b. A diagrammer.  
    c. Spontaneous.  
    d. Consistent.  
    e. Imaginative.

12. When considering how I act on instructional information, I:
    a. Listen to the instructions.  
    b. Like specific organized instructions.  
    c. Like visual instructions.  
    d. Like instructions in an outline format.  
    e. Like instructions that are not overwhelming.

13. When I am required to perform a procedure such as a laboratory experiment, I:
    a. Use a trial and error approach.  
    b. Follow the directions in a step-by-step manner.  
    c. Am overwhelmed when the procedures have lots of steps.  
    d. Make an outline of the procedure.  
    e. Use pictures to illustrate the steps in the procedure.

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APPENDIX D: PERMISSION LETTER TO USE ASIPS

February 26, 2002

Dr. Beverly Allain Farrell
340 Little John Drive
Baton Rouge, LA 70815

Dear Dr. Farrell:

I request permission to use the “Assessment of Strategical Processing Style” in my dissertation research and subsequent activities. I also request permission to modify the questionnaire by deleting items, adding items, and/or modifying existing items to fit the objectives of my research and subsequent activities. Full credit will be given to you as the source of the items that I elect to use or modify for use in my research both in my dissertation and in any academic manuscripts that are produced from my research and subsequent activities. It is my understanding that you have the authority to give this release.

Your support of my research is appreciated. If you have any questions, please call me at 225-224-9400.

Sincerely,

William McCarthy
Doctoral Student

Approved:

Dr. Beverly Allain Farrell
Date 2.28.02
APPENDIX E: COPY OF THE NATIONAL EMERGENCY RESPONSE AND RESCUE TRAINING CENTER’S TERRORISM AWARENESS TEST

WMD Terrorism Awareness Test

1. There are a number of blister agents, including:
   a. Hydrogen cyanide (AC) and Cyanogen chloride (CK)
   b. Mustard (H), Lewisite (L), Phosgene Oxime (CX)
   c. Tabun (GA), Sarin (GB), Soman (GD), and VX
   d. Mustard (H), Distilled mustard (HD), and nitrogen mustard (HNI, HN2, HN3)

2. (True/False) Cyanides or blood agents include common industrial chemicals such as potassium cyanide which can cause rapid respiratory arrest and death.
   a. True
   b. False
   c. Can not answer, insufficient information

3. (True/False) Pulmonary or choking agents include common industrial chemicals, which can cause eye and airway irritation, dyspnea, chest tightness, and delayed pulmonary edema.
   a. True
   b. False
   c. Can not answer, insufficient information

4. There is an antidote kit for blood agents called ________________.
   a. Palestinian Antidote for Cyanide
   b. British anti-Lewisite Cream
   c. Pasadena Cyanide Antidote
   d. Pasadena Cyanide Cream

5. Can explosives provide a vehicle for dispersal of chemical, biological, incendiary, and nuclear agents?
   a. No, explosives will destroy those agents
   b. Yes
   c. No, only nuclear agents

6. The primary effects of mustard agents occur in the ________.
   a. Eye, airways, and skin
   b. Circulatory and nervous systems
   c. Skin, and circulatory system

7. There is an antidote for Lewisite called ________. This is a military product, but may be available to responder organizations.
   a. British anti-Lewisite cream
   b. Lewisite cream of Britain
   c. Britain’s Lewisite neutralizer
8. Responsibility for directing recovery is based upon many factors. Guidance for this can be found in:
   a. The Terrorism Annex
   d. The Federal Response Plan

9. “Crisis Management” is the responsibility of
   a. Federal Emergency Management Agency (FEMA)
   b. The Department of Justice (DOJ), Federal Bureau of Investigations (FBI)
   c. Department of Energy (DOE)
   d. Department of State (DOS)

10. Terrorist attacks can be delivered in all of the following forms EXCEPT
    a. Incendiary devices
    b. Firearms
    c. Non-trauma mass casualty
    d. Knives

11. Many attacks have been linked to specific
    a. Historically significant days and/or religious holidays
    b. Days of the week and/or time of day
    c. Astrology and/or prophesy
    d. First two answers only
    e. None of the above

12. (True/False) Responders should consider the size of an explosive device as an element in determining threat levels.
    a. True
    b. False
    c. Can not answer insufficient data

