DISTRIBUTION OF PSYCHOLOGICAL TYPES AMONG STUDENTS IN A PROFESSIONAL PILOT BACCALAUREATE DEGREE PROGRAM AND ASSOCIATED ATTITUDES TOWARDS TEACHING

By

MICHAEL E. WIGGINS

Bachelor of Science
Embry-Riddle Aeronautical University
Daytona Beach, Florida
1976

Master of Business Administration
Embry-Riddle Aeronautical University
Daytona Beach, Florida
1981

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF EDUCATION
December, 1998

OKLAHOMA STATE UNIVERSITY

DISTRIBUTION OF PSYCHOLOGICAL TYPES AMONG STUDENTS IN A PROFESSIONAL PILOT BACCALAUREATE DEGREE PROGRAM AND ASSOCIATED ATTITUDES TOWARDS TEACHING

Thesis Approved:

Steven K. Marks
Thesis Adviser

Kenneth E. Wiggins

Cecil W. Dugger

John D. Vitek

Wayne B. Powell
Dean of the Graduate College

ACKNOWLEDGMENTS

I wish to express my appreciation to Dr. Steven Marks, Dr. Cecil Dugger, and Dr. Jack Vitek for their support and encouragement throughout this process. I also wish to thank Captain Billy Cunningham for encouraging me to pursue the study of learning styles. My sincere appreciation to Captain Gene Frampton and Ms. Charlotte Frampton for their support and encouragement with regards to the Myers-Briggs Type Indicator. I also wish to thank Dr. Nancy Parker for her help, encouragement, and advice throughout this study. I also thank Ms. Ann Hickman for her editorial guidance.

I give my most sincere thanks and appreciation to my father, Dr. Kenneth E. Wiggins, and my mother, Dr. Margaret M. Wiggins, for their lifelong assistance, encouragement, love, and unconditional support.

Finally, to my wife, Erika, and my children, Kenny, James, Leanne, and Brian, my lifelong appreciation and devotion in return for their sacrifices, encouragement, love and understanding, for without them, this would not have been possible.

TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

CHAPTER I

INTRODUCTION

Background of the Problem

Differences in students have been observed, noted and expected because we are all unique. Differences are particularly evident in a program involving flight training where one-on-one instruction is the primary method. The Aviation Instructors Handbook addresses such differences by noting "Flight instructors must be able to evaluate student personality if they are to use appropriate techniques in the presentation of instruction" (Federal Aviation Administration, 1977). This approach in the Aviation Instructor's Handbook is quite accurate, unfortunately, the explanation of student personalities in the handbook is limited to discussions regarding anxiety and stress. This explanation does not contribute to understanding the differences in students and how they address learning.

Recently, many educators began to assess the concept of learning styles, trying to find answers to the question of why students are different (Davis, 1993) and how they learn. Erickson and Strommer (1991) state that most teachers attempt to teach students the way they were taught and teach the students as if they all learn in the same manner. This endless circle of learning must change.

Several studies and resources indicate that as students vary in their learning style preferences, these preferences have an impact on their chances to succeed (Claxton & Murrell, 1987; Keefe, 1987; Kolb, 1984; NASSP, 1979; Swanson, 1995).

Thus, the important question becomes, do certain degree programs attract people with all varieties of learning styles or do they tend to attract certain similar types of students? Research on different degree programs indicates the latter (Laribee, 1994 Nourayi & Cherry, 1993, Borg & Shapiro, 1996; Raven, Cano, Garton, & Shelhamer, 1995; Cano & Garton, 1994, Stewart & Felicetti, 1992; Tharp, 1993). It follows that knowing the learning styles of the students in a particular program can lead to an understanding of the students and how to create a better learning environment. Cornesky (1994) insists that to create a quality learning environment it is essential for professors to know and understand learning styles. Whereas it is not feasible to match students of each learning style to instructors with complementary teaching styles, knowing the make-up of the student body can certainly guide instructors when deciding instructional strategies to use in the classroom.

The Myers-Briggs Type Indicator (MBTI), based on Carl Jung's theory of psychological type, has shown over time it is a valid and reliable tool for determining a person's psychological preferences (Lawrence, 1993; Harvey, Murry & Stamoulis, 1995; Myers & McCaulley, 1985). Because learning preferences and teaching styles can be linked to psychological preferences, knowing the distribution of psychological types of students should be used as a guide for the development of more effective teaching methods. The literature suggests that people with certain psychological types are attracted to, or are at least, more successful in particular fields of study.

Statement of the Problem

The literature suggests that people with certain personality types may be attracted to certain collegiate programs. Because of the relationship between teaching methods, learning styles, and achievement a need exists to know the distribution of the psychological type within students of a particular degree program. Success or failure in a college program can result from, at least in part, to the learning styles of students. If a mismatch occurs between the learning preferences of the students and the teaching styles, then students can be at a greater disadvantage than when a mismatch does not occur.

Teachers who are not aware of the learning preferences and needs of their students may be, albeit unknowingly, creating a situation where students are not able to learn in their best manner. By understanding the distribution of the type of learners, teachers can then understand learning preferences associated with preferred types (Fairhurst & Fairhurst, 1995, Keirsy & Bates, 1984; Lawrence, 1993). Once learning preferences are known, teaching methods can be adjusted to create a classroom environment which fosters higher achievement.

Purpose

The purpose of this study is to determine the distribution of psychological types of students enrolled in a professional pilot baccalaureate degree program. This study also will determine the students' attitudes regarding various teaching methods used by faculty and instructors in this degree program.

Objectives

This study has three objectives. First, it is hypothesized that the distribution of psychological types of students enrolled in a professional pilot baccalaureate degree will differ from the distribution of psychological types of students found in the general, traditional age college population. Second, it is further hypothesized that significant differences exist between seniors and each of the other three classifications and between the total sample and each of the classifications.

A third hypothesis is that significant differences occur in student attitudes towards various teaching methods that can based upon their psychological type preferences.

Assumptions

The students who participate in this study are assumed to be psychologically normal and well adjusted. It is further assumed that the students who complete the MBTI and the questionnaire will do so in an honest and open manner. The students who participate are assumed to be in the degree program of their own volition and desire.

Scope and Limitations

The scope of this study is limited to students in collegiate aviation programs that provide professional preparation to become a career pilot as part of a four year academic degree. Students are self-selected into this program and are not screened except for admission standards based upon high school grades, class ranking, and SAT scores. This study may not be generalized to students who are learning how to fly while enrolled in

other college degree programs or to students who are learning how to fly outside of an academic environment.

Because this is not a longitudinal study, the method to determine if a shift in type distributions was to compare the distribution of seniors to each of the other classifications. It was assumed that if certain types dropped out over the course of the four years that it would apply to all cohorts equally and not be specific to any one cohort.

It is acknowledged that students' responses on the survey instrument might be influenced by the fact they will be in a classroom setting and may not feel totally relaxed. Participants may try to give expected answers rather than those that reflect true feelings.

Another caution to consider is that some of the subjects are in the age group affected by test-retest reliability. Myers and McCaulley (1985) state that reliability is lower for people in their teenage years but tends to stabilize when they reach their twenties. The subjects in this study are predominantly between the ages of eighteen and twenty-two.

Definitions

For the purpose of this study, the following definitions are used:

Classification -- Stratification of students by academic year: freshman, sophomore, junior, or senior.

Index of attraction (I) also called Self-Selection Ratio (SSR) -- Ratio of a particular type percentage found in a sample when compared to the percentage found in the base population (Zeisset, 1996). The letter "I" denotes the Index of Attraction and the phrase "I-types" denotes introverts.

Learning Style -- Composite of characteristic cognitive, affective, and physiological factors which serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment.

Myers-Briggs Type Indicator (MBTI) -- Instrument of a theory of dichotomous preferences, using forced choice responses to discover psychological types. Two forms of the instrument are in use today. Form G is the most common and contains a total of 126 items. Form F is a research version and contains 166 items. Both forms use 96 items as core indicators, and the remaining items are used as research items or items under development.

Preference -- Choices in ways people prefer to use their minds for performing certain tasks, such as orientation to the outer world of people or inner world of thoughts, taking in information, making decision, and living. Whereas a person may use both extraversion and introversion in their daily lives, they have a preference for one over the other and will develop it more thoroughly.

Psychological Type or Type -- Type created through the exercise of individual preferences in perception, judgment, attitude, and orientation resulting in a recognizable set of traits and potentialities. An individual's type is identified by the four letters of their preferences, i.e., ESTJ. Type is sometimes used in connection with a particular preference, such as extraversion or introversion, i.e., E types or I types.

Selection Ratio Type Table (SRTT) -- Type table that is used to compare type distributions in study sample population as is compares to the distribution found in a base, or comparison sample. Statistics in each cell contain the number of that type contained in the population being analyzed, the percentage of population represented, and

the index of attraction. This is the standard format for displaying comparisons of type distributions accepted by the Association for Psychological Type.

Temperament -- Unification or moderation of otherwise disparate forces which place a signature or thumbprint on each of one's actions making it recognizably one's own. Temperament determines behavior because behavior is the instrument for getting one what one must have and satisfying the desire for that one thing for which one lives.

Type Table -- Device reflects the relationship of all of the types to each other. Type tables contain sixteen cells in a four-by-four arrangement, with types next to each other differing by only one dimension (Myers, with Myers, 1980/1995).

CHAPTER II

REVIEW OF THE LITERATURE

Overview of Learning Styles

In the past few decades, several models of learning styles have been developed as a result of research. These models place students with similar characteristics into distinct groupings (Claxton & Murrell, 1987; Keefe, 1987; Reiff, 1992; Richter, 1992; Swanson, 1995). Whereas distinct differences exist among these models, common threads also occur. This is to be expected because all of the studies are on the same subject, the human being.

Bokoros, Goldstein, and Sweeney (1990) reviewed five measures of cognitive style and found three underlying factors: a TF dimension, an information-processing dimension, and an attentional focus dimension. The study suggested that the different and independent lines of research found the same cognitive core, which gave credence to these factors as being useful in practice and research.

The model for learning styles used by the National Association for Secondary School Principals (NASSP) contained three dimensions: 1) cognitive, 2) affective, and 3) physiological (Keefe, 1987). The cognitive dimension consisted of seven reception styles and five concept formation and retention styles. Reception styles address the ways in

which information was perceived and analyzed, whereas concept formation and retention styles concerned problem solving, the generation of hypotheses, and memory processing. The affective dimension reflected the issues of attention, emotion, and valuing. This dimension comprised of five affective styles, and ten expectancy and incentive styles. The final dimension contained the physiological styles, with six styles that were based upon sex-related differences, health, and environment. Learning styles based on this model were assessed by the NASSP Learning Style Profile, a 23 scale instrument.

The Learning Style Inventory (Dunn, Dunn, & Price, 1975,1989) and the Productivity Environment Preference Survey (Dunn, Dunn, & Price, 1982, 1990), measured 22 elements involving individual preferences for instructional methods, environments, and resources. These instruments were based upon nine theoretical postulates: 1) learning styles are biologically based, 2) most people have learning style preferences but individual's preferences differ, 3) individual instructional preferences exist and can be measured, 4) as the preferences become stronger the more imperative it is to provide complementary teaching strategies, 5) achievement can be increased by accommodating these preferences, 6) matched learning-teaching environments will promote higher student achievement than mismatched environments, 7) most teachers can use learning styles as a cornerstone to their instruction, 8) most students can learn to capitalize on their strengths when learning new and difficult material, and 9) the need to accommodate learning preferences increases with students who have lower levels of achievement (Dunn, Griggs, Olson, Beasley, & Gorman, 1995).

Dunn (1993) found that differences occurred in learning preferences across cultural boundaries. For example, Dunn's study found that Chinese-Americans worked

better independently whereas African-Americans worked more effectively with peers. Comparisons between African-Americans and Greek-Americans showed differences in 9 of the 22 subscales on the Dunn and Dunn Learning Style Inventory. Dunn also noted that differences occurred between males and females of different cultural backgrounds.

Malloy and Jones (1998) found that African-American students prefer to use holistic or relational approaches in mathematical problem-solving. While their findings showed that the participants used both holistic and analytical reasoning to solve problem, holistic reasoning was used more often.

Kolb (1984) developed a theory of learning he called experiential learning. Kolb's theory involved a four step process whereby people learned by immediate and concrete experience, reflection, abstract conceptualization, and active experimentation, which created the concrete experience for the next cycle. This cycle contained two fundamental elements of learning. First, the individual must take in or grasp the information and then transform that information into knowledge. Kolb's basis for learning styles began with the concept that people grasp information either through concrete experience or through abstract conceptualization. Information was then transformed into knowledge either through reflection or by active experimentation.

Kolb believed that people have preferences as to how they grasp information and transform it into knowledge. The first identified group, known as divergers, prefers to grasp information through concrete experience and transform it through reflective observation. The second identified group, known as accommodators, shares with the divergers the same preference for grasping information through concrete experience, but differs from divergers in that they prefer to transform the information into knowledge

through active experimentation. The third identified group, known as assimilators, prefer to grasp information through abstract conceptualization and transform it into knowledge via reflective observation. The fourth group, known as convergers, prefers to grasp information through abstract conceptualization and transform it into knowledge by active experimentation. Kolb (1985) developed a twelve item inventory, the Learning Style Inventory, that determined a person's learning style according to these four learning styles. He discovered individuals with similar learning styles preferred similar major fields of study in college and the students within a field became more similar as they progressed towards their senior year. (Claxton & Murrell, 1987).

Cornwell and Manfredo (1994) stated that the ipsative nature of Kolb's inventory was subject to many criticisms, and they suggested an alternative inventory using only the first rank order to determine primary learning styles. Their study demonstrated the usefulness of the concept of primary learning styles, while supporting the criticisms of Kolb's Kolb Learning Style Inventory. Cornwell and Manfredo suggested that teachers should take the time to determine the primary learning style of their students and were generally supportive of Kolb's theories.

Gregorc (1982) developed a model similar to Kolb's. Gregorc's theory posited that people gather information through concrete senses or abstract conceptualization and then order, or use, it in either a sequential or random manner. This resulted in four different styles (Gregorc & Ward, 1977).

The first style identifies concrete sequential learner who derives information through direct experience, preferably in an orderly and sequential manner. The concrete

sequential likes clear, organized presentations using overheads, outlines, and hands-on activities but defers to authority.

The second style identifies the concrete random learner who has an experimental attitude, makes intuitive leaps when exploring unstructured problems, and likes to use trial and error. The concrete random likes simulations, independent study assignments, problem-solving activities, and does not like cut-and-dried approaches to learning.

The third style identifies the abstract sequential learner who does well in written, verbal, and images symbols, and who likes to read. The abstract sequential learner likes a presentation that is substantive, rational, and sequential in nature and has a low tolerance for environmental distractions. Like the concrete sequential, this person tends to defer to authority.

The fourth style identifies the abstract random learner, who is attuned to the nuances of the classroom, takes a holistic view of the learning experience, likes multi-sensory environments, and enjoys group discussions. This person prefers to receive instruction in an unstructured manner.

Kolb's model for learning styles was found to have distinct similarities to the a Native American philosophy known as the "Medicine Wheel" (Murk, Place, & Giever, 1994). The Medicine Wheel has been proposed as the basis for adopting a holistic approach to learning that accommodates a wide range of learning styles. The Medicine Wheel is a native legend which has a circle with countless points. Each point represents a different, yet valid, perspective which is symbolic of the various learning styles. The legend says that people must view themselves from four metaphoric directions. The

message of the wheel legend is that people should not hold fast to one point of view, a message that is in concert with the concept of learning styles.

Gardner (1983) identified seven different learning styles which he referred to as "intelligences" labeled: 1) linguistic, 2) musical, 3) logical-mathmatical, 4) spatial, 5) bodily-kinesthetic, 6) inter-personal, and 7) intra-personal. Gardner believed, like the Dunns, that these intelligences are biologically based with each ability and located in a different part of the brain. When students are acquiring information, Gardner noticed that the learners tend to gravitate to those who are doing things the learner considers important or interesting.

Grasha and Reichmann developed and validated the Grasha-Reichmann Student Learning Style Scales (Grasha, 1996), and identified six learning styles: 1) competitive, 2) collaborative, 3) avoidant, 4) participant, 5) dependent, and 6) independent. Grasha noted that, whereas there were six scales suggesting three dichotomies, strong correlations did not exist, except for the avoidant-participant pair. Grasha also pointed out that learning preferences can change, depending upon how the teacher organizes the class. Student learning preferences are not rigid and can be changed and modified to adapt to classroom procedures. The more structure in the class, the less dominant the preferred styles became. Whereas in an unstructured environment, the dominant preferences are prominent.

Another theory on learning styles is based on the primary sense that is involved in the learning process: visual, auditory, or kinesthetic. (Sarasin, 1998). This approach to learning styles is based upon behaviors that can be observed by the teacher. Visual learners are typically global or holistic in their approach to learning. Auditory learners

are more skill-oriented and conceptual than the other two styles. Kinesthetic learners prefer to learn by doing through active engagement in the task as hand. Sarasin notes that the typical post-secondary learning environment favors auditory learners and kinesthetic learners are at the greatest disadvantage of the three.

To summarize the literature, many studies exist and several models and theories of learning styles have been developed. Whereas, some distinct differences occur, many common themes exist. Most notably are the similarities between the Kolb and Gregorc models. Early Native Americans noticed and understood the differences in people, as evidenced by the Medicine Wheel.

People are intelligent in many ways, yet not always in the same ways. And whereas preferences exist, nothing suggests that they are rigid and that students can not adapt to changing environments. Students who are allowed to learn in an environment where they can capitalize on their preferences and strengths, however, have a better chance of higher achievement.

Basis for Psychological Types

Psychological type, referred to as "type", is based upon the work of Carl Jung. In 1921, Jung published Psychologische Typen in Germany, translated and published in the United States in 1923 as Psychological Types. Jung's theory stated that a person has a preference for either the outer world of things and people (known as extraversion) or has a preference towards the inner world of thoughts and reflections (known as introversion). His work postulated the theory that people have preferences in two mental functions. The rational or judging function deals with decision-making, whereas the irrational or

perceiving function deals with sensations and perceptions. Jung's theory is based upon dichotomies and not upon varying degrees of traits (Jung, 1923/1971; Lawrence, 1984; Myers, 1993). This means the individual has a preference for one or the other, but the theory does not allow for degrees of preference.

Jung used the term "attitude" to describe the preference for extraversion or introversion. Jung (1923/1971) defined attitude as "... a readiness of the psyche to act or react in a certain way" (p. 414). Jung also defined function as "... a particular form of psychic activity that remains the same in principle under varying conditions" (p. 436). He stated that preferences are inborn a theory supported by the research of Gardner and the Dunns. Jung discovered that, when the three preferences are combined, certain personality types are noticed. Jung defines "type" as "...a characteristic specimen of a general attitude occurring in many individual forms" (p. 482). Jung determined that if you combined the preferences in the attitude, the rational and irrational mental functions, you had "types" with similar characteristics.

Jung postulated that, when the preferences of the three dichotomies are combined, they form categories of behavior attributed to all people with similar preferences. For example, people who exhibit a preference for extraversion, sensation, and thinking will have be different from people who exhibit a preference for introversion, intuition, and feeling in certain and distinguishable ways.

Katherine Briggs and Isabel Briggs-Myers found a fourth dimension they felt was implicit in Jung's work (Myers with Myers, 1980/1995). This dichotomy of judging verses perception deals with a person's orientation to the outer world. The preference in this dimension dictates the how the auxiliary processes affect the dynamics of a person's

type. In the extraverted individual, the person's dominant mental function is displayed to the outer world, whereas the introvert deals with the outer world with the auxiliary mental function (Myers with Myers, 1980/1995).

The addition of the fourth dimension led to the establishment of sixteen distinct types, basis for the MBTI, and the foundation for this study. Type theory, as used in this study is based on Myers definition of type which states that personality is structured by four preferences concerning the use of perception and judgment (Myers with Myers, 1980/1995).

Type theory usually considers only Jung's work on type, without other aspects of Jung's theories (Myers & McCaulley, 1985). The primary addition of Myers to Jung's theory was the addition of the dominant and auxiliary processes (Myers with Myers,1980/1995). The dominant mental process is likened by Myers to the "captain of the ship" as a governing force in their personality. The auxiliary mental process supplements the dominant, providing balance between extroversion and introversion.

Descriptions of the Types

The Four Preferences

Type theory is based upon the four dichotomies discovered by Jung and Myers. Each of these dichotomies has distinguishable characteristics that can be observed and measured. These preferences, arising from these four dichotomies, are eventually combined into temperaments and types.

The first preference is extraversion (E) or introversion (I). People with a preference for extroversion tend to focus on the outer world of things and people. People who have a preference for introversion tend to focus on the inner world of thoughts and ideas (Myers, 1993). Hirsh and Kummerow (1989) referred to extraversion and introversion as the "energizing preference" (p. 5). This dimension is normally annotated as EI, meaning E or I.

The second preference is sensing (S) or intuition (N). To distinguish between introversion and intuition, the letter "N" is used instead of the letter "I". People with a preference for sensing take in information through their senses and are observant about what is going on around them. Whereas those who prefer intuition take in information holistically, by seeing the big picture and relationships between facts (Myers, 1993). Hirsh and Kummerow (1989) referred to this preference as the attending preference (p. 6). This dimension is normally annotated at SN, meaning S or N. The SN preference is similar to the concrete sensing and abstract conceptualization preference used by both Kolb and Gregorc.

People with a preference for thinking (T) or feeling (F) tend to make decisions by being logical, objective, and analytical whereas those who prefer feeling tend to make decisions guided by their values, are sympathetic, compassionate, and are people-centered (Myers, 1993). Hirsh and Kummerow (1989) called this the deciding preference (p. 6), normally annotated as TF, meaning T or F.

The last preference is judging (J) or perceiving (P). In this preference people are oriented to the outer world. People with a preference for judging prefer order, like to come to closure and move on, are systematic, and enjoy sticking to a plan whereas those

who have a preference for perceiving are flexible, spontaneous, open to new information, and like to experience life as it comes (Myers, 1993). Hirsh and Kummerow (1989) labeled this the living preference (p. 6), normally annotated as JP, meaning J or P.

The Temperaments

Keirsey and Bates (1984) formulated four temperaments, using combinations of two mental functions along the lines of the four temperaments of Hippocrates: the sanguine, the choleric, the phlegmatic, and the melancholic. These four combinations were given names associated with the names of Greek gods: Apollo, for spirit; Dionysus, for release; Prometheus, for science; and his brother Epimetheus, for duty. Keirsey later changed these names to Idealist, Artisan, Rational, and Guardian (Fairhurst & Fairhurst, 1995).

Idealists, the combination of intuition and feeling, or NF, seek interaction, relationships, and are people centered (Keirsey & Bates, 1984). Fairhurst and Fairhurst (1995) described Idealists as creative, authentic, encouraging, enthusiastic, having a strong regard for interpersonal relationships. Idealists need identity and seek self-actualization. They value meaningful relationships and are considered to be futurists.

Artisans, the combination of sensing and perceiving, or SP, seek freedom, action, tend to be impulsive, and can get bored with the status quo (Keirsey & Bates, 1984). Artisans are iconoclasts and very pragmatic. They do not necessarily respect authority for authority's sake, but only if the authority figure can prove his or her ability with practical results. Artisans are flexible, tolerant, and tend to have a characteristic lack of fear or worry (Fairhurst & Fairhurst, 1995).

Rationals, the combination of thinking with intuition, or NT, are fascinated by power over nature, seek competence and intelligence, continually strive to improve, and are very self-critical (Keirsey & Bates, 1984). Fairhurst and Fairhurst (1995) noted that Rationals make connections not readily apparent to others, tend to think in terms of systems, and sometimes have a lack of regard for the feelings of others.

Guardians, the combination of sensing and judging, or SJ, have a desire for hierarchy and rules, are compelled to be bound and obligated, and are very traditional in their beliefs (Keirsey & Bates, 1984). Fairhurst and Fairhurst (1995) noted that because Guardians prefer to obey authority, they expect everyone else to do the same. Because Guardians value tradition, they can be slow to accept change and are typically cautious, conservative, and are usually prepared for various contingencies.

Golay (1982) developed four learning styles based on four temperaments, labeling them: 1) conceptual-global (for the Idealist), 2) actual-spontaneous (for the Artisan), 3) conceptual-specific (for the Rational), and 4) actual-routine (for the Guardian). Golay's rationale for this theory of learning styles was that, if people can be grouped by temperaments, then it was reasonable that each temperament had its own learning preference. His descriptions of each learning style were very similar to the descriptions by Keirsey and Bates.

The Sixteen Types

As previously noted, when Myers included the JP scale into Jung's work, sixteen types were the result. By adding the individual preference to each of the four dichotomies, the four letter combination identifies for each particular type. For instance,

if a person has a preference for extraversion, sensing, thinking, and judging, that person's type would be labeled ESTJ. If the person has a preference for introversion, intuition, feeling, and perception, that person's type would be labeled INFP. The following type table shows the sixteen types. It is designed so that each type can be seen in relation to the others. Each type that is adjoining, either vertically or horizontally shares three preferences with those types. Table I depicts the type table, showing the relationship of the sixteen types.

TABLE I

THE TYPE TABLE

ISTJ	ISFJ	INFJ	INTJ
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESFJ	ENFJ	ENTJ

Note: Source – Myers with Myers, 1980/1995.

To summarize, the concept of type involves the preferences a person uses in judging and perceiving mental functions, the SN or TF dichotomies. Type is coupled with the person's preferred attitude, the EI dichotomy, and how they choose to orient

themselves to the outer world, the JP dichotomy. The combination of preferences determines the person's type. These sixteen types are the basis for of understanding how people live, learn, and relate to others.

The Use of the Myers-Briggs Type Indicator in Educational Research

Myers (Myers with Myers, 1980/1995) knew that many teachers struggle with the differences in learning styles of students. She suggested that an understanding about type can offer solutions to the problems associated with those differences in students.

Myers and McCaulley (1985) related type to three aspects of education: aptitude, application, and interest. Type theory indicates that those with preferences for introversion and intuition will have a higher academic aptitude, whereas those with preferences for extraversion and sensing have a higher aptitude in practical areas requiring action. Whereas all types may perform well, IN types, according to the theory, may have an advantage in school because their preferences match academic tasks and the design of aptitude tests.

The judging attitude is related to application (Myers & McCaulley, 1985) because these individuals prefer to be planned and organized. Myers found that interests varied by types as well. SP types tend to prefer mathematics because of its clarity and certainty. NT types prefer science because of this field's basis in discovery, theory, and analysis. NF types prefer the humanities because of abilities and interests in communication. ES types tend to choose history because it involves the study of real people in real times.

To compare one group with another, the Association for Psychological Type accepted an analysis tool, known as the Selection Ratio Type Table (SRTT), (McCaulley, 1985). The SRTT compares the percent of the each type in test sample with the percent of each type in the base sample. The result is a ratio, known as the index of attraction, or I. The Chi-square method tests if the sample differs significantly from the base. An I of greater than 1.0 indicates a higher percentage in the test sample than the base sample and suggests people with that type are more likely to be attracted to that population. An I of less than 1.0 indicates a lower percentage in the test sample than the base sample and suggests people with that type are less likely to be attracted to that population.

Reliability and Validity of the Myers-Briggs Type Indicator

The internal consistency reliability of the MBTI has been tested using information from several studies. Results of these tests consistently showed reliabilities ranging from lows of near .60 to highs of near .90 using the Spearman-Brown prophecy formula (Myers & McCaulley, 1985, p165- 168). These tests did show lower reliabilites for teen-age respondents, but stabilized responses from respondents in their twenties and older. College and university samples had higher reliabilites than high-school samples.

Test-retest reliablities were also tested by Myers and McCaulley. These tests found high correlations for intervals ranging from a week to several years (Myers & McCaulley, 1985, p. 171 -174). In the majority of the cases there was a change in only one of the four dichotomies. One reason there may have been a change is that the individual may become more certain of their preference.

In checking for validity in the MBTI, content validity was a key consideration in the development of the instrument. Development of the instrument began in 1942 and continued continuously until publication of Form G in 1977 (Myers & McCaulley, 1985). Items of forced choice were chosen because the theory proposes dichotomies. Each dichotomy is between equally legitimate selections, with one selection appearing attractive to a person with a particular preference. As Myers and McCaulley stated, "The strategy was to use observable 'straws in the wind' to make inferences about the direction of the wind itself" (p. 141). Each item on the MBTI was to point to a preference much like straws thrown into the air indicates the direction of the wind. This is why the MBTI is referred to as an "indicator" and not a test.

In selecting the wording for each item, every effort was made to select responses that appealed to the appropriate type. One response would appeal to a person with one preference whereas the other response would appeal to the person with the opposing preference. The constructs and validity of the MBTI was confirmed by Harker, Reynierse, and Komisin (1998). Their conclusion was that the differences indicated by the MBTI were real and measurable and are consistent with and confirm the preference pairs, which are word-pairs that are part of the instrument.

The results of a comparison between the MBTI and the Jungian Type Survey, developed independently of Myers work, contributed to verification of the validity of the construction of the MBTI (Myers & McCaulley, 1985). Myers and McCaulley compared results from the MBTI with numerous other psychological tests and measures, such as the Adjective Check List, California Psychological Inventory, Edwards Personality Preference Survey, Minnesota Multiphasic Personality Inventory, Omnibus Personality

Inventory, and the Sixteen Personality Factor Questionnaire, to name a few (Myers & McCaulley, 1985, p. 177-206). They found enough correlations to verify the validity of the construction of the MBTI. Carlson (1985) found that numerous studies examined the validity of Form G in several settings, with generally favorable results. SRTTs showed different distributions among various groups of people contributes which to the construct validity of the MBTI.

In their 1995 study, Harvey, Murry, and Stamoulis concluded it was a "good news-bad new" scenario. While they found the structure of the MBTI to provide the most plausible representation of its latent structure, they suggested that improvements were needed to the model in order to get a better fit to the data.

Pittenger (1993) was critical of the MBTI. He suggested that insufficient evidence supports the claims made about the MBTI. He claimed insufficient evidence exists to support the claim of 16 unique types. Because all the correlations were made on the dichotomous scales, Pittenger suggested the data do not support proponents claims that the MBTI properly identifies the uniqueness of the 16 types. He also was critical of the SRTT and the use of I to compare groups because I is not independent. He felt changes in small samples could skew the results.

To summarize, the MBTI has been subjected to a development process of more than 40 years, and its validity and reliability have been scrutinized by many studies. Whereas the MBTI does have its detractors, over 2.5 million people take the MBTI each year making it one of the most widely used and thoroughly researched instruments used to identify types (Myers with Myers, 1980/1995; Nasca, 1994).

Learning Preferences Based on Type

Type can be used to discover learning styles or preferences. A study by Winer and Bellando (1989) supported the notion that variabilities can be associated with personality, and Wood (1993) found a correlation between Bloom's taxonomy and personality types. Bloom (1956) listed six levels of cognitive development: knowledge (or rote memorization), understanding, application, analysis, synthesis, and evaluation. Wood's study connected the student who has a preference for sensing and thinking (ST) with the knowledge level of Bloom's taxonomy. The student with a preference for intuition and thinking (NT) linked with the second level, understanding. Students with a preference for intuition and feeling associated with Bloom's fifth level, synthesis.

Power and Lundsten (1997) correlated the left brain/right brain cognitive theories with type theories. They discovered a correlation between left brain thinking preferences and the I, S, T, and J preferences and a correlation between right brain thinking preference and the E, N, F, and P preferences.

In a study involving Canadian first-year engineering students, Rosati (1997) found that male students with ITJ preferences were the most successful of all entering engineering students. Of those students who were admitted into the program with lower averages, Rosati found that males with IN preferences had the highest achievement. It was interesting to note that this study found that these trends were not the same for female students in the program, but gave no further findings for explanations.

The relationship between college attrition and students' MBTI preferences (Schurr, Ruble, Palomba, Pickerill, & Moore, 1997) revealed how the relationship

between type and various subcultures found in colleges influenced degree completion rates among college students. Students with the I preference had a positive influence due to better academic preparation for college where students with the E preference had a positive influence due to identification with the collegiate subculture. Students with the J preference were found to lower attrition rates that student with the P preference. This finding was attributed to the academic work ethic and identification with the academic and vocational subcultures. Students with the S preference had a higher graduation rate than did students with the N preference. This finding suggests that because S type students have a higher tolerance for routine tasks for a extended period of time, they are more likely to persist until graduation.

Tharp (1993) studied college biology students and discovered that I students had the highest achievement, whereas P students had the lowest. Students with the combined preferences of IJ had the highest achievement, whereas students with the combined preferences of EP had the lowest. Tharp's results suggested that the EI and the JP preferences have more influence on achievement than do the other preferences. Because introductory science courses appeared to favor IJ students, and, because the majority of entering freshmen were EP students, Tharp believed this may be a reason for large attrition rates of first year students. He suggested that if changes occurred in the learning environment to accommodate the EP students, they might be successful.

Moody (1993) found the relationship between personality types and learning strategies indicated that type seemed to the factor determining the extent of successful learning strategies employed by students. Moody found that E types were better at seeking other students and their instructors for additional help. He also found that

intuitive students had a stronger belief in their own ability to control their learning than did sensing students. Intuitive students had the apparent advantage of being able to discover relationships and critically analyze the material presented. Moody learned that sensing students tended to blame external forces for a lack of success, and judging students managed their time more effectively and consulted with their instructors outside of class more often than perceiving students.

Elliot and Sapp (1988) found a relationship between Grasha's learning styles and personality type. They discovered that students who favored the collaborative style had a majority preference for extraversion, sensing, and perceiving. Students who identified a participant style had a majority preference for intuition and introversion. The students who choose the dependent style had strong preference for sensing and perceiving.

A study conducted by Herbster, Price, and Johnson (1996) found a correlation between learning styles as identified by the Teaching and Learning Styles Survey for Adolescents (TLC) and the MBTI. Whereas this study found little or no difference between students in community colleges and four year universities, it did discover that certain types and styles were dominant in certain fields of study, i.e., math and foreign languages as compared to music and social sciences.

In a study involving dental students, introverted students performed well in the initial academic portion of the program, yet had difficulty in the clinical part (Jones, Courts, Sandow, & Watson, 1997). The study concluded because introverted students are reflective and inner-directed, they spend less time manipulating their environment and tend to have less developed communication skills than their extraverted counterparts. Both of these factors affect their performance in clinical situations and the relationships

with the faculty who evaluate their performance. The researchers suggested that introverted students could benefit from a program to enhance their communication skills, or least be made aware of their potential weaknesses. The mean academic rank of judging type students was found to remain constant over the four-year program while the mean academic rank of perceiving students steadily declined. The conclusion was that judging students are able to better use their preference for organization and planning to better meet the demands of the program more than the perceiving students. Sensing students were found to progressively increase their ranking more than intuitive students. The researchers attributed this to the fact that sensing students are more likely to interact with their environment and patients than do intuitive students. The researchers did not suggest using the MBTI as a screening tool, but rather as a tool for recognizing and addressing weaknesses that might influence their success.

In summary, learning styles can be linked to type. Research suggests that the MBTI is a useful tool in helping teachers determine the learning styles of students. The MBTI also has been linked to teaching styles: consequently, it stands to reason that it also can be used to help teachers understand themselves.

The Relationship between Learning Styles and Teaching

Cromwell (1996) found that teachers rarely thought about the issues linking learning styles and diversity in personalities. His study suggested that diversity is lacking in some teaching cultures and, therefore, people with different learning styles and types need to be actively recruited as teachers. Teachers aware of learning styles are more effective because they provide a variety of instruction methods (Montgomery, Simpson,

& Lindholm, 1993). Butt, Miller, Sutton, and Zhang (1996) suggested that teacher awareness of learning styles, and the link of those learning styles to the student's cultural background, can foster achievement in diverse classrooms. Type can be a very useful tool in assessing learning styles (Thompson & Melacon, 1996).

Hettich (1993) found that students aware of their learning styles increase their level of achievement. Dunn (1990) stated that when students are unable to learn, then we must teach them in a way that facilitates learning. Willis (1991) found that because of the nature of brain functions, traditional classroom instruction inhibits the brain from learning.

Dunn, Griggs, Olson, Beasley, and Gorman (1995) studied the meta-analysis of the Dunn and Dunn learning style model and found that students whose learning styles had been matched with the learning environment had three-fourths of a standard deviation higher level of achievement than those students whose learning styles had not been accommodated. Their findings supported the notion that interventions to accommodate learning styles are beneficial to student learning.

Braio, Beasley, Dunn, Quinn, and Buchanan (1997) discovered the accommodation of learning styles can improve the achievement of students who have been classified into special education classes. They also discovered that the gains in achievement for special education students in regular classes was more gradual. Because this category of student may have learning styles so nontraditional, regular classes may not accommodate them. The researchers suggested special education students should be grouped according to learning style preferences so teachers do not have to employ an unusually large number of strategies.

Rothschild and Piland (1994) found a significant correlation between personality types, as identified by the Sixteen Personality Factor questionnaire and learning styles. They concluded that teachers need to prepare classes well in advance to ensure the inclusion of an array of teaching strategies and methods which would accommodate differences in students' learning styles.

Moody (1993) concluded in his study that personality types, with the associated learning styles, and learning strategies are linked and teachers must consider the influences of type upon learning. He suggested that personality should be used as a guide to structure the context of the learning.

DiTibierio and Hammer (1993) found that the distributions of preferences differed greatly between faculty and students. They found that twice as many faculty had the IN preferences than the students. The students' predominate preference was ES. IN faculty tended to show more interest in abstraction and in learning for learning's sake, whereas the ES students preferred practical usefulness in their learning. DiTiberio and Hammer noted that most students had a preference for S and needed to develop strategies to cope with the N preference of their professors. This finding was supported by a study that concluded that students who are S types, ES in particular, are disadvantaged in traditional academic programs with a piecemeal, segmented approach (Haygood & Iran-Nejad, 1994).

Reiff (1992) suggested that at least six approaches can take learning styles into account when teaching. She also suggested that teachers go through several stages in understanding children's learning styles. The administration must provide developmental

support for the teachers. Although her study focused on younger learners, the principles are applicable to college students.

Wood (1993) suggested that teachers need to understand their own preferences and those of their students to develop and use appropriate teaching strategies. Wood noted that an NF teacher may construct a test with predominately higher order questions, according to Bloom's taxonomy, which will ignore the needs of ST students. This may lead the instructor to draw the erroneous conclusion that ST students did not learn.

Winters (1996) discovered that a multi-sensory approach to teaching adults with learning disabilities was more effective than a strictly auditory approach. Thus it is essential to use more than one approach to teaching. Cano and Garton (1994) suggested teachers need to plan lessons which use a variety of approaches which are effective with each of the learning preferences. Perry (1994) noted that for those who are working with students, an understanding of learning preferences allows the teacher to chose appropriate activities and create better learning environments.

Reigstad (1991) reported that understanding type had great significance for teaching basic writers. For feedback, Reigstad recommended that specific information, such as checklists or rating scales be given to S students, whereas written comments were preferred by N students. Prewriting exercises should be assigned with consideration to type preferences, using writer's circles for E students and journal writing for I students. Reigstad also noted that I students were sometimes adverse to writing in computer labs because of a lack of privacy while writing.

Higgs, Givonetti, and Williams (1995) found no relationship between type and class participation. They did find that a pedagogy which included differing strategies led

to greater student satisfaction and achievement. Preferences and learning styles affect the value attached to various teaching methods. Kariuki (1995) found that students and teachers have a dominant preference for one learning style. The study discovered, however, that no relationship exists between the students learning style and their evaluations of the class. This was attributed to the possibility that mismatched students had to work harder for understanding and clarity, thereby neutralizing any mismatch effect. In a study involving teaching methods in bibliographic instruction, Prorak, Gottschalk, and Pollastro (1994) did not find any correlation between the students' personality types and their performance scores. A correlation was discovered, however, between knowledge scores and the teacher. Because the many factors affecting small group study focused on small group teaching strategies, these factors may have overshadowed the effect of personality types and suggested more research.

Thompson and O'Brien (1991) found that teachers who were identified as Concrete Sequential, by the Gregorc Style Delineator, issued lower grades than the teachers identified with the other three styles. Their study did not show any significant correlation between learning styles or between students and teachers with matched or mismatched learning and teaching styles. Thompson and O'Brien found that students whose learning styles did not match their teacher did better, which was contrary to expectations.

Barrett (1989) found that a teacher's personality affected the classroom environment, as perceived by students. He suggested that an understanding of personality types by teachers can help to create environments that promote learning. Barrett found that TJ teachers may send messages to students resulting in negative effect on the class.

His study suggested that E, S, F, and P preferences are more often linked to positive environments than I, N, T, and J preferences. Barrett believed that by understanding this data, teachers could develop or select teaching methods and behaviors to create better learning environments for all students. Murray, Rushton, and Paunonen (1990) found three significant correlations between the teacher's personality and ratings teachers receive from students. First, this study found that teachers do well only in some courses. Second, student ratings were strongly related to peer ratings of personality traits. Third, specific personality traits that contribute to effective teaching vary substantially for different types of courses.

In a study evaluating the relationship between achievement and learning styles, Carthey (1993) found that students classified as "divergers" according to Kolb's Learning Style Inventory (Kolb, 1985) had lower achievement in certain business related courses. Carthey also discovered that those students who were classified as "right brain dominant" had a significantly lower level of achievement. Carthey discovered that those students who tested "whole brain" earned the highest number of A grades.

Price (1992) found that grouping students with someone who had a different way of perceiving and processing information reduced test anxiety. She also discovered that students who were placed in groups increased their social skills and given a sense of team spirit. Price also noted that the highest gain in achievement occurred with those students who had a learning style similar to hers.

Comparing observable behaviors of teaching effectiveness to temperament, Barrett (1991) discovered a significant relationship between one-third of the competencies measured. Whereas some results can be attributed to the specific field of

vocational education, the implications are that temperaments identified by Keirsey (Keirsey & Bates, 1984) have a positive relationship to a number of effective teaching competencies. Barrett recommended that strategies for teacher preparation may need to be changed to help teachers capitalize on their strengths and overcome their weaknesses.

Thompson (1992) found a correlation between type and the responses that writing teachers give to students regarding assignments. Thompson discovered that Judging types focus on words and phrases, whereas Perceiving types focused on larger revisions. Teachers who were Thinking types offered more direct advice, whereas Feeling teachers offer more evaluations. Thompson noted in a later study (1993) that students who were primarily STJ's tended to favor comments and responses that helped fix the problem and did not value teacher comments of a more holistic nature. Sudol (1991) found that students reacted predictably to the use of technology in writing courses. Technology magnified the strengths and weaknesses of learners. Some students used word processing to compensate for some of those weaknesses. Sudol suggested that students be encouraged to use technology.

Mertz and McNeely (1992) found individuals who were in teacher preparation programs entered with predetermined constructs about what comprises good teaching. These constructs correlated with psychological types. The most significant factor was the T-F dimension. Mertz and McNeely recommended teacher preparation programs take into account the different constructs and beliefs existng among teacher candidates and to prepare those candidates to understand and adapt to differences in students learning styles and preferences.

Wheeler (1991) stated that, even when the individual's learning style is known, other factors intervene and make it difficult to generalize students. This study went as far as to suggest that what was once labeled a learning disability may have been a mismatched, yet strong, learning style.

In a three year study, Barrett and Kepler (1991) concluded that in-service training based upon sound pedagogical theory and included teaching and that included learning styles would have a positive effect. Results of the study found that an in-service training program not based upon sound pedagogical theory would have little effect, if any.

Huitt (1992) studied individual preferences and their influence on problem-solving and decision-making. Such preferences even had an effect on the scientific method by influencing perspectives and goals. He suggested individuals should be trained so that personal experiences can be validated. Huitt found when all perspectives have been considered, the solution will mostly likely be more effective.

4MAT is a learning style model developed by McCarthy (1987) combining Kolb's model with brain hemisphericity. McCarthy suggested that lessons should have eight activities to accommodate the four types of learning related to left and right brain dominance. Scott (1994) concluded that the model is capable of comprehensive use and utilization for development of curricula and faculty.

Sadler-Smith (1996) summed up the concept of accommodating learning styles with a recommendation for a balanced approach in the development and production of learning materials. This balanced approach, he argued, allows students the chance to work within their preferences while encouraging them to undertake activities that are not congruent with their preferences. Such balance will help develop their skills.

In summary, there is a variety of strong evidence which stress that learning styles and teaching styles have an impact on student achievement and student perceptions of teaching. Environments that consider the learning styles of students tend to foster higher achievement. Whereas these studies suggest taking student learning styles into account, they do not suggest that the teacher should try to create a separate environment for each students. Rather, teachers should use a balanced approach which acknowledges and considers the differences in students.

Distributions of Psychological Types in College Students

Wahl (1992) studied students in a college nursing programs in which registered nurses had returned to school. The study noted a distribution of types which varied from the general population. She noted that the distribution of types in her study was similar to distributions found in other studies which also involved nurses. Wahl discovered three types with a larger representation than the general population, ESFJ, ISTJ, and ISFJ. She also recognized dominant preferences for extraversion, sensing, feeling, and the SJ temperament.

Barrett (1989) reported that vocational students were predominantly students with preferences for sensing, thinking, and perceiving when compared to other high school students.

Torkelson (1992) studied international teaching assistants and reported the percentage of I types was more than double the general population and the percentage of SJ temperaments was more than double. Cano and Garton (1994) found preservice

teachers in the methods of teaching agriculture course had three predominant types: ESTJ, ISTJ, and ESFJ. These three types accounted for nearly 55% of all students in the course with the remain thirteen types comprising the remaining 45%. Considering the combinations of mental functions (ST, SF, NT, and NF), the ST combination alone accounted for just over half of the students in the study.

Boreham and Watts (1998) reported the dominant temperament of students in an applied physics program to be NT and the dominant temperaments of education students to be NF and ST. Boreham and Watts concluded that teacher bias and preferences may contribute to these results by creating a learning environment that his favorable to certain types or learning styles.

Laribee (1994) reported a distribution of the types among accounting students differed from traditional-age college students. ISTJ and ESTJ comprised the largest preferences of accounting students. Sixty percent of the male accounting students were STJ, as compared to 25 percent for the traditional-age college student male. Female accounting students with STJ preferences doubled that of the traditional-age college student female, 33 percent to 16 percent. Laribee also found that the type distribution of seniors nearly matched that of professional accountants. Laribee speculated that teaching methods of accounting faculty and the course materials may filter out those students who are not of the STJ type.

Borg and Shapiro (1996), studied economics students and found a significant difference in the performance of students with SJ temperaments over those with NT or NF temperaments. Two of the three professors included in the study had SJ

temperaments. Borg and Shapiro also reported that any type significantly different from the ISTJ had a negative effect.

Soliday and Sanders (1993) found a significant difference in personality types and learning styles between secondary students in vocational technical education and those secondary students in non-vocational technical education. They concluded that differences between the two groups required teaching techniques, curricular objectives, learning environments, and evaluation procedures be distinct for each group.

Stice, Bertrand, Leuder, and Dunn (1989), studied language arts and reading teachers in a methods course. They reported a majority of phonics teachers had a preference for judging whereas a majority of whole language teachers had a preference for perceiving. Whole language and skills teachers had a preference for feeling.

Fisher (1994), researched students in first year freshman composition courses at community colleges and reported that the predominant psychological types were ISFJ and ENFP. Intuitive types did better on reflective or argumentative papers, while making lower grades on reports. Fisher also discovered that feeling types wrote better argumentative papers than thinking types.

In a recent study, Quilty (1996) noticed a significant difference in cognitive bias between freshmen students and graduating students. This poses a question as to whether students drop out or develop more well rounded skills.

These studies all support the concept that the distribution of types differs by programs of study. Data collected by Myers and McCaulley (1985) and MacDaid, McCaulley, and Kainz (1995) support the conclusion that people with similar interests and preferences will be attracted to similar careers. These studies did not suggest that

only the students with a particular preference would succeed. Yet, it should be emphasized that they do support the idea that students with preferences different from the dominant preferences may experience more difficulties.

Summary

The literature indicates that very strong evidence exists for differences in student learning styles. Whereas several models exist, most contain common themes. Jung's theory of psychological types, as adapted and used by Myers, provides a basis for identifying individual preferences. Because the literature suggests that preferences have associated learning styles, assumptions about a person's learning style can be made if a person's type is known. The MBTI provides a valid method of determining type.

In addition, the literature also indicates that teaching preferences are associated with type and that teachers have particular teaching styles. As a result, if student learning styles can be accommodated, at least in part, then student achievement should increase. Student attitudes toward teaching can be affected by certain teaching methods. If the student attitudes are known, then steps can be taken to accommodate student needs.

Of particular importance, a review of the literature also revealed that certain types are found in larger percentages in various college degree programs. This suggests that particular degree programs may have a predominant type of student. If the predominant type is known, then the predominant learning styles can be better accommodated. It must be expected that the environment of some programs filter out students who are not of the prevailing type.

In addition, it is possible that the distribution of student types may change in the progression from freshmen to seniors. If a change in the distribution student types can be detected, then steps can be taken to prevent drop out. Such preventative measures should utilize teaching methods which better accommodate learning preferences.

CHAPTER III

METHODOLOGY

Chapter Overview

The methodology of this study consists of five sections: research design, selection of subjects, research instruments, research methodology, and data analysis. The first section identifies the design of the study, which was intended the reveal the distribution of psychological types of students in the Aeronautical Science undergraduate degree program and associated attitudes towards teaching. The second section discusses procedures used to select the subjects, students in the Embry-Riddle Aeronautical University Aeronautical Science degree program. The third section discusses the research instruments used, Form G of the MBTI and the Attitudes Toward Teaching Methods Survey, developed by the author for this study. The fourth section addresses the methodology and chronological procedures which guide the conduct of this study, as well as the issue of student confidentiality. The fifth, and final, section outlines the procedures used to analyze the resulting data.

Research Design

The descriptive design using self-selection and a survey was used for this study (Gay, 1992; Leedy, 1993). Such a design was appropriate because this study was intended to assess type preferences in a particular population and attitudes of this population towards specific teaching methods and policies.

Distribution of types are reported in SRTTs based upon responses to the MBTI. The SRTT representing the entire sample was compared to the SRTT of the general, traditional age college student population, as reported in the Atlas of Type Tables (McDaid, McCaulley,& Kainz, 1995). In addition, the SRTT for the senior students was compared to the SRTTs for freshmen, sophomores, and juniors to discover if any significant differences existed between them.

Students were surveyed to discover their attitudes towards specific teaching methods and policies. These responses were compared to the targeted preferences of the students to determine if any significant differences in attitudes regarding each specific survey items existed the two preferences.

Selection of the Subjects

The sample was drawn from the students who were enrolled in the Aeronautical Science Degree at the Daytona Beach, Florida campus of Embry-Riddle Aeronautical University (ERAU) during the fall of 1997. Of a program total population consisting of approximately 1,700 students, the study sample consisted of approximately 380 students. The minimum number of subjects needed to generalize the results to the population at a

confidence interval of .95, according to Krejcie and Morgan (1970) was 313. The sample was stratified according to classification, i.e., freshman, sophomore, junior, and senior in order to compare distributions of type among the subgroups.

The instruments were administered in clusters using assigned classes. To eliminate the possibility of criticism raised by Pittenger (1993) as to sample size variability affecting the SRTT, the intent of this study was to have approximately 100 students in each classification.

With the exception of the Aeronautical Science Success courses, which were specifically designed for entering freshmen, no courses had students of only one classification. A search for classes was necessary that would yield the desired number of students in each classification. ERAU's registration system at the time of the study included student classification on class rosters. Using this information, classes were selected which yielded the appropriate number of students in each classification. The selected classes were: ASC 101, Aeronautical Science Success; AS 240, Principles of Basic Navigation; AS 260, Principles of All-Weather Navigation; AS 310L, Aircraft Performance Lab; and AS 452, Electronic Navigation and Flight Control Systems. The number of students in these selected courses were: 126 seniors, 109 juniors, 104 sophomores, and 109 freshmen, for a total of 448. The final number of students who participated in the study was 380, comprised of with 119 seniors, 98 juniors, 70 sophomores, and 93 freshmen. The lower number of sophomores is attributed to the dates when the instruments were administered to those classes with sophomores as the predominant classification. These dates fell just prior to and just after ERAU's

Thanksgiving break. This is a time when several students are often absent for an extended period, but this was not known by the researcher until after the study began.

The main limitation to the selection of a sample was that students are not randomly assigned into course sections. Students register according to a predetermined seniority process. Enrollment priority is based on classification, with seniors registering ahead of lower classmen. In addition, students within each classification then are afforded further priority based upon cumulative grade point average. Students with higher grade point averages register first. Because of this method of enrollment, it is possible to have separate sections of the same course occur with significant differences in levels of student aptitude and achievement. Such a circumstance was not expected to have any significant impact on this study.

The comparison group was from the Atlas of Type Tables (McDaid, McCaully, & Kainz, 1995), a sample size of 28,088 students. The comparison group was based upon the most recent and complete data, which was collected between 1971 and 1982, representing students between 18 and 25 years of age when they took the MBTI while they were enrolled and attending college. This sample was taken from a database containing a total 88,971 MBTI results from two forms of the MBTI, Form F and Form G. This sample was chosen because it reflected the broadest base possible and was not specific to any one college or degree program.

The attitude survey was completed by 359 of the 380 students who participated in this study. In one case, the subject did not answer all of the items.

Research Instruments

The first instrument was Form G of the MBTI. Form G has a total of 126 items, 94 of which score for type and 32 of which are used for research by the instrument's publisher. Answer sheets were computer scored by the Center for Application of Psychological Type (CAPT) located in Gainesville, Florida. This allowed for consistency in scoring. The MBTI indicated the type preference of each student, yielding a four letter type identifier. No significance was attached to the numerical preference scores because this was not relevant to the study. A computer scoring program developed by Granade and Briggs-Myers (1987) generated the SRTTs used in comparisons. As previously noted, the reliability and validity of the MBTI has been adequately addressed in Myers and McCaulley (1985).

The second instrument, the Attitudes Toward Teaching Methods Survey, was a 25 item survey using a Likert-type scale to measure students' attitudes towards various teaching methods. Although a Likert-type scale is normally used to provide a summated rating, this survey was not designed with that intent. No overall score was generated. It was intended that each of the 25 items would be considered independently when determining the differences associated with the four basic preferences. Each of the survey items was planned to stand alone. Results of the survey were used to test whether student attitudes towards a particular teaching method, classroom practice, or setting were different based on a known preference.

The items were developed from the expected responses based on the theory for each preference as reflected in the literature. Items 1, 2, 3, 4, 7, 10, 16, and 24 were

designed to check for differences regarding EI preferences. Items 8, 9, 11, 13, 14, 17, 18, 21, 22, and 23 were designed to check for differences regarding SN preferences. Items 19 and 20 were designed to check for differences regarding TF preferences. Items 5, 6, 12, 15, and 25 were designed to determine differences regarding JP preferences. Subjects were asked to respond to each item that was a statement about a particular teaching method or policy. Answers were given using a five point scale ranging from "strongly agree" to "strongly disagree", with the midpoint being neutral. Responses were converted to a numerical score, ranging from 5 to 1, with 5 representing the response "strongly agree" and 1 representing the response "strongly disagree." The number 3 represented a "neutral" selection. The instrument was reviewed by two individuals qualified to administer and interpret the MBTI. They checked content validity, item validity, and sampling validity.

An initial pilot study was conducted in two undergraduate classes with known student types. The results of this pilot study were compared for construct validity and reliability. In addition, construct validity was checked by comparing responses of the students from both test classes and comparing the responses of one preference type with the answers of students with the opposite preference type. Validity was indicated if students of opposite preferences answered an item differently or in a manner that was consistent with type theory. Answers can indicate the same attitude, but a significantly different strength of attitude is indicative of a type difference.

Results from two preference groups were compared on target items. For example, responses from E types were compared with responses from I types. The Mann-Whitney U test checked for significance. Validity results are contained in Table II.

TABLE II

SURVEY VALIDATION DATA (N = 44)

Item	Preference	z-score	p
1	E-I	-2.14	.03
2	E-I	-1.39	.17
3	E-I	-2.59	.01
4	E-I	-1.28	.20
5	E-I	-2.58	.01
6	E-I	-1.63	.10
7	E-I	-1.74	.08
8	S-N	-3.02	.00
9	S-N	-2.33	.02
10	S-I	-1.99	.05
11	S-N	-1.83	.07
12	J-P	-1.97	.05
13	S-N	-1.56	.12
14	S-N	-2.29	.02
15	J-P	-1.52	.13
16	E-I	-1.63	.10
17	S-N	-1.74	.08
18	S-N	-2.29	.02
19	T-F	-1.14	.25
20	T-F	-0.74	.46
21	S-N	-2.07	.04
22	S-N	-0.58	.56
23	S-N	-2.48	.01
24	E-I	-2.58	.01
25	J-P	-1.71	.09

Results from the pilot study showed that items 1, 3, 5, 8, 9, 10, 12, 14, 18, 21, 23, and 24 differed between the two targeted preference groups with a significance of at least $p < .05$. Items 2, 4, 6, 7, 11, 13, 16, 17, and 25 revealed a difference between the two targeted preference groups, but not did not achieve a significance of at least $P < .05$. The failure to achieve a higher level of significance result from the relatively small size of the subsamples and could increase the possibility of a Type I error. Differences between the two targeted preference groups warranted further use with a larger sample, but with caution. Items 15, 19, 20, and 22 failed to show enough of a difference in the target preference, but were left in the survey to reflect the opinions of the entire sample. It is possible that a sufficiently larger sample might reveal significant differences; however, any results would have to be viewed with extreme caution.

The survey tested for reliability by comparing results from each of the two classes, using the Mann-Whitney U test. It was assumed that, if students in each class came from the same population, then students of like preferences would answer each item in the same manner a significant difference would not occur between the groups. If a significant difference did not occur between those with the same preference from each group, the item could be assumed to be reliable. Because of no intent to arrive at a summated score, the non-parametric nature of the study, and the interpretation of each item independently, traditional measures of reliability did not seem appropriate.

Analysis of the data from the pilot test revealed no significant differences occurred (to at least the $\underline{p} < .05$ level) between results from the two classes on all items except two. Item 12 showed a difference, significant to the $\underline{p} = .02$ level. This difference was __between the two perceiving preference groups. Item 13 showed a significant

difference (to the $p = .05$ level) between the two sensing preference groups. Such differences could have been due to sampling errors resulting from the small size of the sample. Results on items 12 and 13 should be viewed with caution; however, the results indicate the survey had sufficient reliability to proceed.

The amount of time necessary for the subjects to complete the survey was assessed during the pilot study. Students took between 25 to 35 minutes to complete the MBTI and between 4 to 9 minutes to complete the survey. The amount of time needed to explain the purpose of the survey, give instructions for the MBTI and attitude survey, and then to complete the consent form took approximately 10 minutes. A 60 minute class period was a sufficient amount of time to complete the survey.

Research Methodology

The first step in the study was to develop and validate the survey. The second step was to identify the class sections to be used for the study. Data from ERAU's Records and Registration Office were used to identify target classes. Each class was reviewed to determine the actual composition according to student classification. Once the appropriate classes were identified, permission to enter the class and conduct the study was obtained from the course instructor. Then an appropriate schedule was arranged to cause minimal disruption to each class.

Because the MBTI and survey were given at the same time, it was necessary to correlate the results from the MBTI to the survey. The MBTI and the survey were labeled with an identifying number used to correlate the results of the MBTI with the survey. When the results of the MBTI were scored and types identified, the types was transferred

to the survey, using the identifying number. No names were attached to the survey and no names were kept once the data were entered. These steps insured confidentiality of individual results.

Data Analysis

Type distributions are displayed in SRTTs. The index of attraction checked for significance in any differences noted between the two tables. The index of attraction, annotated as I on the type table, is the ratio of the percentage of a particular type found in the sample and the percentage of the type found in the comparison group. Tests for significance were made by the SRTT computer program (Grenade and Brigg-Myers, 1987), using the Chi-square method or the Fisher's Exact Test when any of the cells had frequencies 5 or less, even if the cells were in the comparison group and did not show on the displayed SRTT. When the Fisher's Exact Test was used, the probability symbol in the type table and the calculated value are underlined. The SRTT program was preset to check for significance at $\underline{p} < .05$, then $\underline{p} < .01$, and finally, $\underline{p} < .001$. It reported the highest of those three levels of significance, but it did not report significance when a minimum of $\underline{p} < .05$ was not obtained. The SRTT computer program reported the Chi-square or Fisher's Exact value. Whereas the program will report all combinations of preferences, this study analyzed only the differences in the sixteen types and the four basic preference dichotomies. These values are displayed in tables following the SRTTs. The data displayed in the SRTTs conform to the format recommended by the Association for Psychological Type with one exception. Symbols used to denote significance are one, two, or three asterisks, promoting consistency and ease of comparison with other tables

contained in this study. Percentages in the type tables are reported to two decimal places, but the statistical data tables reported them as whole numbers.

SRTTs were created for the entire sample and for each classification of students. The SRTT representing the entire sample was compared to the comparison group. SRTTs compare the senior class with each of the other classes and compare each class to the total sample. Again, the index of attraction was used to check for significance.

Survey results were scored and the means for each group determined the general level of agreement with the statement. Results were checked for significant differences between the two groups. Because of the non-parametric nature of the population, tests for significance between the two independent samples used the Mann-Whitney U test. Because of the large number of tests performed on the same set of data, an increased chance of a Type I error exists, although not to the level thought to be a significant threat to the study.

CHAPTER IV

FINDINGS

Introduction

Results of this study are reported in a manner designed to provide for ease of interpretation and analysis, in two different styles. First, the data regarding type distributions are contained in SRTTs with accompanying tables for the relevant statistical data. SRTTs are not displayed for the final comparison of each subsample to the entire sample. Instead, only the data regarding the few significant differences are provided. The SRTTs for the previous comparisons contain enough data to replicate these few findings.

The second method contains an item by item review of survey results, presented in a standard manner to allow comparisons between items.

The data were subjected to statistical analyses in order to answer three research hypotheses.

Research Hypothesis One – No significant difference occurs between the distribution of types among students in the study sample and students in the comparison sample.

Research Hypothesis Two – No significant differences exist between seniors and each of the other three classifications and between the total sample and each of the classifications.

Research Hypothesis Three -- No difference occurs between student's attitudes towards various teaching methods and practices that can be predicted based upon their basic psychological type preferences.

These hypotheses will be used to test results to decide whether or not to accept the three main objectives, or hypotheses, for this study.

Results of the Study

The MBTI results for the study sample test the first research hypothesis. The results comparing the study sample with the comparison group are displayed in type table format in Table III. The associated statistical data are outlined in Tables IV and V.

Information presented in Tables III, IV, and V reflect type distribution and type preferences of the students contained in the study sample. Six types were found to be significantly over-represented, and six types were found to be under-represented in the study sample. The six over-represented are ISTJ, ISTP, INTJ, INTP, ESTP, and ENTP. The six under-represented are ISFJ, INFJ, ESFP, ENFP, ESFJ, and ENFJ. Significant differences were found on the three of the four dichotomous preferences, EI, TF, and JP. All of these differences were significant to at least the $\underline{p} < .05$ level. The EI and TF preferences were significant to the $\underline{p} < .001$ level whereas the JP preference was significant to the $\underline{p} < .01$ level.

TABLE III

TOTAL STUDENT SAMPLE SRTT

ISTJ ***	ISFJ ***	INFJ *	INTJ **
N = 71	N = 14	N = 4	N = 25
% = 18.68	% = 3.68	% = 1.05	% = 6.78
I = 2.04	I = 0.44	I = 0.33	I = 1.85
ISTP ***	ISFP	INFP	INTP ***
N = 35	N = 11	N = 22	N = 30
% = 9.21	% = 2.89	% = 5.79	% = 7.89
I = 2.33	I = 0.60	I = 1.09	I = 1.94
ESTP **	ESFP *	ENFP **	ENTP ***
N = 29	N = 14	N = 19	N = 35
% = 7.63	% = 3.68	% = 5.00	% = 9.21
I = 1.71	I = 0.59	I = 0.56	I = 1.90
ESTJ	ESFJ ***	ENFJ ***	ENTJ
N = 43	N = 13	N = 5	N = 10
% = 11.32	% = 3.42	% = 1.32	% = 2.63
I = 1.10	I = 0.33	I = 0.16	I = 0.62

Note: N = 380 ***p <.001, **p <.01, *p <.05
Comparison group n = 28,088
_____ indicates Fisher's exact value

TABLE IV

STATISTICAL DATA FOR TABLE III
TOTAL STUDENT SAMPLE SRTT

Preference	n	%	I	X^2
ISTJ	71	19	2.04	40.36***
ISFJ	14	4	.044	10.82***
INFJ	4	1	0.33	0.02*
INTJ	25	7	1.85	9.94**
ISTP	35	9	2.13	21.26***
ISFP	11	3	0.60	3.02
INFP	22	6	1.09	0.16
INTP	30	8	1.94	13.92***
ESTP	29	8	1.71	8.66**
ESFP	14	4	0.59	4.34*
ENFP	19	5	0.56	7.03**
ENTP	35	9	1.90	15.25***
ESTJ	43	11	1.10	0.46
ESFJ	13	4	0.33	19.10***
ENFJ	5	1	0.16	0.00***
ENTJ	10	3	0.62	2.47

Note: n= 380
***p <.001, **p <.01, *p <.05
____ indicates Fisher's exact value

TABLE V

STATISTICAL DATA FOR PREFERENCE DICHOTOMIES
TOTAL STUDENT SAMPLE

Preference	n	%	I	χ^2
E	168	44	0.77	25.97***
I	212	56	1.30	25.97***
S	230	61	1.04	1.04
N	150	39	0.94	1.04
T	278	73	1.63	20.37***
F	102	27	0.49	20.37***
J	185	49	0.85	10.49**
P	195	51	1.19	10.49**

Note: n = 380
***p <.001, **p <.01, *p <.05
____ indicates Fisher's exact value

Because a significant difference occurred between the students in ERAU's Aeronautical Science degree program and the comparison sample of traditional age college students, research hypothesis one is rejected.

These findings support the evidence in the literature (Barrett, 1989; Boreham & Watts, 1998; Borg & Shapiro, 1996; Fisher, 1994; Laribee, 1994; MacDaid, McCaulley, & Kainz, 1995; Nourayi & Cherry, 1993; Quilty, 1996; Raven, Cano, Garton, & Van Shelhammer, 1993; Rosati, 1997 Soliday & Sanders, 1993; Stice, Bertrand, Leuder, & Dunn, 1989; Tharp, 1993; Torkelson, 1992; Wahl, 1992;) that students with similar preferences are attracted to certain college degree programs and can be find in higher percentages than students with different preferences.

The MBTI results for students in each classification were compared to see if any significant difference between seniors and juniors, seniors and sophomores, and seniors and freshmen. The distribution of types is contained in Table VI, and the statistical data are contained in Tables VII and VIII.

Table VI shows the only type with a significant difference was ENTP, and a significant difference occurred only on the JP preference. Judging types were under-represented by an I of .74, whereas perceiving types were over-represented by an I of 1.33.

TABLE VI

TOTAL STUDENT SAMPLE SRTT

ISTJ N = 16 % = 17.20 I = 0.97	ISFJ N = 3 % = 3.23 I = 0.64	INFJ N = 0 % = 0.00 I = 0.00	INTJ N = 6 % = 5.38 I = 0.71
ISTP N = 13 % = 13.98 I = 1.85	ISFP N = 2 % = 2.15 I = 0.51	INFP N = 5 % = 5.38 I = 3.20	INTP N = 4 % = 4.30 I = 0.71
ESTP N = 8 % = 13.98 I = 1.85	ESFP N = 1 % = 1.08 I = 0.32	ENFP N = 15 % = 16.13 I = 3.20	ENTP ** N = 15 % = 16.13 I = 3.20
ESTJ N = 10 % = 10.75 I = 0.61	ESFJ N = 1 % = 1.08 I = 0.32	ENFJ N = 1 % = 1.08 I = 1.28	ENTJ N = 3 % = 3.23 I = 1.28

Note: N = 93
***p <.001, **p <.01, *p <.05
Comparison group n = 119
_____ indicates Fisher's exact value

TABLE VII

STATISTICAL DATA FOR TABLE VI
FRESHMAN VS. SENIORS SRTT

Preference	n	%	I	χ^2
ISTJ	16	17	0.97	>.01
ISFJ	3	3	0.64	0.73
INFJ	0	0	0.00	0.52
INTJ	5	5	5.38	0.59
ISTP	13	14	1.85	2.31
ISFP	2	2	0.51	0.47
INFP	5	5	3.20	0.24
INTP	4	4	0.51	0.28
ESTP	8	9	1.28	0.26
ESFP	1	1	0.32	0.39
ENFP	6	6	0.96	1.10
ENTP	15	16	3.20	7.09**
ESTJ	10	11	0.61	1.99
ESFJ	1	1	0.32	0.39
ENFJ	1	1	1.28	1.00
ENTJ	3	3	1.28	1.00

Note: n = 93
***p <.001, **p <.01, *p <.05
____ indicates Fisher's exact value

TABLE VIII

STATISTICAL DATA FOR PREFERENCE DICHOTOMIES
FRESHMAN VS. SENIORS

Preference	n	%	I	χ^2
E	45	48	1.05	0.10
I	48	52	0.96	0.10
S	54	58	0.89	1.24
N	39	42	1.22	1.24
T	74	80	1.09	1.19
F	19	20	0.76	1.19
J	39	42	0.74	4.31*
P	54	58	1.33	4.31*

Note: n = 93
***p <.001, **p <.01, *p <.05
____ indicates Fisher's exact value

The comparison between seniors and sophomores is shown in Table IX. Statistical data are contained in Table X and XI.

TABLE IX

SOPHOMORES VS. SENIORS SRTT

ISTJ N = 14 % = 20.00 I = 1.13	ISFJ N = 4 % = 5.71 I = 1.13	INFJ N = 1 % = 1.43 I = 0.85	INTJ N = 5 % = 7.14 I = 0.94
ISTP N = 7 % = 10.00 I = 1.32	ISFP N = 1 % = 1.43 I = 0.34	INFP * N = 6 % = 8.57 I = 5.10	INTP N = 5 % = 7.14 I = 0.85
ESTP N = 3 % = 4.29 I = 0.64	ESFP N = 5 % = 7.14 I = 2.12	ENFP N = 1 % = 1.43 I = .021	ENTP N = 4 % = 5.71 I = 1.13
ESTJ N = 3 % = 4.29 I = 0.64	ESFJ N = 6 % = 8.57 I = 2.55	ENFJ N = 2 % = 2.86 I = 3.40	ENTJ N = 3 % = 4.29 I = 1.70

Note: N = 70
***p <.001, **p <.01, *p <.05
Comparison group n = 119
_____ indicates Fisher's exact value

TABLE X

STATISTICAL DATA FOR TABLE VI
SOPHOMORES VS. SENIORS SRTT

Preference	n	%	I	χ^2
ISTJ	14	20	1.13	0.16
ISFJ	4	6	1.13	1.00
INFJ	1	1	0.85	1.00
INTJ	5	7	0.94	1.00
ISTP	7	10	1.32	0.34
ISFP	1	1	0.34	0.42
INFP	6	8	5.10	0.03*
INTP	5	7	0.85	0.79
ESTP	3	4	0.64	0.54
ESFP	5	7	2.12	0.29
ENFP	1	1	0.21	0.16
ENTP	4	6	1.13	1.00
ESTJ	3	4	0.24	0.01*
ESFJ	6	9	2.55	0.17
ENFJ	2	3	3.40	0.56
ENTJ	3	4	1.70	0.67

Note: n = 70
***p <.001, **p <.01, *p <.05
____ indicates Fisher's exact value

TABLE XI

STATISTICAL DATA FOR PREFERENCE DICHOTOMIES
SOPHOMORES VS. SENIORS

Preference	n	%	I	χ^2
E	27	39	0.83	1.05
I	43	61	1.14	1.05
S	43	61	0.94	0.32
N	27	39	1.12	0.32
T	44	63	0.86	2.18
F	26	37	1.38	2.18
J	38	54	0.96	0.07
P	32	46	1.05	0.07

Note: n = 70
***p <.001, **p <.01, *p <.05
____ indicates Fisher's exact value

Results reveal only two significant differences among the sixteen types. INFPs show an over-representation, indicated by an I of 5.10 whereas ESTJs are under-represented by an I of 0.52. Caution must be taken due to the small number of subjects in these categories. No other significant differences occurred between these two samples.

The type distribution comparison between juniors and seniors is shown is Table XII. Statistical data are contained in Tables XIII and XIV.

Comparison between juniors and seniors reveal that only one of the sixteen types is significantly different from the others. INFPs, like the sophomores, are over-represented. Again, the small size of this category requires caution during the interpretation of the data. Juniors have an almost identical division among the judging/ perceiving preference as do the freshmen. No other significant differences occurred between these two samples.

Results from each classification of students are also compared to the total sample, with the seven comparisons yielding only a few significant differences. The comparison of seniors to the total sample found significant differences in two types and on the JP preference. INFPs (n = 2) were under-represented by an I of .29, Fisher's exact = .0301, $p. < .05$. This small number requires caution when analyzing comparisons among the INFPs in each classification. ESTJs (n = 21), 17.65% of the sample, were over-represented by an I of 1.56, $\chi^2 = 6.92$, $p < .01$. Significance was found in the difference between the JP preference. Judging types, 56.30% of the sample, were over-represented by an I of 1.16, whereas perceiving types were under-represented by an I of .85, $\chi^2 = 4.03$, $p < .05$. No other significant differences were found.

TABLE XII

JUNIORS VS. SENIORS SRTT

ISTJ N = 20 % = 20.41 I = 1.16	ISFJ N = 1 % = 1.02 I = 0.20	INFJ N = 1 % = 1.02 I = 0.61	INTJ N = 6 % = 6.12 I = 0.81
ISTP N = 6 % = 6.21 I = 0.81	ISFP N = 3 % = 3.06 I = 0.73	INFP * N = 9 % = 9.18 I = 5.46	INTP N = 11 % = 11.32 I = 1.34
ESTP N = 10 % = 10.20 I = 1.52	ESFP N = 4 % = 4.08 I = 1.21	ENFP N = 4 % = 4.08 I = 0.61	ENTP N = 10 % = 10.20 I = 2.02
ESTJ N = 9 % = 9.18 I = 0.52	ESFJ N = 2 % = 2.04 I = 0.61	ENFJ N = 1 % = 1.02 I = 1.21	ENTJ N = 1 % = 1.02 I = 0.40

Note: N = 98

***p <.001, **p <.01, *p <.05

Comparison group n = 119

_____ indicates Fisher's exact value

TABLE XIII

STATISTICAL DATA FOR TABLE VI
JUNIORS VS. SENIORS SRTT

Preference	n	%	I	χ^2
ISTJ	20	20	1.16	0.27
ISFJ	1	1	0.20	1.13
INFJ	1	1	0.61	1.10
INTJ	6	6	0.81	1.10
ISTP	6	6	0.81	0.17
ISFP	3	3	0.73	0.73
INFP	9	9	5.46	0.01*
INTP	11	11	1.34	0.40
ESTP	10	10	1.52	0.86
ESFP	4	4	1.21	1.00
ENFP	4	4	0.61	0.55
ENTP	10	10	2.02	2.09
ESTJ	9	9	0.52	3.23
ESFJ	2	2	0.61	0.69
ENFJ	1	1	1.21	1.00
ENTJ	1	1	0.40	0.63

Note: n = 98
***p <.001, **p <.01, *p <.05
____ indicates Fisher's exact value

TABLE XIV

STATISTICAL DATA FOR PREFERENCE DICHOTOMIES
JUNIORS VS. SENIORS

Preference	n	%	I	χ^2
E	41	42	0.91	0.42
I	57	58	1.08	0.42
S	55	56	0.86	2.01
N	43	44	1.27	2.01
T	73	74	1.02	0.05
F	25	26	0.95	0.05
J	41	42	0.74	4.50*
P	57	58	1.33	4.50*

Note: n = 98
***p <.001, **p <.01, *p <.05
____ indicates Fisher's exact value

Comparing the juniors to the total sample revealed no significant differences to a minimum of $p < .05$ among any of the sixteen types and among the four preference dichotomies.

The comparison of sophomores to the total sample revealed a significant difference in only type ESFJ ($n = 6$). Data indicate that this type is over-represented by an I of 2.51, $\chi^2 = 6.89$, $p < .01$. The small size of the sample requires caution when interpreting the data. The data also indicate a significant difference in the TF preference. Thinking types comprised 62.86% of the sample and were under represented by an I of .86, whereas feeling types, 37.14% of the sample, were over represented by an I of 1.38, $\chi^2 = 4.64$, $p < .05$. No other significant differences were evident.

The comparison of the freshmen to the total sample found only one type, ENTP ($n = 15$), to have a significant difference as shown by an I of 1.75, $\chi^2 = 7.05$, $p < .05$. No other significant differences were found.

The overall number of significant differences among the four classifications of students is relatively small when compared to the number of comparisons where no difference was found. Whereas some differences are evident among the classifications of students, many might be attributed to the small number of subjects of particular types within that particular sample. As Pittenger (1993) noted, small samples can skew the results. These small samples may be the result of sampling errors caused by the limitations noted regarding the process used to select the subjects. Because of the uncertainties surrounding these results, the most appropriate approach is to accept the second research hypothesis that no significant difference occurred between the various classifications of students in the study sample.

There is evidence in the literature (Barrett, 1989; Cromwell, 1996; Dunn, Griggs, Olson, Beasley, & Gorman, 1995; Jones, Courts, Sandow, & Watson, 1998; Laribee, 1994; Moody, 1993; Quilty 1996; Schurr, Ruble, Paloma, Pickerill, & Moore, 1997; and Wood, 1993) to suggest that students of one type may have better chances of success than students of other types. However, the results do not support the suggestion that students with any particular type in this study leave the program such numbers to significant change the composition of the sample.

Data for the survey reveal significant differences in the responses for items 1, 2, 3, 5, 8, 9, 10, 11, 12, 13, 14, 16, 18, and 23. The data reveal no difference, to a minimum of $\underline{P} < .05$, for items 4, 6, 7, 15, 17, 19, 20, 21, 22, 24, and 25.

Item 1 asked subjects to respond to the statement, "I enjoy classes that are primarily lecture." This item targeted the EI preference. Responses indicate both groups disagreed with the statement, with E types more than I types. The average of the extraverts' responses was 2.56 (= 163) whereas the average of the introverts' responses was 2.82 (n = 196). Results of the Mann-Whitney $\underline{U}$ test were significant, $\underline{z} = -2.04$, $\underline{p} = .042$. The E types had a average rank of 168.22, whereas the I types had an average rank of 189.80.

Item 2 asked subjects to respond to the statement, "I look forward to group discussions." The target preference was EI. Both groups indicated agreement with the statement, but E types agreed more than did I types. The average of the extraverts' responses was 3.96 (n = 163) whereas the average of the introverts' was 3.36 (n = 196). Results of the Mann-Whitney $\underline{U}$ test were significant, $\underline{z} = -5.72$, $\underline{p} = .000$. The E types had an average rank of 212.22, whereas the I types had an average rank of 153.20.

Item 3, also targeting the EI preference, asked the subjects to respond to the statement, "I enjoy classes that require a lot of independent, or self-study." The introverts' scores had a mean of 3.13 (n = 196), indicating slight agreement, whereas the extraverts' mean was 2.83 (n = 193), indicating slight disagreement. The Mann-Whitney U test was significant, z = 2.83, p = .005. E types had an average rank of 163.63, and I types had an average rank of 193.62.

Item 4 targeted the EI preference, with subjects asked to respond to "I like classes that have a lot of in-class writing assignments." Both preferences indicated a similar disagreement with the statement. The extraverts' average response was 2.29 (n = 163) and the introverts' average response was 2.23 (n = 196). The results of the Mann-Whitney U test were not significant, z = -.75, p = .452. The average rank for the E types was 184.27, and the average rank for the I types was 176.45.

Item 5 targeted the JP preference using the statement, "I like classes with a well-structured course outline that is rigidly followed." Judging types had an average response score of 4.01 (n = 173), whereas perceiving types has an average response score of 3.38 (n = 186). Both types indicated agreement with the statement, and the Mann-Whitney U test indicated a significant difference, z = -5.69, p = .000. Judging types had an average rank of 210.80, and the perceiving types had an average rank of 151.35.

Item 6 also targeted the JP preference through the statement, "I like classes that have a lot of activities, such as problem solving, flight planning, or chart interpretation." Both judging types and perceiving types agreed equally with the statement, each with an average score of 3.96. Results of the Mann-Whitney U test did not indicate a significant

difference, z = -.21, p = .838. The average rank for judging types was 181.08, and the average rank for perceiving types was 179.00.

Item 7 targeted the EI preferences. Averages of both types indicated agreement with the statement, "I like classes that focus on the possible uses of the information more that on the specific details of the information." E types had an average response of 4.10 (n = 163), and I types had an average response of 4.01. Results of the Mann-Whitney U test were not significant, z = -.91, p = .363. E types had an average rank of 184.95, and I types had an average rank of 175.88.

Item 8 targeted the SN preferences with the statement, "I prefer multiple choice tests over short answer or essay tests." Whereas both types indicated agreement with the statement, the average response for sensing types was 4.12 (n = 223), and the average response for intuitive types was 3.72 (n = 136). Results of the Mann-Whitney U test were significant, z = -3.70, p = .000. The average rank for sensing types was 194.98, whereas the average rank for intuitive types was 155.44.

Item 9 also targeted the SN preference, using the statement, "I like classes that move through the subject in an methodical, step-by-step manner." Both preferences agreed with the statement, sensing types with an average response of 4.08 (n = 222) and intuitive types with 3.82 (n = 136). Results of the Mann-Whitney U test were significant, z = 2.87, p = .004. Sensing types had an average rank of 190.37, and intuitive types had an average rank of 191.75.

Item 10 targeted the EI preferences with the statement, "I like classes that have a lot of group learning activities." Both types agreed with this statement, however, the average response from E types was 3.81 (n = 162), indicating a stronger level of

agreement than did the I types, who had an average response of 3.34, (n = 196). Results of the Mann-Whitney U test were significant, z = 4.44, p = .000. The average rank for E types was 205.00, and the average rank for I types was 158.42.

Item 11 targeted subjects with preferences for either sensing or intuition with the statement, " I like assignments that are open-ended and allow for a lot of flexibility and individual creativity." Average responses indicate that intuitive students, with an average response of 4.09 (n = 136), have a stronger level of agreement with that statement than do sensing students, who had an average response of 3.59 (n = 222). Results of the Mann-Whitney U test were significant, z = -4.93, p = .000. Sensing types had a mean rank of 159.64, whereas intuitive types had a mean rank of 211.92.

Item 12 targeted the JP preference with the statement, "I like to complete assignments early." Judging types indicated a stronger level of agreement with an average response of 3.75 (n = 172) than did perceiving types who indicated very slight agreement with an average response of 3.05 (n = 186). Results of the Mann-Whitney U test were significant, z = -6.81, p = .000. