

**INVESTIGATING THE IMPACT OF DIFFERENTIATED INSTRUCTION ON  
SOLDIER TRAINING**

**by**

**Sara Rebecca Baumgarten**

**A Dissertation Presented in Partial Fulfillment**

**Of the Requirements for the Degree**

**Doctor of Education**

**Liberty University, Lynchburg, VA**

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## ABSTRACT

As the individuals identified as the Millennial Generation transition into adulthood, postsecondary instructional institutions must adjust training methods for increased learning. This postsecondary institutional transformation is not exclusionary, thus military training must also evolve to increase knowledge acquisition. For soldiers in the unit supply specialist program, training utilized differentiated instruction methods and strategies with an end state of improved learning for soldiers at their first duty station and lasting through the course of their career. This revised learning methodology has increased property accountability as directed by the Command Supply Discipline Program, Department of the Army. Conducting an ANCOVA on Control and Experimental group posttest scores, there appeared to be no significant differences within group ( $p=.669$ ). The results of the study, as conducted, did not prove the modification of learning produce significant results. However this research study has initiated additional questions on the analysis of the modification of soldier instruction through the use of differentiated instruction techniques. Further analysis would include the expansion of the sample population to a more diverse cohort of soldiers represented across a larger military community with focus remaining on the initial entry soldier.

*Keywords: differentiated instruction, military, learning strategies, learning styles, VARK*

### **Dedication**

This dissertation is dedicated to my husband, Mathew, whose continued support and encouragement has been the reason I have pushed forward in obtaining this dream. Every day is a gift, thank you. I greatly appreciate the guidance and support provided by the professors at Liberty University and my friend, Dr. Lisa Leppo, for always allowing me to believe I could achieve this goal.

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## **CHAPTER ONE: INTRODUCTION**

United States Army soldiers responsible for the organization's supplies and equipment are known as *Unit Supply Specialists*. Equipment and supplies include, but are not limited to, real property, vehicles, weapons, furniture, office supplies and equipment; and durable and expendable goods required for completing the organization's mission and supporting military and civilian mission personnel. These soldiers account for several thousand to several million dollars of Army equipment on a daily basis through various automated systems they learn during their Advance Individual Training (AIT). The AIT training period immediately follows the 10-week Basic Combat Training (BCT) period. Training during AIT prepares soldiers for their Military Occupational Specialty (MOS). This research study focused on reform the training process is currently undergoing while paying attention to differentiated instruction on AIT training in the Unit Supply Specialist MOS.

### **Background**

The background of this study revolves around the belief that the primary purpose of instruction is the empowerment of diverse learners (Darling-Hammond, 1993). For example, in the U. S. Army this empowerment is embodied in the technically and tactically competent soldier who can complete the tasks required for the chosen MOS. To ensure the increased competency of the soldier, an evaluation of current instructional techniques, processes, and products is required. The antiquated instructional delivery modes currently utilized do not complement the learning preferences of the Millennial Generation as the Army instruction. The Army training model has not evolved in a manner consistent with models developed for in the K—12 setting.

Research has suggested that methods of instruction that are more successful utilize methodologies that incorporate responsiveness to individual readiness, personal interests,

learning preferences, and individual motivations (Maslow, 1968; Sternberg, Torff, & Grigorenko, 1998; Vygotsky, 1978, 1986). These instructional methods are collectively known as *differentiated instruction* and has been employed in elementary schools for the last decade.

The evaluation of instructionally-appropriate techniques was increased exponentially through the implementation of the Command Supply Discipline Program (CSDP). The CSDP was designed to increase property accountability for the millions of dollars of supplies and equipment at the unit level and above. With the drawdown of troops, after more than a decade of war and the downturn in the economy, this focus is of the greatest importance. This study utilized educational principles that are commonly used in traditional classrooms that incorporate the principles and practices of Vygotsky, Bloom, Gardener, and Tomlinson while focusing primarily on differentiation of content, product, and process.

### **Statement of the Problem**

Training soldiers in the environment of diminishing resources requires the Army to be more efficient. Principles and practices used in traditional educational settings, such as learning style surveys to prescribe instructional strategies and differentiated instruction, contrast with the traditional Army training format. In addition soldier population has changed over the years, requiring attention to the process of instruction. Under the current one-style-fits-all training, instructors lecture from podiums, working through extensive PowerPoint presentations, whereby soldiers are in receive mode. It is not uncommon for PowerPoint slide decks to consist of more than 500 slides incorporated into one lesson, resulting in instruction that can consume weeks.

In addition to the current dated instructional style and changing learning styles represented in the new soldiers, property accountability has moved into the forefront of the challenges that Army leaders are facing in this era of financial difficulties. With current established military operations,

the need shifts to identifying gaps in accountability procedures created by the contemporary environment known as *operational tempo* or OPTEMPO. In addition to the higher OPTEMPO the Army is experiencing, the conversion to a modular force has created many challenges in maintaining property accountability (Dickson, 2009).

Addressing the challenges in training modern soldiers can possibly be achieved by reviewing research in traditional education. Since the 1980s the use of differentiated instruction in the K-12 setting has produced positive results for students (Clark, 1997; Neber, Finsterwald, & Oc Urban, 2001; Tomlinson, 1999), as it encompasses individual learning styles and cultural and linguistic backgrounds (Convey & Coyle, 1993). There is limited research on the application of differentiated instruction in the post-secondary setting with the emphasis being placed on college educational settings. The review of the literature continued to focus on the applications of this area of research with regard to the postsecondary setting, more specifically, Army AIT training.

The majority of learning theories are most commonly viewed as a process rather than product. However, differentiated instruction focuses on both aspects (Foo, Mokhtar, & Majid, 2008). The instructional process has been designed to ultimately affect the product and the process (Tomlinson et al., 2003). Modification of the instruction based on learning styles can produce the greatest benefits for students and soldiers alike. Modification based on learning styles can increase potential learning for soldiers. Unit Supply Specialists are invaluable in instituting with accuracy the Army's command supply discipline mission of increased accountability of property and equipment at all levels and better stewardship of resources. According to Bork (2001) the central problem in learning is that each student has unique capabilities, learning styles preferences, and problems, demanding individualized attention for the most efficient and effective learning. By applying differentiated instructional strategies, Army instruction can address the unique needs of soldiers to

increase proficiency in supply accountability. The Unit Supply Specialist training period includes 8 weeks of residential instruction in a learning cohort of soldiers focusing on the technical and tactical.

Therefore, this study addresses the fact that military training has not evolved alongside civilian educational philosophies and theories that address individual learning differences and preferences. The new recruits and current soldiers are identified as the Millennial Generation, who and present learning styles preferences that differ from those of previous generations of soldiers. These soldiers have been exposed to different learning models which are learner-centric and thus their expectations of the learning experience differs from previous generations. Soldiers themselves have changed and how the Army trains must change (Rose, 2010).

### **Purpose and Scope of the Study**

The purpose of this quasi-experimental study was to investigate the use of differentiated instruction in improving individual learning for U.S. Army soldiers at Fort Anywhere. At this stage in the research, improving soldier learning is generally defined as increasing the performance on end-of-course assessments given to all Unit Supply Specialist soldiers. This research examined commonly accepted principles of Gardner's multiple intelligences and differentiated instruction and applied these theories to the postsecondary setting of Army training. This research surveyed soldiers' learning domains or styles to determine the most prominent learning domain to modify and adapt instructional delivery. The adaptation of instructional delivery through the use of learning domains should allow soldiers the opportunity to realize the maximum outcome from the training process.

### **Significance of the Study**

The focus of the study was to enhance the content of the Unit Supply Specialist course and delivery in the post-secondary setting while informing AIT instructors and training

developers on effective instructional models and their respective strategies and techniques. The importance of improving knowledge acquisition in the Unit Supply MOS is precipitated by the increased emphasis the U.S. Army is placing on the CSDP. There is limited research focusing on instructional methodologies and outcomes of U. S. Army soldiers with no significant research addressing these critical areas in the AIT level of training.

### **Research Questions and Hypotheses**

If specific instructional strategies are determined to have a significant impact on the postsecondary instruction, then these instructional strategies should be incorporated into instructional programs to ensure that soldiers are provided an instructional program with strategies and techniques that produce the greatest results and long-term competence.

The research questions for the study are as follows:

RO1: What is the impact of differentiated instruction techniques on postsecondary learners in the Unit Supply Military Occupational Specialty?

RO2: Will the integration of differentiated instruction techniques produce more competent Unit Supply Specialists as measured by the Command Supply Discipline Program standards at first duty station based on posttest performance?

Null Hypothesis 1: There will be no significance difference in the means of posttest scores between the experimental group, which will receive differentiated instruction, and the control group will not receive differentiated instruction.

Null Hypothesis 2: There will not be a significant difference in competency of Unit Supply Specialists in relation to the Command Supply Discipline Program upon completion of Military Occupational Specialty training based on posttest performance.

### Identification of Variables

The dependent variable for this study was be knowledge acquisition as measured by pretest posttest comparisons. Differentiated instruction, the independent variable, was given to the experimental group. The control group received instruction commensurate with the current instructor-centric format versus the experimental group, which received learner-centric instruction.

### Summary of Methodology

This quasi-experimental research was completed using quantitative research methods to examine the impact of two philosophically divergent instructional approaches on knowledge acquisition. The study utilized the comparison of data collected from administering pretests and posttests after soldiers were presented course content utilizing the traditional instructor-centric instructional model and differentiated instruction. Data analysis consisted first of *t*-tests to determine if the means of the two groups were statistically similar. If a significant difference was measured between pretest and posttest, a second analysis included the analysis of covariance (ANCOVA) to determine the differences between the mean scores of the control and experimental groups (Gall, Gall, & Borg, 2005).

### Key Terms

Definitions of key terms used in the study follows:

*collaboration.* With meaning changing based on the purposes, requirements, and/or justifications comprises mutually beneficial and well-defined relationships entered into by two or more organizations to achieve common goals (Vallance, Towndrow, and Wiz, 2010).



*CSDP (Command Supply Discipline Program).* Ensures compliance with Department of the Army supply policies and

procedures meant to simplify command, supervisory and managerial responsibilities (AR 710-2).

*competency.* Assigned rating that compares current ability levels against the targeted levels for set objectives.

*cookie cutter approach.* Standard model to fit every scenario in the instructional process.

*differentiated instruction.* Method or approach to teaching to include all learners, specifically, an approach incorporating planning of curriculum and instruction to address learner diversity through the components of content, process, product, and learning environment directly in response to students' understanding of concepts through readiness, interests, and learning profiles (Tomlinson, 1999).

*learning preference.* Individual learning preferences for knowledge acquisition.

*Millennial Generation.* Comprising persons born between 1981 and 1999, who have been exposed to technology for their entire lives and thus, tend to be technologically savvy; accustomed to having, the learning process, products, and content modified to accommodate their preferences (Mangold, K. 2007).

*postsecondary education.* Apprenticeship, trades certificate, or diploma; college, CEGEP or other non-university certificate or diploma; university certificate or diploma below bachelor's level, or a university degree (Statistics Canada, 2010).

*Standard Operating Procedures (SOP).* A set of documented procedures and/or guidelines written by the military.

## **CHAPTER TWO: LITERATURE REVIEW**

The review of literature in this research study presents a comprehensive view of differentiated instruction, its meaning, the associated research, and the contribution of different theorists to the field of differentiated learning and education and the relationship to adult learning and postsecondary learning. This literature review provided an in-depth review of Adult Learning Theory and research of Malcom Knowles as related to differentiated instruction. In addition to the conceptual framework of Adult Learning Theory, this section illustrated relevant research and theories to include Howard Gardner's Multiple Intelligence, Benjamin Bloom's Taxonomy of Learning Domain, Abraham Maslow's Hierarchy, Jean Piaget's Cognitive Theory and Lev Vygotsky's Social Development.

The review of these theories provided a foundation for understanding Carroll Ann Tomlinson's Differentiated Instruction and how the implementation of differentiation on soldier instruction can produce the hypothesized research results of more effective and efficient training. The review begins by detailing the different viewpoints that describe differentiated learning and post-secondary education and training. The studies included in this review are peer-reviewed journals and articles that strongly resonate with the mentioned topic.

### **Conceptual Framework**

**Adult Learning Theory.** The researchers and respective theories mentioned above are primarily associated with pedagogy versus andragogy or adult learning. Malcolm Knowles introduced the concept of adult learning or andragogy in 1970. This concept of adult learning provided key insight on the differences in learning between adults and children and thus the need for different instructional techniques (Knowles, 1970). Knowles provided five assumptions for both the study of pedagogy, learning of children, and andragogy. The assumptions are as follows for pedagogy:

1. The young learner is dependent on another person to learn.
2. The young learner lacks the experience to make learning relevant.
3. The learner has been told “what is needed to learn”. This provides the learner motivation to strive for success within given perimeters.
4. Learning activities for young learners are organized in a logical manner for scaffolding or building on knowledge.
5. External pressures such as parents and teachers motivate young learners.

The assumptions for adult learners drastically differ resulting in the need for prescribed methodologies specific to andragogy. The first assumption of andragogy is that the adult learner is self-directed and is not dependent upon another person as is the young learner. Second, the adult learner has more valuable experiences when they enter the educational setting. This experience is key in making the educational process more relevant and meaningful. The third assumption of andragogy is the learner is ready to learn. Fourth, the educational process is life-centered with a focus on specific results directed by tasks and problems experienced. The final assumption of andragogy is driven by internal and external motivators (Kerka, 2002 and Knowles, 1970). The different motivators enhance the learning outcomes for the adult learner.

Adult educational programs are about arrangements of institutional backgrounds and their proper implementations because the division of assets and wealth with associated vulnerability has to be known in advance. Linguistic and cultural barriers any and possible consequences should be considered. Certain events and causes that can threaten their living and increase chances of putting their lives in danger are also planned out and included within the discussion.

The differentiation method takes into account that the understanding and teaching procedures are about hardships and regulations of different functions within such skillful

patterns. The essential features and things which are to be known should be regarded in a positive manner. It should be known that cultural human development is going to be beneficial in all regards for helping out with the progress of industry and recollecting necessary implementations of future objectives and advancements.

The aim of this literature review is to build knowledge about the topic of differentiated instruction and its strategies and to have its ultimate benefits involved within the practical applications in a consistent amount of time because, for teaching as a profession, this is very important. Differentiation strategies are for the investment alignment of potential students, and they are regarded as the essential purposes through which channeling of information and qualitative advancements take place. To invest in these instructional procedures is to invest in the teaching mechanisms which are such an integral part of this system because they are responsible for carrying important information and skills on the behalf of all the consumers of energy and information in a beneficial manner.

For the proper attainment of differentiation in adult education, it is important to note professional and impartial behavioral responses from credentialed people as they are responsible for the responses of students and their career requirements as well as for those future investors who used their capabilities for good of the US Army's mission. The efforts were then be used for the adult educational and learning purposes in different institutional developments, which largely affect the quality and reflection of an attitude toward society, depending on the effectiveness of the resource learning strategies and funds (Kavanagh, 2005).

This study represents an explanation of the transitional and developmental changes that are taking place within the environment of adult education and its perspectives for association of cultural and teaching beliefs. Owing to such culminations and associations, things are getting

even better and relatively less complex to be understood for those who were not aware of differentiated instruction in the first place.

Adult educational and cultural trends, communication linking and several other developmental strategies ensure the terms that are taking place within the paradigm of culture can easily solve the problems that are taking place for the purpose of attaining better strategies and planning. Differentiated instructional program strategies are important first, because they plan out the sequential events of things that are taking place within the adult educational department of an institute and second, because it all affects the future planning and layout formation of the industrial purposes.

### **Teaching Principles**

A taxonomic approach, first introduced by Beatty and Schneier, has been said to provoke different classifications of cultural human development. To organize culture and teaching beliefs with research and optimization into a universal approach, cultural human development is controlled in an effective manner without consequential arrangement of data analysis.

The primary purpose of instruction is to empower diverse learners to construct personal knowledge as well as effectively build on individual talents (Darling-Hammond, 1993). This development of knowledge and talent is not exclusive to primary, intermediate, or secondary school; it transcends all levels of training and education. Institutions, especially in the public sector, support differentiated instruction and education as it provides for a smoother transition for students from high school to adulthood or postsecondary educational institutions. The essence behind such a smooth transition is the principle of inclusion of all students while devising a curriculum that identifies and imparts knowledge according to the needs of the students.

Furthermore, this research discussed some of the educational theorists, such as Maslow, Piaget, Vygotsky, and Gardner and their contributions toward differential instruction and education.

Howard Gardner's research on and theory of multiple intelligences focus on three domains to establish seven intelligences (Callahan, Renzulli, & Sternberg, 2011). The three domains central to Gardner's multiple intelligences are intelligence, creativity, and wisdom/ethics; more specifically Gardener (2008) articulated the social, educational, and psychological impacts. From these domains, Gardner further delineated multiple intelligences: (a) linguistic intelligence, or the ability to focus on the spoken and written word and the ability to learn languages and to exploit knowledge of words to achieve specific goals; (b) logical-mathematical intelligence, or the ability to complete and understand mathematics concepts, including complex logical systems; (c) spatial intelligence, or the ability to see and perceive the visual dimension and manipulate it at will; (d) bodily-kinesthetic intelligence, or the ability to use the body to achieve a goal; (e) interpersonal intelligence, or being able to perceive and understand the moods, desires, and motivations of others; (f) intrapersonal intelligence, or possessing an understanding of one's own emotions; (g) musical intelligence, the ability to understand and create music (McClellan & Conti, 2008).

Modifying instruction requires prescribed strategies paired with assessed learning styles to achieve the outcomes desired. In addition to strategies, Bloom's research focuses on cognitive growth through questioning. The instrument developed by Bloom allowed researchers to determine behavior patterns of students (Halawi, Pires, & McCarthy, 2009). The six categories identified in Bloom's research and strategies to promote greater cognitive thinking through questioning techniques included (a) knowledge, (b) comprehension, (c) application, (d) analysis, (e) synthesis, and (f) evaluation. Bloom's research continues to be utilized in many aspects of

modern education. Recent revisions to Bloom's Taxonomy include the new domains of creating, evaluating, analyzing, applying, understanding, and remembering. The following graphic provides the relationship between the original and new domains as presented by Anderson, et al. (2001).

Image has been removed to comply with copyright laws.

*Figure 1.* Table Bloom's Taxonomy Revised. From A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives, Abridged Edition (29 December 2000) by Lorin W. Anderson, David R. Krathwohl, Peter W. Airasian, et al..

Synthesizing the research from Gardner, Maslow, and Bloom and applying principles to adult learning will aid in better preparing soldiers for their military occupations. Producing lifelong learners in the adult training arena requires understanding the characteristics and general educational goals specific to the adult learner. This understanding of the adult educational field and adult learning characteristics will provide insight on how Gardner's multiple intelligences and differentiated instruction can benefit learners lifelong (Bork, 2001). This lifelong benefit to learners is imperative in the post-secondary educational environment, more specifically in the Army training environment.

Many postsecondary students do not attend college, for a variety of circumstances beyond their control. Thus many adult learners attend alternative educational programs, such as the Army, for career development and academic advancement (Kenner & Weinerman, 2011). Creating a learning environment that educates students in an optimal manner requires discovery of students learning styles along with understanding how each student is affected within the instructional process (Tuan, 2011). Understanding that students have different learning styles, different interests, and different ways of learning new information and concepts as well as

expressing them is imperative. This understanding better prepared instructors to teach students to reach their greatest potential (Lauria, 2010).

Hock and Mellard (2011) discussed the body of research involving instructional strategies that are predominantly used in the K-12 setting. This research supports the value of using such strategies in the instructional process. There is no real data for their effectiveness in postsecondary settings. Data have shown over the past several decades that instruction utilizing one instructional strategy does not meet the needs of all students (Hawk & Shah, 2007). It is important to remember that one size does not fit all. Varying pedagogy to meet soldiers at their learning stage and using those instructional strategies produces the most effective teaching. Knowing strengths and weaknesses of students, one can better prepare engaging and relevant instruction. Research has shown that roughly half of the students in a classroom would learn best with some sort of physical manipulation of themselves and/or their environment (Griggs et al., 2009). To increase the overall learning process, students must play more active roles in the learning process by participating through hands on activities; involvement in the process increases learning.

### **Relation of Literature to Research**

The current process of curriculum development for any ARMY MOS includes surveying experienced soldiers currently serving in the military occupation to determine the tasks required at all levels of service to be successful. The survey results are presented to a board of subject matter experts to determine which previously identified tasks are critical. The critical tasks then drive the development of the Program of Instruction (POI) or the curriculum. This process occurs every 3 years, unless there is a change in the military occupation or equipment. In addition to this triennial revision, POIs or curricula can be changed within the institution through



informal pen-and-ink changes up to 30 percent. This process provides opportunity for the course managers, developers, and instructors to make on-the-spot changes without going through the school commandant to the Army Training Command for approval. If there are no resourcing changes, this is the collaborative means for adjustment.

General Martin Dempsey, while serving as the Commander of the Army's Training and Doctrine Command, initiated a revision of Army training. The transition, known as Army Learning Model 2015, was intended to provide soldiers and leaders with more relevant, tailored, engaging learning experiences through a career-long continuum of learning that is not location-dependent, but accessed at the point of need. This initiative was introduced the TRADOC Pamphlet 525-8-2 which provided a broad implementation of the instructional transition designed to invigorate the training process focusing on the Millennial Generation learning style. This transition leveraged existing and emerging technologies to compliment the learning styles of new recruits statistically representing the Millennial Generation.

Prior to General Martin Dempsey's initiative the vast majority of instructional techniques employed in Army classrooms centered on lecture with PowerPoint, conferences, and special guest speakers. Teaching occurs in small seminars supplemented by lectures by distinguished guests (Stiehm, 2001). Interactions with the curriculum, other students, or subject matter experts are very limited, if not non-existent. Soldiers simply train via rote memory, where they are in receive mode to gain knowledge for the position they fill throughout their career in the Army. The Army Learning Model initiative recognizes the challenges this antiquated instructional delivery presents when instructing soldiers of the Millennial Generation.

### **Understanding Differentiated Instruction**

Different students have different capabilities. Tomlinson (2001) characterizes differentiated instruction (DI) as a teaching-related theory. The theory is hinged on the ground that teaching strategies, or approaches, should be tailored in accordance with the diverse and individual learners in any given classroom (Hall, Strangman & Meyer, 2003; Tomlinson, 2001). Hall (2002) characterizes it as an approach of learning as well as teaching, which is ideal for learners with dissimilar abilities. The underlying theory is that instructors should adapt, modify or vary their strategies to match the diversity of their students. Each learner has unique abilities shaped by her or his experiences, knowledge, culture, language, interests and learning persuasions. Through DI, diverse learners can have comparable attainments regardless of the learning paths that they take (Metropolitan Center for Urban Education, 2008).

Various researchers conclude that different factors occasion uneven representation of some categories of learners in given classrooms (Metropolitan Center for Urban Education, 2008). The factors include instructors' limited acquaintance with linguistically and culturally diverse learners (Villegas & Lucas, 2002), and instructors' tendency of negatively labeling the behaviors of certain learners (Klingner, Artiles, Kozleski, Harry, Zion, Tate, Duran, & Riley, 2005). Ideally, DI expects and recognizes that learners are dissimilar. It also expects and recognizes that teaching requirements should match each learner's unique abilities.

As a strategy, DI is learner-centered. Pham (2012) submits that in developing the strategy, Tomlinson (2001) aimed at ensuring all learners with low-level and high-level skills were suitably supported and that their competencies were sharpened. The learners can be suitably supported by having them work in flexible teams, assessing them continuously and giving them challenging but respectful assignments (Ernst & Ernst, 2005). The teams, assignments, and assessments are learner-centered and allow learners to express what they can ably do,

understand, and know (Lightweis, 2013). Differentiated Instruction models require instructors to approach teaching in ways that are flexible. Ideally, they adjust how they present lessons rather than expecting learners to adjust themselves as regards the lessons (Hall, Strangman & Meyer, 2003).

What is the rationale behind the differentiated instruction theory? According to Meier (1995) contemporary classrooms are characterized by scholarly diversity. Each classroom is mostly thought to host learners who are appreciably homogenous owing to their ages (Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover & Reynolds, 2003). However, each of the learners has a unique race and family background, learning challenges and competencies. It is expected that the diversity of the typical classroom will continue increasing due to globalization (Sapon-Shevin, 2001).

There is a growing need of detracking to enhance learning equity among students, especially in environments typified by lowered expectations (Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover & Reynolds, 2003). There are growing calls for special-needs learners to be mainstreamed. Such dynamics compel instructors to deal with student variances within the typical classroom, as opposed to via organizational structuring (Jackson & Davis, 2000). Failure to address the variances impedes learners with mixed abilities from benefiting from instruction, even if the instruction is heterogeneous (Sapon-Shevin, 2001; Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover & Reynolds, 2003).

In the typical classroom, opportunity form of equality is only realizable if learners get instruction that is fit for their different levels of readiness, learning persuasions, and interests. Such instruction enables the learners to optimize their growth opportunities according to McLaughlin and Talbert (1993). Gamoran and Weinstein (1995) submit that even where unique

pull out services are provided for select learners, there is a high possibility that the learners spend most of their school hours in typical classrooms. Additionally, Gamoran and Weinstein (1995) conclude that even in settings that appear highly homogenous, like some special-need classrooms, learners have heterogeneous motivation levels, competencies, and experiences.

Tomlinson (2001) asserts that the evolution of the typical schools and society requires instructors to develop teaching routines that address the variances rather than ignoring them. The routines should fit into different learners' studying profiles, readiness, and interests. The routines are viewed as manifestly differentiating instruction and curriculums (Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover & Reynolds, 2003). In this regard, differentiation comes off as a clearly pedagogical approach, as opposed to being organizational. Differentiation may be conceptualized as an adjustment of characteristic learning along with teaching routines so as to match them with diverse learning modes, interests, and levels (Tomlinson, 1999; Tomlinson, 2001).

Tomlinson (2001) is quite clear on which instructions are particularly not differentiated. These include tasks that are similar for several learners but whose complexity is more for given learners than for other learners (Tomlinson, 2001). Instructions that have been watered down to ensure that some learners find them easy are not differentiated. Differentiated instruction is not an instruction that is individualized to meet the specific requirements of every learner. Differentiated instruction suggests that an instructor seeks learner clusters, which they offer several means of reaching set goals within a given duration (Bafle, 2004; Metropolitan Center for Urban Education, 2008).

## **Implementation**

The differentiated instruction theory portends that the separation, or differentiation, of instruction is done on the basis of content, process, and product elements. Each of the three categories is easily differentiable. Concerning content, elements are employed in supporting teaching content. They include learning skills, attitudes, generalizations, acts, principles, and concepts. They are differentiated to ensure that each learner accesses essential learning. The ability to access the relevant content in instructional processes is critical. Instructors, ideally, align learning tasks with teaching objectives along with goals. They ensure that the concepts that they teach are wide-ranging and not zeroing in on unlimited certainties or narrow details. In differentiated instruction classrooms, the teaching content is characterized by similar concepts as regards all learners. It is the complexity of the content that is modified to match different learners' learning modes, interests, and levels (Hall, Strangman & Meyer, 2003).

Some of the process elements that are commonly differentiated include learner grouping modes, lesson organization strategies, and strategies for delivering instruction. The varying of learner groups should be done in ways that appropriately change classroom evaluations, projects, and the content. With regard to the product elements, instructors carry out pre-evaluations and regular assessments. These help the instructors provide effective scaffolds, approaches, and choices that suit varying learner abilities, interests, and needs. The re-evaluations and assessments may take the form of casual or formal performance appraisals, surveys, or interviews. Each task should challenge each learner. All the learners in a classroom should find each task accessible, engaging, and fascinating. Instructors should vary the set requirements and expectations for learner responses. Each instructional product should allow for wide-ranging expression as well as alternative practices. It should present varying levels of complexity, scoring, and forms of appraisal (Hall, Strangman & Meyer, 2003).

The figure below shows the differentiated instruction learning, or implementation, cycle as well as the factors that are considered in the implementation of differentiated instruction. It shows the place value of differentiation of content, process, and product elements that are relevant in differentiated instruction implementation.

Image has been removed to comply with copyright laws. Image can be found at *Figure 2. Table Learning Cycle and Decision Factors Used in Planning and Implementing Differentiated Instruction*. From *Differentiated Instruction and Implications for Universal Design for Learning Implementation*, by Hall, T., Strangman, N., and Meyer, A., 2011. Wakefield, MA: National Center on Accessing the General Curriculum.

There is no evidence in the available literature that the cycle shown in Figure 2 has been challenged. A review of the literature reveals that the implementation of differentiated instruction has not been empirically validated. Initially, differentiated instruction was implemented with gifted learners who were not adequately challenged by taught content. The increasing diversity of classrooms saw differentiated instruction being implemented with all learners regardless of their abilities. Ideally, instructors implement differentiated instruction practices gradually, possibly one area of content after another. Presently, several websites show the differentiated instruction developed by various teachers using various differentiated instruction models (Hall, Strangman & Meyer, 2003).

Different post-secondary institutions implement differentiated instruction. Their implementation of differentiated instruction has been successful as demonstrated by the research conducted by Beloshitskii and Dushkin (2005), Chamberlin and Powers (2010), and Ernst and Ernst (2005). Beloshitskii and Dushkin (2005) studied the implementation of differentiated instruction in a training course, which was specialist and technical in nature. They developed

teaching tasks and put them in six categories, in accordance with trainees' abilities. The trainees commenced by selecting tasks from any of the initial three categories. The first category had tasks related to duplicating and receiving knowledge. The fifth category had tasks that enhanced trainee creativity. Upon reaching the last two categories, the trainees had a good mastery of the taught content. They demonstrated high-level reflection and thinking. Further, the experimental trainees were highly motivated to train owing to the implementation of differentiated instruction. The experimental trainees were more motivated than the control trainees (Beloshitskii & Dushkin, 2005).

Chamberlin and Powers (2010) carried out a quasi-experimental study that largely concerned the outcomes of the implementation of differentiated instruction in university mathematics classes. The lesson plans for the subject contained differentiated performances, instruction, and products. The differentiated instruction was designed in accordance with learners' interests, studying profiles, and readiness. The evaluation of learners was distinctly differentiated and involved homework tasks and a number of projects. Chamberlin and Powers (2010) quantitatively established that learners who were put through the differentiated instruction posted better evaluation scores than the control learners. They qualitatively determined that differentiated instruction supports learning.

The study conducted by Ernst and Ernst (2005) was both qualitative and exploratory in nature. They sought to determine the essence of implementing differentiated instruction in universities as well as colleges. They also studied whether learners are adequately challenged with respect to their prior acquaintance with a given subject. The study's subjects, students, were categorized as least, averagely, or highly ready. Each of the categories of students was given a differentiated assignment. Ernst and Ernst (2005) established that student categorization on the

basis of their readiness was adequately wide-ranging to justify the implementation of differentiated instruction in undergraduate classrooms. The readiness of any given student relates to his or her major, academic competencies, GPA scores as well as writing skills. In the study, all the experimental subjects reported that the assignments given were suitably challenging. Each of the student categories selected an assignment that best brought out its cumulative strengths, and that it found highly interesting (Ernst & Ernst, 2005). One of the recommendations presented by Ernst and Ernst (2005) is that professors should be given the discretion to allow or disallow the implementation of differentiated instruction in courses they handle.

Evidently, research into the implementation of differentiated instruction in post-secondary institutions is presently quite limited. Beloshitskii and Dushkin (2005), Chamberlin and Powers (2010), and Ernst and Ernst (2005) show that the implementation leads to marked individual development and scholarly attainments among students. Even then, they do not indicate whether the implementation of differentiated instruction was extended to typical non-research settings. None of the three studies indicated whether differentiated instruction would have been useful in other post-secondary courses. Tulbure (2011) and Lightweis (2013) conclude that the implementation of differentiated instruction is linked to various disadvantages or weaknesses such as being time intense of the teacher, slowing the pace of learning for some learners in the class, and difficulty in measuring the effectiveness of the teacher. They include that differentiated instruction requires instructors to expend substantial energy and time on its implementation. Instructors who are not knowledgeable on differentiated instruction find its implementation difficult and the designing of differentiated instruction is challenging. While much success is reported regarding the implementation of differentiated instruction in pre-



secondary, secondary, and postsecondary institutions, there is little empirical research on how instructors should implement it, especially in postsecondary institutions (Lightweis, 2013).

According to Wormeli (2003), the instructors who successfully implement differentiated instruction are usually those who with at least three of experience of working with differentiated instruction. Small classes are more likely to report success with the implementation of differentiated instruction than large ones (Hess, 1999; Metropolitan Center for Urban Education, 2008; Willis & Mann, 2000). Notably, Wormeli (2003) and Hess (1999) do not back their claims with empirical proof.

Stradling and Saunders (1993) conclude that previous efforts aimed at implementing differentiated instruction have been ineffective and limited. The differentiation of instruction has a high likelihood of being reactive or improvisational. Ideally, the differentiation is proactive and preplanned. Tomlinson (1995). Johnsen, Haensly, Ryser and Ford (2002) are of the opinion that instructors are particularly unenthusiastic about the modification and adaptation of teaching materials, development of individualized lessons and modification of assessment procedures. Their lack of enthusiasm may hamper implementation of differentiated instruction in classrooms (Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover & Reynolds, 2003). Suitable responses to student variances may be hindered by overemphasizing coverage of content at the expense of growing understanding. Responses are ineffective when instructors fail to identify requisite skills, concepts, and ideas that constitute effective content modification frameworks (Vaughn and Schumm 1994).

Schumm and Vaughn (1995) note that there are marked challenges in implementing differentiated instruction where learner variances stem from advanced learning and learning-related problems, challenges that relate to the grasp of second languages, or cultural persuasions.

Schumm and Vaughn (1995) also note that most instructors are enthusiastic about learners with average disabilities. Even then, the adaptations that the instructors make with respect to the learners are almost exclusively aimed at forging good relationships, or rapport, with them (Schumm & Vaughn, 1995; Tomlinson, Brighton, Hertberg, Callahan, Moon, Brimijoin, Conover & Reynolds, 2003).

Image has been removed to comply with copyright laws.

Figure 3. Table Three Rings of Differentiated Instruction. From 3 RING CIRCUS of DIFFERENTIATED INSTRUCTION by D. Scigliano & S. Hipsky, 2010. Kappa Delta Pi Record.

The concept of differentiated learning also comprises the important concept of enhancing the academic learning of students, coupled with placing significance on their personal growth. In this manner, the personal success of a student is charted out by a teacher. In standard academic performance evaluations or benchmarks are subscribed at different grade levels. However, for a differential teacher such performance measures are not of as much importance as is evaluating the personal growth and academic performance of a student (Tomlinson & Allan, 2000).

In contrast, Robb (n.d.) defined differentiation as a way of teaching that cannot simply be tied down to being annotated as a standard program comprising distributing and grading worksheets of students. It demands the teachers know their students' learning strengths and weaknesses and then impart classroom learning in a manner that reflects the different learning abilities of students. Such tailored teaching and provision of learning tasks not only improves a student's learning, but also proves a unique learning experience for them. Some of the important principles that serve as the foundation of differentiating instruction include the following:

- *Continuous student learning assessment.* This principle helps teachers identify the current levels of skills and abilities of their students and recognize those individuals who require extra help to improve their performance.
- *Improved and innovative lesson plans.* Continuous assessment allows teachers to develop and formulate their lessons to meet the different learning needs of all their students.
- *Group work.* This principle allows students to interact and hold discussions with their peers and greatly contributes to their learning through meaningful discussions and the opportunity to learn from one another.
- *Problem solving.* Differentiated instruction in classrooms focus on discussing issues and building concepts rather than emphasizing *book* concepts. This method encourages students and teachers to explore different ideas and develop individual problem-solving skills.
- *Availability of choice.* Differentiated instruction encourages teachers to exercise choice in asking their students about their classroom learning experiences and what lessons they would like to concentrate more on in the future. It allows instructors to develop motivating assignments per the students' needs and interests, thus increasing overall motivation to learn in the students.

### **Components or Features of Differentiated Instruction**

Hall et al. (2011) noted that several different elements guide differentiated instruction in the educational environment. One of the noted differentiated instruction authors, Tomlinson (2001), identified three rudiments of educational curricula that can be differentiated; content, process and products. These components are described in detail as follows:

**Content.** In broader terms, this component highlights the material that a teacher would teach in his or her classroom. Material not only refers to the textual substance of a curriculum, but also to the actions, attitudes, and skills with which a teacher delivers the learning to his or her students. It is vital that students have open access to the content delivered in the classroom. For content to be impactful in differentiated instruction, it is essential that the learning tasks be in complete alignment with the learning goals and objectives. Importantly, the teachers or classroom instructors must ensure that the instruction or the learning being delivered in the classroom revolves around the concepts, skills, and principles the students should learn. While addressing the same concept to all the students, complexity of the topic must be adjusted for better learning outcomes in line with levels of different students. For example, one student may easily grasp the pronunciation of a complex word compared to another student who is unable to understand the word itself. The teacher must ensure that he or she delivers the learning in such a manner that it is easy for both the students to understand the pronunciation of a complex word.

**Process.** This component details the manner in which the teacher would impart the instruction to his or her students. There are various methods of delivering a lesson plan; however, great emphasis must be placed on the learning outcome. Hence teachers should focus on delivering their lessons through increased interaction or participation by the students. The teachers could begin by introducing the lesson plans and objectives by broadly discussing the topic with the whole class and later segmenting or dividing the students into pairs or groups for assignments or tasks. This method allows greater coaching, while the students also interact with one another. A key aspect of this process of grouping students is that no one student group is the same. Teachers are encouraged to group students differently for different assigned tasks. This grouping and ungrouping of students is one of the prime foundations of differentiated instruction.

**Product.** This component engulfs initial and ongoing student assessments with respect to the learning delivered. Such pre- and ongoing assessments allow the teacher to observe and identify the various learning needs of students in his or her class, which in return helps the teacher prepare a range of approaches to cater to these varying needs and abilities. Such assessments can be informal and formal, such as surveys, performance assessments, and interviews. Nonetheless, apart from evaluating their classroom learning intake, teachers must also ensure that whatever learning material they are imparting is engaging, relevant, accessible, interesting, and easy to understand by the students. This ongoing process also promotes critical thinking and provides analysis based on group discussion.

**Learning environment.** Tomlinson (2000) identified one other essential component of differentiated instruction in addition to those Hall et al. (2011) highlighted. This fourth component is the learning environment. This feature entails the manner or way in which a classroom functions and feels to the students. For example, the instructor could ensure that there are portions of classroom space that allow the students and teachers to work quietly without distraction. It is also necessary that a positive learning environment provides materials that are reflective of the different cultural backgrounds of the students. Along with effectively communicating clear guidelines for independent work, this positive environment sets the trend for certain practices. Practices such as in the case of a query and the unavailability of the instructor to immediately assist one particular student, the student is permitted to seek the help of their peers until the instructor becomes available to assist the student.

**Understanding postsecondary education and training.** This section aims to explain the meaning of secondary education and training. Thus, in this dissertation, *postsecondary education* refers to the highest level of educational attainment beyond completion of high school

or the equivalent such as a university degree program, an apprenticeship, a trade certificate, or any other non-university certificate (Statistics Canada, 2010). Another definition of postsecondary education describes an advanced level of academic qualification or instruction following high school, often referred to as a college or university education. Such advanced qualification can either be skill, career or academically oriented, such as master's or a bachelor's degree.

Likewise, Kuczer, and Puukka (2012) commented that the rising demand among employers for highly skilled labor has led to an increase in postsecondary education and training among less affluent students. In addition, the two key roles of postsecondary education are to prepare individuals to enter the professional job market and to upgrade their current skills.

### **Different Theorists and Differentiated Instruction**

New evidence and research have emerged that highlight the important fact that all learners do not learn in the same manner. This fact dictates an awareness of different learning styles as a significant tool for understanding differences and to further assist with student development. Such models of education, based on diverse learning styles, help teachers or differentiated instructors plan and deliver their lessons and curricula so students can learn in the best possible manner. Such diligent planning also helps improve students' learning experiences and their attitudes toward education itself. Moreover, different learning styles when incorporated allow formulating an inclusive learning plan. Students of different educational needs are addressed collectively to help them perform better. This section has highlighted some of the renowned educational theorists and their stances or contributions toward differentiated instruction.

**Vygotsky's theory of learning.** Subban (2006) commented that many researchers and academicians consider the Russian psychologist Vygotsky's theory of learning to be one of the most central in instructional enhancement, change, and redevelopment of the classroom. This particular sociocultural theory has strong connotations for schooling, teaching, and education itself, as it is based on the premise that an individual learner must be studied within a particular social and cultural context. Zoning a learner in this particular context allows for further development of many other higher functions that are gained through increased social interaction. More importantly, this theory emphasizes education to be an on-going process in the life of a learner instead of a one-time or age-specific experience.

One of the central propositions or components of this theory is its notion of *Zone of Proximal Development (ZPD)*, which signifies the level of development attained when learners engage in social behavior. It is the difference between the actual or current developmental level and the potential level of development of an individual. To develop ZPD, it is mandatory for individual learners to increasingly socialize or interact with their peers or associates who are knowledgeable and capable. The ZPD of a student could be assessed based on the student's level of individual learning, which first must be guided by a teacher or an expert. This meaningful adult interaction allows the student to learn, enhances the knowledge and skills they already know, and motivates to further enrichment through learning. This interaction highlights the role of the teacher providing purposeful instruction, as a mediator of activities that allows the student to learn and attain his or her ZPD. This theory also perceives speech and language as tools used by humans to mediate and further explore their social environments.

It is important to mention that in contemporary times, Vygotsky's theory for differentiated instruction holds great importance for teaching and learning functions. The areas

of social interaction, student teacher engagement, classroom space and arrangement, meaningful and purposeful instruction and content as well as the student's ability all are inclusive within the context of contemporary education. This theory places great stress on social interaction; the student-teacher relationship as a collaborative effort in which the learning experience becomes reciprocal. The learning or instructional environment becomes increasingly productive: from the physical arrangement of the classroom furniture to the designing of the lesson plans, everything focuses upon enhancing the current developmental level of the student. This collaboration ensures that the lesson content is meaningful, compelling the interests of the student and motivates the student to participate in class and interact with his or her peers to complete the assigned lesson tasks.

**Gardner's theory of multiple intelligences.** This theory, introduced by Howard Gardner in 1983, proposed a departure from the widely believed view that intelligence is a single measurable unit and focuses on eight intelligences while highlighting the need for problem solving. This theory also provides a solution for learning, especially for those students who receive instruction based on one of these intelligences and may be unable to grasp or learn properly. However, if collectively used, these eight intelligences are meaningful tools for greater learning and problem solving. Gardner's theory creates opportunities for all students by enriching the classroom environment through various techniques and assessment forms, thus developing and bringing out the students' strengths.

Gardner aimed to describe the cognitive competencies of humans in terms of a set of abilities, talents, and mental skills, which he termed as intelligences. Based on the pluralistic view of the mind, this theory details the idea that the human mind is made up of several intelligences. This plural view of the mind accounts for the different ways individuals think and



act as based on fact that everyone has different intellectual strengths and weaknesses. As Gardner himself identified, intelligence is a psychological and biological potential that is capable of being realized to a greater or lesser extent depending upon the consequences of the cultural, motivational, and other experiential factors that have influence on a person. The eight distinct intelligences identified by Garner include linguistic, bodily kinesthetic, intrapersonal, musical, interpersonal, spatial, naturalistic and logical mathematical intelligences. Each intelligence is associated with a specific part of the brain (Gangi, 2011). Gardner experimented on the cognitive functions of different individuals, including those who were highly intelligent and those whose brains were damaged. This research allowed him to identify and realize that despite if one part of the brain is not functioning or is severely damaged, intelligence in the other part(s) of the brain still functions. This insight led to the realization of different intelligences in a person, where if one is not functioning properly, the other ones collectively would.

Interestingly, Gardner did not anticipate the use of his multiple intelligence theory in the field of education, let alone differentiated instruction (Gangi, 2011). However, with the passage of time, educators studied his theory and applied it to the field of education. To apply this theory to the classroom, the teacher must first understand all of Gardner intelligences in detail. The next appropriate step is to identify the intelligence level or strength of a student and use this observation with Gardner's intelligences to formulate class activities and lessons that play on the strengths of their students. Studies have shown that using this theory remarkably improved the student's learning, performance, and academic achievement.

**Maslow and differentiated instruction.** Chen (2007) shared the view that differentiating instruction relates to humanistic philosophy, which inspires people's activities and actions. Conversely, to discuss Maslow's relationship with education and differentiated instruction, it is vital to note that learning in terms of self-development is best highlighted by one of Maslow's key human needs of self-actualization.

This need of self-actualization is a growth need of self-fulfillment and fully exercising and realizing one's potential. Reaching one's greatest potential becomes a goal of self-actualization as it entails that an individual is best able to become what he or she wants or strives to become through attaining quality education. In addition to this goal of self-actualization, Maslow pressed upon educators the importance of inculcating intrinsic rather than extrinsic learning in education. Maslow's extensive study of famous personalities, such as Lincoln and Beethoven, brought out the many positive characteristics possessed by these self-actualized individuals, including a positive mental outlook, creativeness, a compassionate nature, and more important a harmonious acceptance of self.

Conversely, Panesar (2010) shared that when students become self-actualized their teachers, too, feel a sense of self-fulfillment, increasing the motivation and retention levels amongst teachers in schools that focus on the different needs of their students. Similarly, Corley (2005) related that Maslow also highlighted that the lesson plan devised by a teacher should incorporate learning material that is of interest to the students. If the students receive learning according to their interests, it would help them fully tap into extracting their performance, fulfilling learning goals and objectives.

Hence Maslow has contributed to the humanistic aspect of education by stressing learning as a development tool attuned to the personality of an individual by promoting and

building the person's character, encouraging the person to take challenges and work with a diverse set of individuals. This approach has contributed to the greater efficacy of education itself, where the focus has now shifted from just obtaining certain grades to imparting an educational experience to students. This experience involves acknowledging and allowing flexibility for individual performance, making learning an enjoyed full experience for students, which would in return increase their participation, performance, and educational achievement.

**Piaget and differentiated instruction.** Unlike Maslow, who propagates a humanistic philosophical view of education and learning, Piaget is a constructivist. The philosophy of constructivism is based on the premise that individuals develop their own understanding of the world through different experiences. Hence, to correlate learning with this premise, it is suggested that learning acquired on the basis of experience adjusts an individual's mental and learning models. Under this school of thought, learning is based on concentrating on whole facts instead of certain isolated ones. To deliver or foster effective learning, educators must understand the individual mental models of their students. By doing this, the purpose of learning would be transformed for the individual, with great emphasis being placed on the utilization of the student's own learning and analysis, instead of reproducing the memorized material from class (Panesar, 2010).

Piaget, a Swiss psychologist, is credited with initiating the constructivism movement and is also renowned for developing a highly influential model of learning and child development. He believed in developing a child's cognitive structure for understanding and responding to physical experiences by maintaining equilibrium with the child's environment. One of his popular theories called *schemata*, attests that a child's cognitive structure matures and becomes more sophisticated with the child's interaction with the environment. This interaction helps the

child develop and solve complex mental activities and innate reflexes. It also highlights the important aspect that growth of knowledge in an individual is a progressive measure. This developmental theory of Piaget proposed that teachers and academicians plan the educational curricula of their students in an appropriate manner to increase and enhances students' cognitive growth by realizing the critical value of experiences in the learning process.

Conversely, Blake and Pope (2008) opined that Piaget identified four stages in the cognitive development of an individual. These include the sensorimotor, preoperational, concrete, and formal stages of cognitive development. These stages span from the time that an individual is a baby until he or she attains adulthood. Thus highlighting the importance of utilizing cognitive measures in devising and provisioning of differentiated instruction.

### **Stressors on Adult Learners**

There is limited literature on the stress adult education students experience and much less on the stressors that impact those serving in our nation's military service branches. One particular research worth citing focuses on balancing the various demands of work, school, and home (Giancola, Granwitch, and Borchert, 2009). Adult learners, more so than younger learners, have numerous obligations which detract from the time available to dedicate to learning. Fram and Bonvillian (2001) discussed the effects stress has on the learner to include distractions, focus, and energy that impacts "the most essential element of the learning process, developing critical thinking skills."

The stress is increased by the impact returning to school places on time, energy, and finances. For soldiers the stressors are the same as the adult learners with additional stressors such as family separations, potential deployments into combat zones with limited notice, future reductions in force, and the knowledge that fellow soldiers, those you entrust your life with, may

lose their life fighting beside you. Adler et al. (2008) stated, “the implication for individual job performance, the health and well-being of the military personnel, the functioning of the military families, and the desire of the military personnel to remain in the military” are factors increasing the stress felt by military personnel.

Leadership has not effectively addressed the stressors faced by our military members. However, new programs and heightened awareness are positive new trends. The Army has various programs in place that focus on recognizing stress in soldiers. Programs, such as the Periodic Health Assessment and the Primary Care Behavioral Health Assessment, provide a means to appropriate actions.

### **Summary**

This literature review discussed in detail concepts and related educational theories pertaining to differentiated instruction. It is vital to note that many of the theories mentioned do not shed light on postsecondary education or training. Thus, there is a potential gap in educational theories providing an opportunity for undertaking research in the future.

Nonetheless, it is important to stress that each student is different. Therefore learning should be incorporated in a manner that is inclusive and sensitive to the needs of all students, instead of creating differences and treating students with varying needs separately.

Differentiated instruction works on the principle that all students must receive equal learning in accordance with their varying learning needs. This type of instruction also highlights the importance of teachers and other educators in developing a curriculum that incorporates the characteristics of differentiated instructional learning. With advancement of technology and increased awareness for new and result-oriented teaching methods, differentiating instructional approaches are fast gaining popularity in many countries and are realizing positive and beneficial

results for both students and teachers. This research also mentions different educationist theorists and their contributions to educational and differential instruction, detailed their different models and measures. This literature review has highlighted the concept, gaps, and efficacy of differentiated instruction and has positively impacted this quasi-experimental study.

### **CHAPTER THREE: METHODOLOGY**

The purpose of this quasi-experimental non-equivalent control group study was to examine the impact of two philosophically divergent instructional approaches on knowledge acquisition after one cohort of soldiers was presented course content utilizing the traditional teacher-centered instructional model and another cohort was provided differentiated instruction. The dependent variable for this study was knowledge acquisition as measured by pretest-posttest scores. Differentiated instruction, the independent variable, was given to the experimental group.

The focus of the study was to inform AIT instructors and training developers on effective instructional models and their respective strategies. The importance of improving knowledge acquisition in the unit supply MOS was precipitated by the increased emphasis the U.S. Army has placed upon the CSDP as directed by Army Regulation property accountability.

Current instructional strategies are more teacher-centric as soldiers are presented information through lectures and PowerPoint. This delivery method restricts soldiers to receive mode; not allowing the opportunity for active learning. The control group received the traditional teacher-centric instruction soldiers have historically received. The effectiveness of the instructional strategies on knowledge acquisition was measured by pretest-posttest scores.

The experimental group received instruction following differentiated instruction principles. The format of instruction included collaboration and cooperation. Long-term understanding should focus on the fact that differentiated instruction is not a recipe or instructional strategy, but rather a philosophy or way of approaching teaching and learning (Akos, Cockman, & Strickland, 2007). By focusing on knowledge acquisition, the effectiveness of the instructional strategies provides a means of training effective and efficient supply soldiers.

### **Research Design**

This study was a quasi-experimental nonequivalent group design as the experimental and control groups were drawn from very similar classrooms (Gall et al., 2005). The use of intact groups were precipitated by the nature of the course, and soldier assignment prohibited the randomization of participants. Soldiers are assigned to the MOS based on Army fielding requirements and individual performance on pre-entry assessments. Gall et al. (2005) provided understanding of an intact group as a set of individuals who must be treated as members of an administratively defined group rather than as individuals. Soldiers are accessed into classes based primarily on a timeline with prerequisites for the MOS achieved by all prior to arrival at training installations. Prerequisites for the MOS include completion of Basic Combat Training (BCT) last ten weeks. The intact group of soldiers is not homogenous beyond intent in service in the military and general qualifications for MOS training to include General Test scores. The selection of a quasi-experimental nonequivalent study group design for this study is also supported as appropriate by Gay, Mills, and Airasian (2006) as it is not possible to randomly assign individual participants to groups.

Soldiers were bound in a group of cohorts. Soldiers train in cohorts ranging from 40-120, with multiple cohorts in session simultaneously. Informed consent (Appendix D) was collected from all participants. Soldiers were administered a screening questionnaire (Appendix A) to collect basic demographic information as well as educational and military experience. Demographic data collection provided the determination of similarities possessed by control and experimental groups with a potential of having an impact on effectiveness of treatment. Upon collecting demographic screening data, the experimental group received instruction utilizing



differentiated instructional strategies while the control group received instruction utilizing traditional strategies over the course of the 8-week class.

### **Research Questions and Hypotheses**

If specific instructional strategies are determined to have a significant impact on the postsecondary instruction, then these instructional strategies should be incorporated into the instructional program to ensure that soldiers are provided strategies and techniques that produce the greatest results and long-term competence. The research questions for the study are as follows:

RO1: What is the impact of differentiated instruction techniques on postsecondary learners in the unit supply Military Occupational Specialty?

RO2: Will the integration of differentiated instruction techniques produce more competent unit supply specialist as measured by the Command Supply Discipline Program standards at first duty station based on posttest performance?

Null Hypothesis 1: There will be no significance difference in the means of posttest scores between the experimental group, which will receive differentiated instruction, and the control group will not receive differentiated instruction.

Null Hypothesis 2: There will not be a significant difference in competency of Unit Supply Specialists in relation to the Command Supply Discipline Program upon completion of Military Occupational Specialty training based on posttest performance.

### **Population and Sample**

Participants were unit supply Army soldiers with limited military experience and most commonly direct from the secondary educational setting. Soldiers' ages ranged between 18 and

30 years, the vast majority are male. The course length is 8 weeks with classroom and non-classroom training.

To gain access to the soldiers (respondents), the Army Survey Institute required a conditional Institution Review Board (IRB) approval from the university in addition to supporting documents. One document was a signed memorandum from the Commanding General supporting the research process (Appendix D). The Army Survey Institute determined the research project was exempt due participant group's size. Once approval was granted, coordination with the training department was required to ensure minimal impact on training occurred.

The data was collected through surveys, individual interviews and questionnaires presented to 30 soldiers. The data collection occurred during the instructional portion of the day with 27 soldiers participating and three soldiers opting to not participate. The participation rate of 90% was higher than average response rates. The review of literature does not provide a definitive acceptable response rate; however Bowling (2004) considers a response rate of 75% as minimally acceptable. An additional study of relevance on response rates by Baruch and Holtom (2008) reviewed more than 1600 studies published between the years 2000 and 2005 with an average a response rate of 52.7 percent.

### **Setting**

The study setting was a military training installation which trains in excess of 100,000 soldiers annually. The learning environment consists of instruction in the classroom, as well as practical learning in the warehouse setting.

### **Instrument**

The pretest and posttest data was collected through the administration of an assessment with the scope focused on knowledge acquisition of critical tasks presented course and prescribed by the program of instruction (POI). The POI consists of critical and functional tasks that guarantee competency by a training development team. The team consists of subject-matter experts knowledgeable in the MOS, as well as an instructional systems specialist who possess knowledge of adult learning theories. Critical tasks are reviewed on a biannual basis to ensure relevancy and to incorporate many new products, processes, or policies that have been identified as important to complete the mission.

Validation of the assessment has been completed using Cronbach's alpha analysis. Cronbach's alpha measures internal validity by assessing true and observed values with error measurement within a range of negative infinity to 1.0, with the following as an accepted rule of thumb for interpreting Cronbach's alpha: > .9 excellent; > .8 good; > .7 acceptable; > .6 questionable; > .5 poor; and < .5 unacceptable (Gliem & Gliem, 2003). The end-of-course assessment is administered to 2,500-3,000 soldiers annually. Therefore, the validated sample size was 10% or 250 assessments. End-of-course assessments are comprised of 30 closed-end questions. Cronbach's alpha was measured at .84, and per the preceding standards the assessment has been considered to have good internal validity.

### **Procedures**

The treatment was presented to the control group, where strategies and techniques identified as differentiated instruction was utilized. This approach differs from the expectation that students participate in the modification for curriculum. Hall et al. (2011) indicated that educators have identified differentiated instruction as a more helpful method of teaching students in diverse settings and that through it, increased levels of success are realized. Instructors

delivered instruction of lessons into which differentiated instruction has been incorporated.

Tomlinson and Kalbfleish (1998) provided three principles integral to brain research and differentiated instruction:

1. Learning environments must feel emotionally safe for learning to take place.
2. To learn, students must experience appropriate levels of challenge.
3. Each brain needs to make its own meaning of ideas and skills.

These three principles are applied to all aspects of modification. Differentiated instruction involves the modification and manipulation of the instructional content, process, and product for the entire class, but is also geared for individual learners.

### **Data Analysis**

The data analysis process focused on gaining a greater understanding of the impact of the treatment of differentiated instruction on the experimental group as compared to the control group. The first analysis of data was a *t*-test to determine if the means of the two groups were statistically similar. Upon completing the *t*-test for mean scores for both groups, analysis with ANCOVA determined the differences between the mean scores for the control and experimental groups (Gall et al., 2005). The ANCOVA analysis controlled for the influence of the independent variable on the dependent variable (Gall et al., 2005), or in this study, the ANCOVA controlled for the influence of the differentiated instruction on knowledge acquisition. Cochran (as cited by Belin & Normand, 2009) described five potential uses for ANCOVA:

1. to increase precision in randomized experiments,
2. to adjust for sources of bias in observational studies,
3. to throw light on the nature of treatment effects in randomized experiments,
4. to study regressions across levels of classification variables, and

5. to analyze data when some observations are missing.

The classes associated with the research were in session for 8 weeks, thus soldiers were be easily accessible during training hours and after for additional observation and questioning. As part of this analysis, responses were be grouped to determine specific trends in data. Capturing and examining outliers would provide greater understanding of responses by using literature to establish connections or to determine if a response is truly unrelated. This type of analysis is important as it allows the researcher to correlate data collected to the literature reviewed.

### **Summary**

The evolution of educational trends did not affect the training of U.S. Army soldiers until General Martin Dempsey, while TRADOC commander, initiated a system-wide review of initial entry training. This quasi-experimental research infused differentiated instructional principles and practices into the supply specialist course of instruction

Treatment consisted of modification of content, process, and product with the hypothesis that differentiated instruction would affect soldier training. By proving the hypothesis, the results of this research serves as a way ahead for designing and developing POIs. Competency in the initial stages of a soldier's career can lead to increased longevity and success throughout his or her career. Additionally, increased competency can ensure the accountability of supplies and equipment worldwide during a period in which there is financial uncertainty and austerity is imperative.

## **CHAPTER FOUR: FINDINGS**

The purpose of this study is to determine the impact of differentiated instructional on the Unit Supply Specialist training at Fort Anywhere and make recommendations to the training department to improve the overall effectiveness of training. Recommendations presented to the training department will be based upon the analyses of the surveys, questionnaires, and performance of participants.

### **Demographics of Respondents**

Sixty-seven % (n=18) of the study participants were female. This percentage exceeds the Army's demographics published in the 2015 Demographics: Profile of the Military Community as composed by Defense Manpower Data Center (DMDC). Female enlisted soldiers currently represent approximately 15% of the US Army, an increase from the 2005 study released by DMDC of 13%. The Unit Supply Specialist MOS typically has a higher than average Army female population as reported by the US Army Research Institute for Environmental Medicine (2008). During physical year 2000, the total strength of the Army was 469,292 with 53,116 of the total force female for a total of 11.3%. In 2014 the total force was 504,330 with 70,058 females or 13.9% of the total Army personnel. The Unit Supply Specialist MOS had 33.7% of female soldiers in its ranks, n=4,980, of the total population of 14,781 (US Army Research Institute for Environmental Medicine, 2008).

The comparison of age of participants was limited as the majority of the soldiers surveyed were under 25 years old (83.3%) with a response rate of 89.9% (when three non-respondents are aggregated). This age compares significantly to the overall MOS reporting 50.3% under the age of 25 (US Army Research Institute for Environmental Medicine 2008). The 2014 Demographics: Profile of the Military Community published by DMDC reported the same

population constituted 39.7% of the Army. The average age for Army soldiers was reported by DMDC at 28 years old. Additional demographics collected include 81.5% of participants have earned their high school diploma and 14.8% completed post-secondary training or degree programs.

### Data Collection Environment

The twenty-seven participants were soldiers training in the Advanced Individual Technical phase of their Army training that was conducted in a mixed environment to include classroom instruction, warehouse instruction, and instruction in the field. The data collection occurred in the instructional environment where the learning strategies were applied during the varying and diverse learning process by the instructors assigned to the course. Each instructor had completed numerous trainings to be certified as an instructor in addition to being highly qualified in the subject matter taught. The data in Table 1 is exclusive to the Control group.

Table 1

#### *Demographic Variables for Control Group*

Variable	<i>n</i>	%
Gender		
Female	17	56.7
Male	10	33.3
Missing	3	10.0
Age (years)		
17-20	6	20.0
21-24	19	63.3
25-28	1	3.3
29+	1	3.3
Missing	3	10.0
Level of Education		
GED	1	3.3
Technical	1	3.3
High School	22	73.3
Associate	2	6.6
Bachelor's	1	3.3
Missing	3	10.0

*Note.* Due to rounding errors, percentages may not equal 100%.

Preliminary descriptive analysis includes percentages and frequencies of the demographics information for the respondents participating in the research, frequency of learning styles, various combinations of learning styles, in addition to pretest and posttest analysis to include raw scores, percentage, mean scores, standard deviations, and ANCOVA analysis. This information will be used to determine if the treatment of prescribed learning styles presents a significant impact of the Unit Supply Specialist soldier training program in comparison to soldiers in the control group.

### **Frequencies and Percentages**

The data analyzed in Table 2 is inclusive of Experiment and Control groups combined. The Control Group presented 28 respondents while the Experiment group had 27 respondents. The most frequently observed category of Group was 0 or Control ( $n = 28$ , 51%). The experimental group had a frequency of  $n = 27$ , 49%. The most frequently observed category of Age was 17 - 20 ( $n = 32$ , 58%). The most frequently observed category of Gender was F or female ( $n = 33$ , 60%). The most frequently observed category of Education was HS or High School ( $n = 45$ , 82%). Frequencies and percentages are presented in Table 2.



Table 2  
*Frequency Table for Nominal Variables*

Variable	<i>n</i>	%
Group		
Control	28	50.91
Experimental	27	49.09
Age		
17 20	38	69.09
21 24	12	21.82
25 28	2	3.64
29 +	2	3.64
Missing	1	1.82
Gender		
F	33	60.00
M	21	38.18
Missing	1	1.82
Education		
GED	2	3.64
Technical	1	1.82
High School	45	81.82
Associate's	5	9.09
Bachelor's	1	1.82
Missing	1	1.82

*Note.* Due to rounding errors, percentages may not equal 100%.

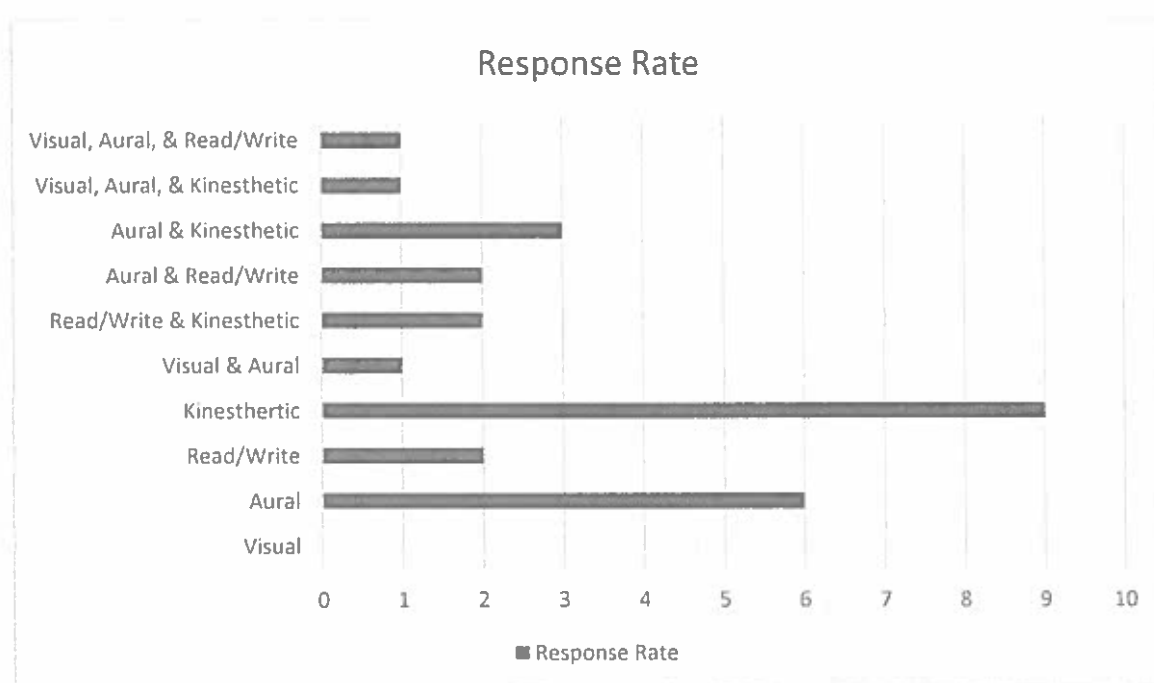
### **Learning Styles Represented**

The VARK was administered to 30 Unit Supply Specialist soldiers with 27 opting to participate in the study. Participants' results were coded by instructional staff to ensure correct treatment is applied to the appropriate soldier to provide the greatest impact on overall training. The chart below shows the results include ten multimodal learners and 17 with only one learning style identified. The initial analysis demonstrates that no respondent scored solely for visual learning on the VARK. The only representation of the Visual learning style was in the multimodal responses, therefore limited visual strategies were integrated into the learning process. The majority of the learning strategies to be integrated into the curriculum was

Kinesthetic. The lack of visual unimodal representation is consistent with similar studies to include Lujan (2006) who found that 5.4% of medical students (n=392) were unimodal visual learners and Urval et al. (2014) with a representation of 5.6% of a study assessing learning styles influence on academic performance which consisted of 415 second year undergraduate students through the administration of the VARK survey.

Chart 1

### *Response Rate*



Prior to completing the VARK, the soldiers were asked to identify their preferred manner of learning in an open-ended question. The 27 soldiers provided a written response to the prompt with many validated the learning style assigned by the VARK questionnaire at the following rates: Visual at 7%, Aural at 4%, Read/Write at 4%, and Kinesthetic at 44%. This would allow one to infer that two-thirds of the population sampled are self-aware of their learning style preference, therefore the population sampled will most likely be an advocate for integration of the identified strategies into future learning activities.

To ensure the correct VARK strategies to ensure correct treatment of respondent occurs, a concise definition of each and associated strategies as listed below were provided to the instructors.

**A. Visual**

The best learning occurs when the respondent can see the material they are learning.

Visual learners tend to utilize symbolic representations of knowledge to include graphs, hierarchies, figures, maps, and flowcharts (Murphy et al., 2004).

Specific strategies include:

- utilize pictures, videos, posters, and slides as much as possible.
- underline/highlight in different colors and take notes in different colors.
- replace words with symbols (Fleming, N 2007).

**B. Aural**

The most efficient learning for an aural learner occurs through sound (Drago & Wagner 2004). Aural learners tend to prefer to listen to presentations and typically do not take notes as well as non-Aural learners. Word delivery plays a critical role in the learning process. Specific strategies include:

- discuss topics with others
- use a tape recorder
- leave space in your notes for later recall and filling (Fleming, N 2007).

**C. Read/Write**

Printed words and text is the preferred learning method for students that are Read/Write dominant. Read/ Write learners tend to arrange lecture materials into lists, glossaries, and paraphrased notes. Specific strategies include:

- write out the words again and again.
- read notes (silently) again and again.
- rewrite the ideas and principles into other words (Fleming, N 2007).

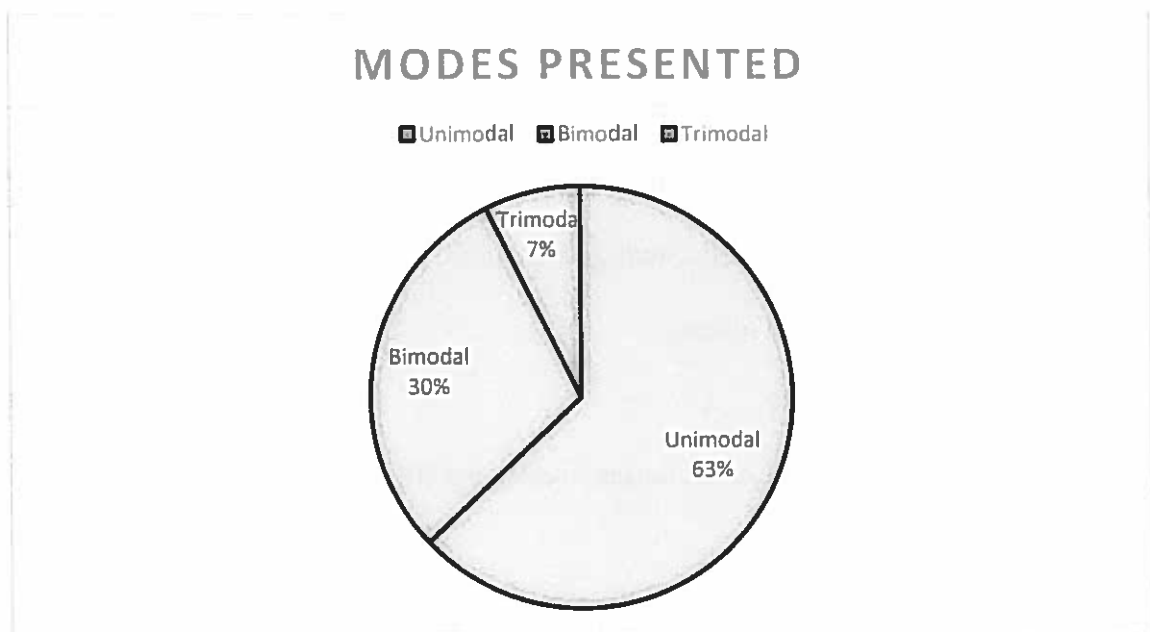
#### D. Kinesthetic

Learners who are kinesthetic learn best through real-life experiences and actions such as touch and movement (Drago & Wagner 2004). Specific strategies include:

- incorporate role play or acting out notes.
- return to the laboratory to practice experiment.
- incorporate as many hands-on activities in the learning process as possible (Fleming, N 2007).

Chart 2

*Modes Presented in Respondents*



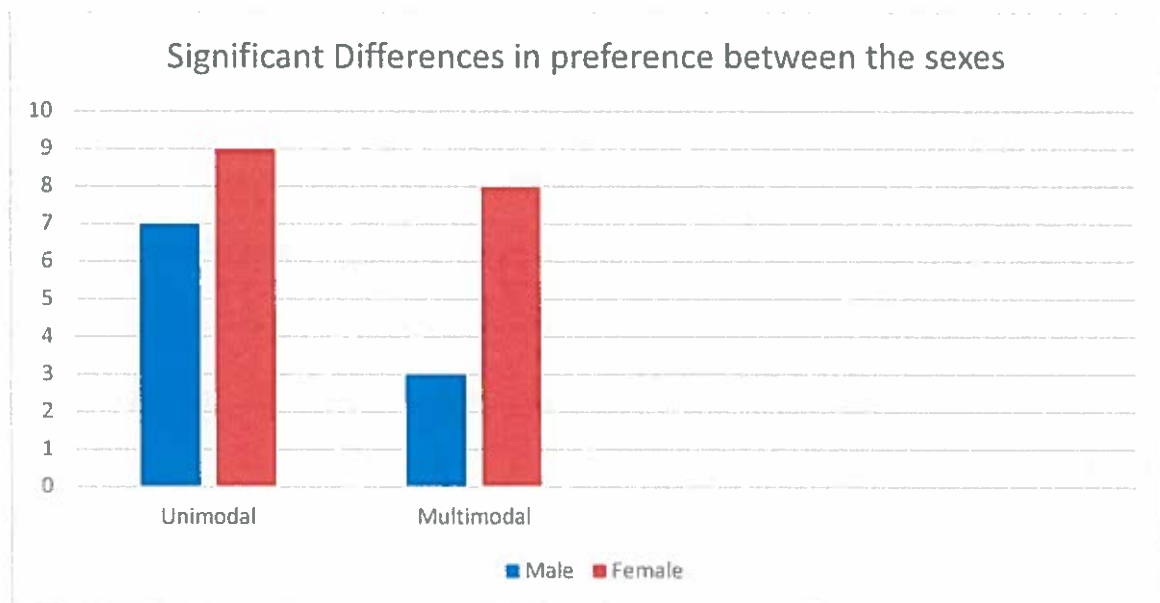
When analyzing at the data of unimodal and multimodal respondents in comparison to the representation of male and female in the Army as well as the MOS, there appears to be a significant difference between the sexes. Female respondents had a higher

presence in the multimodal learning style category, while in the unimodal category there appeared to be no significant difference in learning style preferences. When indexing learning styles by designation of unimodal or multimodal, the multimodal category includes respondents that were identified as bimodal, trimodal, and quadramodal.

According to Wehrwein, E. A., Lujan, H. L., and DiCarlo, S. E. (2007), the majority of male respondents in observed research preferred multimodal learning while female respondents preferred unimodal. The observed rates were significantly different as 45.8% of female respondents and 87.5% of male respondents indicated multimodal preference. This data was in complete contrast to the results obtained from the survey administered as part of this study. This could have been a result of the environment the data was collected. The environment, Army classroom, impacted the population as the Army population is majority male with 85% of the total force.

Chart 3

*Significant Differences Between Sexes*



### Research Questions

The research questions for the study are as follows:

RO1: What is the impact of differentiated instruction techniques on postsecondary learners in the unit supply Military Occupational Specialty?

RO2: Will the integration of differentiated instruction techniques produce more competent unit supply specialist as measured by the Command Supply Discipline Program standards at first duty based on posttest performance?

Null Hypothesis 1: There will be no significance difference in the means of pretest-posttest scores between the experimental group, which will receive differentiated instruction, and the control group will not receive differentiated instruction.

Null Hypothesis 2: There will not be a significant difference in competency of Unit Supply Specialists in relation to the Command Supply Discipline Program upon completion of Military Occupational Specialty training based on posttest performance.

The analysis of the pretest and posttest data provided the evidence that will approve or disapprove the null hypotheses and research questions and provide for the discussion during the final chapter of this research. The presentation of the data will provide a way ahead and suggestions for the training program's future. The purpose of this analysis is to determine if there is a significant difference between the pretest and posttest scores *p value* prior to conducting the ANCOVA analysis.

### Analysis of Posttest Scores

The posttest score data was provided for the respective periods in the previous pretest score comparison from the years of 2013 through 2015. During this three year period, the comparative test had an average score of 82.5%, 83.7% and 86.2%. During this period the 92Y MOS, as well as the military as a whole, saw a reduction in force structure and the population was not as large and robust as this study group. For a successful completion of the Unit Supply Specialist Advanced Individual Training program, a soldier is required to achieve a cumulative average of 80% for all learning objectives. Non-successful completers of the MOS have the opportunity to recycle one time through the program for various reasons to include academic and medical reasons. The average attrition rate has fluctuated between 3 and 6% over the past few years and remains acceptable for the program. The group of respondents had a 100% successful completion rate. All respondents reported to their follow-on duty station or unit possessing the skills required to perform their occupation requirements based on the Command Supply Discipline Program. This was measured by posttest performance in comparison with historical performance.

Analysis of the posttest scores for the experimental group receiving the treatment presented scores in a range from 30 out of 30 questions to 21 out of 30. The Mean of the scores presented on the posttest was 85.67 ( $\mu=85.67$ ) with the experimental group Standard Deviation of 8.31 or ( $\sigma=8.31$ ) with the  $N=27$  produced at sum of 2313. The Control Group Mean was calculated at 83.32 and the Standard Deviation was calculated at 9.69 or ( $s=9.69$ ). Additional descriptive statistics related to the posttest scoring is the Control Group Variance was calculated at 93.83.

The average percentage scores for the respondent group presented as 85.67% with only five respondents not scoring the passing score of 80% for this examination on the first iteration. Soldiers are allowed to retest if not successful however, looking at the treatment scores collected and analyzed were from the first attempt of the test. Consideration of validity and reliability to the treatment was the driving fact of analyzing the initial assessment score and not the retest score. The Population Standard Deviation of the posttest percentage was calculated at 8.22. As previously stated all respondents in this group scored a cumulative 80% required to be a successful completer of the program. The respective group of soldiers in the program from the years of 2013 through 2015 scored an average of 83.13.

### Summary Statistics

The observations for Pretest Raw had an average of 23 ( $SD = 3.61$ ,  $SE_M = 0.69$ ,  $Min = 17.00$ ,  $Max = 29.00$ ). The observations for Pretest had an average of 76.66 ( $SD = 12.02$ ,  $SE_M = 2.32$ ,  $Min = 56.70$ ,  $Max = 96.70$ ). The observations for Post Test Raw had an average of 25.70 ( $SD = 2.49$ ,  $SE_M = 0.48$ ,  $Min = 21.00$ ,  $Max = 30.00$ ). The observations for Post Test had an average of 85.67 ( $SD = 8.31$ ,  $SE_M = 1.60$ ,  $Min = 73.30$ ,  $Max = 100.00$ ).

Table 3

*Summary Statistics Table for Interval and Ratio Variables*

Variable	$M$	$SD$	$n$	$SE_M$
Experiment Pretest	76.66	12.02	27	2.32
Control Pretest	75.31	11.34	28	2.14
Experiment Posttest	85.67	8.31	27	1.60
Control Posttest	83.32	9.69	28	1.83

**Homogeneity of regression slopes.** The assumption for homogeneity of regression slopes was assessed by rerunning the ANCOVA, but this time including interaction terms between each



independent variable and covariate (Field, 2009; Stevens, 2009). If there are no significant interactions between an independent variable and a covariate, homogeneity of regression slopes is met. Every interaction between each independent variable and covariate was not significant and the assumption was met.

Table 4

*Tests of Between-Subject Effects*

Tests of Between-Subjects Effects					
Dependent Variable: Pretest					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	25.268 <sup>a</sup>	1	25.268	.185	.669
Intercept	317450.078	1	317450.078	2326.683	.000
Group	25.268	1	25.268	.185	.669
Error	7231.262	53	136.439		
Total	324708.570	55			
Corrected Total	7256.529	54			

a. R Squared = .003 (Adjusted R Squared = -.015)

Table 5

*Marginal Means, Standard Error, and Sample Size for Posttest by Group Controlling for Pretest*

Combination	Marginal Means	SE	n
Post test	83.24	1.69	28
Pretest	85.77	1.73	27

**Post-hoc.** There were no significant effects in the model. As a result, post-hoc comparisons were not conducted.

**Evaluation of Findings**

**Research Question One:** What is the impact of differentiated instruction techniques on postsecondary learners in the unit supply Military Occupational Specialty? The results of the ANCOVA were not significant ( $F(1, 53) = 1.85, p = .669$ ) in the mean pretest-posttest mean score difference between the control and experimental group examined. For this analysis, the

dependent variable is knowledge acquisition as measured by the difference in the control and experimental mean pretest-posttest score. The null hypothesis was there would be no significance difference in the means of pretest-posttest scores between the groups, which will receive differentiated instruction, and the control group will not receive differentiated instruction. The null hypothesis was not rejected.

The posttest mean percentage for the experiment group with an  $n = 27$  was 85.67% presenting a pretest posttest mean score difference for the experiment group was 9.01. Standard deviations was 8.31 with a range from 73.3% to 100.0%. While the mean percentage for the control group with an  $n=28$  was 83.32% with a pretest posttest difference of 8.01. The control posttest standard deviation was 9.69 with a range from 70.0% to 100.0%. The mean score analysis for the experiment and control group resulted in an increase of 1.0%. This results were not significant.

**Research Question Two:** Will the integration of differentiated instruction techniques produce more competent unit supply specialist as measured by the Command Supply Discipline Program standards at first duty based on posttest performance? The ANCOVA revealed not significant difference in posttest results when controlling for pretest scores ( $F(1, 53) = 1.85, p = .669$ ). The null hypothesis was there would be no significance difference in the means of pretest-posttest scores between the experimental group, which will receive differentiated instruction, and the control group will not receive differentiated instruction. The null hypothesis was not rejected.

### Summary

Data collection occurred in the Unit Supply Specialist training environment at the onset of training. Thirty soldiers were enrolled in the experimental class and were provided the surveys

for completion, three soldiers chose to not participate in the research project. Data collection of the twenty-seven participants was analyzed to determine what learning styles were represented in order to affect the learning process and incorporate the differentiated instruction strategies. This data was compared with the performance of the control group on the pretest and posttest.

The results of the initial analysis provided no significant differences between the experiment, control, and historical groups based on the implementation of differentiated instruction. With there being no significant differences, thus resulting in both Research Questions being rejected and acceptance of both Null Hypothesis.

## **CHAPTER FIVE: CONCLUSIONS**

### **Overview**

The purpose of this quantitative research project was to determine the impact of Differentiated Instruction on soldier training in the Unit Supply Specialist program with the ultimate goal to improve the overall effectiveness and efficiency of the training process. The experiment group (respondents) consisted of 27 soldiers with varying levels of education and experience. The data were compared with that of a control group in simultaneous phases of instruction. Additionally, historic data was utilized to determine some key information for long-term growth.

The participants in the research project were in a residential training program with approximately 300 soldiers at varying phases of Unit Supply MOS training and learning advanced soldier skills. The soldiers in the research consisted of individuals that were active duty, as well as those that were in the reserve or guard. The career goals for the group varied from desire to be a lifelong soldier to completing their four year contract to the military and then transition to civilian life. The group indicated various civilian career goals with varying levels of education. The group came from all over the United States and Puerto Rico and were stationed all over the world.

The strategies implemented in the instructional process were based on data obtained from the completion of the VARK. The surveys indicated the majority of the soldiers in the experiment group were kinesthetic learners with the second highest unimodal category being identified as Aural. These two learning styles and their related strategies are most conducive to the Unity Supply training program with hands on demonstrations for the successful completion of required tasks, as well as receiving instructions through oral delivery. The data from the surveys would advise minimal use of PowerPoint presentations as visual learners were not well

represented in the responses. The over usage of PowerPoints in previous years was a huge factor in initiating the transition in learning strategies prescribed by TRADOC through the Army Learning Model, later renamed the Experimental Learning Model.

### **Discussion**

The purpose of this study was to determine if the implementation of differentiated instruction into soldier training would prove beneficial for unit supply specialist and thus transferrable to all advance individual training soldiers. Specifically, this study looked at the effects of utilizing strategies based on the VARK and respective learning styles. The control group mean pretest score was 75.4. The experimental group pretest mean score was 76.66. The posttest mean score for the control group was 83.33 and 85.67 for the experiment group. The delta for the posttests was 2.34 points and the difference in the Standard Deviation was 1.38. When conducting the ANCOVA analysis controlling for pretest means, the results were p-value .669. The analysis presented not significant difference between the pretest and posttest scores of the experiment group than by the control group. The resulting p-value of .669 indicates weak evidence against the first null hypothesis, thus failure to reject the first null hypothesis. This is consistent with other pretest-posttest studies on various study populations (Zienteck, L., Nimon, K, and Hammack-Brown, B., 2016 and Valente, M. J., 2015). Both cited pretest-posttest studies with findings of no significant difference between posttest controlling for pretest while using ANCOVA to complete the analysis. The application of specific learning style strategies could have attributed to the tighter scoring.

Utilizing strategies that complement the soldiers' learning styles had an impact on the overall knowledge gained during the training for the participants of the research which was measured by the initial evaluation completed at the soldier's first duty station. A study focusing

on adaptation of learning process and products to compliment an individual's learning has produced proven results in the civilian academic setting (Kelly, 2013) as well as military educational setting (Scoppio and Covell, 2016).

Conversely, a study by Adduci (2016) examined the impact of self-identified learning styles and the impact on the understanding their Preferred Learning Style (PLS) was useful or interesting in a traditional and blended learning environment. This study indicated that 86% of students in the traditional setting found this information to be useful or interesting and 83% in the blended setting. While the students found this information useful or interesting, 56% of respondents ( $N=61$ ) did not change their study habits based on the understanding of their learning styles in both settings. Additionally, the respondents ( $N=60$ ) indicated they did not select resources that matched their learning style at home or in the classroom at rate of 61% traditional setting and 69% for the blended. This brings in to question the impact of understanding of learning styles and how willing the learner is to independently utilize the resources available best on identified learning styles.

The modification of learning strategies and processes are in alignment with the Army Learning Concept 2015 (Department of the Army, 2011). The initiating research presented the challenges that this transformation in learning would impose on the military education process. These challenges included addressing the instructors possess subject matter expertise, the excessive use of passive-lecture based instruction, teaching to time not to standard, ineffective usage of distance learning, and assessments do not measure actual learning (Christian, 2012) and (Wlodkowski, 2008).

### **Implications**

The premise of the research project presented potential implications for the overall effectiveness of the Unit Supply training program. With the integration of instructors who have been certified as facilitators by the Army Logistics University Staff and Faculty Development staff, along with the integration of learning style specific strategies into the daily training process, the impacts on training could have been significant. This significance would have provided the training department leaders evidence to integrate this process into all Unit Supply Specialist and then ultimately across all training programs on Fort Anywhere. The implications would be resource intensive with the integration into nine initial entry soldier training programs as a Program of Instruction is typically revised in a three year cycle.

The greatest implication is the ability to produce soldiers who are better prepared than their predecessors due to a more concrete and personal training program that would increase retention of the skills, knowledge, and abilities gained during the training process. The ultimate goal of any training command in the Army is to produce a force that is well trained, ready, and effective in their specific MOS.

### **Limitations**

There were two critical limitations of the approved process that posed an impact on the outcome of this research project. The limitations were a direct result of the guidance and parameters set by the Army Survey Committee's IRB process. After more than one year of working the IRB approval process, the Army Survey Committee first proposed that I could receive exemption by reducing the sample population size from approximately 100 soldiers to 25-30 soldiers. The benefit of this decision was that I had to coordinate with only one instructor and only one platoon sergeant throughout the course of the study.

The second limitation that was presented during the course of the research was the fact that no coding of soldiers was permitted for long term tracking. This limitation would present the greatest impact on tracking long-term retention and progression throughout career. This longitudinal study aspect would provide the greatest evidence if the impact of differentiated instruction is substantial enough to warrant the additional resources required to support the complete transition. The transition would include integration of differentiation into the POIs including the incorporation of strategies in the learning process that address all learning styles. Additionally, there will need to be a process for developing instructors to diagnose the individual learning styles of all soldiers in their charge, as well as prescribe and evaluate the effectiveness of the strategies.

Conversely, longitudinal studies present complications that dictate the use or prevent the use of research, the first being the cost of conducting a long term study. Additional complications include the collection of the data, processing of the data, and the analysis of the data, but most importantly securing the data collected over the life of the research. One of the complications that would seriously impact a longitudinal study and is highly probable for a military research population, would be the participants dropping out of the study. The majority of initial entry soldiers, complete four years of service prior to leaving the military. If a longitudinal study was proposed, the optimal length of the research study would be within the four year range to produce the greatest impact.

### **Recommendations**

The decision to conduct this research study was based on the premise of identifying a positive impact for soldier training through the use of differentiated instruction. At the onset of the implementation of the Army Learning Model 2020, later renamed the Experimental Learning



Model, a research-based study became optimal to determine effectiveness. After gaining the support of the Department of the Army, the Quartermaster School Commanding General, the Logistical Training Department Director, and the Course Director, the study commenced with data collection and the subsequent analysis. The goal set throughout the research was to determine first, if the use of differentiated learning strategies would have an impact on the training of soldiers and second, if the impact would be sustained to the first duty station.

From the collection and analysis of the data in respect of the Research Questions, the Null Hypotheses was not rejected but actually supported through the use of multiple statistical analyses. The limitation of size could have impacted the result of the study thus one recommendations for future research would be to expand the study to a larger sample size. Fitzpatrick, A. R., & Yen, W. M. (2001), Teme, G. O., Erdoğan, S., Selvi, H., & Kaya, I. E. (2016), and Strube, M. J. (1991) provide discussion on how the sample size increases the validity of the research. The greater the sample size, the more valid the results. This increase in sample size will provide a foundation for the Department of the Army to conduct future studies to determine the long-term and all-inclusive benefits of the integration of differentiated instruction into soldier training, as mandated by Army Learning Model. The increase in the sample size will not only impact the validity and reliability of the research, but will also mitigate the dropout rate that would be associated with longitudinal studies.

While there are potentially numerous benefits of increasing the sample population with the result of a more valid and reliable training program, the greatest benefit is producing a soldier that is highly competent and capable to complete the mission at hand. An additional benefit of increasing the sample size is related to the possible reduction in cost of training a soldier from Basic Training, through Advance Individual Training, and onto the first duty station. DMDC

estimates the cost of initial training and preparation of a soldier between \$50,000 and \$70,000. The cost benefit from the individualization of prescribed training to the learner reduces recycling. Recycling occurs when a soldier doesn't successfully complete the training to standard the first time and has to go through the program a second time. Recycling soldiers substantially increases that estimated cost of training.

The second recommendation based on the research is to complete a longitudinal study with increased sample size. The increased sample size will allow for the collection of data that the Department of the Army and other military services can use to determine if a complete revision of how training is developed, delivered, and evaluated for all levels of training for military members. The Department of Army is currently investigating new ways to improve training. Proposing a longitudinal study with a substantial population size and representation across multiple Military Occupational Specialties on multiple training installations could provide more definitive results. The benefits of the longitudinal study will provide more accurate data collection (Molyneux, P., Scull, J., & Aliani, R.), as well as an easier process of data collection as the sample population would be observed for a longer period of time than short term research projects (Garratt, E. A., Chandola, T., Purdam, K., & Wood, A. M.). Observation would occur at their duty stations after graduation. Most soldiers entering the Army complete an initial contract of four to six years depending on the MOS and the Army's need for the occupation based on current and projected strength. According to the Department of Army, the 2017 attrition rate was approximately twenty percent across the force with a disproportion amount associated with the lower enlisted soldier. The causes of this disproportionate attrition are widespread, numerous, and based on the individual soldier's personal situation. Many of the soldiers in my study, and I assume more soldiers as well, entered the military with a goal of receiving training and

experience and the expectation that the Army will not be a career. Many of these soldiers will take advantage of the Post 911 GI Bill upon leaving the military. An improved training program for initial entry soldiers and coupled with professional military education may possibly result in greater retention, thus reducing the financial requirement to training more initial entry soldiers annually.

### **Summary**

From the onset of this research, the goal was to make a positive impact on soldier training. With the implementation of Army Learning Model, or Experimental Learning Model, the research design was to integrate differentiated instruction into the daily training of Unit Supply Specialists training on Fort Anywhere. The research included completion of the VARK question to allow the appropriate prescription of educational strategies for each soldier at the appropriate time in the curriculum. After collection and analysis of the data, implications, limitations, and recommendations were made apparent and discussed. The data, as well as the research, was conducted based on Army IRB approval guidance and supported the Null Hypothesis and the rejection of the Hypothesis.

From the inconclusive results of this research based on the small sample size, the recommendations for future research in this area includes conducting a longitudinal study following a large sample population that would extend beyond one Military Occupational Specialty as well as beyond one military instillation. This recommendation will allow for more accurate data that can be analyzed over a larger population. Also with the diversity of occupations and location, the sample population will be intact longer and will provide a more valid and reliable outcome. This outcome should be communicated across training environments to ensure that all programs of instruction development, delivery, and evaluation are updated with

the most relevant research-based information. The overarching benefit will be a ready and resilient military force that will complete day to day requirements with ease, as well as be mission ready and capable.

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## Appendix A PARTICIPANT DATA QUESTIONNAIRE

1. What is your gender? Male \_\_\_\_\_ Female \_\_\_\_\_
2. What ethnicity do you most commonly associate with?
  - a. American Indian or Alaskan Native
  - b. Asian or Pacific Islander
  - c. Black, not of Hispanic origin
  - d. Hispanic
  - e. White, not of Hispanic origin.
  - f. \_\_\_\_\_
3. How old are you? \_\_\_\_\_
4. What is your greatest level of education?
  - a. GED
  - b. High School Diploma
  - c. Certificate Program
  - d. Technical Degree
  - e. Associates Degree
  - f. Bachelor's Degree

5. How long have you served in the US Army?

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6. How do you prefer to learn new tasks?

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7. What level of success do you anticipate achieving in this training program?

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8. Do you have any questions about this research and/or differentiated learning?

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## Appendix B INTEREST INVENTORY

Circle the letter of the answer which best explains your preference Please circle more than one letter per question. Leave blank any question that does not apply.

1. You are helping someone who wants to go to your airport, the center of town, or railway station. You would:
  - a. go with her.
  - b. tell her the directions.
  - c. write down the directions.
  - d. draw, or give her a map.
2. You are not sure whether a word should be spelled 'dependent' or 'dependant'. You would:
  - a. see the words in your mind and choose by the way they look.
  - b. think about how each word sounds and choose one.
  - c. find it online or in a dictionary.
  - d. write both words on paper and choose one.
3. You are planning a vacation for a group. You want some feedback from them about the plan. You would:
  - a. describe some of the highlights.
  - b. use a map or website to show them the places.
  - c. give them a copy of the printed itinerary.
  - d. phone, text, or email them.
4. You are going to cook something as a special treat for your family. You would:
  - a. cook something you know without the need for instructions.
  - b. ask friends for suggestions.
  - c. look through the cookbook for ideas from the pictures.
  - d. use a cookbook where you know there is a good recipe.
5. A group of tourists want to learn about the parks or wildlife reserves in your area. You would:
  - a. talk about or arrange a talk for them about parks or wildlife reserves.
  - b. show them internet pictures, photographs, or picture books.
  - c. take them to a park or wildlife reserve and walk with them.
  - d. give them a book or pamphlets about the parks or wildlife reserves.
6. You are about to purchase a digital camera or mobile phone. Other than price, what would most influence your decision?
  - a. Trying or testing it.
  - b. Reading the details about its features.
  - c. It is a modern design and looks good.
  - d. The salesperson telling me about its features.
7. Remember a time when you learned how to do something new. Try to avoid choosing a physical skill (riding a bike). You learned best by:
  - a. watching a demonstration.
  - b. listening to somebody explaining it and asking questions.
  - c. diagrams and charts - visual clues.
  - d. written instructions - e.g. a manual or textbook.
8. You have a problem with your heart. You would prefer that the doctor:
  - a. gave you something to read to explain what was wrong.
  - b. used a plastic model to show what was wrong.
  - c. described what was wrong.
  - d. showed you a diagram of what was wrong.

9. You want to learn a new program, skill, or game on a computer. You would:
  - a. read the written instructions that came with the program.
  - b. talk with people who know about the program.
  - c. use the controls or keyboard.
  - d. follow the diagrams in the book that came with it.
10. I like websites that have:
  - a. things I can click on, shift, or try.
  - b. interesting design and visual features.
  - c. interesting written descriptions, lists, and explanations.
  - d. audio channels where I can hear music, radio programs, or interviews.
11. Other than price, what would most influence your decision to buy a new non-fiction book?
  - a. The way it looks is appealing.
  - b. Quickly reading parts of it.
  - c. A friend talks about it and recommends it.
  - d. It has real-life stories, experiences and examples.
12. You are using a book, CD or website to learn how to take photos with your new digital camera. You would like to have:
  - a. a chance to ask questions and talk about the camera and its features.
  - b. clear written instructions with lists and bullet points about what to do.
  - c. diagrams showing the camera and what each part does.
  - d. many examples of good and poor photos and how to improve them.
13. Do you prefer a teacher or a presenter who uses:
  - a. demonstrations, models, or practical sessions.
  - b. question and answer, talk, group discussion, or guest speakers.
  - c. handouts, books, or readings.
  - d. diagrams, charts, or graphs.
14. You have finished a competition/test and would like feedback. You would prefer feedback to:
  - a. use examples from what you have done.
  - b. use a written description of your results.
  - c. be from somebody who talks it through with you.
  - d. use graphs showing what you had achieved.
15. You are going to choose food at a restaurant or cafe. You would:
  - a. choose something that you have had there before.
  - b. listen to the waiter or ask friends to recommend choices.
  - c. choose from the descriptions in the menu.
  - d. look at what others are eating or look at pictures of each dish.
16. You have to make an important speech at a conference or special occasion. You would:
  - a. make diagrams or get graphs to help explain things.
  - b. write a few key words and practice saying your speech over and over.
  - c. write out your speech and learn from reading it over several times.
  - d. gather many examples and stories to make the talk real and practical.

Adapted from <http://www.vark-learn.com/documents/the%20vark%20questionnaire.pdf>

## Appendix C STAMPED INFORMED CONSENT FORM

The Liberty University Institutional  
Review Board has approved  
this document for use from  
12/12/2017 to --  
Protocol # 2107.121217

### Investigating the Impact of Differentiated Instruction on Soldier Training

Sara Baumgarten  
Liberty University  
School of Education

You are invited to be in a research study of the impact of differentiated instruction or Army Learning Model (ALM) and its impact on soldier training. You were selected as a possible participant because your military occupational specialty (MOS) is part of the ALM transformation for the Quartermaster School. I ask that you read this form and ask any questions you may have before agreeing to be in the study.

Sara R. Baumgarten, a doctoral candidate in the School of Education at Liberty University, is conducting this study.

#### Background Information:

The purpose of this study is determine the effectiveness of the implementation of educational strategies as described by the Army Learning Model (ALM). Strategies include utilizing differentiated instructional techniques to accommodate the multiple modes of learning present in the diverse population of US Army Soldiers in the 92Y10 Military Occupational Specialty.

#### Procedures:

If you agree to be in this study, I would ask you to do the following things:

Instructors will collect informed consent (this document) in class and code it with a number linking it to your identity. I (primary investigator) will not have class roles with the names of soldiers to protect your identities, and I will not have access to the code key, so I will not know who participated.

Participants will complete a demographics questionnaire and interests inventory survey coded with numbering consistent with the informed consent documents. The questionnaire and survey will take approximately 20 minutes to complete. Documents will be collected by the instructor and provided to the primary investigator outside of the class setting. The results of the survey and questionnaire will not be used to formulate soldiers' grades; they are solely for identifying interests and learning styles, which will drive the modifications of lessons and activities in line with differentiated instruction or the principles of the ALM mandate.

At the conclusion of the course, the Course Director and Course Instructor will provide the End of Course scores and any documentation of differentiated instruction that has been utilized for each participant in this study coded in the same format as the demographic questionnaires and interest inventories from the beginning of the course for analysis.

#### Risks and Benefits of being in the Study:

The risks involved in this study are no more than you would encounter in everyday life as you are studying in the 92Y10 program.

Participation in this research study will not provide any direct benefits.

This research study will be in keeping with the Department of Defense Instruction (DoDI) 1400.25, Volume 410 dated 25 September 2013.

### **Compensation:**

You will be entered into a raffle for taking part in this study. The raffle is for one of five \$50 gift cards. Raffle drawing will be conducted in the last week of your course of study and gift cards presented prior to graduation from the 92Y10 course.

### **Confidentiality:**

The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a subject. Research records will be stored securely and only the researcher will have access to the records. We may share the data we collect from you for use in future research studies or with other researchers; if we share the data that we collect about you, we will remove any information that could identify you before we share it.

To ensure confidentiality, all data will be collected and coded by the instructors and provided to me. There will be no personally identifiable information provided to me. In my dissertation, I will refer to individual participants by their sequentially assigned numbers. Data collected will be stored in a secured and locked filing cabinet in my home office. After three years, all materials will be delivered to a local shredding company for secure disposal.

### **Voluntary Nature of the Study:**

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with Liberty University. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

### **How to Withdraw from the Study:**

If you choose not participate in this study, please check the box that indicates you do not wish to participate.

### **Contacts and Questions:**

The researcher conducting this study is Sara R. Baumgarten. You may ask any questions you have now. If you have questions later, you are encouraged to contact her at



[sbaumgarten@liberty.edu](mailto:sbaumgarten@liberty.edu) or [sara.r.baumgarten.civ@mail.mil](mailto:sara.r.baumgarten.civ@mail.mil). You may also contact the research's faculty advisor, Dr. Beth Ackerman, at [mackerman@liberty.edu](mailto:mackerman@liberty.edu)

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd, Green Hall Suite 1887, Lynchburg, VA 24515 or email at [irb@liberty.edu](mailto:irb@liberty.edu).

*Please notify the researcher if you would like a copy of this information to keep for your records.*

**Statement of Consent:**

I have read and understood the above information. I have asked questions and have received answers. I consent to participate in the study.

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS IRB APPROVAL INFORMATION WITH CURRENT DATES HAS BEEN ADDED TO THIS DOCUMENT.)

Participant: ☐ I consent to participate in study  
☐ I do not consent to participate in study

Signature of Investigator: \_\_\_\_\_ Date: \_\_\_\_\_

## Appendix D MEMO FROM BG RODNEY D. FOGG, QUARTERMASTER GENERAL



DEPARTMENT OF THE ARMY  
UNITED STATES ARMY QUARTERMASTER SCHOOL  
2221 ADAMS AVENUE  
FORT LEE, VIRGINIA 23801-2102

ATSM-CG

20 July 2017

## MEMORANDUM FOR RECORD

SUBJECT: U.S Army Survey on Investigating the Impact of Differentiated Instruction on Solder Training

1. Ms. Sara Baumgarten has presented her research proposal, Investigating the Impact of Differentiated Instruction on Solder Training and spoken with me about the research. I believe the research and connected survey is worth the time of the personnel who would participate in the survey. This includes the instructional staff and Soldiers in training status in the Logistics Training Department of the US Army Quartermaster School, Fort Lee, VA. Once the results of this research have been collected and analyzed by Ms. Baumgarten the information will be shared with Quartermaster leadership and training developers. Understanding the impact of learning styles on our training mission will allow deeper analysis of our process and will continue to align the 92Y – Unit Supply Specialist Program of Instruction with Experiment Logistics Module (ELM) or its predecessor Army Learning Model (ALM).
2. In keeping with the Institutional Review Board (IRB) process, the researcher and those connected have to ensure that no one will be harmed in the research project. Liberty University's IRB has determined this research does not pose any harm to participants and has granted conditional IRB approval contingent upon Army Survey approval. Copy of IRB approval will be accompanied with this letter of endorsement.

## Appendix E NOTICE OF EXEMPTION FROM ARMY SURVEY COMMITTEE

**From:** Baumgarten, Sara R CIV OSD USMEPCOM (US) <sara.r.baumgarten.civ@mail.mil>  
**Sent:** Tuesday, December 12, 2017 3:32:40 PM  
**To:** Baumgarten, Sara  
**Subject:** FW: [Exemption of Investigating the Impact of Differentiated Instruction on Soldier Training]

Ms. Sara Baumgarten,

Thank you for your survey request. I've determined your data collection to be exempt from survey licensure given your study contains no sensitive questions and targets fewer than 99 participants (none of whom belong to a vulnerable population). If you would like to inform potential respondents or IRB about this exemption, you may note the following:

The Army Research Institute for the Behavioral and Social Sciences deemed the survey project, investigating the Impact of Differentiated Instruction on Soldier Training, exempt from Army survey licensure on 12/1/2017.

Best wishes in your data collection and in completing your studies!  
 V/R,

Nicole Thompson, PhD  
 Research Psychologist  
 U.S. Army Research Institute  
 703-545-2361  
 nicole.j.thompson14.civ@mail.mil

-----Original Message-----

**From:** Baumgarten, Sara R CIV OSD USMEPCOM (US)  
**Sent:** Friday, December 01, 2017 2:24 PM  
**To:** Thompson, Nicole J CIV USARMY HQDA ARI (US)  
 <nicole.j.thompson14.civ@mail.mil>; Simmons, Robert O CIV USARMY HQDA ARI  
 (US) <robert.o.simmons2.civ@mail.mil>  
**Cc:** Stroud, Sandra D CIV (US) <sandra.d.stroud.civ@mail.mil>  
**Subject:** RE: Army Survey Request - Baumgarten, Sara (UNCLASSIFIED)

Hi Nicole,

I anticipate 25, that has been the average class size but it could be 30, but no more than that.

S

-----Original Message-----

**From:** Thompson, Nicole J CIV USARMY HQDA ARI (US)  
**Sent:** Friday, December 01, 2017 2:22 PM  
**To:** Baumgarten, Sara R CIV OSD USMEPCOM (US)  
 <sara.r.baumgarten.civ@mail.mil>; Simmons, Robert O CIV USARMY HQDA ARI (US)

<robert.o.simmons2.civ@mail.mil>

Cc: Stroud, Sandra D CIV (US) <sandra.d.stroud.civ@mail.mil>

Subject: RE: Army Survey Request - Baumgarten, Sara (UNCLASSIFIED)

Hi Sara,

How many Soldiers do you expect that would be?

Thank you,

Nicole

-----Original Message-----

From: Baumgarten, Sara R CIV OSD USMEPCOM (US)

Sent: Friday, December 01, 2017 1:28 PM

To: Thompson, Nicole J CIV USARMY HQDA ARI (US)

<nicole.j.thompson14.civ@mail.mil>; Simmons, Robert O CIV USARMY HQDA ARI (US) <robert.o.simmons2.civ@mail.mil>

Cc: Stroud, Sandra D CIV (US) <sandra.d.stroud.civ@mail.mil>

Subject: RE: Army Survey Request - Baumgarten, Sara (UNCLASSIFIED)

Good Afternoon,

The sample size is the number of Soldiers in one class iteration. This would be a cohort that would have the same instruction by the same instructors.

Does that answer your question?

Thank you very much!

Sara

Very Respectfully,

Sara Baumgarten, M. Ed.

Education Services Specialist

ASVAB/Career Exploration Program

Fort Lee MEPS

Phone: 804-765-4030

Cell: 804-549-6084

sara.r.baumgarten.civ@mail.mil

#### DISCLAIMER

The information contained in this communication is intended for the sole use of the named addressees/recipients to whom it is addressed. This communication may contain information that is exempt from disclosure under the Freedom of Information Act, 5 U.S.C. 552 and the Privacy Act, 5 U.S.C. 552a. Addressees/recipients are not to disseminate this communication to individuals other than those who have an official need to know.

If you received this communication in error, please do not examine, review, print, copy, forward, disseminate, or otherwise use the information. Please immediately notify the sender and delete the copy received.

-----Original Message-----

From: Thompson, Nicole J CIV USARMY HQDA ARI (US)  
 Sent: Wednesday, November 29, 2017 9:41 AM  
 To: Baumgarten, Sara R CIV OSD USMEPCOM (US)  
 <sara.r.baumgarten.civ@mail.mil>; Simmons, Robert O CIV USARMY HQDA ARI (US)  
 <robert.o.simmons2.civ@mail.mil>  
 Cc: Stroud, Sandra D CIV (US) <sandra.d.stroud.civ@mail.mil>  
 Subject: RE: Army Survey Request - Baumgarten, Sara (UNCLASSIFIED)

Good morning Ms. Baumgarten,

We greatly appreciate your reduction in the collection of demographic and removal of request for personally identifiable information in the interest protection participant's identities. Would you clarify for me your sample size?

V/R,

Nicole  
 Nicole Thompson, PhD  
 Research Psychologist  
 U.S. Army Research Institute  
 703-545-2361  
 nicole.j.thompson14.civ@mail.mil

-----Original Message-----

From: Baumgarten, Sara R CIV OSD USMEPCOM (US)  
 Sent: Wednesday, November 29, 2017 4:57 AM  
 To: Simmons, Robert O CIV USARMY HQDA ARI (US)  
 <robert.o.simmons2.civ@mail.mil>  
 Cc: Stroud, Sandra D CIV (US) <sandra.d.stroud.civ@mail.mil>; Thompson,  
 Nicole J CIV USARMY HQDA ARI (US) <nicole.j.thompson14.civ@mail.mil>  
 Subject: RE: Army Survey Request - Baumgarten, Sara (UNCLASSIFIED)

Good Morning,

Liberty University has reviewed my change of protocol and has given conditional IRB approval pending Army Survey approval. The change of protocol includes reducing the number of participants and removing personal identification questions to include name, ethnical and racial responses.

Thank you and I look forward to your response.

Very Respectfully,

Sara Baumgarten, M. Ed.  
 Education Services Specialist  
 ASVAB/Career Exploration Program Manager  
 Fort Lee MEPS  
 Phone: 804-765-4030

Cell: 804-549-6084

sara.r.baumgarten.civ@mail.mil <mailto:sara.r.baumgarten.civ@mail.mil>

DISCLAIMER

The information contained in this communication is intended for the sole use of the named addressees/recipients to whom it is addressed. This communication may contain information that is exempt from disclosure under the Freedom of Information Act, 5 U.S.C. 552 and the Privacy Act, 5 U.S.C. 552a. Addressees/recipients are not to disseminate this communication to individuals other than those who have an official need to know. If you received this communication in error, please do not examine, review, print, copy, forward, disseminate, or otherwise use the information. Please immediately notify the sender and delete the copy received. ~

-----Original Message-----

From: Simmons, Robert O CIV USARMY HQDA ARI (US)

Sent: Friday, September 15, 2017 4:54 PM

To: Baumgarten, Sara R CIV OSD USMEPCOM (US)

<sara.r.baumgarten.civ@mail.mil>

Cc: Stroud, Sandra D CIV (US) <sandra.d.stroud.civ@mail.mil>; Thompson, Nicole J CIV USARMY HQDA ARI (US) <nicole.j.thompson14.civ@mail.mil>  
Subject: RE: Army Survey Request - Baumgarten, Sara (UNCLASSIFIED)

CLASSIFICATION: UNCLASSIFIED

Ms. Baumgarten, I want to add my perspective on asking about race and ethnicity. I have been following the OMB standards on these questions since the 1990s.

Although the standard prescription is to ask first about Latino or Hispanic ethnicity and then to ask five categories of race, this is not recommended when you have such a small sample that one or more individuals could be identified. At the same time, though, you cannot use terms such as "other" or "minority." Because of this, and because a substantial proportion of people are offended by these questions, it may be best to delete them. \*If\* race and ethnicity are key to your study, and so you cannot simply delete the questions, then I believe the following single question is your best substitute for the standard race and ethnicity questions:

What is your race or ethnicity? (MARK ONE OR BOTH)

- White, not Hispanic or Latino
- Black, African American, Hispanic, Latino, Asian, American Indian, Alaska Native, or Native Hawaiian or other Pacific Islander

I am confident this question meets the OMB standards even though you will not find it on the OMB site.

V/r

Robert O. Simmons, Ph.D.

Senior Research Psychologist

U.S. Army Research Institute (ARI)

(703) 545-2332

DSN: 865-2332

-----Original Message-----

From: Thompson, Nicole J CIV USARMY HQDA ARI (US)  
 Sent: Friday, September 15, 2017 4:14 PM  
 To: Baumgarten, Sara R CIV OSD USMEPCOM (US)  
 <sara.r.baumgarten.civ@mail.mil>  
 Cc: Stroud, Sandra D CIV (US) <sandra.d.stroud.civ@mail.mil>; Simmons,  
 Robert O CIV USARMY HQDA ARI (US) <robert.o.simmons2.civ@mail.mil>  
 Subject: RE: Army Survey Request - Baumgarten, Sara

Good afternoon Ms. Baumgarten,

I apologize for our delay in getting back to you. We have been quite busy as the fiscal year comes to a close and internal Army agency surveys must be prioritized over student research. I have reviewed your survey. Given your sample size and that your survey contains no sensitive questions, I can exempt your survey but have to first address concerns about the identifiability of participants.

Are you able to reduce the number and specificity of demographic items? You currently ask 5 demographic questions which include gender and race/ethnicity along with 2 open-ended questions. Individuals that belong to smaller groups could easily be identified by aggregating responses across multiple demographic items. This is especially the case in smaller samples such as yours. For example, responses to the first 3 questions alone are likely to identify an individual in a sample of 80. I understand it is the norm in academia and academic papers to report a great deal of demographic information to describe your sample. The guidance we've received from the Privacy Office is to only collect demographic data that is essential to your research question and analytic plan.

You can always describe the demographics of the population from which you sampled without collecting demographic data from survey respondents. For example, gender, race, and perhaps age may be candidates for this revision. You should also consider reducing specificity of questions by making open-ended questions closed-ended and by collapsing response options. For example, education level responses could be reduced to 3 or 4 categories rather than 6: (1) GED/High School, (2) Certificate Program/Technical Degree/Associates Degree (3) Bachelors' Degree. Another example would be providing ranges for participants to select years of service as well as age as opposed to a write-in. We often find that responses to categories are so small researchers often end up collapsing categories for analysis.

I would also ask that you consult [http://www.whitehouse.gov/sites/default/files/omb/assets/information\\_and\\_regulatory\\_affairs/re\\_guidance2000update.pdf](http://www.whitehouse.gov/sites/default/files/omb/assets/information_and_regulatory_affairs/re_guidance2000update.pdf) in revising your race/ethnicity question. Questions about the respondent's race and ethnicity must conform to Office of Management and Budget (OMB) standards for Federal surveys.

Additionally, your informed consent collects PII as you plan to collect participant's names. This entails a host of more stringent requirements, which prevents me from being able to exempt your study. If your IRB does not require you to collect name on your consent form, I suggest 1 of 2 options. Having participants select or express "I consent" or "I do not consent" on the Consent form and/or adding a statement that answering survey questions indicates informed consent.

Please let me know if you are able to make such changes. I look forward to hearing from you.

V/R,

Nicole  
 Nicole Thompson, PhD  
 Research Psychologist

U.S. Army Research Institute

703-545-2361

nicole.j.thompson14.civ@mail.mil



## Appendix F PRETEST SCORES FOR EXPERIMENT GROUP

*Pretest Scores for Experiment Group*

Participant #	Raw Score	Percentage
1	25	83.3
2	17	56.7
3	21	70.0
4	28	93.3
5	19	63.3
6	21	70.0
7	29	96.7
8	18	60.0
9	18	60.0
10	24	80.0
11	27	90.0
12	21	70.0
13	19	63.3
14	22	73.3
15	19	63.3
16	23	76.7
17	25	83.3
18	20	66.7
19	19	63.3
20	28	93.3
21	27	90.0
22	23	76.7
23	25	83.3
24	27	90.0
25	26	86.7
26	26	86.7
27	24	80.0
28	no score reported	no score reported
29	no score reported	no score reported
30	no score reported	no score reported

## Appendix G POSTTEST SCORES FOR EXPERIMENT GROUP

*Post Test Scores for Experiment Group*

Participant	Raw Score	Percentage
1	26	86.7
2	24	80.0
3	27	90.0
4	28	93.3
5	30	100.0
6	25	83.3
7	23	76.7
8	21	70.0
9	28	93.3
10	25	83.3
11	23	76.7
12	30	100.0
13	22	73.3
14	26	86.7
15	24	80.0
16	29	96.7
17	27	90.0
18	25	83.3
19	28	93.3
20	24	80.0
21	25	83.3
22	22	73.3
23	28	93.3
24	29	96.7
25	26	86.7
26	25	83.3
27	24	80.0
28	no score reported	no score reported
29	no score reported	no score reported
30	no score reported	no score reported