13. To get away from potential line-of-site blast pathways, responders should use all of the following EXCEPT:
    a. Fire apparatus
    b. Riot gear
    c. Stand-off distance
    d. Solid structures/buildings

14. The degree or level of operational involvement of the responders may be predicted by their _________.
    a. Training
    b. Equipment
    c. Experience
    d. All of the above
    e. None of the above
15. (True/False) Explosive devices may be used to disperse B-NICE agents.
   a. True
   b. False
   c. Can not answer insufficient data

16. Establishing control (work) zones early will:
   a. Enhance scene control, public protection, and better facilitate medical treatment efforts
   b. Ensure capture of perpetrator
   c. Eliminate the need for additional resources
   d. Overload the available responders and resources

17. Responders must attempt to identify “clean” areas as well as hazardous areas. This is usually accomplished by using:
   a. Detection and monitoring equipment
   b. Canaries, mice, and other types of animals
   c. Taste, smell, and touch test
   d. Not the responsibility of responders, incident commanders must call for federal support

18. Protection of the public will largely depend on the ability of responders to effectively conduct a hazard and risk analysis of the affected population. During a B-NICE event, which of the following options should be considered as an approach to protect the public?
   a. Shelter in place
   b. Evacuate
   c. Combination
   d. All of the above

19. (True/False) The type of information that may influence your decision to evacuate should include the following: the degree or severity of public dangers or threats and the number of individuals or population areas affected by the danger.
   a. True
   b. False
   c. Can not answer insufficient data

20. (True/False) Availability of the resources needed to evacuate the affected population may include fire/EMS/police personnel and transportation mediums.
   a. True
   b. False
   c. Can not answer insufficient data
21. Command and control issues in terrorist incidents _____ involve(s) a unified command system.
   a. Will not
   b. May (if the incident commander wants a unified command)
   c. Will
   d. Often

22. The _____ plan provides for a focused source of information that will instruct evacuees on how and when to return home; status reports of incident recovery operations and planned events; information about areas that are restricted, and why; any other incident related details that will provide a sense of security, or enhance a return to “normalcy”; provide points of contact for the community to ask questions; and establishing a counseling center for community use.
   a. Strategic
   b. Operations
   c. Recovery
   d. Termination

23. The Federal Response Plan (FRP) is a written agreement among the various department and agencies that augment state and local government response efforts during declared emergencies and disasters, and includes response, mitigation, and recovery assistance. It also coordinates government resources and federal activities for response to disasters, as a part of the __________.
   b. Robert T. Stafford Disaster Relief and Emergency Assistance Act
   c. Anti-terrorism directive
   d. Federal Mutual Aid Agreement

24. The governor of the affected state requests federal assistance when _______.
   a. the fire chief requests mutual aid
   b. disaster overwhelms local and state resources or has been forecasted and federal assistance will be needed
   c. the police chief requests SWAT intervention
   d. All of the above
   e. None of the above

25. (True/False) Biological agents pose even less of a manufacturing safety problem than chemical agents.
   a. True
   b. False
   c. Can not answer insufficient data

26. (True/False) The first indication of a chemical attack may be when people start to collapse.
   a. True
   b. False
   c. Can not answer insufficient data
27. (True/False) There are many obvious indications of a radiological attack.
   a. True
   b. False
   c. Can not answer insufficient data

28. ____ materials must be used in relatively large quantities.
   a. Biological
   b. Chemical

29. It costs less to produce ____ than to produce ____.
   a. Chemical agents, biological agents
   b. Biological agents, chemical agents
   c. The cost is the same for both
   d. All of the above

30. Viruses are ________.
   a. Poisons produced by a variety of living organisms including plants and animals
   b. Much smaller than bacteria
   c. Single-celled organisms that cause a variety of diseases in animals, plants, and humans

31. Which agent is more likely to be used at night or in enclosed areas?
   a. Chemical
   b. Biological

32. Treatment procedures for casualties of radiation should generally follow this sequence:
   a. Patient management, transport to medical facilities (hospital), decontamination, and definitive care from the medical field.
   b. Patient management, decontamination, transport to medical facilities (hospital), and definitive care from the medical field
   c. Decontamination, patient management, transport to medical facilities (hospital), and definitive care from the medical field.
   d. Definitive care from the medical field, decontamination, and transport to medical facilities (hospital)

33. The acronym RDD stands for ________.
   a. Really Deadly Device
   b. Radiological Detection Device
   c. Radiological Dispersion Device
   d. Radiation Dose Detection

34. (True/False) Radioactive materials are not readily available due to strict control.
   a. True
   b. False
   c. Can not answer insufficient data
35. (True/False) Possible targets containing nuclear materials include bases where nuclear weapons are housed, weapons construction/maintenance facilities, nuclear-powered vessels, nuclear power plants, fuel reprocessing facilities, and nuclear waste facilities.
   a. True
   b. False
   c. Can not answer insufficient data

36. In respect to delivery, a rocket is an example of a _______ explosive.
   a. Stationary
   b. Hand-thrown
   c. Self-propelled

37. (True/False) Components for an incendiary device are roadway flares, gasoline and motor oil, light bulbs, common electrical components and devices, matches and other household chemicals, fireworks, propane and butane cylinders, plastic pipes, bottles, and cans.
   a. True
   b. False
   c. Can not answer insufficient data

38. (True/False) Decomposition often takes the form of extremely rapid oxidation (burning).
   a. True
   b. False
   c. Can not answer insufficient data

39. (True/False) Explosions are the result of sudden and violent release of gas during the decomposition of explosive substances.
   a. True
   b. False
   c. Can not answer insufficient data

40. (True/False) There is NOTHING emergency responders can do to prepare for a terrorist incident.
   a. True
   b. False
   c. Can not answer insufficient data
APPENDIX F: PERMISSION LETTER TO USE THE EMERGENCY RESPONSE AND RESCUE TRAINING CENTER’S TERRORISM AWARENESS TEST

October 23, 2001

Mr. Bill May  
Director, Operations and Training  
National Emergency Response and Rescue Training Center  
301 Tarrow Drive, Room 138  
College Station, TX  77840-7896

Dear Mr. May,

I request permission to use the “Weapons of Mass Destruction First Responder Pre-test Questionnaire” in my dissertation research and subsequent activities. I also request permission to modify the questionnaire by deleting items, adding items, and/or modifying existing items to fit the objectives of my research and subsequent activities. Full credit will be given to your organization as the source of the items that I elect to use or modify for use in my research both in my dissertation and in any academic manuscripts that are produced from my research and subsequent activities. It is my understanding that you have the authority to give this release on behalf of your organization.

You support of my research is appreciated. If you have any questions, please call me at 225-248-9158.

Sincerely,

William J. McCarthy  
Doctoral Student
APPENDIX G: MODIFIED EMERGENCY RESPONSE AND RESCUE TRAINING CENTER’S TERRORISM AWARENESS TEST USED IN PILOT TEST (30 QUESTIONS)

Terrorism Awareness Test

This information will be kept confidential and you cannot be identified by this data.
Please record the last 4 digits in your Social Security Number.
This survey will take 5-10 minutes to complete.

Nuclear, Biological, or Chemical = NBC

Please select the most correct answer for each question.

1. Terrorists have the capability to manufacture ________.
   a. Conventional weapons only
   b. Non-lethal weapons only.
   c. Nuclear, biological and chemical weapons.

2. Which of the following legislation affects the community’s emergency management system.
   a. The Clean Water Act and the Nunn-Lugar-Domenici Amendment.
   b. The Brady Handgun Bill
   c. The Family Medical Leave Act

3. The most likely emergency response plan your community will follow is:
   a. Record, response, and data
   b. Identification, data, and collection.
   c. Preparedness, response, and recovery

4. Communicating the need for additional resources during a Nuclear, Biological, or Chemical terrorist incident can be accomplished by:
   a. Viewing the events as they unfold on television.
   b. Providing information to response officials.
   c. Getting to a location away from the emergency.
   d. Speaking with the media.

5. Exposure to nuclear, biological, and chemical materials ________ decontamination.
   a. Never requires
   b. Sometimes requires
   c. Does require

6. The optimum time of day for a biological terrorist attack is
   a. Noon. to 1:00 p.m.
   b. 3:00 p.m. to 4:00 p.m.
   c. Dawn and dusk.
7. If an employee see a need for additional aid during a terrorist attack, he/she should:
   a. Consider the costs of the aid and assistance.
   b. Call the media to report the event.
   c. Contact the emergency response authorities.
   d. Consider the outcome.

8. Accidents involving radioactive materials occur:
   a. rarely.
   b. monthly.
   c. 20 times per year.
   d. daily.

9. Radiation can be detected by:
   a. Smell.
   b. Sight
   c. It cannot be detected by the senses.
   d. It can only be detected at night.

10. Employees working in or near a crime scene must respect the mission of law enforcement investigators by:
    a. cleaning all evidence items thoroughly before turning it over to law enforcement.
    b. identifying and preserving potential evidence.
    c. stopping all activity while the investigators work.
    d. placing all debris found in a big pile near the command post.

11. During the past two decades, the number of international terrorist incidents have decreased and the trend toward
    a. less injuries or killings has been reported.
    b. more injuries or killings has increased.
    c. more peaceful outcomes has been reported.
    d. less documentation has increased.

12. All of following personal action steps are recommended for an employee when a hazardous materials incident is suspected except:
    a. Communicating the suspicion to the authorities.
    b. Collecting samples of the hazardous materials.
    c. Removing clothing exposed to nuclear, biological and chemical agent.

13. The most likely individuals and groups that are considered to be possible terrorist are all of the following except:
    a. Doomsday cults
    b. Insurgents
    c. FEMA
    d. Rebels
14. Once released, biological, chemical, and radiological agents can remain in the air as vapor or settle on surfaces and can be active ________.
   a. For hours or days
   b. For weeks.
   c. For years.
   d. All of the above.

15. Signs and symptoms of exposure to chemical materials include the following except:
   a. mass hysteria and confusion.
   b. excessive bleeding.
   c. pin-pointed pupils, and or convulsions.
   d. immediate hair loss.

16. Which characteristic is not identifiable with biological agents?
   a. Living organisms and humidity will affect them.
   b. Best used in an open environment.
   c. Sunlight, in particular ultraviolet rays, will kill many of them.
   d. Most will only last a few hours or days.

17. The major objectives of the terrorists include all of the following except:
   a. to produce a large number of victims
   b. to attack symbolic targets
   c. to have very little media attention
   d. to produce mass panic and confusion

18. The food supply in most U.S. cities will last approximately ________ days.
   a. 60
   b. 90.
   c. 5.
   d. 30.

19. Threats of biological incidents exist in all of the following except:
   a. food
   b. animals
   c. space
   d. water

20. A radiological survey should be conducted:
   a. When a threat did not mention radiation.
   b. After a known radiation release.
   c. After a known chemical or biological attack has occurred.
   d. Always.

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   a. ten times as many
   b. more
   c. less
   d. Can not answer, insufficient data.

22. The majority of people within an area affected by a Weapon of Mass Destruction event are going to be ____________.
   a. uninjured.
   b. seriously injured.
   c. killed.

23. The Occupational Safety and Health Administration requires that response personnel at an Biological, Chemical incident are provided with information on
   a. Potential victims.
   b. Data recovery.
   c. Evidence collection.
   d. Decontamination actions.

24. Toxins are ________.
   a. Poisons produced by a variety of living organisms including, plants, and animals.
   b. Much smaller than bacteria.
   c. Single-celled organisms that cause a variety of diseases in animals, plants, and humans.

25. Cyanides or blood agents include common industrial chemicals such as potassium cyanide which can cause rapid respiratory arrest and death.
   a. True.
   b. False.
   c. Can not answer, insufficient information.

26. Law Enforcement usually dictates security measures for scene control in all of the following areas except:
   a. Ongoing attacks.
   b. Counseling centers.
   c. Unstable criminal activity.
   d. Organized evacuations.

27. The rate of action or onset time is the period of time that elapses before a victim begins to show or feel the symptoms of the particular agent. The onset can normally be seen in ________.
   a. Hours to days.
   b. Days to weeks.
   c. Seconds, minutes, or hours.
   d. More than a week.
28. Pound for pound ________ are a thousand times less toxic than ______ agents.
   a. Biological agents, chemical.
   b. Chemical agents, biological.

29. Possible targets containing nuclear materials include bases where nuclear weapons are housed, weapons construction/maintenance facilities, nuclear-powered vessels, nuclear power plants, fuel reprocessing facilities, nuclear waste facilities.
   a. True.
   b. False.

30. Guidance for recovery from a nuclear, biological, and chemical incident is based upon many factors. This assistance can be found in:
APPENDIX H: MATRIX OF THE U.S. DEPARTMENT OF DEFENSE PERFORMANCE OBJECTIVES FOR AWARENESS COMPETENCY LEVELS AND TERRORISM AWARENESS TEST QUESTIONS

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<td>1. Describe the potential for terrorist use of NBC weapons.</td>
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<td>2. Discuss the indicators, signs, and symptoms of NBC agents, and identify the agents from signs and symptoms, if possible.</td>
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<td>3. Name relevant NBC response plans and SOP’s and your role in them.</td>
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<td>4. Distinguish and outline the need for additional resources during an NBC incident.</td>
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<td>5. State the proper notification and communicate the NBC hazard.</td>
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<td>7. Outline individual protection at a NBC incident. - Use self-protection measures. - Select and use proper protective equipment.</td>
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<td>8. Describe protective measures and how to initiate actions to protect others and safeguard property in an NBC incident.</td>
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<td>9. CB decontamination procedures for self, victims, site/equipment and mass casualties. - Detail &amp; implement.</td>
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<td>10. Define crime scene and evidence preservation at an NBC incident.</td>
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Item Analysis Definitions:

**Item Analysis:**
Analysis of a test determining for each item the number and proportion of correct responses and the correlation of scores on that item with total test scores.

**Item Discrimination Index**
The Item Discrimination Index shows the extent to which each item discriminates among the respondents in the same way as the total score discriminates.

**Item Difficulty Index**
The item difficulty index can be computed by dividing the number of test takers who answered the item correctly by the total number of students who answered the item.

**Item Distractor Analysis**
Item distractor analysis examines the percentage of examinees who select each incorrect alternative, to determine whether the distractors are functioning as intended.

(Ary, Jacobs, and Razavich, 1996)
APPENDIX J: TERRORISM AWARENESS TEST USED AS PRE-TEST AND POST-TEST (25 QUESTIONS)

Terrorism Awareness Test

Information will be kept confidential and you cannot be identified by this data.
Please record the last 4 digits in your Social Security Number

Nuclear, Biological, or Chemical = NBC

Please select the most correct answer for each question.

1. A community’s emergency management system is affected by the following legislation:
   a. the Pell Act.
   b. the Brady Handgun Bill.
   c. the Family Medical Leave Act.
   d. the Nunn-Lugar-Domenici Amendment and the Clean Water Act.

2. The most likely emergency response plan your community will follow is
   a. record, response, and data.
   b. identification, data, and collection.
   c. preparedness, response, and recovery.
   d. record, identification, mitigation.

3. Communicating the need for additional resources during a Nuclear, Biological, or Chemical terrorist incident can be accomplished by
   a. viewing the events as they unfold on television.
   b. providing information to response officials.
   c. getting to a location away from the emergency.
   d. speaking with the media.

4. Exposure to hazardous Nuclear, Biological and or Chemical materials
   a. never requires decontamination.
   b. sometimes requires decontamination.
   c. seldom requires decontamination.
   d. does require decontamination.

5. Employees who see the need for additional aid during a terrorist attack should
   a. consider the costs of the aid and assistance.
   b. call the media to describe the event.
   c. contact the emergency response authorities.
   d. consider the outcome of this action.

6. Radiation
   a. can be detected by the sense of smell.
   b. can be detected by the sense of sight.
   c. cannot be detected by the senses.
   d. can only be detected at night.
7. Employees working in or near a crime scene must respect the mission of law enforcement investigators by:
   a. cleaning all evidence items before turning it over to law enforcement.
   b. identifying and preserving potential evidence.
   c. stopping all activity while the investigators work.
   d. placing all debris found in a big pile near the command post.

8. During the past two decades, the number of international terrorist incidents have decreased and the trend toward
   a. less injuries or killings has been reported.
   b. more injuries or killings has increased.
   c. more peaceful outcomes has been reported.
   d. less documentation has increased.

9. All of the following personal action steps are recommended for an employee when a hazardous materials incident is suspected except
   a. communicating the suspicion to the authorities.
   b. collecting samples of the hazardous materials.
   c. removing clothing exposed to nuclear, biological and chemical agents.
   d. wearing protective clothing to reduce exposure.

10. The most likely individuals and groups that are considered to be possible terrorist are all of the following except
    a. doomsday cults.
    b. insurgents.
    c. FEMA.
    d. Suicide bombers.

11. Once released, biological, chemical, and radiological agents can remain in the air as vapor or settle on surfaces and can be active
    a. for minutes.
    b. for hours.
    c. for weeks.
    d. for years.

12. Signs and symptoms of exposure to chemical materials include the following except
    a. mass hysteria and confusion.
    b. excessive bleeding.
    c. pin-pointed pupils, and or convulsions.
    d. immediate hair loss.

13. Which characteristic is not identifiable with biological agents?
    a. Living organisms and humidity will affect them.
    b. Best used in an open environment.
    c. Sunlight, in particular ultraviolet rays, will kill many of them.
    d. Most will only last a few hours or days.
14. The major objectives of the terrorists include all of the following except
   a. to produce a large number of victims.
   b. to attack symbolic targets.
   c. to have very little media attention.
   d. to produce mass panic and confusion.

15. The food supply in most U.S. cities will last approximately
   a. 60 days.
   b. 90 days.
   c. 5 days.
   d. 30 days.

16. A radiological survey should be conducted
   a. when a threat did not mention radiation.
   b. after a known radiation release.
   c. after a known chemical or biological attack has occurred.
   d. in all situations.

17. Biological agents pose manufacturing safety problems that are
   a. ten times worse than chemical agents.
   b. more dangerous than chemical agents
   c. less dangerous than chemical agents.
   d. immeasurable in regards to safety.

18. The Occupational Safety and Health Administration requires that response personnel at a
    biological/chemical event are provided with information on
   a. potential victims.
   b. data recovery.
   c. evidence collection.
   d. decontamination actions.

19. Toxins are
   a. poisons produced by a variety of living organisms including, plants, and animals.
   b. much smaller than bacteria.
   c. single-celled organisms that cause a variety of diseases in animals, plants, and humans.
   d. much larger than bacteria and are produced by living organisms.

20. Cyanides or blood agents include common industrial chemicals such as potassium cyanide
    which
   a. can only cause rapid respiratory arrest.
   b. can cause death.
   c. can cause rapid respiratory arrest and death.
   d. can not be determined due to insufficient data.

21. Law Enforcement usually dictates security measures for scene control in all of the following
    situations except
   a. ongoing attacks.
   b. counseling centers.
   c. unstable criminal activity.
   d. organized evacuations.
22. The period of time that elapses before a victim begins to show or feel the symptoms of a particular agent is
   a. hours to days only.
   b. days to weeks only.
   c. seconds, minutes, or hours.
   d. more than a week.

23. Biological agents pound for pound are
   a. more toxic than chemical agents.
   b. equal in toxicity to chemical agents.
   c. less toxic than chemical agents.
   d. immeasurable in regards to toxicity with chemical agents.

24. The most likely targets would could contain hazardous nuclear materials include
   a. bases where nuclear weapons are housed and nuclear waste sites.
   b. weapons maintenance facilities and nuclear power plants.
   c. all the above.
   d. none of the above.

25. If an individual is exposed to a hazardous agent, the most important decontamination measure is
   a. location.
   b. space.
   c. time.
   d. reporting.
APPENDIX K: MAJOR AREAS OF STUDY FOR UNDERGRADUATE STUDENTS PARTICIPATING IN THE TERRORISM PREPAREDNESS COURSE

List of all majors as reported by undergraduate students participating in Terrorism Preparedness Course.

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**Grand Total**                                                      **307**
VITA

At the time of the dissertation defense, William James McCarthy was a candidate for the degree of Doctor of Philosophy in the human resource education program at Louisiana State University. He completed his undergraduate work at Anna Maria College in 1987 and received a Bachelor of Arts degree in social relations. After graduation, he worked as a State Trooper in Connecticut. In 1993, he received his Master of Arts degree in public administration from Clark University.

He married Debora A. Melton. They have three children, William II, Lauren, and James. During his studies in Louisiana, he worked for the Department of Revenue as a Senior Level Executive in the Office of Alcohol & Tobacco Control.

During completion of his dissertation, he was an assistant professor at Quinsigamond Community College in Worcester, Massachusetts.