LEARNING AND TEACHING STYLES OF

THEORY OF FLIGHT STUDENTS
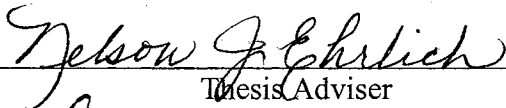
By

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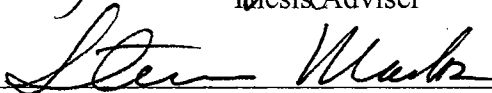Bachelor of Art
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LEARNING AND TEACHING STYLES OF

THEORY OF FLIGHT STUDENTS

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goal. In addition to that, I would also like to be thankful to my spouse, Berta. She helped

out not only at home and with the children, but also in helping me to succeed. I

profoundly dedicate this dissertation to my children Francis Victoria Martínez and

Gidbert Nicolas. Their love and warmth were supportive at all times. Finally, I would like

to share my happiness with my relatives who helped out. To Antonio Molina. Lord be

with you.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Table   Page

CHAPTER I

INTRODUCTION

Although the topic of learning styles has been substantially researched at different educational levels, it is an area that needs attention in specific areas of education. College and university faculty lacked the pedagogical competence to appropriately teach a diverse body of students. Concern with educational issues such as appropriate teaching strategies, important characteristics of students, and effective pedagogical strategies were sometimes viewed disdainfully by faculty in traditional academic programs (Wooldridge and Janhna, 1990). Learning styles research was critically needed for faculty in the selection of the most effective teaching strategy in course delivery and instruction. Studies had shown that the predominant teaching mode is lecturing which fell into one dimension "auditory learners" (Keefe, 1979, Sousa, 1997).

In the context of teaching styles, observationally, few instructors, either with the airlines, professional flight instruction service companies, or as independent instructors, had any substantial background or education in instructional theory or technique beyond having gone through the same training course they were teaching. The extent of their education in instruction theory and practice was a fifty-question written examination, required by the FAA (The Fundamentals of Instruction, 1998). Although the test questions were valid and reflected current teaching and learning theory, the results were

not reliable indicators of content knowledge in that the questions and their respective answer choices are published (as mandated by federal public law) and exam candidates simply memorized the questions and answers without understanding the theory (Hamby, 2001, p 36). This study expanded knowledge-based research in understanding the learning and teaching styles preferences of Theory of Flight AVED 1113 students in aviation education at Oklahoma State University.

Statement of the Problem

In the professional pilot degree option, the "Theory of Flight" AVED 1113 course was changed to AVED 1114 beginning with the Spring 2003 semester with the addition of one classroom session per week. A main concern, according to the undergraduate aviation coordinator in the College of Education at Oklahoma State University, Col. G. Nemecek was *"To increase the number of students eligible for endorsement to take the FAA Private Pilot Exam."* Due to the complexity of material covered, too many students were not completing course requirements under Part 141, (AIM/FAR 2002). The AVED 1113 Syllabus states, "The final exam may consist of the FAA Private Pilot Exam. Only those scoring higher than seventy two percent on each exam (I-III) will be eligible for endorsement to take the FAA/ Private Pilot Exam" (p.4).

Since aviation training differed from other scholastic instruction, Karp (1996) stated,

> "As aviation technology and the international airspace structure
>
> become more complex, aviation students must assimilate, on a

high retention and application level, an increasing amount of information. A complete understanding of this material is critical since the success of aviation training is not measured on the bottom line of a balance sheet like most other professions, but it is measured rather in safety—the protection of the lives of flight crews and their passengers" (p.217).

The students who did not take the FAA Private Pilot Exam must take the instructor's test. To determine how well they were performing in the Theory of Flight course, the GPA of students in the Theory of Flight course was analyzed using Tukey tests with Statistical Analysis System (SAS®) from 1997-2001 academic years. The findings showed that in 1997 the overall GPA was 2.97; in 1998 the students' GPA was 3.34, reaching its maximum peak; in 1999 the overall GPA for this year was 2.68; in 2000, it was 2.62; and in 2001, it was 2.68. The GPAs are depicted in Figure 1. There was an observable general decline between 1998 and the following years in which the overall GPA dropped from 3.34 to 2.68 in Theory of Flight AVED 1113.

Due to the complexity and extent of the subject matter and in light of improving teaching and learning in the aviation education training program research should be done. Previous to this study, there had been no research studies conducted or centered on course design, teacher effectiveness and students satisfaction with the Theory of Flight

AVED 1113. This study intended to identify the student learning styles and the instructor teaching styles with regard to the student training satisfaction of Theory of Flight AVED 1113 course during the fall semester, 2002. Hamby (2001) contended, "There may be a stronger relation between the pilot's expressed satisfaction or dissatisfaction with the training and the degree to which instructor teaching style matched his/her learning style." (p.15)
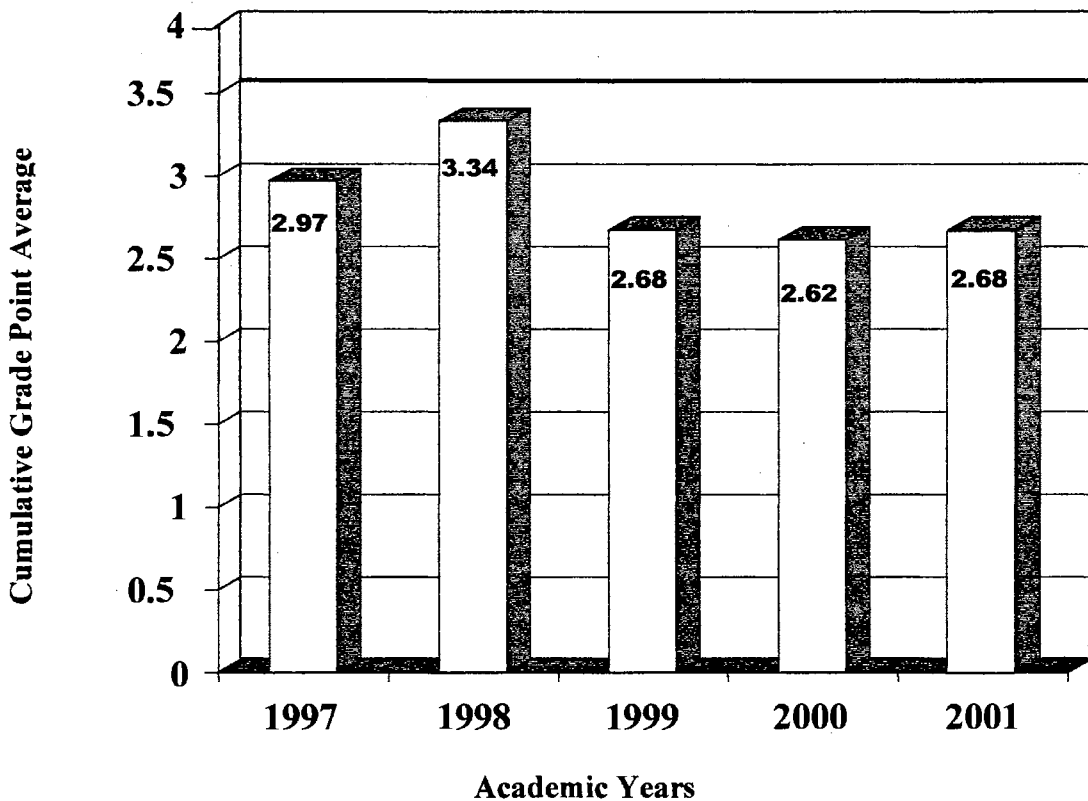
Figure 1. Theory of Flight Overall Student Cumulative Grade Point Average (GPA) 1997-2001 Academic Years

Purposes of this Study

The purposes of this study were to identify the "Theory of Flight" (AVED 1113) student learning style preferences and determine whether these learning styles vary by gender, major, and ethnicity and to determine the student satisfaction with the course and to describe how students perceive their instruction in the following categories: a) instructional techniques; b) instructor involvement; c) means of teaching; d) means of evaluation; and e) nature of instructor; and f) to determine the relationship between student learning style and the instructor teaching style with regard to the student satisfaction and instructional delivery in 'Theory of Flight" (AVED 1113). This course was offered in the fall 2002 semester at Oklahoma State University, Stillwater campus.

Research Questions

The following questions guided this study:

1. What were the learning style preferences of Theory of Flight students in the fall 2002 as measured by Kolb's Learning Style Inventory (LSI-IIa)?;

2. Did Theory of Flight students learning styles vary by major, gender, and ethnicity?;

3. How did Theory of Flight students perceive their instruction as measured by the Training Satisfaction Survey (TSS)?;

4. How did Theory of Flight students describe their training instruction in the following categories: a) instructional techniques; b) instructor involvement; c) means of teaching; d) means of evaluation; and f) nature of instructor? (Adapted by Hamby, 2001 from Wheeler and Marshal, 1986, p.86); and

5. What was the relationship between the student learning style and the instructor teaching style in regard to the student satisfaction and the instructional delivery in Theory of Flight AVED 1113?

Need for Study

There were limited or no studies of learning style and teaching style satisfaction of Theory of Flight students in pilot training and preparation at Oklahoma State University. The findings could be incorporated into the training of student pilots to enhance not only their learning process, but also academic performance with the goal of increasing the number of students signed off for the FAA written exam. Faculty and students may benefit from this study because the findings may:

- Contribute to improve the instructor's teaching effectiveness, and course design;
- Help understand how "Theory of Flight" students learn;
- Lead to better student performance;
- Lead faculty to better prepare students for lifelong learning;
- Help faculty earn greater respect from their students by demonstrating concern for their growth;
- Help students realize the school's support for their success, thus reducing transfers, dropouts, and unrest; and

- Increase the number of students in AVED 1113 that are signed off for the FAA written private pilot exam.

In light of the importance of this study, Hamby (2001) contended,

> "A pilot's satisfaction with a training experience may not necessarily be driven by his/her performance as much as the quality of training. A key factor in training quality is recognition of individual differences. The approach to pilot training has traditionally been compartmentalized with the methodology and philosophies of the airlines in one camp, the military in another, aero clubs in another, and private business flying schools in still another. The methods of these camps differ greatly." (p.13)

Definition of Terms

This section provides the definition of terms that have been used throughout this study:

Learning Style: Refers to the characteristic ways each individual collects, organizes, and transforms information into useful knowledge (Kolb, 1984).

Cognitive Learning Theory: Theories that focus on learner's internal thought processes (Eggen and Kauchak, 1999).

Teaching Style: Refers to the distinct qualities displayed by a teacher that are persistent from situation to situation regardless of the content (Conti, 1990, p. 80-81).

Experiential Learning: The experiential learning model produces a complex variety of learning processes of apprehension and comprehension, as well as intention and extension. Their synthesis leads to higher levels of learning; one or all the processes interacting simultaneously may govern these processes. Thus, the learning process is not the same for everyone (Kolb, 1984).

Convergent Learning Style: Relies primarily on the dominant abilities of abstract conceptualization and active experimentation. Convergers prefer to deal with technical tasks and problems rather than social and interpersonal issues.

Divergent Learning Style: Emphasizes concrete experience and reflective observation. Divergers view concrete experience from many perspectives to organize it into a meaningful gestalt.

Assimilation: the learning abilities are abstract conceptualization and reflective observation. This orientation is less focused on people and more concerned with ideas and abstract concepts.

Accommodation: Emphasizes concrete experience and active experimentation. Accommodators tend to solve problems in an intuitive trial and error manner, relying heavily on other people for information rather on their own analytic ability.

Limitations of the Study

The study was limited to those students enrolled in the course Theory of Flight AVED 1113 during the fall 2002 semester. The course consisted of sections 001 and 002. Each taught by a different instructor. Of the 62 students enrolled, a total of 55 students

8

participated in the study. The student learning styles were specifically measured by Kolb's (1993) Learning Style Inventory IIa and the perceived level of satisfaction and the deliver of instruction were measured by the Training Satisfaction Survey (adapted by Hamby 2001 from Wheeler and Marshal, 1986, p.86). Another limitation was that there might not have been a common understanding of the subcategories of Part II in the Training Satisfaction Survey.

Assumptions of the Study

The researcher in this study assumed that the Theory of Flight (AVED 1113) students who participated voluntarily in the study provided correct answers to these instruments: the Learning Style Inventory IIa (LSI IIa), the Training Satisfaction Survey (TSS), the Personal Demographic Questionnaire (PDQ), and the Personal Interview Guide (PIG).

CHAPTER II

LITERATURE REVIEW

This chapter considers the theoretical foundations, concepts, and perspectives of cognition and learning, Bloom's model structure, experiential learning foundations and learning styles, the differences between cognitive and learning styles, theories on adult learning, self-directed learning and models of self-directed learning, teaching styles, the and the trainer type inventory. These theoretical orientations are the basis for understanding not only the topic of learning styles, but also teaching styles. The first part of the chapter presents an overview of the literature in connection with the topic of how individuals learn and how teachers teach. The second part of the chapter includes descriptions of the research instruments such as Kolb's Learning Styles Inventory (LSI, IIa), Wheeler's and Marshal's Training Type Inventory (TTI), and Hamby's Training Satisfaction Survey (TSS) regarding the topic of learning and teaching styles in the field of aviation education found in the Digital Dissertations section of the Oklahoma State University library.

Understanding individual learning differences, on the one hand, allows faculty to organize their learning activities that involve learners in an attempt to maximize the learning potential during the learning process. On the other hand, when students are familiar with their learning styles, they may be led toward a more successful learning

when applying learning strategies to acquire and retrieve knowledge. Keeping these ideas in mind, it is possible to alter a curriculum, and faculty teaching styles to accommodate differences in ability, styles or interest among individual students to improve learning outcomes and their abilities to adapt college learning to actual work applications (Sims, 1995, p.150). In doing so, I take into account the following orientations to learning:

Cognition and Learning

Behaviorists claim that learning is a relatively enduring change in observable behavior that occurs as a result of experience (Skinner, 1953). This definition, however, fails to capture some of the complexities involved, such as whether one needs to perform in order for learning to have occurred or whether all human behavior is learned (Merrian and Caffarella, 1999, p. 249). Thus, a rather complete definition of learning would be: "Learning is a relatively change in behavior or in behavioral potentiality that results from experience and can not be attributed to temporary body states such as those induced by illness, fatigue, or drugs" (Hergenhahn, 1988, p.7). More simply, learning can be thought of as a process by which behavior changes as a result of experience (Maples and Webster, 1980, p.1). Learning as a process, rather than an end product, focuses on what happens when the learning takes place. Explanations of what happens are called "learning theories."

Cognitive learning theories (CLTs) have increased steadily during the last forty years (Bruer, 1993; Mayer, 1996; Greeno, Collins, and Resnick 1996; Merrian and Caffarella, 1999). Learning from a cognitive perspective is a change in a person's mental structures that provides the capacity to demonstrate different behaviors. Eggen and

11

structures that provides the capacity to demonstrate different behaviors. Eggen and Kauchak (1999) argue, "These mental structures include knowledge, beliefs, goals, expectations, and other components in the learner's head" (p.242). The theoretical framework (CLTs) explains learning by focusing on changes in mental processes that people use in their efforts to make sense of the world. These processes are used for tasks as simple as remembering a phone number and as complex as solving detailed math problems. They also stress the importance of mental processes, such as reasoning and focus on what is happening in the learner.

These processes allow learners to actively interpret and organize information, an underlying principle of all cognitive theories. It is important to point out that the theories of learning or orientations not only present different assumptions about learning, but also give us a conceptual framework to discuss learning and how it occurs.

As Hill (1977) puts it,

"For most of us, the various learning theories have two chief

values. One is in providing us with a vocabulary and a conceptual-

framework for interpreting the examples of learning that we

observe. These are valuable for any one who is alert to the world.

The other, closely related, is in suggesting where to look for

solutions to practical problems. The theories do not give us

solutions, but they do direct our attention to those variables that are

crucial in finding solutions." (p.261)

Information processing theories, work on memory, theories of transfer and metacognition have been the subject of recent research in how the mental processes are

involved in learning. Authors such as Piaget (1972) laid the foundation for our understanding of cognitive development. Among his most important contributions are:

1. The emphasis on qualitative rather than quantitative developmental changes in cognition (and his related "structuralist" approach to cognitive development).

2. The importance attached to the active role of the person in constructing his or her knowledge (with the implication that learning through activity is more meaningful than passive learning).

3. A conception of mature adult thought that is, formal operations.

Bloom's Model Structure

Ausubel, Bruner, and Gagne provide examples of how the understanding of these mental processes can be linked to instruction. Bloom (1950), proposed the "Taxonomy of Cognitive Domain," which has six levels from the least to the most complex, these levels are: knowledge, comprehension, application, analysis, synthesis, and evaluation. This complexity is not rigid, the individual may move among the levels during extended processes. This classification system was developed to help teachers think about their objectives they write, the learning activities they design, and the assessment they prepare. One paramount value of the taxonomy is to remind us what we want our students to learn more than knowledge of the topics we teach, and that we want conscious efforts to help students reach higher levels. The goal is more important as we move into the twenty-first century, with increased emphasis on student thinking, decision-making, and problem

solving (Eggen & Kauchak, 1999, p. 504). The Taxonomy of Cognitive Domain levels are:

Knowledge: It is defined as the mere rote recall of previously learned material, from specific facts to a definition or a complete theory. All that is required is bringing it forth in the form in which it was learned. It represents the lowest level of learning in the cognitive domain since there is no presumption that the learner understands what is being recalled.

Comprehension: This level describes the ability to make sense of the material. This may occur by converting the material from one form to another (words or numbers), by interpreting the material (summarizing a story), or by estimating future trends (predicting consequences or effects). This learning goes beyond mere rote recall and represents the lowest level of understanding. When a student understands the material, rather than merely recalling it, the material becomes available for future use to solve problems and to make decisions.

Application: It refers to the ability to use learned material in new situations with a minimum of direction. It includes the application of such things as rules, concepts, methods and theories to solve problems. The learner uses convergent thinking to select, transfer, and apply data to complete a new task. Practice is essential at this level.

Analysis: It is the ability to break material into its component parts so that its structure may be understood. It includes identifying parts, examining the relationship of the parts of each other and to the whole, and recognizing the organizational principles involved. The learner must be able to organize and reorganized information into

categories. This is a higher level because the learner is aware of the thought process in use (metacognition) and understands both the content and structure of the material.

Synthesis: It refers to the ability to put parts together to form a plan that is new to the learner. It may involve the production of a unique communication (essay or speech) a plan of operations (research proposal), or a scheme for classifying information. This level stresses creativity, with major emphasis on forming new patterns or structures. It indicates that being creative requires a great deal of information, understanding, and application to produce a tangible product.

Evaluation: It is concerned with the ability to judge the value of material based on specific criteria. The learner may determine the criteria or may be given them. The learner examines criteria from several categories and selects those that are the most relevant to the situation. Activities at this level almost always have multiple and equally and acceptable solutions. This is the highest cognitive thought in this model because it contains elements of the other levels, plus conscious judgments based on definite criteria. At this level, learners tend to consolidate their thinking and become receptive to other points of view.

The lower three levels (knowledge, comprehension, and application) describe a convergent thinking process whereby the learner recalls and focuses what is known and comprehend to solve a problem through application. The upper three levels (analysis, synthesis, and evaluation) describe a divergent thinking process, since the learner's processing results in new insights and discoveries that were not part of the original information. When the learner is thinking at these upper levels, they flow naturally from one to the other and the boundaries disappear.

Experiential Learning Theory, Foundations, and Learning Styles

John Dewey influenced educational practitioners and theorists since the writings of "Education and Experience" in 1938 at a time of conflict between traditional education and new principles in education. He made some thoughtful connections between experience and learning. Dewey (1938) postulated, "All genuine education comes about through experience" (p.13). Therefore, for learning to take place, experience must exhibit the two major principles of continuity and interaction. Numerous writers Lewin (1951), Piaget (1920), Jung (1930, Bruner (1946), Maslow (1987), Knowles (1987) Freire (1973) and others have examined how adults learn from experience.

Lewin (1951) conceptualized that learning from experience requires four different kinds of abilities:

1. An openness and willingness to involve oneself in new experience (concrete experience);

2. Observational and reflective skills so these new experiences can be viewed from a variety of perspectives (reflective observation);

3. Analytical abilities so integrative ideas and concepts can be creative from their observations (abstract conceptualizations); and

4. Decision-making and problem-solving skills so these new ideas and concepts can be used in actual practice.

The approach to learning must be guided by a holistic framework, and include a range of activities including experiential exercises, discussions, readings, and role-plays.

16

Experiential learning is a theory of life and learning that celebrates human potential. It prepares learners for life in an ever-changing society (Rainy & Kolb, 1995, p. 145). In my opinion, teachers should be able to transmit knowledge by understanding how students learn. They should have a great deal of knowledge and a profound awareness of the learning process and its implications for instruction; particularly how individuals learn and how the brain learns. The basis of learning research should be the individual learner, because that is the learning unit. However, most teaching efforts today are made at the classroom level with a relatively large group of students. Thus, while the teaching approaches are at the class (macro) level, learning must take place at the individual student (micro) level. The challenge to the teacher is to bridge this gap (Sim & Sim, p.7). The fact is that our students learn different has been drawn from the field of psychology. Thus, learning styles has been a major focus of research the last fifteen to twenty years in order to find out the best way adults learn. Although there is no common definition of learning style nor is there a unified theory in which this work is based (Stenberg, 1990). Learning style has become important because it has become culturally based and it would seem feasible that different ethnic groups with different cultural histories, different adaptive approaches to reality, and different socialization practices, would differ concerning their respective learning style (Anderson, 1998, p. 4).

The first psychologist who made some thoughtful connections between experience and learning was Dewey (1938). He postulated, "All genuine education comes about through experience" (p.13). Therefore, for learning to take place, experience must exhibit the two major principles of continuity and interaction. Numerous writers have examined how adults learn from experience. Kolb (1984) has probably been the most

influential, building his theory on the work of Dewey (1938), Lewin (1951·), and Piaget (1971). Piaget's experienced-based learning programs transformed the educational process because the programs altered the content of curriculum and the learning process by providing new ways of teaching students these subjects. In his concept of intellectual development, several factors influence learning. Durable changes in a learner result from a combination of learning, experience, and maturation (Eggen and Kauchak, 1999, p.27). According to Piaget (1952-1959), people have an innate way to understand how the world works and to find order, structure, and predictability in their existence. When the world makes sense, people are at equilibrium. In response to this need people try to organize life's experiences into coherent patterns that Piaget called schemes or mental systems that describe how people think about the world.

In his work Piaget claims that as people acquire experiences, learners' existing schemes often become inadequate so they are forced to adapt to function adequately. Thus, *adaptation* is the process of adjusting schemes and experiences to each other to maintain equilibrium. Adaptation consists of two reciprocal processes: accommodation and assimilation. *Accommodation* is a form of adaptation in which an existing scheme is modified and a new one is created in response to experience. *Assimilation* is a form of adaptation in which an experience in the environment is incorporated into an existing scheme. *Accommodation* and *Assimilation* are required to maintain equilibrium. If new knowledge is only assimilated into existing schemes, the existing schemes will not change and growth would not occur. Both the process of assimilation and accommodation and the drive for equilibrium combine to promote cognitive development in children. Piaget's distinctive contributions to experiential learning are his descriptions

of the learning process, the relationship between accommodation and assimilation and how knowledge is learned. Experiential learning is conceived differently from the behavioral theories of learning because its foundations rest on a different philosophical and epistemological base because learning is described as a process whereby concepts are derived from and continuously modified by experience (Kolb, 1984, p. 28). Kolb claims that learning is the major process of human adaptation, which is considerably broader than the concept associated with the school classroom. Learning occurs in all human settings, from schools to workplace, from the research laboratory to the management boardroom, in personal relationships and in the aisles of the local groceries. Learning encompasses all life stages, it also encompasses all life creativity, problem solving, decision-making, and attitude change that focus on one another of the basic aspects of adaptation. To Kolb, creativity research has tended to focus on the divergent (concrete and reflective) factors in adaptation such as tolerance for ambiguity, metaphorical thinking and flexibility, whereas research on decision-making has emphasized more convergent (abstract and active) adaptive factors such as the rational evaluation of solution alternatives.

Kolb pictured these capabilities as interrelated phases within a cyclical process, starting with the concrete experience and then moving through reflective observation and abstract conceptualization to active experimentation. "Thus, in the process of learning one moves in varying degrees from actor to observer, and from specific involvement to general analytic detachment" (Kolb, 1984, p. 30-31). This author postulates that the learning process is broken down into four steps, which he calls The Cycle of Learning.

The four learning modes are:

Concrete Experience (CE): This stage of the learning cycle emphasizes personal involvement with people in everyday situations. In this stage, you would tend to rely more on your feelings than on a systematic approach to problems and situations. In a learning situation you would rely on your ability to be open-minded and adaptable to change or the ability to become involved, fully, openly, and without bias in new experience. Learning from feeling;

Reflective Observation (RO): In this stage of the learning cycle, people understand ideas and situations from different points of view. In a learning situation you would rely on patience, objectivity, and careful judgment but would not necessarily take any action. You would rely on your own thoughts and feelings in forming opinions, the ability to reflect on and observe experiences from many perspectives. Learning by watching and listening;

Abstract Conceptualization (AC): In this stage, learning involves using logic and ideas, rather than feelings, to understand problems and situations. Typically, you would rely on systematic planning and develop theories and ideas to solve problems, the ability to create concepts that integrate observations into logically sound theories. Learning by thinking; and

Active Experimentation (AE): Learning in this stage takes an active form, experimenting influencing or changing situations. You would take a practical approach and be concerned with what really works, as opposed to simply watching a situation. You value getting things done and seeing the results of your influence and ingenuity. Learning by Doing. The Cycle of Learning is depicted in Figure. 2.

The Cycle of Learning
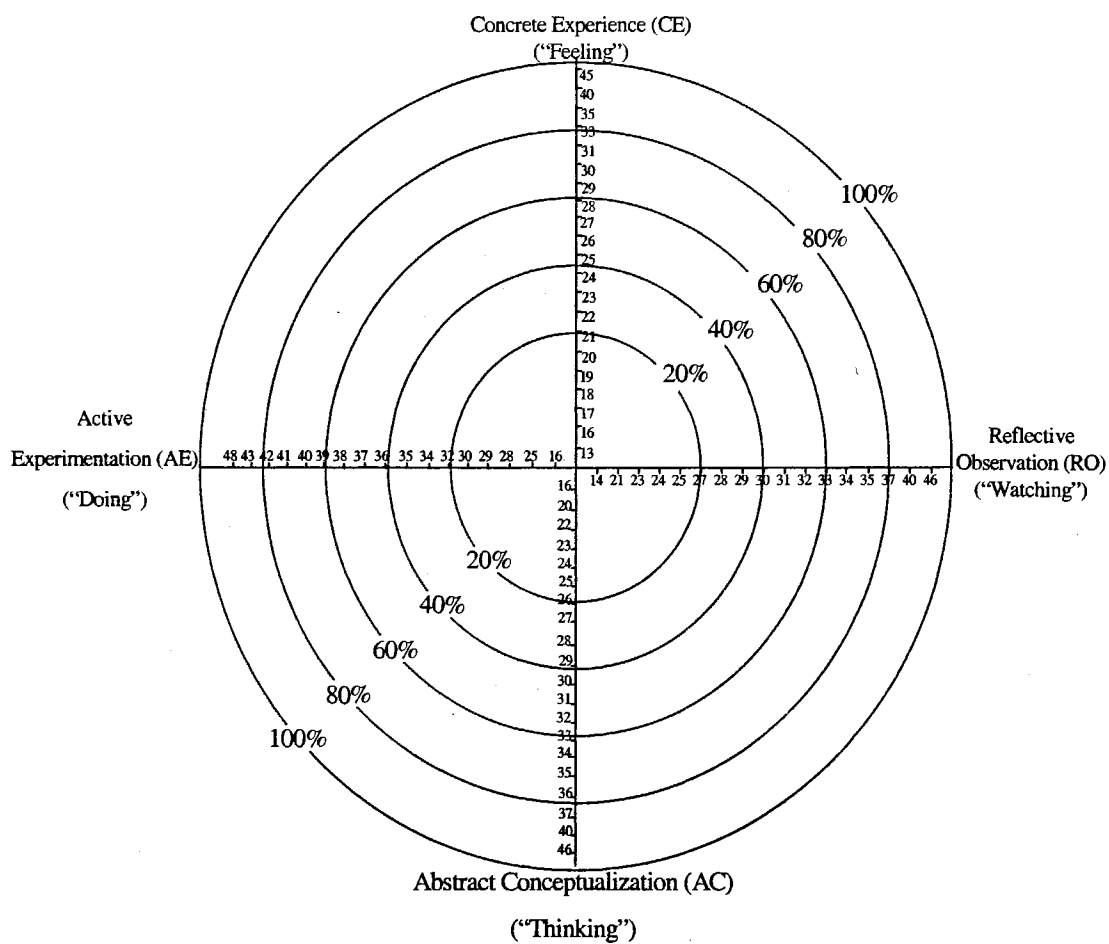
Figure 2. The Cycle of Learning (Kolb, 1984)

Source: Kolb's (1993) Learning style Inventory IIa Booklet

Kolb acknowledged the work of Dewey, Lewin, and Piaget because they saw in the scientific method the highest philosophical and technological refinement of the basic processes of human adaptation. When learning was conceived as a holistic adaptive process, it provided conceptual bridges across life situations such as school and work, portraying learning as a continuous lifelong process. In short, learning conceived holistically includes adaptive immediate reaction to a limited situation or problem was not thought of as learning but as performance. Kolb contends when performance, learning, and development are viewed from the perspectives of experiential learning theory, they form a continuum of adaptive postures to the environment, varying only in their degree of extension in time and space. Thus, performance is limited to short-term adaptations to immediate circumstance, learning encompasses somewhat longer-term mastery of generic classes of situations, and development encompasses lifelong adaptations to one's total life situation.

Based on this model, Kolb argues that concrete experience/abstract conceptualization and active experimentation/reflective observation are very distinctive dimensions, which represent opposed adaptive orientations. The abstract/concrete dialectic is of prehension, which represents two processes of grasping or taking hold of experience in the world. Kolb calls comprehension through reliance on the tangible. He calls apprehension, felt qualities of immediate experience. Conversely, the active reflective/observation is one of transformation, which is a figurative representation of experience, through internal reflection; Kolb calls *intention* or active external manipulation of the external world that he called extension. The process of prehension and transformation ties into Piaget's figurative and operative aspects of thought. With

these concepts in mind, learning is the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping experience and transforming it (Knowles, 1984, p.41).

The experiential learning model produces a complex variety of learning processes, which includes prehension processes of apprehension and comprehension, as well as intention and extension. Their synthesis leads to higher levels of learning; one or all the processes interacting simultaneously may govern these learning processes. Thus, the learning process is not the same for every one.

Kolb (1984) argues,

"The complex structure of learning allows for the emergence of individual, unique possibility-processing structures or styles of learning. Through their choices of experience, people program themselves to grasp reality through varying degrees of emphasis on apprehension and comprehension. Similarly, they program themselves to transform these prehensions via extension and/or intention. This self-programming conditioned by experience determines the extent to which the person emphasizes the four modes of the learning process: concrete experience, reflective observation, abstract conceptualization, and active experimentation (p.64)."

To assess individual learning styles preferences, Kolb designed the Learning Style Inventory (LSI). This is a questionnaire in which respondents are asked to complete 12 sentences in which each has four endings. The person thinks how well he or she would go

about learning something. The ranks are "1" to "4". Being "4" the descriptor that describes how he/she learns and best and a "1" to the sentence ending that seems least like the way he/she learns. For example,

1) When I learn $\underline{2}$ I am happy $\underline{1}$ I am fast $\underline{2}$ I am logical $\underline{4}$ I am careful

Just one word in each item suits one of the corresponding learning modes: concrete experience (feeling), reflective observation (watching), abstract conceptualization (thinking), and active experimentation (doing). The Learning Style Inventory (LSI) measures an individual's relative emphasis on each of the four modes of the learning process: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). Each human being has developed a unique learning style. Through research, it has been evident that there is a tendency to become more analytic and reflective with age. Kolb gives a description of the characteristics of the four basic learning styles based on research and clinical observation of these patterns of LSI. A positive score on the AC-CE scale indicates that the score is more abstract. A negative score on the AC-CE scale indicates that the score is more active or more reflective. Therefore, by marking the two combination scores, AC-CE and AE-RO, on the two lines in the Learning-Style Type Grid and plotting their point or interception or data point, the learner finds which of the four learning styles he/she falls into. These four quadrants are labeled Accommodator, Diverger, Converger, and Assimilator, which represent the learning styles (Kolb, 1993, p.6). This Learning-Style Type Grid is depicted in Figure 3.

Percentiles   0

Accommodator   Diverger

AE-RO   50

Converger   Assimilator

100

100   90   80   70   60   50   40   30   20   10   0

Percentiles

AC-CE
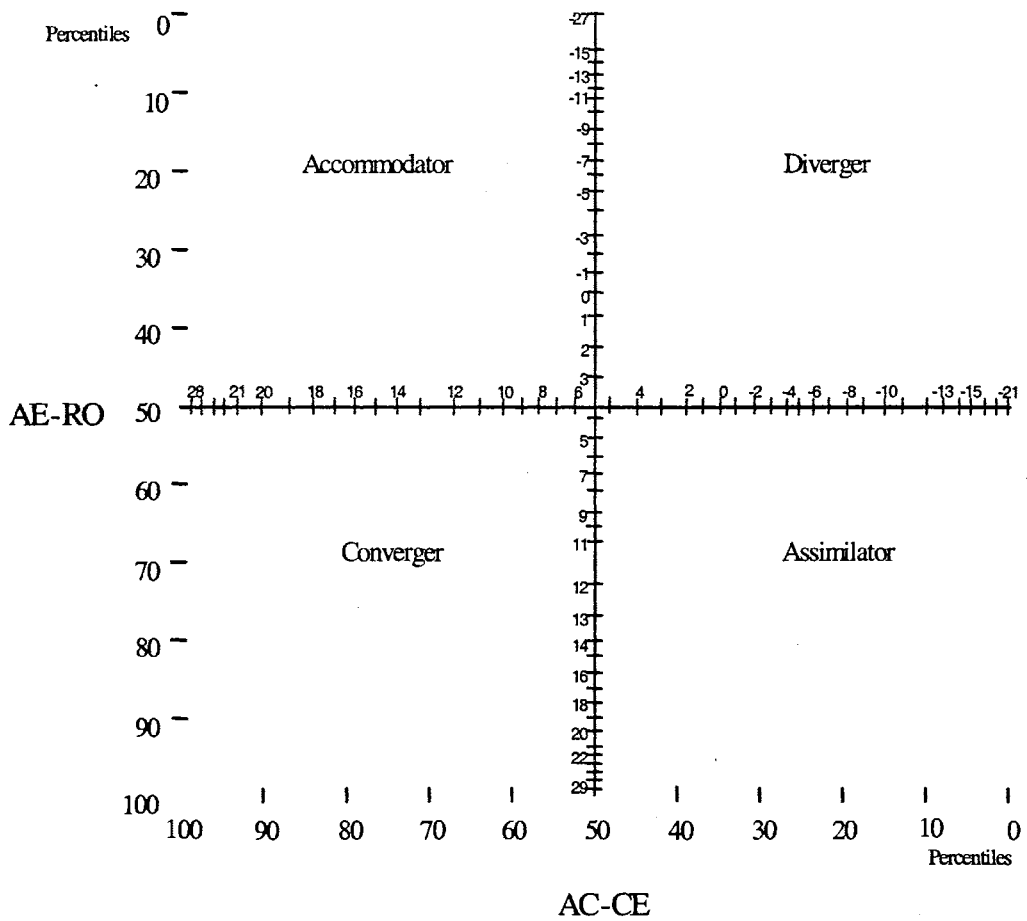
Figure 3. The Learning-Style Type Grid

Source: Kolb's (1993) Learning style Inventory IIa Booklet

25

Kolb (1984) described each learning style in the following way:

❖ The convergent learning style relies primarily on the dominant abilities of abstract conceptualization and active experimentation. The greatest strength of this approach lies in problem solving, decision-making, and the practical application of ideas. Convergent people (Convergers) prefer to deal with technical tasks and problems rather than social and interpersonal issues.

❖ The divergent learning style emphasizes concrete experience and reflective observation. The greatest strength of this orientation lies in imaginative ability and awareness of meaning and values. Divergers view concrete situations from many perspectives and to organize many relationships into a meaningful *gestalt*. This emphasis is on adaptation by observation rather than action. Divergers because people of this type performs better in situations that call for brainstorming idea sessions. People tend to be imaginative and feeling-oriented.

❖ Assimilation, the learning abilities are abstract conceptualization and reflective observation. The greatest strength lies in inductive reasoning and the ability to create theoretical models. This orientation is less focused on people and more concerned with ideas and abstract concepts.

❖ The accommodative learning style has the opposite strengths from assimilation, emphasizing concrete experience and active experimentation. Accommodators tend to solve problems in an intuitive trial and error- manner, relying heavily on other people for information rather than on their own analytic ability. People

under this orientation are at ease with people but are sometimes seen as impatient and pushy (Kolb, 1993).

In spite of the fact that there are more than thirty instruments on learning styles, Kolb's Learning Styles Inventories has proved to be useful to understand one's preferred learning style. They are unique and complex. When they affect learning they are referred to as learning styles. When the patterns are reflective in teaching they are called teaching styles. Learning styles refers to the characteristic ways each individual collects, organizes, and transforms information into useful knowledge (Kolb, 1984).

One of the predominant views of adult learning is that learning is an internal process; cognitive scientists attempt to discover the mental functions and processes that underlie observed behavior (Bruer, 1997, p.10). These mental functions and processes include, but are not limited to, the study of how people receive, store, retrieve, transform, and transmit information. Therefore, how well students process information, how well they learn, and how well they retain knowledge is directly related to the learning style of the individual (Manner, 1998, p. 390). More specifically, James and Blank (1993) define learning style as "the complex manner in which, learners most efficiently and most effectively perceive, process, store, and recall what they are attempting to learn" (pp. 47-48).

Consequently, it is imperative to point out that the experiential learning theory (ELT) describes learning as the holistic engagement of affective, perceptual, cognitive, and behavioral processes (Kolb, 1984). ELT insists that genuine learning only occurs when students are engaged in "praxis" political action informed by reflection. A fundamental aspect of praxis is the process of naming the world. Naming the world is

achieved through dialogue among equals, a dual process of enquiry and learning. Progressive education rejects the banking concept of teaching, where students are passive receptacles for deposits of fixed content from teachers. The idea is to instill critical conscientiousness in learners where the meaning of abstract concepts is explored through dialogue among peers (Freire, 1973, 1974).

Paolo Freire, (1973, 1974) also contributed to experiential learning theory (ELT). This theory supports knowledge in diversity education through a holistic model and process of learning, a structure and tool for assessing learning preferences a framework for creating effective learning environments and dialogue as a vehicle for creating psychological safety in the classrooms. ELT offers a framework that integrates personal experiences and practical application with perceptive appreciation and understanding of concepts. Unlike traditional approaches to learning, where learners are teachers and experts and students are passive recipients of the information that is disseminated; in ELT the responsibility is shared by teacher and learner; it summons all of who learners are, their intelligence, their perception, their practicality, and most importantly, their emotions.

Dialogue was key to human emancipation of the oppressed (Freire, 1974). This theory supported knowledge in diversity education through a holistic model and process of learning, a structure and tool for assessing learning preferences, a framework for creating effective learning environments, and dialogue as a vehicle for creating psychological safety in the classrooms. Learning style acknowledges diversity on the inside and highlights the relevancy of unobservable human characteristics in diversity education (Rainy & Kolb, 1995, p. 139). ELT offers a framework that integrates personal

experiences and practical application with perceptive appreciation and understanding of concepts. Unlike traditional approaches to learning, where learners are teachers are experts and students are passive recipients of the information that is disseminated; in ELT the responsibility is shared by teacher and learner; it summons all of who learners are, their intelligence, their perception, their practicality, and most importantly, their emotions (Freire, 1973, 1974).

Cognitive Styles

Cognitive styles refer to the preferred way an individual processes information; they describe a person's typical way of thinking, remembering or problem solving. Besides, cognitive styles are usually considered to be bipolar dimensions whereas abilities are unipolar (ranging from zero to a maximum value). The fact that one has specific cognitive style denotes a tendency to behave in a certain manner. Cognitive styles are usually described as a personality dimension, which influences attitudes, values, and social interaction. There are a number of cognitive styles studied over the years. Probably the most well known is field independence versus field dependence. Field independence refers to analytical, as opposed to global, fashion. Field independent personalities are able to distinguish figures as discrete from their backgrounds compared to field dependent individuals who have a greater social orientation relative to field independent personalities. Cognitive and learning styles are sometimes used interchangeably. However, they are both used to predict what kind of instructional strategies or methods would be most effective for a given individual and learning task.

Theories on Adult Learning

This segment deals with a brief description of adult learning theories or models such as Knowles's Andragogy, Cross's Characteristics of Adult Learners Model, McClusky's Theory of Margin, Knox's Proficiency Theory, and Jarvis's Learning Process. In addition to this, a brief critique of these models and an application of the ideas to a real life problem will be addressed, taking into account the efforts of these theories to explain how and why adults learn.

A theory or a model that explains how children or adults learn has always been pursued not only by educators, but also by researchers. However, there is no single theory that explains all of human learning. There is no single theory of adult learning. What we do have are a number of frameworks or models, each of which contributes something to our understanding of adult as learners (Merriam and Caffarella, 1999, p.271). Similarly, Hiemstra (1991) contends "There have been many efforts to construct theories or models that provide some explanation of how and why adults learn; some have been more successful than others. A few have drawn considerable attention in terms of being referenced or discussed in the literature (p.55). Andragogy is one or these theories or a model, which was first defined by Knowles "as the art and science of helping adults learn" (Knowles, 1980, p.43). Knowles concept of Andragogy contrasted with the concept of pedagogy, which is the art and science of helping children learn. Thus,

Andragogy is the process of helping adults to learn and to take responsibility for their own learning, by providing a climate in which the learners feel more respected, trusted, unthreatened, and cared about; by exposing them to the need to know before instructing them; by giving them some responsibility in choosing methods and resources;

and by involving them in sharing responsibility for evaluating their learning (Knowles, 1990, p.65). Andragogy is based on five critical assumptions about mature individuals that differ from the traditional assumptions on which pedagogy is based (Knowles, 1980, p. 44-45): adults are self-directed learners, adults accumulate life experiences, readiness to learn, adults are problem centered than subject centered in learning, and adults are internally motivated to learn rather than externally (Knowles, 1984, pp. 9-12). In light of the assumptions that Knowles claims, Knowles wrote that he prefers to think of Andragogy as a model of assumptions about learning or a conceptual framework that serves as a basis for an emergent theory (Knowles, 1989, p.112).

Knowles's Andragogy has provided educators a very significant series of assumptions on adult learning and a theoretical framework as adults mature. In addition to this, Knowles has provided teachers and learners a set of premises, so that teachers can make the teaching environment more meaningful and enjoyable. Kearsley (1996) summarizes what this means to instructors in practical terms: "Andragogy means that instruction for adults needs to focus more on the process and less on the content being taught. Strategies such as case studies, role-playing, simulations, and self-evaluations are most useful. Instructors adopt a role of facilitator or resource rather than lecturer or grader" (p. 98). However, Knowles has not only presented a good case for the validity of such practice (Hartree, 1984, pp. 206-207), but also empirical research must be done to validate this so-called theory.

The other models that explain adult learning are Cross's Characteristics of Adult Learners model in which Cross (1981) claims, "is a tentative framework to accommodate current knowledge about what we know about adults as learners in the hope that it may

suggest ideas for further research and for implementation." Cross also contends that some

of the assumptions of Andragogy (readiness and self-concept) can be incorporated into

the CAL construct (p.238). His model consists of two classes of variables:

- Personal characteristics, which comprises physical, psychological, and

  sociocultural dimensions; and

- Situational characteristics, which focus on variables unique to adult participants.

  For example, part-time-versus full-time learning and voluntary versus compulsory

  participation.

The CAL model claims that it has been based on research on aging, stage, and

phase developmental studies, participation, learning projects, motivation and so on. It can

also be used to stimulate research by thinking across and between categories. Her

purpose was to describe some differences between adults and children so alternative

teaching strategies could be developed. Cross synthesizes some of the assumptions of

Andragogy like "readiness and self-concept into her construct" (1981, p. 238). The CAL

framework also provides a means for thinking about the ever-changing adult in terms of

developmental stages. Notwithstanding, Merriam and Caffarella (1999, p. 279) argue that

"probably a more serious problem with the model is its focus on the characteristics of

adults, which tells us little about how adults learn or if they learn differently than children

do. Furthermore, the personal characteristics can apply to children as well as adults since

they are on continua reflective of growth from childhood into adulthood. McClusky's

theory of margin was developed in 1963. Its application was discussed in 1970 and 1971.

McClusky (1970, p. 42) claims that an adult constantly seeks balance between the

amount of energy needed and the amount available. This balance is conceptualized as a

ratio between the "load" of life, which dissipates energy, and the "power" of life, which allows us to deal with the load. The energy leftover when one divides load by power McClusky called "margin in life." However, Merriam and Caffarella (1999, p. 281) argue, "Since learning in adulthood is often a function of changing roles and responsibilities and physical and mental development, McClusky's theory can be used in understanding this link between development and learning." McClusky's model speaks to the every day events and situations of adults, it is considered a tool for counseling rather than an explanation of learning. It does not focus on learning itself, but when it probably occurs.

McClusky's claims,

"In the light of our theory, therefore, a necessary condition

for learning is access to and/or the activation of a Margin of

Power that may be available for application to the process

which the learning situation requires." (p. 170)

The Margin theory can be used as a research framework in continuing education. It can also be used as a basis for practical application. Hiemstra (1981) proposed a framework for planning educational programs based on load and power imbalances, including examples for how it could be used. Likewise, Knox's proficiency theory is about an adult's life situation. Knox (1989, pp. 383-384) claims, "adult learning is distinctive on two counts: the centrality of concurrent adult role performance and the close correspondence between learning and action beyond the educational program." Knox also defines "proficiency" as "the capability to perform satisfactorily if given the opportunity, and this performance involves some combination of attitude, knowledge,

and skill" (p.378). This model contains the following interactive components: the general environment, past and current characteristics, performance, aspiration, self, discrepancies, specific environments, learning activities and the teacher's role.

This set of interrelated concepts hinges on what Knox (1980, p. 99) defines as being the purpose of adult learning (whether self-directed or in organized programs): to enhance proficiency to improve performance. Knox (1986, p. 16) distinguishes between his notion of proficiency and competency-based learning: "Whereas competency-based preparatory education emphasizes the achievement of minimal standards of performance in educational tasks, proficiency-oriented continuing education emphasizes achievement of optimal standards of proficiency related to adult life roles." Knox believed that proficiency-oriented learning has potential for helping adults achieve at the highest possible level. In comparing proficiency ideas with the competency based-approaches, he noted, "whereas competency-based preparatory education emphasizes achievement of minimal standards of performance in educational tasks, proficiency-oriented continuing education emphasizes achievement of optimal standards of proficiency related to adult life roles" (Knox, 1986, p. 16). Promoting excellence or optimal learning is one of the most attractive features of this theory. Hiemstra (1992) suggests, "Engaging learners in conversations, promoting self-reflection, and asking learners to develop learning plans that show how proficiencies will be increased are other possible techniques." Unfortunately, Knox's theory is not well known by adult educators, perhaps because its publication has been in sources outside the field. Its emphasis on performance would also appear to limit its application to learning that can be demonstrated by better performance.

More problematic is the model's mixture of learning, teaching, and motivation (Merriam and Caffarella, 1999, p. 283).

The last theory summarized in Merriam and Caffarella (1999) is Jarvis's learning process, which according to these authors, begins with an adult's life situation. Jarvis claims, "all experience occurs within a social situation, a kind of objective context within which one experiences life: Life may be conceptualized, as an ongoing phenomenon located within a sociolcultural milieu which is bounded by the temporality of birth and death. Throughout life, people are moving from social situation to social situation; sometimes in conscious awareness but in other occasions in a taken-for-granted manner" (Jarvis, 1984, p. 64). Jarvis's model starts with a person moving into a social situation in which a potential learning experience occurs. From an experience, there are nine different routes that a person might take, some of which result in learning and some of which do not. Presumption, nonconsideration, and rejection do not result in learning. The six other responses: preconscious, practice, memorization, contemplation, reflective practice, and experimental learning represent six different types of learning. The nine responses form a hierarchy. The first three are nonlearning responses, the second three are nonreflective learning, and the final three are reflective learning. These last three Jarvis (1987, p. 27) says are the "higher forms of learning". Unlike the other theories described above, Jarvis does deal with learning itself. The thoroughness of his discussion, which concentrates on explaining the responses one can have to an experience, is strength of this model (Merriam and Caffarella, 1999, p. 283).

The theories or models on learning described briefly above, Knowles's Andragogy is the most common model that provides a framework on learning in

adulthood. Besides, it has provided a set of assumptions widely used in adult education.

Andragogy, or self-directed learning, is based on the premise that learning should be

meaningful and enjoyable for the adult learner and provided in an atmosphere that is

supportive, fosters cooperation, and allows choices in the development of course

objectives (Konicek, 1996). In an attempt to differentiate adult learners from children

Andragogy "the art and science of helping adults learn" based on Knowles's assumptions

as opposed to pedagogy "helping children learn" identifies conditions of learning for

adults, together with associated principles of teaching. However, this theory does not

explain empirically the validity of its assumptions or its usefulness in predicting adult

learning behavior (Merriam and Caffarella, 1999, p. 276). Meta-analyses of research and

theory conducted by Australian, Canadian and American authors have raised questions

about the political dimension to self-directedness and the need to study how deliberation

and serendipity interest intersect in self-directed learning projects (Collins, 1988; Candy,

1991; Brockett and Hiemstra, 1991). We are still struggling to understand how various

factors - the adult's previous experience, the nature of the learning task, and domain

involved, the political ethos of the time, - affect the decision to learn in this manner. We

also need to know more about how adults engaged in self-directed learning use social

networks and peers support groups for emotional sustenance and educational guidance

(Brookfield, 1995, p.34).

Merriam and Caffarella (1999) argue that more than the other theories, Jarvis's

model does deal with learning itself. The thoroughness of his discussion, which

concentrates on explaining the responses one can have to an experience, is strength of the

model. These responses encompass multiple types of learning and their different

outcomes, a refreshingly comprehensive view of learning. Furthermore, his model situates learning within a social context; learning is an interactive phenomenon, not an isolated internal process (Merriam and Caffarella, 1999, p. 278). There is some question, however, as to whether his model is exclusively to adults. Although it was constructed through research with adult learners and has been used by Jarvis with adults in various setting, he himself suspects that "it is as valid for children as with adults.... There may be a relationship between the frequency of use of these different types of learning and the age of the learner, but no evidence exist at present that might verify this" (Jarvis, 1987a, pp. 35-36). Finally, all of the models or frameworks presented here have a potential value because they organize a set of knowledge concerning adult involvement with learning. In fact, in relation to Cross's CAL, Knox's proficiency, and McClusky's theory of margin,

Hiemstra (1992) adds, "There is a considerable utility in their models and theories. Adults can see "practical applications in what three authors propose. For example, students can be helped to use their ideas in promoting personal change. Some people when they understand what Cross, Knox, or McClusky have described can immediately begin applying the concepts to their own situation. Thus, there is value in having these models accomplish such ends even if they are not fully developed" (p. 122). Similarly, Andragogy helps educators focus more on the process by which adults take control of their own learning and less on the content being taught. Therefore, some instructional strategies such as role- playing, simulation, and discussions should be considered when teaching adults (Merriam and Caffarella, 1999, p. 293).

In summary, a coherent and empirically tested theory does not exist and, because of the diversity of theoretical orientations, probably never will. The various theories so

far developed are to an extent complimentary, as the central hypotheses they address tend to be concerned with different aspects of learning. A pluralistic and multidisciplinary perspective on adult learning is recommended (Van Der Kamp, 1992, p. 193).

Self-Directed Learning

Self-directed learning focuses on the process by which adults take control of their own learning. In particular, how they set their own goals, locate appropriate resources, decide on which learning methods to use and evaluate their progress (Brookfield, 1995).

In addition, Thomas and Harri-Augstein (1985. pp.xxvii-xxviii) have defined the concept of self-directed learning in the following way: "Self-organization consists in the ability to converse with oneself about one's own learning processes and to observe, search, analyze, formulate, review, judge, decide and act on the basis of such creative encounters."

Self-directed learning usually implies that learners take responsibility for their learning processes, such as command of goal-setting, instructional design or evaluative procedures. Thus, on the teachers' part, the objective of conducting self-directed learning is to help learners become skillful in those processes independent of teachers. On the learners' part, in addition to attaining their learning goals, the objective of self-directed learning is to gain a sense of autonomy during and after their learning processes. Thus, the eventual goal of self-directed learning is the learner becomes a teacher of herself or himself.

The idea of self-directed learning is particularly associated with the work of Tough, who carried out or inspired a body of empirical research in the 1970's and 1980's by individual adults in the form of learning projects, largely outside of the influence of formal educational institutions. He defined a learning project as a highly deliberate effort to gain and retain certain knowledge or skill, and set an arbitrary minimum length of seven hours. From his studies, Tough (1961) estimated that the average or median adult conducted 8 learning projects lasting 700 hours in total in a year. Of these, two thirds were planned by the learner and only one fifth by a professional educator. The most common motivation for learning was some anticipated use or application of knowledge or skill, with less than 1 percent of projects being undertaken for credit. He found that "highly deliberate efforts to learn take place all around you. The members of your family, your neighbors, colleagues, and acquaintances probably initiate and complete several learning efforts, though you may not be aware of it" (Tough, 1971, p. 3).

Although the research of Tough and his associates has been influential, it has also been criticized. First, because the study focused on middle class respondents; second, the tendency to reduce their experiences to quantitative measures rather than exploring the quality of the learning engaged in; third, the concentration on the individual as opposed to their broader social context; lastly, the lack of attention given to the implications of the research findings (Brookfield, 1984). In addition to this, researchers have attempted to propose theoretical models of self-directed learning; they have linked the concept with ideas such as critical reflection, internalized learning conversations, and experiential learning (Boud et al. 1985; Candy 1987).

However, recent studies have looked at how adult educators actually perform better as facilitators for those engaged in self-directed learning and how these practices might be built into educational programs (Boud et al 1992). The idea of self-directed learning has attracted researchers to articulate theoretical models. For example, critical reflection and internalized learning conversations; as well as experiential learning (Boud et al. 1985; Candy 1987).

The goals of self-directed learning are grouped into three major aims:

1. To enhance the ability of adult learners to be self-directed in their learning,

2. To foster transformational learning as central to self-directed learning, and

3. To promote emancipatory learning and social action as an integral part of self-directed learning.

The assumption with the first goal is that job the teacher is to help learners whether they are learning on their own or in formal learning programs, to be able to plan, carry out, and evaluate their own learning. If the learning process is independent, the job of educators might be to provide assistance to individuals or groups of learners in locating resources or mastering alternative learning strategies. The learners themselves would seek out this assistance, perhaps in community learning centers or through learning technologies. This goal is grounded on the assumptions of humanistic philosophy, which posits personal growth as the goal of adult learning.

The second goal deals with fostering transformational learning found in the work of Mezirow (1985) and Brookfield (1985, 1986). There is no such thing as a self-directed learner, except in the sense that there is a learner who can participate fully and freely in the dialogue through which we test our interests and perspectives against those of others

and accordingly modify them and our learning goals (Mezirow, p.27). Similarly, Brookfield (1985p.38) contends, "The most complete form of self-directed learning occurs when process and reflection are married in the adult's pursuit of meaning".

The third goal is to provide emancipatory learning and social action as an integral part of self-directed learning. Collins (1996, p. 119) is his study emphasizes the importance of having an "unequivocal focus of emancipation as a core concern." Participatory research methods should be used to foster democratic and open dialogue about self-directed learning, and ethical and political concerns about self-directed learning should be a part of this dialogue. To foster the study of this critical practice of self-directed learning, Collins suggests that researchers use critical theory and interpretive and participatory research approaches.

In addition to this, Brookfield (1993, p.227) asserts, "That any authentic exercise of self-directedness requires that certain political conditions be in place." Collins argues, specifically, that having learners control over all educational decisions needs to be a consistent element of self-directed learning. Therefore, educators of adults in formal and nonformal settings need to shift to learners as much control as possible in the learning process.

Models of Self-Directed Learning

The fact that self-directed learning is seen as a process of learning, empirical research, and concepts have come up with three types of models known as:

1. Linear,

2. Interactive, and

3. Instructional.

Tough (1971) was the first who proposed a linear model of self-directed learning; then Knowles (1975) described self-directed learning in six major steps: (1) climate setting, (2) diagnosing learning needs, (3) formulating learning goals, (4) identifying human and material resources for learning, (5) choosing and implementing appropriate learning strategies, and (6) evaluating learning outcomes.

Unlike this linear position, some authors argue this learning process is well planned or linear in nature, Spear (1988), Cavaliere (1992), Brockett and Hiemstra (1991). There are factors such as the context of learning, the environment where people act, cognitive process, and personality of learners that interact for self-directedness to take place. Spear (1988) found that the process of self-directed learning could be reduced to seven principal components: Knowledge 1) residual knowledge, and 2) acquired knowledge; Action 3) directed action, 4) exploratory, 5) fortuitous action; and Environment 6) consistent environment and 7) fortuitous environment. He concluded that self-directed learning projects do not generally occur in a linear fashion.

Consequently, one cluster does not bear any relation to the next cluster. Rather, information gathered, through one set of activities (one cluster), is stored until it fits in with other ideas and resources on the same topic gleaned from one or more additional clusters of activities. A successful self-directed learning project is one in which a person can engage in a sufficient number of relevant clusters of learning activities and then assemble these clusters into a coherent hole (Spear 1988 p.217).

Cavaliere (1992) proposed an interactive model as a result of her case study of the Wright brothers learned to fly. She identified five specific stages of their learning project:

1) inquiring (a need to solve a problem, 2) modeling (observing similar phenomena and developing a prototype model), 3) experimenting and practicing (continuous refinement and practice with the model), 4) theorizing and perfecting (perfection of their skills and product), and actualizing (receiving recognition for the product of their learning efforts). Within each of these steps, four "repetitive cognitive processes (goal setting, focusing, persevering, and reformulation) occurred with a clearly identifiable breakpoint (between stages), preceded by frustration and confusion on the part of the Wright Brothers" Cavaliere (1992, p. 53).

Brockett and Hiemstra (1991) proposed the Personal Responsibility Orientation model that provides a new framework for what they term self-direction in learning, which comprises "both instructional method processes (self-directed learning) and personality characteristics of the individual learner (learner self-direction)." In the instructional process dimension, learners assume primary responsibility for planning, implementing, and evaluating their learning experiences. The role of the facilitator is important here because he/she must possess skills to meet learners' needs and be able to choose instructional methods and evaluation strategies. Another dimension is related to the personality characteristics of individual learners where they assume responsibility for their own learning. These authors also regard the importance of the context or social milieu in the self-directed learning process.

The model of self-directed learning, the Personal Responsibility Orientation (PRO), focuses on: first, human nature is basically good; second, individuals possess virtually unlimited potential for growth; and third, only by accepting responsibilities for one's own learning is it possible to take a proactive approach to the learning process

43

(Brockett and Hiemstra, 1991, pp.26-27). By accepting responsibility and being proactive take into account: personal autonomy and free will to make individual choices. These ideas come from the tenets of humanistic philosophy, which also influenced Knowles' work (1975, 1980).

Danis (1992) grounded her model in the notion of what she terms self-regulated learning, which refers to the various process components of the learning cycle and not to the internal cognitive aspects. In building this model Danis synthesized relevant data from research in self-directed learning, self-instruction, and study strategies. Similarly, Garrison (1997) designed a multidimensional and interactive model of self-directed learning, which was grounded in a collaborative constructivist perspective that integrates self-management (contextual control), self-monitoring (cognitive responsibilities), and motivational (entering and task) dimensions to reflect a meaningful and worthwhile approach to self-directed learning (p.18).

As far as the instructional models are concerned, two models represent the theoretical framework that instructors could use to integrate self-directed methods of learning into their programs and activities: first, Grow (1991) proposed the self-directed learning model grounded in the situational leadership model of Hersey and Blanchard (1988). It comprises four distinct stages of learners in which Grow outlines possible roles for the teacher or facilitator. Grow argues that good teachers individualize their teaching strategies to match the learner's stage of self-direction and allow the students to become more self-directed in their learning. Therefore, integrating self-directed learning as a way to organize learning experiences; and second, Hammond and Collins (1991) designed a

model that outlines emancipatory learning and social action as a central tenet of self-directed learning.

They grounded their work in studies of critical pedagogy, popular education, and participatory research; these authors have outlined seven components to assist learners in formal settings. In these tenets learners are responsible for: 1) building a cooperative climate, 2) Analyzing and critically reflecting on themselves and the social, economic, and political contexts in which they are situated, 3) generating competency profiles for themselves, 4) diagnosing their learning needs within the framework of both the personal and social context, 5) formulating socially and personally relevant learning goals that result in learning agreements, 6) implementing and managing their learning, and 7) reflecting on and evaluating their learning. This model stresses the purposeful inclusion of the critical perspective through the examination of the social, political, and environmental contexts that affect their learning and the development of their personal and social goals. Their "ultimate goal is to empower learners to use their learning to improve the conditions under which they and those around them live and work" (p.14).

Another aspect of research is self-directedness or characteristics of the learner. Learning in adulthood means becoming more self-directed and autonomous (Brockett and Hiemstra; Candy 1991; Knowles 1980). In fact, one of knowles's tenets of Andragogy is that mature "adults have a deep psychological need to be generally self-directing." In light of this tenet Brockett and Hiemstra (1991) support this assumption because they see a link between learner self-direction, which they define as characteristics of learners that predispose them toward taking primary responsibility for their own learning and a positive self-concept. Based on research Brockett argues that this link between learner

self-direction and a positive self-concept is one of the two or three major findings that I can glean from this literature.

The concept of self-directed readiness is also discussed in the literature about self-directed learning. It consists of a complex of attitudes, values, and abilities that create the likelihood that an individual is capable of self-directed learning. She argues that there are some psychological qualities involved in readiness of self-directed learning. They are: initiative, independence, and independence, and persistence in learning; acceptance of responsibility for one's own learning; self-discipline; a high degree of curiosity; a strong ability to learn independently; enjoyment of learning; a tendency to be goal-oriented; and a tendency to view problems as challenges rather than obstacles. These qualities undergird her Self-Directed Readiness Scale (SDLRS), which is the most often used in quantitative measure in studies of self-directed learning. However, some caution with the results is being argued due to the reliability and validity of this instrument

The other attribute that is related to self-directed learning is autonomy that is discussed at the contextual level is the concept of autonomy. Chene (1983) defines three major elements that describe an autonomous learner: independence, the ability to make choices, and the capacity to articulate the norms and limits of a learning society. Although autonomy does not mean context free, there is a relationship between the personal and situational variables that must come into play for a person to be autonomous in certain learning situations. Four major variables appear to have the most influence on whether individual adult learners exhibit autonomous behavior in learning situations, their familiarity with their subject matter, their sense of personal competence as learners,

and their commitment to learning at this point in time (Merriam and Caffarella, 1999, p. 310).

Candy et al (1991) asserts that research in self-directed learning has been slow to evolve to some extent because of insufficient critical dialogue and use of the theory and models that have been developed, continual disregard of the observations of previous researchers about recommendations for future research, and predominant use of the quantitative or positivist paradigm in data based studies. Although there is not a consensus on a definite definition of self-directed learning because of unique roots and it is considered a multifaceted concept, there is a need in the use of diverse research paradigms to move beyond what it has been found. Finally, self-directed learning has resonated in North America as well as in Europe. In a recent publication of the book "European Views of Self-directed learning: Historical, Conceptual, Empirical, Practical Vocational" about self-directed learning, which contains the introduction and nine chapters by leading educators, representing nine European countries: Switzerland, France, Belgium, the Netherlands, the United Kingdom, Portugal, Italy, Greece, and Germany.

All these countries except Switzerland see self-directed learning in the future of education and recognize a need to share their ideas and experiences. However, there isn't a consensus either, each country has taken a different route to understanding self-directed learning, and some have embracing the concepts longer than others. Thus the views presented in the book talk about the complexity of the concept. The authors requested to structure their discourse about three parameters: (a) an individual learner's disposition and activities characterizing self-directed approaches; (b) relevant cultural goals or

educational policy; and (c) the social, historical, and educative environment conditions influencing self-directed learning. To Switzerland's view self-directed learning is "the current issue. In North America as well as in Europe self-directed learning seem to embrace the opportunities and advantages in terms of training programs, education, distance learning classes and other learning approaches and a potential for research.

Teaching Styles

Teaching effectively is considered to be a challenge among teachers. The development of teaching skills becomes an important tool in order to carry out the transmission of knowledge to our students. The ultimate goal of the teaching profession is learning. Though there is no a real definition of what effective teaching is, nor just one method that makes it successful. In order for learning to take place, one should involve our students through active learning or collaborative tasks to enable them acquire that new knowledge. One should also keep in mind the components of effective teaching.

When we accept that people are really different, we must also accept that teachers will certainly bring their own uniqueness in the way they teach. We call this "teaching style" …and a teacher's teaching style governs the reality of…his or her classroom (Guild & Garger, 1985, p. 36). Teaching styles, then, are the overall patterns that provide general direction to a person's way of teaching; and every teacher has his or her unique style (Warren, 2000, p. 39). In light of these definitions, teaching styles is very particular to an individual. In his definition of teaching styles Conti (1990, p. 80) writes, "Teaching style refers to the distinct qualities displayed by a teacher that are persistent from situation to situation regardless of the content." The author also argues that the term

teaching style is broader than the term teaching strategy because teaching strategies are employed into accomplish a specific instructional objective so a teaching style cannot be determined by looking at one isolated action of the teacher.

To identify one' style, the total atmosphere created by the teacher's views on learning and the teacher's approach to teaching must be examined (Conti, 1990, p.81). Conti claims that much educational practice can be categorized as either teacher-centered or learner-centered. The former approach is currently the dominant one in North America and it is closely related to the ides of B. F. Skinner. This approach to learning assumes that learners are passive and that they become active by reacting to stimuli in the environment while the latter is implemented in the classroom in several ways; learning is defined as a change in behavior. Therefore, acceptable forms of the desired behavior are defined in overt and measurable terms in behavioral objectives. Outcomes are often described as competencies, which the student must display after completing the educational activity (Conti, 1990, p.81).

To assess one's teaching style Conti devised the Principles of Adult Learning Scale (PALS). High scores on the PALS indicate support for a learner-centered approach to teaching. Low scares reveal support for a teacher-centered approach to teaching. Scores in the middle range disclose an eclectic approach, which draws on behaviors from each extreme (Conti, 1990, p. 83). Similarly, there are other instruments used to identify teaching styles. Sieber and Wilder (1967) described four teaching styles: content-oriented, control-oriented, discovery-oriented, and sympathy oriented, which are based on two dimensions of authoritative versus permissive and high versus low emphasis on

subject matter. Wheeler and Marshal (1986) developed the Trainer Type Inventory (TTI) based on Kolb's experiential learning cycle.

This inventory contained four basic teaching styles: Listener, Director, Interpreter, and Coach. Because this instrument measures teaching styles based on Kolb's Adult Learning Cycle Hamby (2001) devised an instrument called the Training Satisfaction Survey (TSS) based on the Trainer Type Inventory. The TSS contains descriptors taken verbatim from Wheeler's and Marshal's TTI in the absence of an appropriate instrument to measure student perception, which the authors had previously validated. TSS was adapted from Darkenwald's and Valentine's (1986) Adult Classroom Environment Scale (ACES) to measure adult student's perception of the classroom environment. Another instrument that appears to have some relevance to pilot-trainees involved in aviation training, which is Burdsal's and Bardo's (1986) Students Perceptions of Teaching Effectiveness (SPTE), and Tuckman's (1970) Student Perception of Teaching Style (SPOTS) designed to measure student perceptions of teacher attitudes toward students, work load, value of the course to the students, course organization and structure, grading quality, and level of learning materials. Both the SPOTS and SPTE are validated measures of students' satisfaction. However, it did not contain a question that could measure the overall satisfaction of the training experience. Cooper and Miller (1991) employed a questionnaire in which they asked the students to rate only two statements along a five point Liker scale. They concluded that learning style-teaching style congruence in the context of the Myers-Briggs Type Indicator predicted levels of satisfaction with the course and instructor (Hamby 2001).

50

<u>The Training Satisfaction Survey</u>

The TSS was adapted from the aforementioned instruments with some additions in order to measure student perception of satisfaction with an aviation training experience. TSS employs a Liker scale to measure subject perception of specific items of interest. For example: My learning experience with Theory of Flight course was:

Very Satisfying Satisfying Neutral Dissatisfying Very Dissatisfying

Part II of the TSS contains items in ipsative form asking the respondents to identify the word or phrase that best described his/her perception of the instructional delivery in five areas: Instructional Techniques, Instructor Involvement, Means of Teaching, Means of Evaluation, and Nature of Instructor. For example:

In each of the five sets below (A through E) circle one word phrase that best describes your perception of the training instruction you received in the course "Theory of Flight" (AVED 1113).

Nature of Instructor: Coach Listener Interpreter Director

There was a complete description under each descriptor to make the judgment easier for the participant. These items are designed to gain further insight into teaching style of the instructor who delivered the training to the pilot-trainee respondent (Hamby 2001, p. 68).

<u>The Trainer Type Inventory (TTI)</u>

The Training Type Inventory was designed in the belief that trainers train others most comfortably using or emphasizing their own preferred learning styles. The authors hypothesized that, for example, trainers who are Abstract Conceptualizers probably would feel very comfortable integrating theories with events, making generalizations, and interpreting, and would be most effective in training other Abstract Conceptualizers. Such trainers could grow and develop most by expanding theirs skills to include methods that would appeal to the Active Experimenters and Concrete Experiencers in training programs, thus addressing the preferred learning styles of a greater number of trainees. Such recognition has proved to be an exciting and valuable experience for many trainers. Further value is found when the respondents share insights, training techniques; and advice with other trainers who want to build skills in areas outside their current repertoires or "comfort ranges" (Wheeler and Marshal, 1986, p. 89-90)

According to Wheeler and Marshal (1986) The Trainer Type Inventory describes four training approaches, categorized as "Listener:' "Director," "Interpreter," or "Coach." The Listener trains the Concrete Experiencer most effectively and is very comfortable in the activity and publishing steps of the Experiential Learning Cycle. The Director obtains the best results from the Reflective Observer and usually is very comfortable during step 3, processing (particularly in helping trainees to make the transition from "How do I feel about this?" to "Now what? "). The Interpreter trains in the style favored by the Abstract Conceptualizer (step 4, generalizing), and the Coach trains in the style favored by the Active Experimenter (step 5, applying). These relationships are depicted in Figure 2.

The Experiential Learning Cycle

Step 1. Experiencing
(Activity, doing)

THE ADULT LEARNING CYCLE

Experiencing

Step 5. Applying
(Planning more
effective behavior)

Step 2. Publishing
(Sharing reactions
and observations)

Applying

Processing

Generalizing

Step 4. Generallizing
(inferring principles
about the "real world")

Step 3. Processing
(Discussing patterns
and dynamics)

Figure. 4 Trainer Types with Congruent Learning Styles

A Brief History of the TTI

Wheeler and Marshal (1986) claimed that the Trainer Type Inventory has been

administered in conjunction with Kolb's (1976) Learning Style Inventory to more than

five hundred respondents, including participants in public workshops and seminars;

undergraduate and graduate academic classes; and workshops conducted in-house for

business; industry, and service organizations. In addition, the TTI alone has been

administered to participants in programs such as American Society of Training and

Development (ASTD) workshops and has been used

numerous times by both authors in public training events, in programs conducted in-house for a casualty insurance company, and in private consulting work. Respondents have found the instrument to be valid and useful, particularly as a tool for identifying. In addition, some I revisions have been made to the instrument to reflect the contributions of respondents (Wheeler and Marshal, p. 90-91).

Previous Studies on Learning Style and Teaching Style

In aviation education, several authors have studied learning style and teaching style. To put it briefly, at Oklahoma State University, Kreienkamp (1994) studied if a relationship existed between the learning style similarity of student pilots and their flight instructors, and the amount of time it took to fly solo in the aircraft for the first time and also to pass the private pilot practical (flying) examination also called the "checkride." He found that the hypothesis that student pilots who are matched with their flight instructors on the basis of perceptive similarity, as measured by a learning style inventory (MBTI), would learn to fly in less time was rejected. This author concluded that no significant difference in matched or partially matched students and instructors, or by matching instructional techniques to learning style (Kreienkamp, 1994, p. 53).

Kanske (1999) also conducted at Oklahoma State University his doctoral dissertation entitled "Learning Styles of U.S. Air Force Pilots." The data of his study showed that 44.2% of the pilots in the study preferred the Convergent style and a further 23.6% preferred the Assimilator learning style. Thus, a total of 67.8% of the pilots preferred the Abstract Conceptualization mode of learning, whereas less than a third of

the pilots preferred Concrete Experience with 15.9% Accommodators and 16.3% Divergers. The author concluded that several reasons explained the identification of convergence as the primary learning style of pilots qualified in United States Air Force aircraft because of the predictive nature of Kolb's Learning Style Inventory, which suggests that convergence is preferred by those in technical and specialists field (Kolb, 1985). Concerning the Assimilative learning style, Kanske concluded that this style is included as a secondary learning style because of the relationship convergent and assimilative learning styles have relative Concrete Experience and Abstract Conceptualization.

Hamby (2001) investigated at the University of Maryland the "Learning and Teaching Styles of Airline Pilots" in which satisfaction of pilot-trainees with each of four distinct airline training experience was measured for the perceived effect of individual learning style, demographic data, and instructional delivery using the 2000 Aviation Training Survey (ATS). The author concluded that the statistical analysis showed that a pilot-trainee's learning style, as measured by Kolb's LSI, had no significant effect on the subject's satisfaction with any of the four training programs. However, a subject's perception of instructional delivery did have significant effects. The author concluded that deference to instructional delivery had a significant effect on the satisfaction with a training experience and that this satisfaction could be a factor in a pilot's desire to remain with the company.

CHAPTER III

METHODOLOGY

This chapter describes the methods that were used to carry out the study. The researcher made use of mixed quantitative and qualitative research methods to better understand the phenomena. The key questions that guided the study were stated as follows:

1. What were the learning style preferences of Theory of Flight students in the fall 2002 semester as measured by Kolb's Learning Style Inventory (LSI-IIa)?

2. Did Theory of Flight students learning styles vary by major, gender, and ethnicity?

3. How did Theory of Flight students perceive their training satisfaction as measured by the Training Satisfaction Survey (TSS)?

4. How did Theory of Flight students describe their training instruction in the following categories: a) instructional techniques; b) instructor involvement; c) means of teaching; d) means of evaluation; and f) nature of instructor? (Adapted by Hamby, 2001 from Wheeler and Marshal, 1986, p.86)

5. What was the relationship between the student learning style and the instructor teaching style in regard to the student satisfaction and instructional delivery with the training process in Theory of Flight AVED 1113?

<u>Data Analysis</u>

Theory of Flight (AVED 1113) was offered in the fall semester 2002 at Oklahoma

State University, Stillwater campus. The data were gathered using the Learning Style

Inventory (LSI-IIa), the Training Satisfaction Survey (TSS), and the Student

Demographic Questionnaire. The first instrument, the Learning Style Inventory (LSI-IIa)

and the Student Demographic Questionnaire addressed question 1 and 2 (see Appendix A

and B). The second instrument, the Training Satisfaction Survey (TSS) addressed

question 3 (see Appendix C). Data were analyzed using "descriptive statistics" to

describe basic features of the data and provide summaries about the samples and the

measures. Descriptive statistics describes what is or what the data show (Trochim, 2002).

Frequency distributions, means, percentages, overall rankings, and Chi-Squared were

used. To analyze the data, the researcher used the Statistical Analysis System (SAS®)

software version 8.0.

<u>Quantitative Instrumentations</u>

The researcher identified and described the learning styles preferences profile of

the "fall 2002" Theory of Flight students. In that regard, Kolb's Learning Style Inventory

IIa was used to identify and describe the student learning style preferences. Kolb's LSI-

IIa (Kolb, 1986) had been shown to be a valid and reliable instrument to measure learning

styles. The second instrument was the Training Satisfaction Survey (TSS), and the third

one was the Student Demographic Questionnaire. The instrument Training Satisfaction

Survey had been adapted and used to identify perceived satisfaction with instructional

delivery in a doctoral dissertation entitled "Learning and Teaching Styles of Airline

Pilots" (Hamby 2001). This author used the TSS with six items for four different training

program described as follows: The first item used a Likert scale to identify the

respondent's satisfaction with the program. This item was scored as ordinal data in that

the greater the level of satisfaction, the higher the score. For example, Very Satisfying=5,

Satisfying=4, Neutral=3, Unsatisfying=2, Very dissatisfying=1. The next five items used

descriptive terms or phrases to identify the respondent's perception of the nature of the

delivery of the instruction in each of the following categories: A) Instructional

Techniques, B) Instructor Involvement, C) Means of Teaching, D) Means of Evaluation,

and E) Nature of Instructor. The data were scored as nominal data and analyzed with Chi-

Square. Descriptors were taken as frequencies, from left to right on the survey form.

Thus, percentages were used to describe the frequency in which each one occurred. The

descriptors were taken verbatim from Wheeler's and Marshal's (1986) Trainer Type

Inventory (TTI) in the absence of an appropriate instrument to measure student

perception, which the authors had previously validated.

TSS was also adapted from Darkenwald's and Valentine's (1986) Adult

Classroom Environment Scale (ACES), Burdsal's and Bardo's (1986) Student Perception

of Teaching Effectiveness (SPOTS), Tuckman's (1970) Student Perception of Teacher

Style (SPOTS), and Cooper's and Miller's (1999) MBTI Learning Style and Teaching

Style Discongruencies (Hamby 2001, p. 67). The researcher in this study used the TSS

(see Appendix B) to identify the satisfaction of the aviation training in the Theory of

Flight (AVED 1113) of 55 students enrolled in sections 001 and 002 in the fall 2002

semester with two different FAA-certified instructors. The Student Demographic Questionnaire collected information regarding the student's ethnicity, age, full-time or part-time, and college major.

Procedures

The researcher gathered data in the following way: First, The instructors were contacted in order to allow the researcher to come into class to collect the data. Permission from the instructors was granted. Second, the researcher visited the class (sections 001 and 002) and explained the importance of the study and the purposes of it. The researcher read the Consent Form aloud and highlighted that participation was voluntarily. Third, Consent Forms were passed out to the students. The students read and signed the Consent Forms, which were collected by the researcher. Fourth, the researcher explained the importance of the Student Demographic Questionnaire (SDQ) and the Learning Style Inventory IIa (LSI IIa). Instructions were given on how to fill out both the SDQ and the LSI IIa. Fifth, the researcher explained the concept of learning styles and then he distributed the Students Demographic Questionnaire and the Learning Style Inventory IIa. The finished SDQ and the LSI IIa forms were collected by the researcher. Sixth, The instructors were asked to leave the classroom while the students completed the surveys. After that, the researcher explained the importance of the Training Satisfaction Survey (TSS) and its purposes. The researcher collected the completed TSS surveys. Seventh, the researcher expressed gratitude to both instructors and students. The data were collected a week before finals in the fall 2002 semester. At the beginning of the

spring semester 2003, the Theory of Flight students were informed via email and mail

into which particular learning style. The email also asked students to participate in

interviews. If a student agreed, an appointment was set and the interview was conducted.

In the Qualitative Approach

Qualitative research approaches were very descriptive and led to selecting

information-rich cases to study in-depth issues of central importance to the purpose of the

research. Thus, qualitative research used purposeful sampling (Patton, 2001, p. 230).

Likewise, the same author suggested different strategies to purposefully select

information-rich cases.

The strategy for the data collection and fieldwork in the present study was what

Patton (2001) calls, *Theory-based sampling, construct sampling, and theoretical*

sampling in which the researcher samples people on the basis of their potential

manifestation or representation of important theoretical constructs. Operational construct

sampling simply means that one samples for study real world examples of the constructs

in which one is interested (p. 238). Theoretical sampling is what grounded theorists

define as "sampling on the basis of emerging concepts, with the aim being to explore the

dimensional range or varied conditions along which the properties of concepts vary"

(Strauss and Corbin, 1998, p. 73).

Since the researcher in this study was interested in identifying student learning

styles according to Kolb's model (accommodator, diverger, assimilator, and converger).

Students were selected with different learning style, thus a total of 12 students were

interviewed, 7 students from group 1 and 5 students from group 002. Through interviews

the researcher gained further insights to corroborate information from the participants why the Theory of Flight AVED 1113 was satisfying or not satisfying and the relationship with the student learning style and the instructor teaching style.

Procedures

The researcher conducted interviews with 12 Theory of Flight students to address research question 5. These 12 students had different learning styles, which were distributed this way: for group 001, 2 Assimilators, 4 Divergers, 2 Convergers and for group 002, 1 Assimilators, 2 Accommodators, and 2 Convergers. The researcher used the Personal Interview Guide (PIG), which was comprised of 11 questions (see Appendix D). The researcher developed questions 1, 2, 3, and 5. Questions 4, 6, 7, 8, 9, 10, and 11 we taken verbatim from Hamby 2001. The researcher validated questions 1,2 3, and 5 in a qualitative research class with MBA students in a previous semester. The other questions were validated in his study (Hamby 2001).

The researcher conducted interviews during the spring semester 2003 in the following way: first, the researcher determined the student's learning style. Each participant was informed via email or mail in which learning style the student fell into. The students were selected for the interview according to his or her learning style. An email was sent asking the student for an interview. If the student agreed, an appointment was set for an interview privately. Before the interview, the researcher talked to the participant about his or her learning style. The researcher showed the participant the instrument Personal Interview Guide and gave him or her 5-10 minutes to think about the

responses. The researcher asked permission to record the interview and said that the recording needed to be transcribed so that the participant could read and agree with what was said. The researcher explained that this process needed to be done to comply with research processes such as the member check. Participants were asked questions from the Personal Interview Guide (PIG). The answers were recorded and transcribed for analysis.

The transcriptions were handed personally to the students. Students were given two to three weeks to read and return the transcription. Participants ere allowed to add information to the transcriptions. The researcher conducted member checks to gain further insights and to expand the responses from the participants when needed. Each interview lasted between 45-60 minutes. This process was very difficult because of student schedules. However, the researcher insisted on the importance of the study and often visited classes to find participants until each one had read and made any changes, and agreed with the printed forms of their interviews.

Population

The population of this study was all the students enrolled in the Theory of Flight (AVED 1113). A total of 62 students were enrolled. Of these, 55 participated in the study, with 31 students in section 001 and 24 students in section 002.

CHAPTER IV

FINDINGS

Introduction

The purposes of this study were to identify the learning styles of Theory of Flight (AVED 1113) students and determine whether these learning styles varied by gender, major, and ethnicity; and to determine the student satisfaction with instruction; and to describe how students perceived their training instruction in the following categories: a) instructional techniques; b) instructor involvement; c) means of teaching; d) means of evaluation; and e) nature of instructor (Adapted by Hamby, 2001 from Wheeler and Marshal, 1986, p.86); and to describe the relationship between student learning style and the instructor teaching style with regard to student satisfaction and instructional delivery with the training process in Theory of Flight (AVED 1113). Since this study used mixed methods (quantitative and qualitative) the results are presented separately; first, the findings in the quantitative approach are reported in the following major parts:

- Results of the students' learning styles;

- Results of the learning styles by gender, major, and ethnicity;

- Results of the students' satisfaction of the "Theory of Flight" (AVED 1113) course, sections 001 and 002 according to the Training Satisfaction Survey" (TSS); and

- Results of how the students described their training instruction in the following categories: a) instructional techniques; b) instructor involvement; c) means of teaching; d) means of evaluation; and e) nature of instructor.

Sample

The population of this study consisted of 62 students enrolled in Theory of Flight (AVED 1113). Section 001 and 002, each had different instructor. Of the total 55 students (88.7%) participated in this study; 24 in Section 001 and 31 in Section 002. The researcher visited the classrooms to gather data from the participants. The instruments, Student Demographic Questionnaire, Kolb's Learning Styles Inventory II-a (LSI-IIa) (1993), and Hamby's Training Satisfaction Survey (TSS) were used with the Theory of Flight (AVED 1113) students at the end of the fall semester in 2002.

Research Question One

What were the learning style preferences of Theory of Flight students in the fall 2002 as measured by Kolb's Learning Style Inventory (LSI-IIa)?

In observing the data in Table I, Kolb's Learning Style Inventory consisted of four possible endings to each of 12 sentence stems using a scale from one to four. The

rank given to each ending provided a score for the four learning modes within the experiential learning cycle. When the rankings for the sentence endings were added over the twelve sentences, a range between 12 and 48 resulted for each learning mode. The four totals represented the learner's emphasis on each mode of learning. There are four learning modes in the Cycle of Learning from Experience. They were: concrete experience (CE), learning by feeling; abstract conceptualization (AC), learning by thinking; active experimentation (AE), learning by doing; and reflective observation (RO), learning by watching and listening. The data shown in Table I depict results for each learning mode for the total groups. Each score represented a learning mode, the AC-CE scores, which resulted by subtracting abstract conceptualization minus concrete experience, indicated that if the score was positive on the AC-CE scale, the score was more abstract. If the score was negative on the AC-CE scale, the score was more concrete. Similarly, on the AE-RO scale, which resulted by subtracting active experimentation and reflective observation, a negative or positive score indicated the scores were either more active or more reflective (Kolb, 1993).

TABLE I

RESULTS FOR EACH LEARNING MODE FOR THE TOTAL GROUP

DESCRIPTIVE STATISTICS

	Concrete Experience	Reflective Observation	Abstract Conceptualization	Active Experimentation	AC-CE[1]	AE-RO[2]
Mean	23.51	30.25	31.96	34.67	8.45	4.42
Standard Deviation	5.92	7.52	6.82	5.96		

[1] (31.96-23.51)

[2] (34.67-30.25)

The AC-CE and AE-RO scores when combined on the "X" and "Y" axes of the Cycle of Learning Grid and plotted for their point of interception, the scores (data point) reflected the subjects' learning style. These four quadrants were labeled: Accommodator, Diverger, Converger, and Assimilator (Kolb, 1993). The data obtained through the LSI IIa, were analyzed using Statistical Analysis Software®, which produced basic statistical measures (Descriptive Statistics). The total groups' preferred response was expressed in a mean score of 34.67 for the Active Experimentation (AE) stage of learning. The second highest response was for Abstract Conceptualization with a mean of 31.96. In the Reflective Observation (RO), the mean value was 30.25. The least preferred learning mode was Concrete Experience (CE) with a mean value of 23.51. These means are represented in Figure 5, the Cycle of Learning - Total Group.
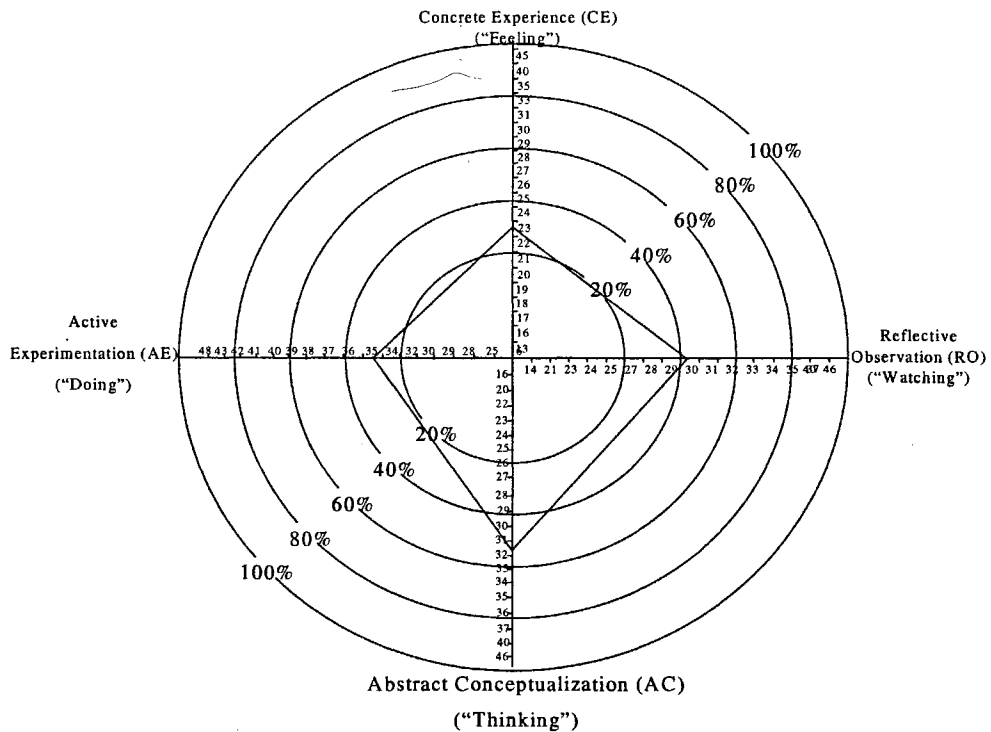
Figure 5. The Cycle of Learning – Total Group

The means for the total group 55 students were 4.42 for Active Experimentation

(AE) minus Reflective Observation (RO), (AE-RO), and 8.45 for Abstract

Conceptualization (AC) minus Concrete Experience (CE), AC-CE. These mean values

fall on the Assimilator quadrant when plotted on the Learning-Style Type Grid - Total

Group. Figure 6 shows individual learning styles of the 55 Theory of Flight students

plotted in the four quadrants on the Learning-Style Type Grid – Total Group, in which 8

(14.55%) were Accommodators; 13 (23.64%) were Divergers, 18 (32.73%) were

Convergers, and 16 (29.09%) were Assimilators. The predominant learning style for the

total group of 55 was Assimilator when plotted on the AC-CE and AE-RO scales of The

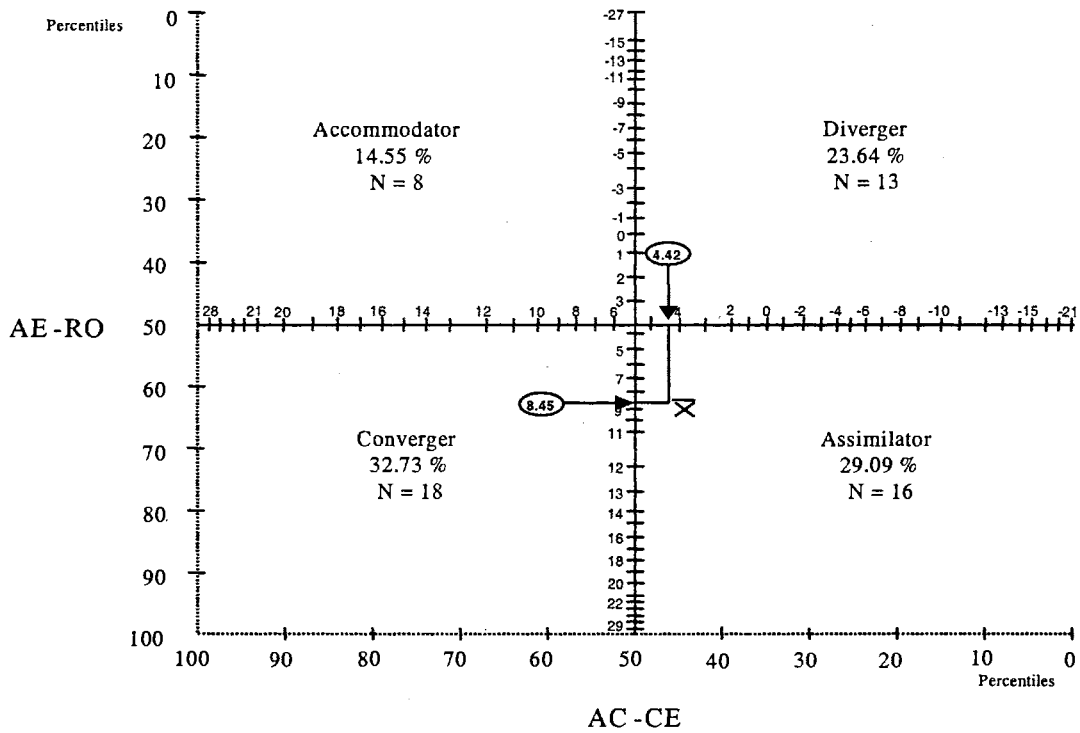Learning-Style Type Grid – Total Group shown in Figure 6.

Figure 6. Learning-Style Type Grid – Total Group

In the summaries, in Table II, Section 001 mean scores for the four stages of

learning cycle were 23.04 for Concrete Experience (CE), 32.33 for Reflective

Observation (RO), 29.38 for Abstract Conceptualization (AC), and 35.67 for Active

Experimentation (AE).

TABLE II

RESULTS FOR EACH LEARNING MODE FOR SECTION 001

DESCRIPTIVE STATISTICS

	Concrete Experience	Reflective Observation	Abstract Conceptualization	Active Experimentation	AC-CE[1]	AE-RO[2]
Mean	23.04	32.33	29.38	35.67	6.33	3.34
Standard Deviation	5.10	7.95	6.32	4.35		

[1] (29.38-23.04)

[2] (35.67-32.33)

The data in Figure 7, obtained through the LSI IIa, were analyzed using Statistical Analysis Software®, to produce basic statistical measures. The means for Section 001 of 24 students were 3.34 for Active Experimentation (AE) minus Reflective Observation (RO), and 6.33 for Abstract Conceptualization (AC) minus Concrete Experience (CE).
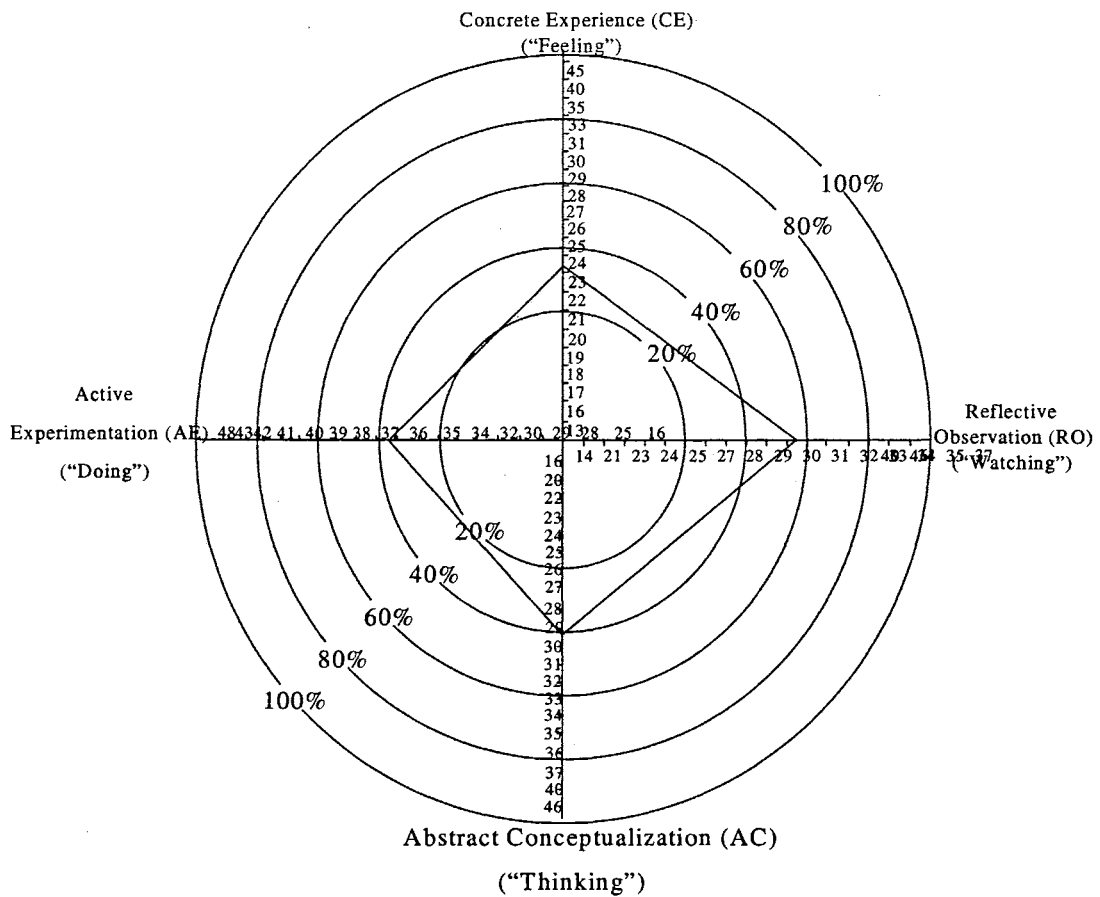
Figure 7. The Cycle of Learning – Section 001

These means fell in the Assimilator quadrant when plotted on the Learning-Style

Type Grid Section 001. Figure 8 shows individual learning styles of Theory of Flight

students Section 001plotted in the four quadrants on the Learning-Style Type Grid, in

which 4 of the 24 students (16.67%) were Accommodators, 7 (29.17%) were Divergers, 6

(25.00%) were Convergers, and 7 (29.17%) were Assimilators. Therefore, the

predominant learning styles for Section 001 were Divergers and Assimilators. These

means were plotted on the Leaning-Style Type Grid – Section 001 in Figure 8. The

70

results for Abstract Conceptualization (AC) minus Concrete Experience (CE) (AC-CE)

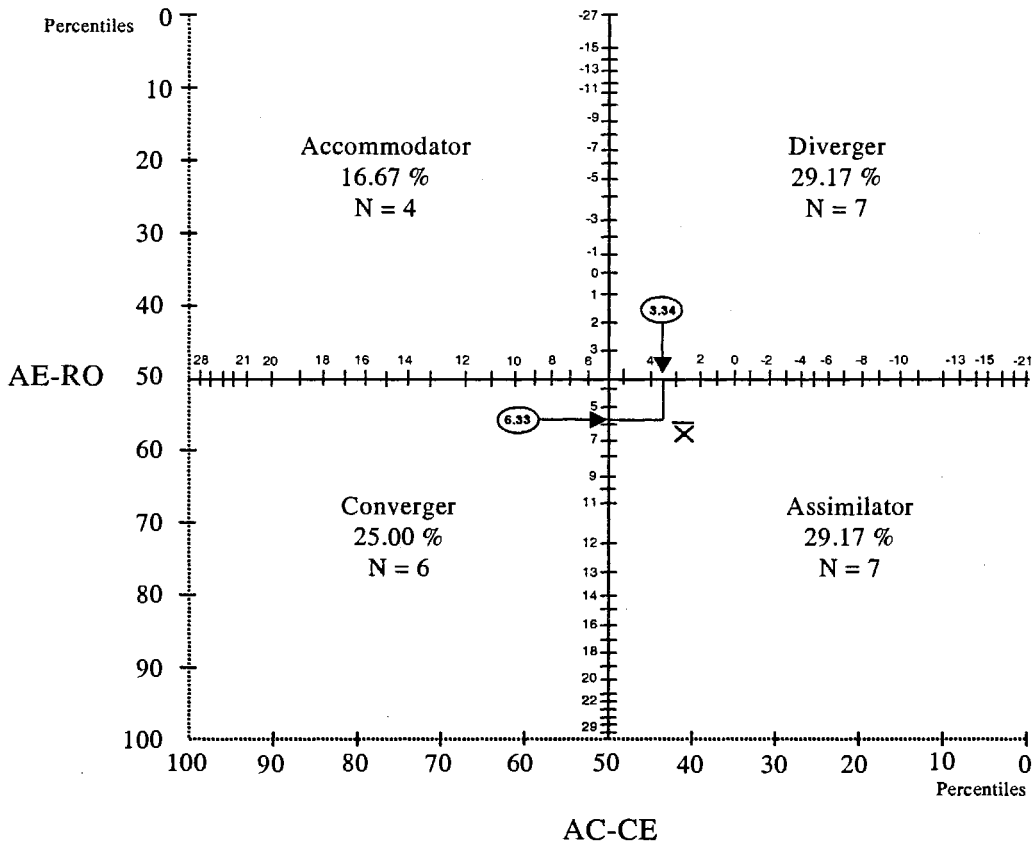and Active Experimentation (AE) and Reflective Observation (RO) (AE-RO) scores.

Figure 8. The Learning-Style Type Grid – Section 001

71

In the summaries, in Table III, Section 002 mean scores for the four stages of the four learning modes were: 23.87 for Concrete Experience (CE), 28.64 for Reflective Observation (RO), 33.96 for Abstract Conceptualization (AC), and 33.90 for Active Experimentation (AE). These mean scores were depicted in Figure 9 the Cycle of Learning – Section 002.

TABLE III

RESULTS FOR EACH LEARNING MODE FOR SECTION 002

DESCRIPTIVE STATISTICS

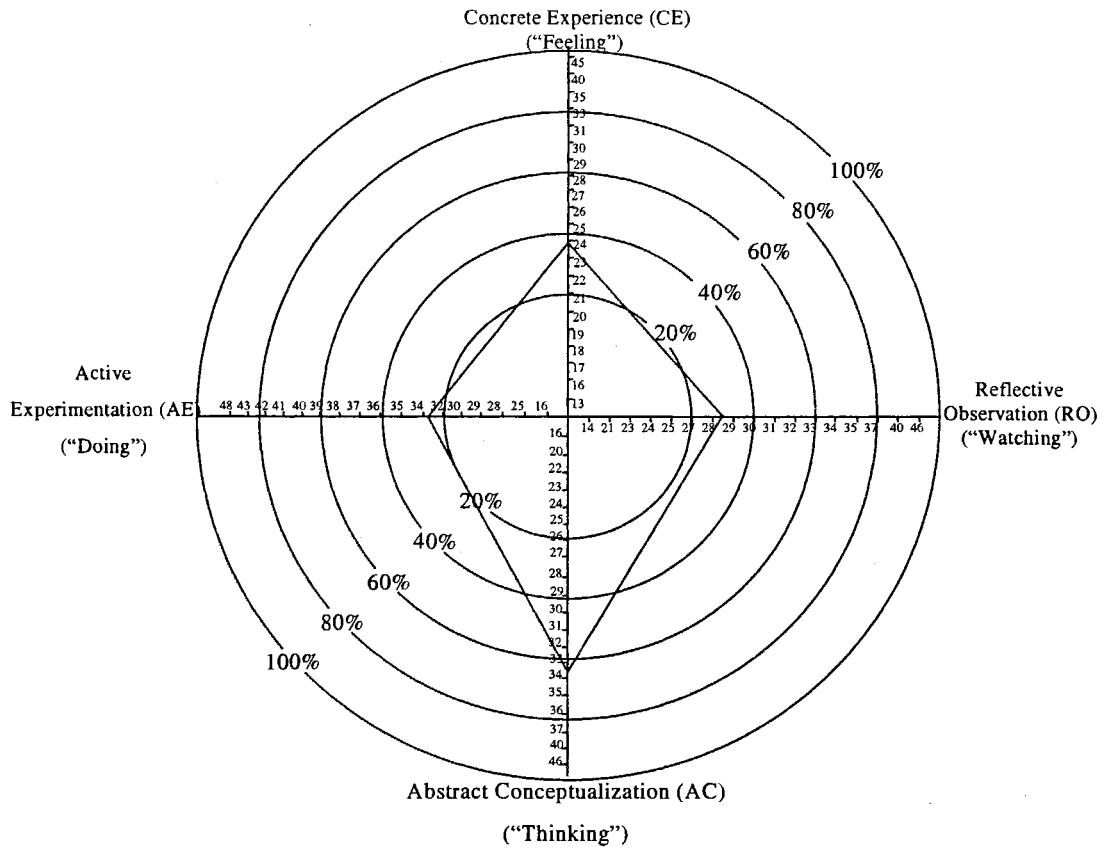|	Concrete Experience	Reflective Observation	Abstract Conceptualization	Active Experimentation	AC-CE[1]	AE-RO[2]
Mean	23.87	28.64	33.96	33.90	10.10	5.26
Standard Deviation	6.54	6.86	6.61	6.93		

[1] (33.96-23.87)
[2] (33.96-28.64)

Figure 9. The Cycle of Learning – Section 002

The mean for Active Experimentation (AE) minus Reflective Observation (RO), (AE-RO) was 5.26, and for Abstract Conceptualization (AC) minus Concrete Experience (CE), (AC-CE) was 10.10. These means fell in the Assimilator quadrant when plotted on the Learning-Style Type Grid – Section 002 depicted in Figure 10.
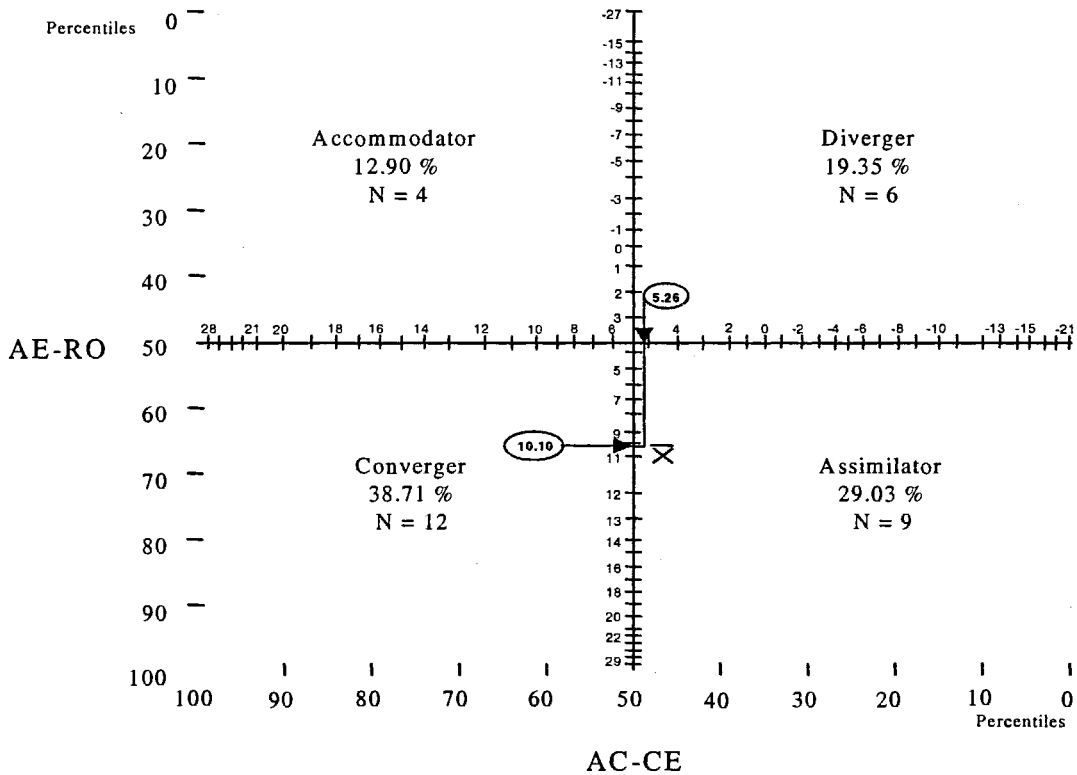
Figure 10. The Learning-Style Type Grid – Section 002

Research Question Two

Did Theory of Flight students learning styles vary by major, gender, and

ethnicity?

In observing the data in Table IV, analysis of data of the total group in the

distribution of Theory of Flight students learning style by major, it was found that 8

student participants (14.55%) were in the Accommodator quadrant. Their majors were: 1 (1.82%) business student, 5 (9.09%) in the professional pilot option, 1 (1.82%) psychology student, and 1 (1.82%) undecided. There were 15 (27.27%) student participants in the Assimilator quadrant, 1 (1.82%) Aerospace Engineer student, 1 (1.82%) Agriculture Economics Student, 1 (1.82%) Business student, 1 (1.82%) Management student, 9 (16.36%) Professional Pilot students, 1 (1.82%) Psychology student, and 1 (1.82%) undecided student. The analysis of the data also revealed that 18 (32.73%) student participants were Convergers in which 1 (1.82%) was an Animal Science major, 1(1.82%) was in Education, 1(1.82%) was from Electrical Engineering, 3 (5.45%) were from Finance, 1(1.82%) student from Human Resources Administration, there were 7 (12.73%) from the Professional Pilot option, and 1 (1.82%) undecided. Whereas there were 14 (25.45%) student participants in the Diverger quadrant whose majors were: 1 (1.82%) nursing student, 13 (23.64%) students in the Professional Pilot option.

For the 18 (32.73%) students categorized as Convergers, 7 (12.74%) were Professional Pilot Option majors; 15 (27.27%) who were Assimilators, in which 9 (16.38%) were from the Professional Pilot Option, and 14 (25.45%) were Divergers, 13 (23.66%) were from the Professional Pilot Option. Therefore, the majority of the students 13 (23.66%) in the Professional Pilot Option were Divergers

TABLE IV.

DISTRIBUTION OF LEARNING STYLE BY MAJOR

Major	Accommodator	Assimilator	Converger	Diverger	Total	%
Accounting			1		1	1.82
Aerospace Engineering		1	2		3	5.45
Agriculture Education		1			1	1.82
Animal Science			1		1	1.82
Business	1	1			2	3.64
Education			1		1	1.82
Electrical Engineering			1		1	1.82
Finance			3		3	5.45
HRAD			1		1	1.82
Management		1			1	1.82
Nursing				1	1	1.82
Professional Pilot	5	9	7	13	34	61.82
Psychology	1	1			2	3.64
Undecided	1	1	1		3	5.45
Total	8	15	18	14	55	
%	14.55	27.27	32.73	25.45		100.00

In observing the summaries for Table V, the distribution of Theory of Flight students by ethnicity revealed that 8 students (14.55%) of the 55 students were Accommodators; in which 1 student was American Indian and 7 were White Non Hispanic (Caucasian). A total of 15 students were assimilators.

TABLE V

DISTRIBUTION OF THEORY OF FLIGHT STUDENTS BY ETHNICITY

Learning Style	American Indian	Asian/ Pac-Islander	White Non-Hispanic	Total
Accommodator	1	-	7	8
%	1.82		12.73	14.55
Assimilator	-	-	15	15
%			27.27	27.27
Converger	-	-	18	18
%			32.73	32.73
Diverger	3	4	7	14
%	5.45	7.27	12.73	25.45
Total	4	4	47	55
%	7.27	7.27	85.45	100.00

These students indicated their racial background as White Non Hispanic (Caucasian). In the Converger quadrant, 18 students (32.73%) indicated their ethnic group was White Non Hispanic (Caucasian). Finally, in the Divergent quadrant 14

students (25.45%) indicated their racial background as follows: 3 are American Indian, 4 are Asians or Pacific Islanders (Japanese), and 7 are White Non Hispanic (Caucasian). The majority of the students were White Non Hispanic (47 students, 85.45%) whose learning style was either Converger (18 students, 32.73%) or Assimilators (15 students, 27.27%). There were only 4 American Indian students and 4 Asian or Pacific Islander (Japanese) students.

In observing the data, it was found that of the total 55 student participants, 48 (87.27%) students were male and 7 (12.73%) were female (see Table VI). The data further revealed that 8 (14.55%) student participants were Accommodators; 6 (10.91%) of these were male and 2 (3.64%) were female. Furthermore, 15 (27.27%) student participants were in the Assimilator quadrant, 13 (23.64%) of these were male, 2 (3.64%) were female. A total of 18 (32.73%) student participants were in the Converger quadrant, 16 (29.09%) students were male, and 2 (3.64%) were female. Finally, it was also found that 14 (25.45%) students were from the Diverger quadrant, 13 (23.64%) were male, and 1 (1.82%) was female. Thus, the majority of the males 18 32.73%) were Convergers in which 16 (29.09%) were male and 2 (3.64) were female; followed by 15 (27.27%) students who were Assimilators in which 13 (23.64%) were male and 2 (3.64%) were female. Overall, all styles are present somewhat equally among female in the study group.

TABLE VI

DISTRIBUTIONS OF THEORY OF FLIGHT STUDENTS BY GENDER

Learning Style	Female	Male	Total
Accommodator	2	6	8
%	3.64	10.91	14.55
Assimilator	2	13	15
%	3.64	23.64	27.27
Converger	2	16	18
%	3.64	29.09	32.73
Diverger	1	13	14
%	1.82	23.64	25.45
Total	7	48	55
%	12.73	87.27	100.00

Research Question Three

How did Theory of Flight students perceive their training satisfaction of the course as measured by the Training Satisfaction Survey?

The data in Table VII indicated that students from Section 001 and 002 perceived the levels of satisfaction as follows: Section 001 Very Satisfying 38.71 percent.

79

Satisfying 51.62 percent and Neutral 9.67 percent. In Section 002, the percentages totaled were, Very Satisfying 25 percent, Satisfying 58.34 percent and Neutral 16.66 percent.

TABLE VII

LEVEL OF SATISFACTION OF THE THEORY OF
FLIGHT COURSE BY SECTION

Level of Satisfaction	Section 001 %		Section 002 %	
Very Satisfying	6	25.00	12	38.71
Satisfying	14	58.34	16	51.62
Neutral	4	16.66	3	9.67
Dissatisfying	-	-	-	-
Very Dissatisfying	-	-	-	-
Total	24		31	
Mean	4.08±0.65		4.29±0.65	

Overall, for the vast majority of the students, the levels of satisfaction were either very satisfying or satisfying 90.33 percent for Section 001 and 83.34 percent for Section 002. No one responded dissatisfying or very dissatisfying.

In the ANOVA summary for the Level of Satisfaction of the Theory of Flight course, Section 001 and 002 is depicted in Table VIII. F was calculated at (1.82). That is,

P is 0.1836 with 1 degree of freedom. The mean 4.08 for Section 001 and the mean 4.29

for Section 002 are not significantly different at $\alpha < .01$.

TABLE VIII

SUMMARY OF TWO-GROUP ANALYSIS OF VARIANCE

Source of Variance	SS	DF	MS	F	P<F
Between Groups (major)	0.774	1	0.774	1.82	0.1836
Within Groups (error)	0.774	1	0.774	1.82	
Total	1.548				

(P > .01)

Research Question 4

How did the students perceive their training instruction in the following

categories: a) instructional techniques; b) instructor involvement; c) means of

teaching; d) means of evaluation; and e) nature of instructor?

The purpose of this section was to describe how Theory of Flight students

perceived their training instruction in the categories: Instructional Techniques, Instructor

Involvement, Means of Teaching, Means of Evaluation, and Nature of Instructor. Each

81

category was analyzed (see Table IX-XXII) by using the Frequency Procedure in Statistical Analysis System ® in the form of nominal scale. The data were gathered through the Training Satisfaction Survey (Hamby, 2001) from 55 students in the Theory of Flight course (AVED 1113) in the fall 2002 at Oklahoma State University- Stillwater. Ages ranged between 17 and 23 years old.

The statistical test used was the Chi-Square (X^2), which involves the differences between the observed (fo) and expected frequencies (fE) that are necessary to test the statistical hypothesis. This test could also be thought as a test of difference between two proportions (SAS® Procedures Guide 1990). The dependent variable was the perceived satisfaction of the students during their training and the independent variables were the perception of instructional delivery in the following categories: a) instructional techniques; b) instructor involvement; c) means of teaching; d) means of evaluation; and e) nature of instructor.

To make a statistical decision if there was any significant difference or not among the subcategories included in the categories of instructional delivery, which were: a) Instructional Techniques: subcategories: Free-Discussion (FD), Lecture-Based (LB), Theory-Based (TB), and Activity-Based (AB); b) Instructor Involvement: subcategories: Active Participation (AP), Gave Time to Think Alone (GT), Little Involvement (LI), and Student-Directed (SD); c) Means of Teaching: subcategories: Got us Involved (GI), Mostly Actions (MA), Mostly Instructions (MI), and Mostly Symbols (MS); d) Means of Evaluation: subcategories: Immediate Feedback (IF), Objective Tests (OT), Personal Judgment (PJ), and Subjective Tests (ST); and e) Nature of Instructor: subcategories: Coach (CO), Director (DI), Interpreter (IN), and Listener (LS).

The statistical hypothesis for the Total Group was:

Ho: There is no significant difference among the subcategories; and

H1: There is a significant difference among the subcategories.

Then the researcher proceeded to make a statistical decision in order to accept or reject the hypothesis. The statistical level was set at $\alpha < .05$.

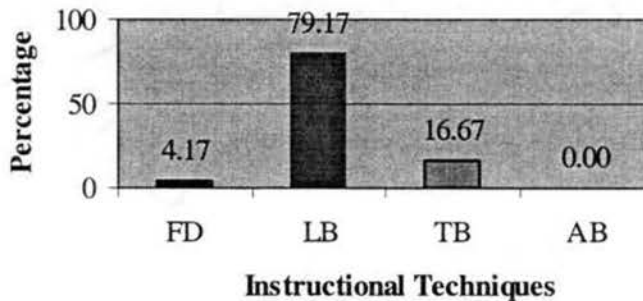Figure 11 depicts the results for Instructional techniques for Group 001 of 24 students.

Figure 11. Instructional Techniques - Section 001.

In the subcategories: free-discussion (FD), lecture-based (LB), theory-based (TB), and activity-based (AB). It was found that free-discussion obtained 4.17 percent; whereas lecture-based (LB) got 78.7 percent. For theory-based were 16.67 percent and activity-based 0 percent. The data showed that for group 001 lecture-based (LB) was perceived as the predominant instructional technique obtaining the highest percentage (78.7).

Figure 12 depicts the results for Instructional techniques for Section 002, (N=31) in the following sub-categories: free-discussion (FD), lecture-based (LB), theory-based

(TB), and activity-based (AB). It was found that free-discussion (FD) obtained 6.45

percent; whereas lecture-based (LB) got 70.97 percent. For theory-based (TB) 22.58

percent and surprisingly activity-based 0 percent. The data showed that for group 002

lecture-based (LB) were perceived as the predominant instructional technique obtaining

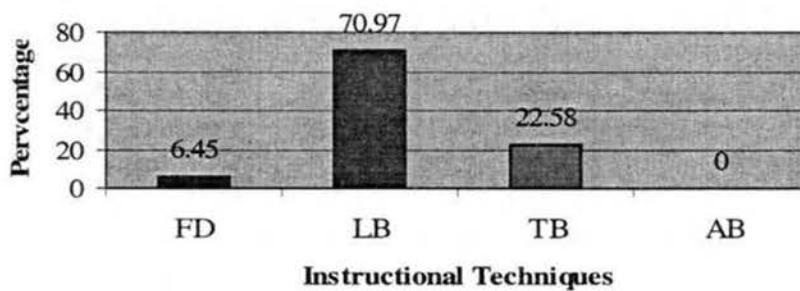the highest percentage (70.97%).

Figure 12. Instructional Techniques - Section 002.

Figure 13 depicts the results of the perceived delivery of instruction for

Instructional Techniques for the Total Group of 55 students, which was calculated by

using the Frequency Procedure in Statistical Analysis System ® in the form of nominal

scale. Results from both classes led to the following data results: free-discussion (FD)

obtained 5.45 percent; whereas the highest percentage was lecture-based with an amazing

74.55 percent. Theory based (TB) was 20 percent and activity-based (AB) got 0 percent.

The Statistics test SAS® output used of table of group by value was Chi-square. The

statistical decision was that at $\alpha = .05$ with a Chi-square $(X^2) = 43.78$ with 2 degrees of

freedom, the null hypothesis is rejected (p < .0001). Therefore, there was a significant difference among the subcategories. Lecture-Based (LB) obtained 74.55% for the Total Group. The data showed that there was a little difference between the two groups with regard to lecture-based (LB). Thus, it was perceived as the predominant instructional technique (74.55%), followed by activity-based (20.00%)
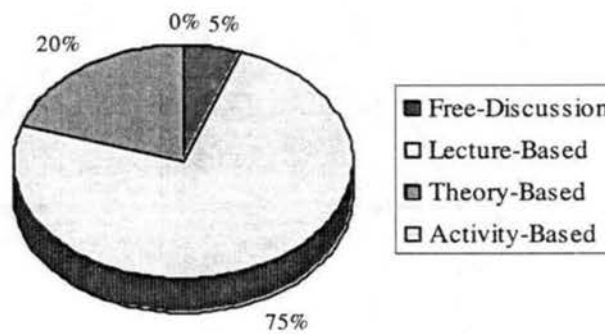

Figure 13. Instructional Techniques – Total Group

Figure 14 depicts the results of the perceived delivery of instruction for Instructor Involvement for Group 001 of 24 students. The table shows percentages of observations regarding the sub-categories of: Active Participation (AP), Got us Involved (GI), Little Involvement (LI), and Student-Directed (SD). It was found that Active Participation (AP) got 29.17 percent, whereas Got us Involved (GI) 8.33 percent and little Involvement (LI) 8.31 percent. However, Student-Directed obtained 54.17 percent being the highest percentage of the perceived observation in the delivery of instruction for Section 001.

Thus, based on the results, instructor involvement for Section could be described as being

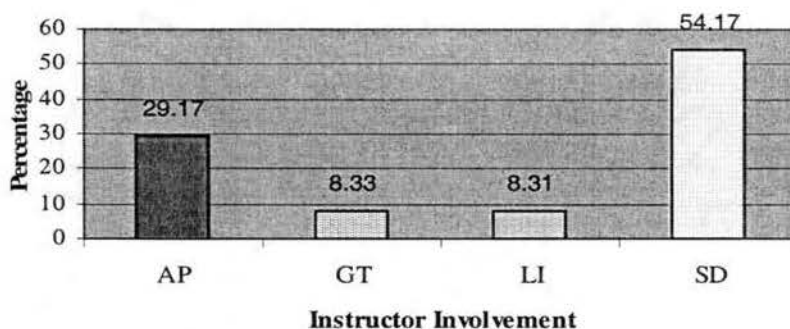Student-Directed (SD) with 54.17%; followed by Active Participation (AP) with 29.17%.

Figure 14. Instructor Involvement – Section 001

Figure 15 depicts the summaries of Instructor Involvement for Group 002 (N=31).

Active Participation (AP) obtained 61.29 percent. However, Got us Involved (GI) got 0

percent and Little Involvement (LI) obtained 6.45 percent; while the subcategory

Student-Directed (SD) got 32.26 percent. Therefore, the subcategory Active Participation

(AP) obtained the highest percentage in the perceived observation of the delivery of

instruction for Group 002. Thus, based on the results, instructor involvement for group

002 could be described as more on Active Participation (AP) 61.29%; followed by

Student-Directed (SD) with 32.26%. The data showed that instructor involvement for

group 002 was Active Participation (AP), whereas for group 002 the instructor

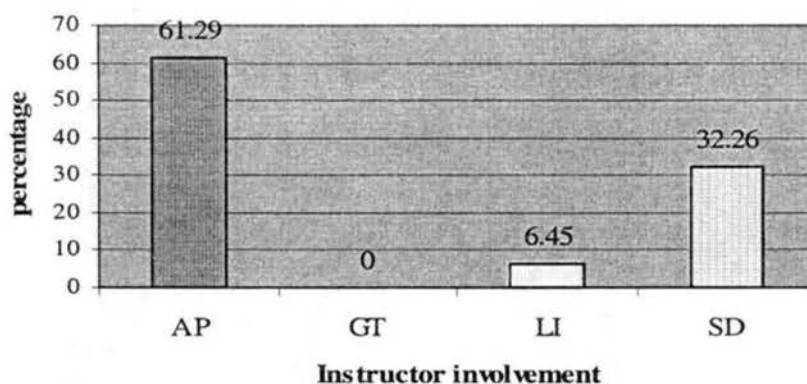involvement was more Student-Directed (SD) with 54.17%.

Figure 15. Instructor Involvement – Section 002

Figure 16 depicts the results of the perceived observation of the delivery of instruction for Instructor Involvement for the Total Group of 55 students, which was calculated by using the Frequency Procedure in Statistical Analysis System ® in the form of nominal scale. Results from both classes led to the following data results: Active Participation (AP) obtained 47.27 percent, whereas in Gave Time to Think Alone (GT) got 3.64 percent and for Little Involvement (LI) 7.27 percent, and Student-Directed obtained 41.82. Thus, bimodal data results indicated that the two Sections (001 and 002) had different approaches by their instructor.
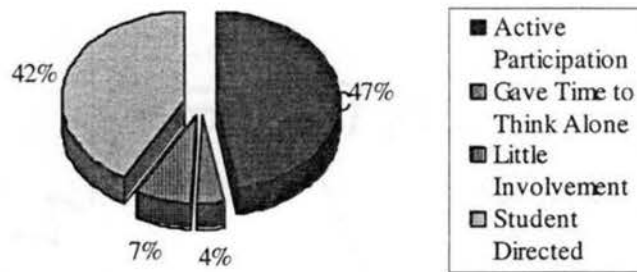
Figure 16. Instructor Involvement – Total Group

The statistics test used of table of section by value was Chi-square. The statistical

decision was that at $\alpha = .05$ with Chi-square (X^2) equal to 34.09 with 3 degrees of

freedom; the null hypothesis is rejected ($p < .0001$). Therefore, there was a significance

difference among the subcategories. Active participation (AP) obtained 47.27%. Active

Participation (AP) and Student-Directed (SD) were perceived as the most used sub-

categories in Instructor Involvement for the Total Group. Besides, in each section the

perceived observation in the category Instructor involvement was different.

Figure 17 depicts the results of the perceived observation of delivery of

instruction for the category Means of Teaching for Group 001 (N=24). The table shows

that in the following subcategories: Got us Involved (GI), Mostly Instructions (MI),

Mostly Symbols (MS), and Mostly Actions (MA), the subcategory Got us Involved (GI)

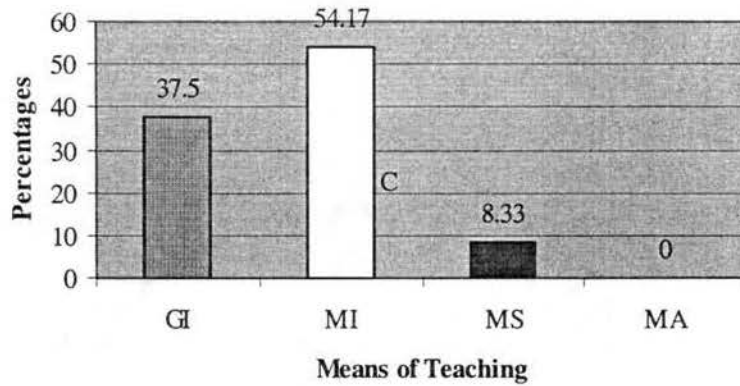obtained 37.5 percent, whereas Mostly Instructions (MI) got 54.17 percent.

Figure 17. Means of Teaching – Section 001

Mostly Symbols (MS) obtained 8.33 percent, while Mostly Actions (MA) got 0

percent. Therefore, the subcategory Mostly Instructions (MI) obtained the highest

percentage in the perceived observation of the delivery of instruction for Section 001.

Figure 18 depicts the results of the perceived observation of delivery of

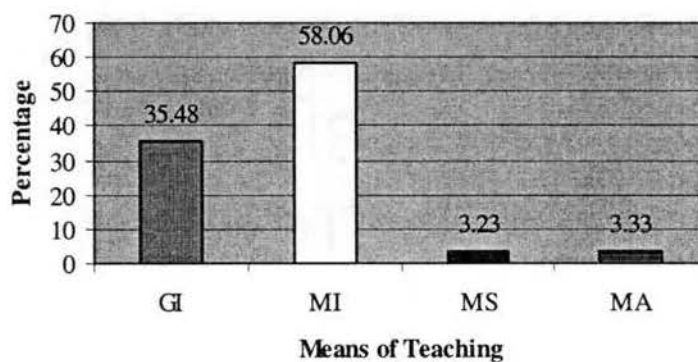instruction for the category Means of Teaching -Section 002.

Figure 18. Means of Teaching – Section 002

The subcategory, Got us Involved (GI) obtained 35.48 percent, whereas Mostly Instructions (MI) got 58.06 percent. Both Mostly Symbols (MS) and Mostly Actions (MA) got 3.23 percent. Therefore, the subcategory Mostly Instructions (MI) obtained the highest percentage in the perceived observation of the delivery of instruction for Section 002.

Figure 19 depicts the results of the perceived satisfaction of the delivery of instruction for Means of Teaching for the Total Group of 55 students, which was calculated by using the Frequency Procedure in Statistical Analysis System ® in the form of nominal scale. Results from both classes led to the following data results: Got us Involved (GI) obtained 36.30 percent, whereas Mostly Instructions (MI) got 54.17 percent. The subcategory Mostly Symbols (MS) only got 8.33 percent. The statistics test used of table of section by value was Chi-square. The statistical decision was that at $\alpha =$ .05 with a Chi-square $(X^2) = 44.70$ with 3 degrees of freedom; the null hypothesis is rejected $(p < .0001)$. Therefore, there was a significance difference among the subcategories. Mostly Instruction obtained 54.00%.
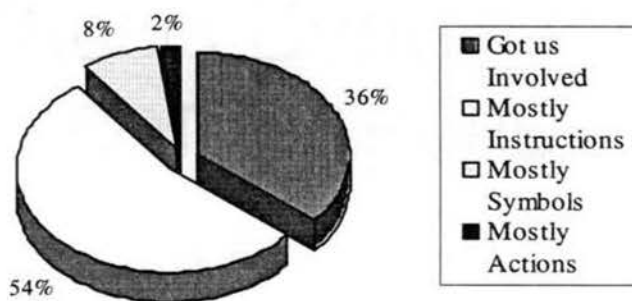

Figure 19. Means of Teaching – Total Group

Figure 20 depicts the results of the perceived observation of the delivery of instruction for the category Means of Evaluation for Section 001 of 24 students. The table shows the following subcategories: Immediate Feedback (IF), Objective Test (OT), Personal Judgment (PJ), and Subjective Tests (ST). The subcategory Immediate Feedback (IF) obtained 37.5 percent; Objective Tests (OT) also got 37.5 percent. Personal Judgment (PJ) obtained 8.33 percent while Subjective Tests (ST) got 16.67 percent. Therefore, the subcategories, Immediate Feedback (IF) and Objective Tests (OT) obtained the highest percentage in the perceived observation of the delivery of instruction for Group 001.
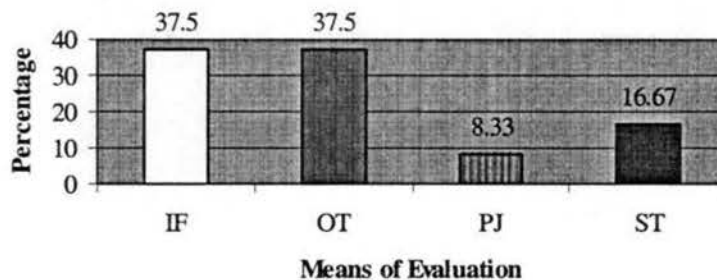

Figure 20. Means of Evaluation – Section 001

Figure 21 depicts the results of the perceived observation of delivery of instruction for the category Means of Evaluation for Section 002 of 31 students. The table shows that the following subcategories: Immediate Feedback (IF), Objective Tests (OT), Personal Judgment (PJ), and Subjective Tests (ST). The subcategory Immediate Feedback (IF) obtained 25.81 percent; Objective Tests (OT) got 58.06 percent. Personal

Judgment (PJ) obtained 0 percent, while Subjective Tests (ST) got 16.13 percent.

Therefore, the subcategories Immediate Feedback (IF) and Objective Tests (OT) obtained

the highest percentage in the perceived observation of the delivery of instruction for
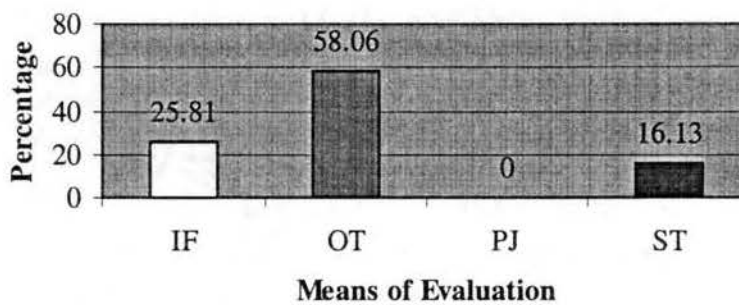
section 002.

Figure 21. Means of Evaluation – Section 002

Figure 22 depicts the results of the perceived observation of the delivery of

instruction for Means of Evaluation for the Total Group of 55 students, which was

calculated by using the Frequency Procedure in Statistical Analysis System ® in the form

of nominal scale. Results from both classes led to the following data results: Immediate

Feedback (IF) obtained 30.91 percent, whereas Objective Tests (OT) got 49.09 percent.

The subcategory Personal Judgment (PJ) only got 3.64 percent, while Subjective Tests

(ST) obtained 16.36 percent. The statistics test used of table of group by value was Chi-

square. The statistical decision was that at $\alpha = .05$ with a Chi-square (X^2)= 25.21 with 3

degrees of freedom. The null hypothesis is rejected (p < .0001). Therefore, there was a

significance difference among the subcategories. Objective Tests (OT) obtained 49.09%.

For Section 001, the subcategories Immediate Feedback (IF) and Objective Tests (OT)

were perceived as the highest observation obtaining 37.5 percent each. In Section 002,

however, the subcategory Objective Tests (OT) was perceived as the highest observation
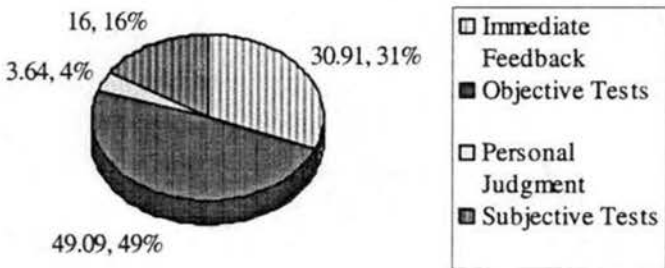
obtaining 58.06%.

Figure 22. Means of Evaluation – Total Group

Figure 23 depicts the results of the perceived observation of the delivery of

instruction for the category Nature of Instructor for Section 001 of 24 students. The table

shows the following subcategories: Coach (CO), Director (DI), Interpreter (IN), and

Listener (LS). The subcategory Coach (CO) obtained 12.5 percent; Listener (LS) got

20.83 percent. Interpreter (IN) obtained 45.83 percent while Director (DI) got 20.83

percent. The subcategory, Interpreter (IN) obtained the highest percentage in the

perceived observation of the delivery of instruction for section 001.

Figure 23. Nature of Instructor – Section 001

Figure 24 depicts the results of the perceived observation of the delivery of

instruction for the category, Nature of Instructor, for Section 002 of 31 students. The

table shows the following subcategories: Coach (CO), Listener (LS), Interpreter (IN), and

Director (DI). The subcategory, Coach, (CO) obtained 22.5 percent; Listener (LS) got

25.81 percent. Interpreter (IN) obtained 22.58 percent while Director (DI) got 29.3

percent. The subcategory, Director, (DI) obtained the highest percentage in the perceived

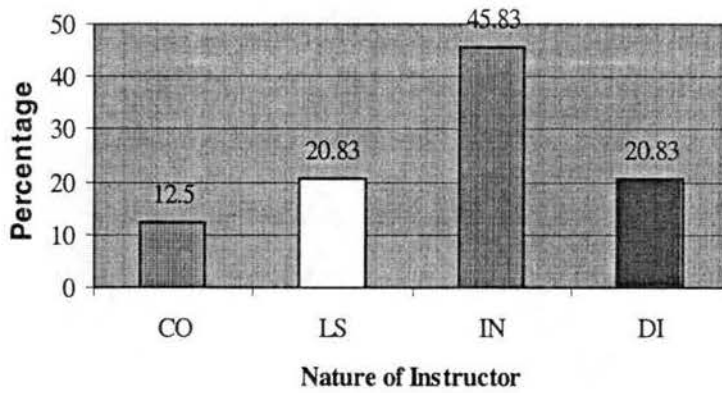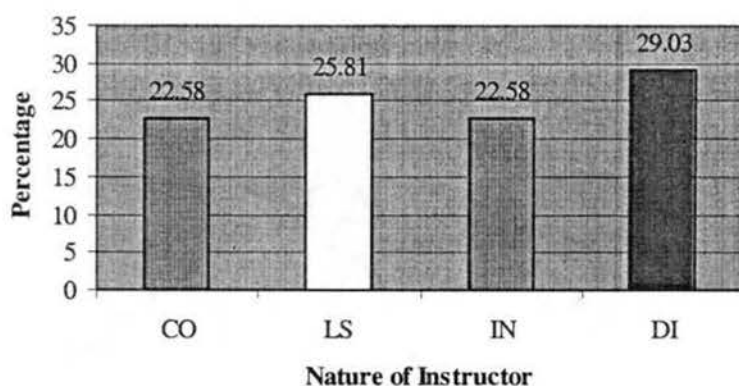observation of the delivery of instruction for section 002.

Figure 24. Nature of Instructor – Section 002

Figure 25 depicts the results of the perceived observation of the delivery of

instruction for Nature of Instruction for the Total Group of 55 students, which was

calculated by using the Frequency Procedure in Statistical Analysis System ® in the form

of nominal scale. Results from both groups led to the following data results: Coach (CO)

obtained 18.18 percent; Listener (LS) got 23.64 percent, whereas Interpreter (IN) got

32.73 percent. The subcategory Listener (LS) obtained 23.64 percent. The statistics test

used of table of group by value was Chi-square. The statistical decision was at $\alpha = .05$

with a Chi-square $(X^2) = 0.3548$ with 3 degrees of freedom. The null hypothesis is

rejected. There was a significance difference among the subcategories Nature of

Instructor for the Total Group. Director obtained 29.03%. But, when comparing the two

sections, the data showed that for section 001 the perceived observation for the Nature of

Instructor was Interpreter (IN) with 45.83% and for section 002 the perceived observation

for the Nature of instructor was Director (DI) with 29.03 %. Thus, the perceived

observation of Nature of Instructor from both sections was different.

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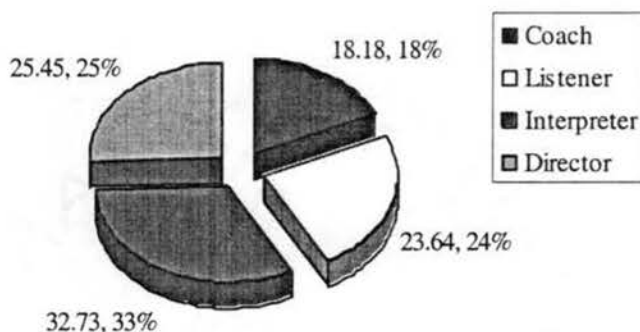
Figure 25. Nature of Instructor – Total Group

Research Question 5

What was the relationship between the student learning style and the instructor teaching style in regard to the student satisfaction and instructional delivery with the training process in Theory of Flight AVED 1113?

Introduction

This section of the study which was qualitative in nature sought to bring to light a possible relationship between the student learning style and instructor teaching style with regard to student satisfaction and delivery of instruction in the course Theory of Flight.. The purpose of learning style analysis was to identify student preferred strategies for learning and to make the study more valuable. It was assumed that the instructor teaching

style had an influence on student satisfaction with instructional delivery within the training process.

Interviews

Interviews were conducted during the spring semester 2003. Each student was first informed in writing about his/her preferred learning style. Twelve students were purposely selected according to their learning style: 7 students from section 001 (4 Divergers, 2 Assimilators, and 1 Converger) and 5 students from section 002 (2 Assimilators, 2 Accommodators, and 1 Converger) were selected at random. Eleven males and one female were interviewed. Participation was voluntary. Member checks were conducted after each interview was transcribed. Follow-up questions were also conducted. All participants were Professional Pilot majors in aviation education.

Analysis of Data

After the interviews were all complete, an analysis was performed using the structural and constitutive analysis, which involved linking together or finding consistent relationships among patterns, components, constituents and structures. The major themes or topic areas that emerged were: a) What motivated students to learn, b) How the instructors and peers helped students learn Theory of Flight material, c) Preferred ways of learning, d) Predominant instructional technique, e) Means of teaching, f) Nature of

instructor, g) Meeting the student learning styles and learning needs, h) Did the students have to adapt his or her learning style? And i) Level of satisfaction.

What Motivated Students to Learn

The most common themes or topics that emerged from the respondents in terms of what motivated them to learn were a) all the things related to flying, b) something applicable outside of class, c) hands-on activities, and c) visuals. For example, one respondent said in regard to things related to flying, "All the basic stuff, all the basic things related to how a plane works so what I need to do in order to fly that airplane." Another student said, "What motivates me to learn is just everything related to flying, because I want to be a pilot for the fact that I want to be able to fly a plane so I am really motivated to learn about as much as I can about flying." Likewise, one respondent said, "I love flying and everything about Theory of Flight, everything behind flying, aerodynamics, and the theory behind it." With respect to something applicable outside of class, one student said, "If I study now, and apply it myself, it will help me in the future." Another student referring to the same topic said, "Something applicable outside of class, you know, thinking about the future." Concerning hands-on activities, students provided several illustrations. For example, "The main stuff is hands-on, something you can relate to, to understand to use in real life situations, e.g. navigational logs and flight planning."

Another student said this about hands-on, "I like doing experiments because in the future to be a pilot means to be able to discuss about airports and planes and it is very helpful to learn Theory of Flight material by doing experiments and projects." Similarly,

another student said, "I'll never stop learning better than hands-on and be able to see words that mean something to you because words don't mean anything to you when you actually put them in action." Visuals also reported to be motivating by some students. They believed visuals played an important role in learning Theory of Flight material. One student said, "I like using the navigational charts because the instructor would show us and tell us to find a place on earth or hold it up, kind of point it at it." Another student said, "I like visuals, anything that has visuals motivates me to learn." One more respondent said, "I like to visualize the material."

To some extent, the participants were motivated in different ways as stated above, some students interviewed expressed they were motivated by topics related to flying and interest for the subject matter meant something to them. Others were motivated by hands-on activities, while others expressed they were motivated by visuals.

How the Instructors and Peers Helped Students

Learned Theory of Flight Material

It seemed that instructors helped students learn during and after class. One student said, "If we had a question, he would answer it during class time and would always sit after class if we had anymore questions so that helped me a lot." Another student said with regard to questions during class, "Just having the option of being able to ask any question if you didn't understand it was helpful." With regard to visuals one participant said, "The drawings he used helped me a lot so everything like that helped us a lot." Another participant added, "I like to see the visuals so that they helped me to understand

a lot better because I had something to look at." Exchanging ideas also emerged as a way of learning among student participants. For instance, "Sometimes I work in projects and I like my part to it and having heard from the rest of the group so I get to know up to what level the other classmates know about the subject."

Concerning how peers helped student participants learn, the common themes that emerged from the data were, interactions, study groups, and to teach somebody else. In terms of interaction one respondent expressed, "Talking to the people around me and working together helped me like learning the E6P first because I think it was hard and then I had some class participation helped out." Another respondent said concerning interactions, "When my classmates ask questions to my instructor, I can learn from that interaction, I mean with student-professor interaction." With regard to study groups one student participant said, "With regard to my peers I think it is more than group involvement, I think the people need to get together more, discuss, and ask each other questions, may be somebody else may know, it would be easier that way to get together." Teaching somebody else was another theme that came up from the student participants, one student said, "It is kind of sounds weird but the best way for me to learn stuff is when you try to teach somebody else."

The students that were interviewed indicated instructors helped students learn by allowing questions during and out of class. Instructors helped them through visuals (drawings), by exchanging ideas and by having group discussions. Peers also helped in learning through interactions, study groups, and group involvement. Overall, it seemed student participants had different learning preferences, especially, when instructors and peers helped them learn during and out of class.

Figure 26 shows that the majority of students (82%) preferred active participation, whereas 9 percent preferred little involvement and 9 percent preferred gave time to think alone. The students indicated they preferred this way of learning because learning by doing was faster. For example, one student said, "Whenever you participate more, you kind of learn more, like when you see what's going on and you get to participate in it. It seems more into your mind." Another student said in regard to active participation, "When everybody is asking questions and everybody is helping each other, it really helps everybody to understand and learn." Likewise, another student said, "I think what would help me more is active participation because active participation is about sharing ideas, opinions, clarifying doubts or solving a problem,"
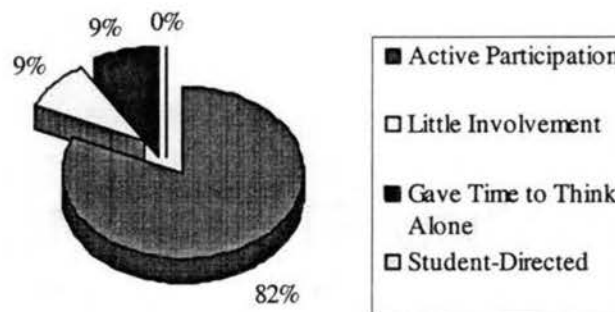

Figure 26. Preferred Ways of Learning

Student participants preferred as a way of learning active participation. These students thought that through activities that led to active participation, they could learn

101

the Theory of Flight materials better. Overall, 9 of 12 students preferred active

participation as preferred way of learning. This mode of learning is similar to the active

experimentation or learning by doing stage of learning.

Means of Teaching

Figure 27 depicts that most of the students (46 percent) preferred Got us Involved

as an instructional technique The remaining subcategories Mostly Instructions, Mostly

Symbols, and Mostly Actions were each preferred by 18 percent. To illustrate, one

student said, "Just sitting there listening to the teacher you get bored with that after a

while, but if you have active participation you make sure you think more." Another

student said, "got us involved, probably is going to keep me occupied in just that, my

mind won't have time to wonder, mostly instructions and symbols won't keep me

occupied enough while getting us involved keeps my attention." Similarly, another

student commented, "Because when you participate more, I believe you kind of learn

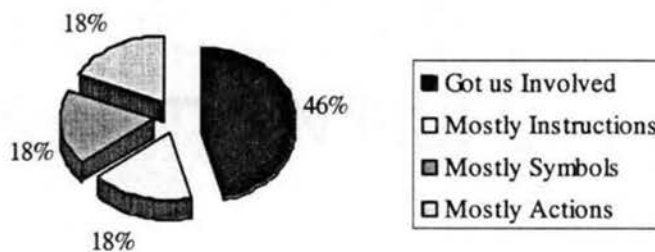more, you get to see what is going on when you get to participate in it."

Figure 27. Means of Teaching

<u>Predominant Instructional Technique</u>

Of the students interviewed, 50 percent thought that the predominant instructional technique was lecture-based, while 25 percent thought that it was activity-based, 17 percent indicated that the predominant instructional technique was theory-based, while 8 percent reported the predominant instructional technique was free-discussion (see Figure 28). One student said, "it was more lecture than anything." Another student said with regard to lectures, "I would say it was lecture-based, because he was just up there and say what it is to say then if you have questions you are free to ask them at anytime." Another student referred to lecture and said, "He used lecture-based but I like activity-based in this class. I don't like lecture-based because we needed to listen to all the class, sometimes we felt bored and sleepy and we wanted to participate and discuss the ideas, but I had little opportunity to share ideas or ask questions so sometimes we had to ask questions after class."
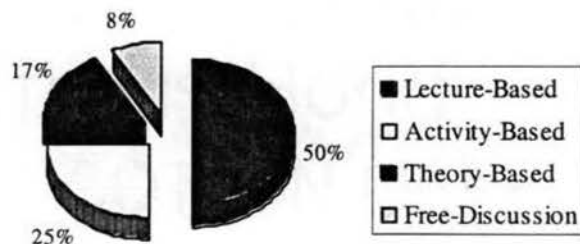

Figure 28. Predominant Instructional Technique

Nature of Instructor

Fifty five percent (55%) of the students interviewed preferred the Coach (CO) teaching style (see Figure 29), while 27% of the students indicated their preference for the Interpreter nature of instructor. Eighteen percent indicated their preference for the director teaching styles. With regard to Coach one student said, "It allows learners to evaluate their own progress, involves learners in activities and discussions." The same student explained why he preferred to learn with that format, "I like to have different activities to show what you have done and have discussions about it and it helps learners to verbalize what they already know." Similarly, another student expressed why he preferred the Coach teaching style, "I think more about coach because he lets us be involved and evaluate our own progress all the time, he was clearly in charge and then he gives us activities and projects that were used in real life like cross country and flight planning, and I like that." Another student said he liked Coach, "I guess because of the activities, projects, and problem-based. In terms Interpreter as a Nature of Instructor. One student said, "This describes real well because it connects past with present."
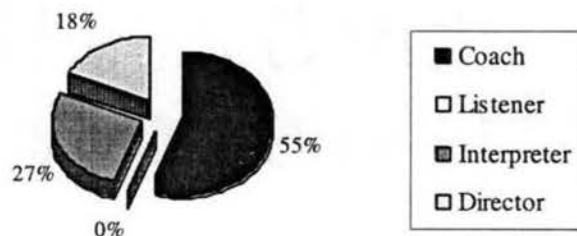

Figure 29. Nature of Instructor

Did the Student have to Adapt his or her Learning Style?

In meeting student learning styles and learning needs, it was found among the student participants that only 7 (58.34%) indicated their learning style and learning needs were met, whereas 5 (41.66%) students said their learning styles and learning needs were not met. The group of seven students that indicated their learning styles and learning needs were met was comprised of 3 Convergers, 1 Accommodator, 1 Assimilator, and 2 Divergers. The group of 5 students who indicated their learning styles and learning needs were not me was comprised of 2 Divergers, 2 Assimilators, and 1 Accommodator. Concerning as to whether they had to adapt their learning styles, all of the student participants said they had to adapt except for 1 Accommodator, 2 Assimilators, and 1 Diverger. The reason why they did not have to adapt their learning style was because they liked their instructors teaching style. To illustrate the reasons why they didn't have to adapt one student said, "I didn't have to adapt because I liked the way he was teaching, which was lecture-based." Another student said, "I didn't have to change at all, all he wanted to do was to be up there and talk and I liked that." Another student said, "It didn't affect me, it is pretty easy to do, I mean we had to adapt but in this class it is pretty easy." Similarly, another student added, "I think what he did was what I was wanting, he was a real good teacher and I think I didn't have to adapt or anything and it didn't affect me in any way."

According to the student responses, seven students (58.33%) said yes, their learning styles and learning needs were met, whereas 5 students (41.67%) said that their

learning styles and learning needs were not met. These five students also added that the Nature of Instructor they preferred was Coach because he takes charge and involves learners in activities and discussions. For example, one student said with regard to Coach, "Coach allows learners to evaluate their own progress, and involves learners in activities and discussions. Similarly, these five students also added that their preferred Instructional Technique was more Active Participation. Therefore, the students whose learning styles were not met preferred learning by doing as opposed to lectures.

Satisfaction

The level of satisfaction was measured based on the responses of question 10 from the Personal Interview Guide (see Appendix D). It was found that one (8.33%) student thought that the course was "Very Satisfying." However, nine (75%) student respondents thought the course was "Satisfying." Whereas 2 (16.66%) students responded Neutral. No student indicated the course was Dissatisfying or Very Dissatisfying. These observations were similar to the ones measured by the Training Satisfaction Survey (TSS) in which the level of satisfaction of both courses was reported as "Satisfying."

The student measured his/her level of satisfaction in the course Theory of Flight based primarily upon their preferred ways of learning, predominant instructional technique, means of teaching, and nature of instructor. Similarly, whether the teaching styles matched the student's learning styles and learning needs. That is to say, if the instructor met their learning style the students were pleased about the class. If their

learning style was not met, the students had to adapt their learning styles to meet the instructors teaching style.

Summary of Research Question 5

The findings revealed that student participants had a preferred learning style. Besides, the interviewee students learned differently and were motivated to learning in several ways. Concerning how instructors and peers helped these student participants to learn, these students indicated their preferred way of learning was active participation. The data also showed that students wanted to be involved in the process. With regard to Nature of Instructor, the student participants indicated that Coach was the most preferred type of instructor because a Coach is clearly in charge and uses real life activities. Seven of 12 students interviewed stated their learning needs were met even though their learning style was not met. They had to adapt their learning style to the instructor teaching style. Five students said their learning styles were not met because their preferred way of learning and the instructor's instructional technique did not match. With regard to the level of satisfaction of the course, nine students thought that the course was "Satisfying." One student said the course was "Very Satisfying." Two students were "Neutral." No students indicated the course was Dissatisfying or Very Dissatisfying.

To conclude, the data showed a relationship between the student learning style and the instructor teaching style with regard to the student satisfaction and the delivery of instruction in the course Theory of Flight. Consequently, if the instructor's teaching styles were congruent with the student learning styles, the higher their level of satisfaction.

CHAPTER V

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The purposes of this study were to identify the "Theory of Flight" (AVED 1113) student's learning style preferences and to determine whether these learning styles varied by gender, major, and ethnicity; to determine the student satisfaction of the course "Theory of Flight" (AVED 1113), and to describe how the students perceived their training instruction in the following categories: a) instructional techniques, b) instructor involvement, c) means of teaching, d) means of evaluation, and e) nature of instructor, and to determine the relationship between the student learning style and the instructor teaching style in regard to the student satisfaction and instructional delivery of the learning process in the course 'Theory of Flight" (AVED 1113). This course was offered in the fall semester 2002 at Oklahoma State University, Stillwater campus.

Research Questions

The following research questions guided this study:

1. What were the learning style preferences of Theory of Flight students in the fall 2002 as measured by Kolb's Learning Style Inventory (LSI-IIa)?

2. Did Theory of Flight students learning styles vary by major, gender, and ethnicity?

3. How did Theory of Flight students perceive their training satisfaction as measured by the Training Satisfaction Survey (TSS)?

4. How did Theory of Flight students describe their training instruction in the following categories: a) instructional techniques, b) instructor involvement, c) means of teaching, d) means of evaluation, and f) nature of instructor? (Adapted by Hamby, 2001 from Wheeler and Marshal, 1986, p.86)

5. What was the relationship between the student learning style and the instructor teaching style in regard to the student satisfaction and instructional delivery with the training process in Theory of Flight AVED 1113?

This study comprised a sample of 55 Theory of Flight students out of 62 enrolled in AVED 1113. Conclusions were based solely on the study sample.

The major concern for conducting this study was that because of the complexity of the material covered, too many students were not completing course requirements under Part 141, (AIM/FAR 2002) AVED 1113. The syllabus states, "Final exam may consist of the FAA Private Pilot Exam, scheduled with the Testing Center on Finals Week. Only those scoring higher than seventy two percent on each exam (I-III) will be eligible for endorsement to take the FAA Private Pilot Exam." (p.4). The other concern was the Theory of Flight students' Grade Point Average (GPA) had generally declined from 3.34 in 1998.

Given those statements and in an effort to assist the manager of the Flight School to better understand why these issues were going on. This researcher conducted research

on learning and teaching styles of Theory of Flight students to determine preferred learning styles and preferred ways of delivering instruction and determine if there was any relationship. This study revealed students had a preference for learning as determined by the Learning Style Inventory and how they perceived the delivery of instruction and teaching determined by the Training Satisfaction Survey.

There were students with different majors enrolled in the Theory of Flight course. A total of 61.82 percent of the students were aviation majors while 38.18 percent were not.

With regard to gender, it was found that, a total of 12.73 percent (7 students) were females, whereas 87. 27 percent (48 students) were males. The women's learning styles varied this way: 2 were Accommodators, 2 were Assimilators, 2 were Convergers, and 1 was a Diverger. Eighteen of the male students were Convergers while 15 were Assimilators 15. The data were similar in terms of learning styles by ethnicity.

In the distribution of learning styles by Ethnicity, it was found that 47 students were Caucasians, 18 being Convergers and 15 being Assimilator whereas 4 were American Indians of which 3 students were Divergers and 1 was an Accommodator. Similarly, all 4 students indicating they were Asians fell into the Diverger learning style category. The data also showed that none of the students claimed to be neither Hispanics nor African Americans.

In looking at the findings of the Training Satisfaction Survey on how the students perceived the delivery of instruction and on satisfaction with the course, it was found that the course was "Satisfying." One of the reasons might be that the predominant Instructional Technique was lecture-based, which didn't match the students learning

styles. Since most learners in the Theory of Flight course preferred to learn by experimenting combined with the development of theories and ideas to solve problems. Therefore, a subject's perception of how the instruction was delivered remains a significant factor (Hamby, 2001, p.123). Similarly, the category Means of Teaching showed that the highest subcategory was Mostly Instruction (MI) with 54.17%; followed by the subcategory Got us Involved (GI) with 37.5%. These results were similar to Instructor Involvement in which Lecture-Based (LB) was the subcategory with the highest percentage.

Conclusions

The data showed that student learning styles and the instructor teaching styles were not congruent as reported. Thus, this researcher can draw the following conclusions:

1) There was a variety of learning styles present in groups 001 and 002 in the Theory of Flight course (AVED 1113).

2) Professional Pilot major students seemed to have different learning styles than other majors, and were dominated by Divergers and Assimilators. These results were similar to Kanke's (1999) with regard to Assimilators, but different in terms of Divergers.

3) The majority of the students were Convergers, which combine the learning steps of Abstract Conceptualization and Active Experimentation. People with this learning style prefer to learn by "doing" and "thinking."

4) Learning styles did differ by ethnicity. The majority of the students were White. Their learning style was Convergers. Again, this group prefer to learn by doing and thinking.

5) With regard to gender, women's learning styles were spread over the four quadrants. Among males, however, the majority indicated their learning style preference as Convergers closely followed by Assimilators.

6) The training seemed to have been more teacher-centered rather than student-centered.

7) Most students indicated they were satisfied with the learning process in both sections.

8) The level of satisfaction was not at the highest possible level (Very Satisfying).

In his study Hamby claims that more involvement from the instructor, more student involvement and active participation, and immediate feedback from the instructor to the student increase the students' satisfaction with the training (Hamby, 2001, p.125).

Recommendations for Practice

Based on the findings, the researcher draws these recommendations for practice:

1) Instructors should conduct learning styles surveys to identify the students learning styles. Matching learning and instruction may result in student having a higher level of satisfaction upon completing the course.

2)   Instructors need to be knowledgeable of instructional techniques and learning styles.

3)   Formative evaluations should be given during the course so that instructors can adapt his or her teaching styles to the students learning styles.

4)   Instructors need to adapt their teaching styles to match the students learning styles.

Recommendations for Further Study

Since the delivery of instruction has a significant effect on satisfaction, it would be great to do a quasi-experimental study in which one control group works with traditional methods of learning while an experimental group instructed using techniques that matched their learning styles. Both groups would be surveyed to determine their level of satisfaction. It would also be to compare student grades among the two groups.

It would also be of interest to determine if instructors teach in a style that matches their own learning style. It is found in the literature that some instructors prefer to learn in one style and prefer to teach in a different style. Studies on teaching effectiveness of other aviation courses should be conducted in relation to learning styles and teaching styles to determine both the level of satisfaction and if there is a match between the instructors teaching styles and students learning styles.

Kolb (1993) argues, "Understanding learning styles helps us become aware of the strengths in the steps of the learning cycle. One way of improving learner's effectiveness is to use those strengths when they are called upon to learn" (p.8).

Recommendations from the Interviewees to Improve Instructors Teaching Strategies in the Course "Theory of Flight"

1. Instructor should continue with review sessions before tests to refresh and clarify concepts and answer student questions.

2. Instructors should use more visuals. For example, use more visuals of the cockpit instruments and their application. One student said, "Visuals or movable parts of the cockpit that we can see what the instructor is talking about."

3. Instructors should promote a class atmosphere in which students may comfortably ask questions. For example, after a 20-minute lecture the instructor should ask questions.

4. Instructors should be aware of how international students have learned. For example, conduct themselves in class; Asian students felt instructor needed to give them more time to ask questions because they were not accustomed to their classroom techniques.

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APPENDIXES

APPENDIX A

KOLB'S LEARNING STYLE INVENTORY

LEARNING-STYLE INVENTORY

The Learning-Style Inventory describes the way you learn and how you deal with ideas and day-to-day situations in your life. Below are 12 sentences with a choice of endings. Rank the endings for each sentence according to how well you think each one fits with how you would go about learning something. Try to recall some recent situations where you had to learn something new, perhaps in your job or at school. Then, using the spaces provided, rank a "4" for the sentence ending that describes how you learn best, down to "1" for the sentence ending that seems least like the way you learn. Be sure to rank all the endings to each sentence unit. Please do not make ties.

Example of completed sentence set:

1. When I learn: _2_ I am happy.   _1_ I am fast.   _3_ I am logical.   _4_ I am careful.

Remember: 4 = most like you   3 = second most like you   2 = third most like you   1 = least like you

	A		B		C		D
1. When I learn:	___	I like to deal with my feelings	___	I like to think about ideas.	___	I like to be doing things.	___	I like to watch and listen.
2. I learn best when:	___	I listen and watch carefully.	___	I rely on logical thinking.	___	I trust my hunches and feelings.	___	I work hard to get things done.
3. When I am learning:	___	I tend to reason things out.	___	I am responsible about things.	___	I am quiet and reserved.	___	I have strong feelings and reactions.
4. I learn by:	___	feeling.	___	doing.	___	watching.	___	thinking.
5. When I learn:	___	I am open to new experiences.	___	I look at all sides of issues.	___	I like to analyze things, break them down into their parts.	___	I like to try things out.
6. When I am learning:	___	I am an observing person.	___	I am an active person.	___	I am an intuitive person.	___	I am a logical person.
7. I learn best from:	___	observation.	___	personal relationships.	___	rational theories.	___	a chance to try out and practice.
8. When I learn:	___	I like to see results from my work.	___	I like ideas and theories.	___	I take my time before acting.	___	I feel personally involved in things.
9. I learn best when:	___	I rely on my observations.	___	I rely on my feelings.	___	I can try things out for myself.	___	I rely on my ideas.
10. When I am learning:	___	I am a reserved person.	___	I am an accepting person.	___	I am a responsible person.	___	I am a rational person.
11. When I learn:	___	I get involved.	___	I like to observe.	___	I evaluate things.	___	I like to be active.
12. I learn best when:	___	I analyze ideas.	___	I am receptive and open-minded.	___	I am careful.	___	I am practical.

APPENDIX B

STUDENT DEMOGRAPHIC QUESTIONNAIRE

Student Demographic Questionnaire

The purpose of this demographic questionnaire is to assist the researcher, **Francisco Martinez**, (hereafter called the researcher) with a dissertation research project entitled **"Learning and Teaching Styles of Theory of Flight Students."** The researcher is interested in identifying the student's learning style and determine if these learning styles vary by gender, major, and ethnicity. Therefore, I urge you to kindly cooperate by answering all the questions listed below and fill out the **Learning Style Inventory** on the next page. The findings will be grouped together with other respondents to answer that research question.

No participant's name will be published in print; the identification will be used to identify your learning style and follow-up interviews. Your learning style according to Kolb's Learning Style Inventory (1986) will be sent to you either by email or by mailing address. Finally, your name will be removed from the data after this process is completed.

If you have any concern or questions, please contact <u>Francisco Martinez</u> at (405)- 744-9892. You may also choose to contact <u>Sharon Bacher,</u> IRB Executive Secretary in 415 Whitehurst, (405-744-1676).

Please Provide the Following Information Either Writing the Correct Response or by Checking the Appropriate Response.

Print Clearly Please

1. **Name**_____
              Last Name   **First Name**   **Middle Name**

2. **Email or Mailing Address**_____

2. **Ethnic Group:** _____American Indian or Alaskan_____Hispanic
                         _____White, Non-Hispanic_____ Black, Non-Hispanic
                         _____Asian or Pacific Islander

3. **Age**_____ **Sex: Male**_____**Female**_____

4. **Proposed Major**_____**Degree Sought**_____

5. **Full-time student**_____**Part-time**_____

131

6. Is this the first time you have taken AVED 1113? Yes_____ No_____

Now turn the page and fill out the Learning Style Inventory!

APPENDIX C

THE TRAINING SATISFACTION SURVEY

PART I

Mark the word phrase that describes your perception of the instruction you received in "Theory of Flight" (AVED 1113) Training.

My learning experience with "Theory of Flight" course was: (mark only one)

VERY SATISFYING ☐   SATYSFYING ☐   NEUTRAL ☐

DISSATISFYING ☐   VERY DISSATISFYING ☐

PART II

In each of the five sets below (A through E), ⟨Circle⟩ one word phrase that best describes your perception of the training instruction you received in the course "Theory of Flight" (AVED 1113).

A.	**Instructional techniques**	Free Discussion	Lecture Based	Theory Based	Activity Based
B.	**Instructor involvement**	Student-Directed	Little Involvement	Gave Time to Think Alone	Active Participation
C.	**Means of teaching**	Got us Involved	Mostly Instructions	Mostly Symbols	Mostly Actions
D.	**Means of evaluation**	Immediate Feedback	Objective Tests	Subjective Tests	Personal Judgment
E.	**Nature of Instructor**	Coach[1] * See below	Listener[2]	Interpreter[3]	Director[4]

COACH[1]	**LISTENER[2]**
• Creates a behavioral learning environment • Allows learners to evaluate their own progress • Involves learners in activities and discussions • Helps learners to verbalize what they already know • Puts learners in touch with one another • Draws on the strengths of the group • Uses learners as resources • Is clearly in charge • Acts as facilitator to make the experience more comfortable and meaningful. • Employs activities, projects, and problems based on real life.	• Creates an affective learning environment • Encourages learners to express personal needs freely • Assures that everyone is heard • Shows awareness of individual group members • Reads nonverbal behavior • Wants learners to be self-directed and autonomous • Exposes own emotions and experiences • Shows sympathy • Feels comfortable with all kinds of expression • Stays in the 'Present' • Is practical • Appears relaxed and unhurried
INTERPRETER[3]	**DIRECTOR[4]**
• Creates a symbolic learning environment • Encourages learners to memorize terms and rules • Connections past to present • Integrates theories and events • Separates self from learners, prefers to observe • Acknowledges others' interpretations as well as own • Uses theory as a foundation. • Encourages generalizations • Presents well-constructed interpretations • Wants learners to have thorough understanding of facts and terminology. • Encourage learners to think independently. • Evaluates from subjective criteria.	• Creates a perceptual learning environment. • Takes charge • Gives directions • Prepares notes and outlines • Appears self-confident • Is well organized • Evaluates with objectives criteria. • Based mostly in lectures. • Concentrates on single item at a time • Tells participants what to do • Is conscious of time • Develops contingency plans. • Limits and controls participations.

From: Wheeler and Marshal. (1986, p.86)

1

APPENDIX D

PERSONAL IINTERVIEW GUIDE

Personal Interview Guide

Purpose. The purpose of this interview is to gain further insight of your learning experience in the course "Theory of Flight" in regard to your learning style and the instructor's teaching style.

Method. Once the respondent has completed the Kolb's LSI (1986) and the preferred learning style has been identified. The following questions will be asked:

1. **What motivates you to learn?**

2. **How do you think the instructor of "Theory of Flight" helps you to learn Theory of Flight material?**

3. **How and what can your peers do to help you learn "Theory of Flight material?**

4. **What are your preferred ways of learning Theory of Flight AVED 1113 in regard to instructor involvement (student-directed, little involvement, gave time to think alone, and active participation) and means of teaching (got us involved, mostly instructions, mostly symbols, and mostly actions) and why?**

5. **Can you describe a powerful experience that you have had in the Theory of "Flight course"?**

6. **What is the predominant instructional technique (free-discussion, lecture-based, theory-based, and activity-based) in the Theory of Flight AVED 1113 course? Do you think your instructor met your learning style and your learning needs?**

7. **Do you think you had to adapt your learning style to the instructor's teaching style? Did it affect you?**

8. **In looking at the Training Satisfaction Survey, what descriptor in the nature of instructor (coach, listener, interpreter, and director) matches your learning style and why?**

9. How do you feel this (specific descriptor) affects your satisfaction with the course "Theory of Flight"?

10. Are you satisfied with the course Theory of Flight? Please explain.

11. How and what would you do to improve your learning experience in Theory of Flight AVED 1113? (questions 7-11 are from Hamby 2001)

APPENDIX E

CONSENT FORM

CONSENT FORM

A. Authorization

I, _____, hereby authorize or direct **Francisco Martinez**, to perform the following treatment or procedure.

B. Description

The study **"Learning and Teaching Styles of Theory of Flight Students"** is to be conducted as a partial fulfillment for the requirement of Doctor of Education through Oklahoma State University. **The purpose of this study is to identify the "Theory of Flight" (AVED 1113) student's learning style preferences and determine whether these learning styles vary by gender, major, and ethnicity; determine the student's satisfaction of the course "Theory of Flight" (AVED 1113); describe how the students perceive their training instruction in the following categories: a) instructional techniques; b) instructor involvement; c) means of teaching; d) means of evaluation; and f) nature of instructor; and determine the relationship between the student's learning style and the instructor's teaching style in regard to the student's satisfaction and instructional delivery of the learning process in the course 'Theory of Flight" (AVED 1113).**

Please, fill out the **"Student Demographic Questionnaire,"** and the **"Learning Style Inventory."** Then, the **"Training Satisfaction Survey."** Once your learning style has been identified, I will select 16 students for an interview (two students per learning style, eight students per section). For this interview, the researcher will use the **"Personal Interview Guide."** Each interview will last about thirty five minutes.

Your name will only be used for the identification of your learning style and for follow-up purposes as in the case of selecting the sample for the personal interviews. Individual responses will not be revealed, nor published in the dissertation or any other manuscript. Your name will be protected at all times. Individual responses will be kept confidential and will be kept away from the instructors and other individuals. The response sheets will be destroyed after they have been collectively summed into a database.

If you have any concern or questions, please contact Francisco Martinez at (405)- 744-9892. You may also choose to contact Sharon Bacher, IRB Executive Secretary in 415 Whitehurst, (405-744-1676) .

C. Voluntary Participation

I understand that participation is voluntary and that I will not be penalized if I choose not to participate. I also understand that I am free to withdraw my consent and end my participation in this project at any time without penalty after I notify the project director.

D. Consent

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date:_____ Time: _____ (am./pm.)

Signed: _____

_____

I certify that I have personally explained all elements of this form to the subject or his/her representative before requesting the subject or his/her representative to sign it.

Signed_____
Project director or authorized representative

APPENDIX F

IISTITUTIONAL REVIEW BOARD

APPROVAL FORM

Oklahoma State University
Institutional Review Board

Protocol Expires: 10/22/2003

Date: Wednesday, October 23, 2002   IRB Application No   ED0330

Proposal Title: LEARNING AND TEACHING STYLES OF "THEORY OF FLIGHT" STUDENTS

Principal
Investigator(s):

Steven Marks   Francisco Martinez   Nelson Ehrlich
306 Cordell North   319 Willard   317 Willard
Stillwater, OK 74078   Stillwater, OK 74078   Stillwater, OK 74078

Reviewed and
Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of
the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of
individuals who may be asked to participate in this study will be respected, and that the research will be
conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol
   must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar
   year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are
   unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved projects are subject to monitoring by the IRB. If you have questions about the
IRB procedures or need any assistance from the Board, please contact Sharon Bacher, the Executive
Secretary to the IRB, in 415 Whitehurst (phone: 405-744-5700, sbacher@okstate.edu).

Sincerely,

Carol Olson, Chair
Institutional Review Board

142

<center>

VITA 2

Francisco J. Martinez

Candidate for the Degree of

Doctor of Education

</center>

Thesis: LEARNING AND TEACHING STYLES OF THEORY OF FLIGHT
STUDENTS

Major Field: Applied Educational Studies

Biographical:

Personal Data: Born in Maturin, Monagas, Venezuela, on October 18,
1957, the son of Cruz Roca y Francisco Martínez.

Education: Graduated from Creación Maturin High School, Maturin,
Monagas, Venezuela in 1980. Received Bachelors of Arts degree in
English Education from Orient University, Cumaná, Sucre, Venezuela in
1987; received Master of Science degree with a major in Education and
Research from Simón Rodriquez University in 1997 in Caracas,
Venezuela. Completed the requirements for the Doctor of Education
degree in May 2003 at Oklahoma State University, Stillwater, Oklahoma.

Experience: ESL Instructor for CEPET, Caracas, Venezuela, 1987-1989.
Director of International Language Management Services, Caracas-
Venezuela, 1989-1990. Adjunct Professor at Nueva Esparta University,
Caracas-Venezuela, 1991-1991. Assistant Professor at Simón Bolívar
University, Caracas-Venezuela, 1992-1999. Research Assistant at
Oklahoma State University, 2000-Spring 2003.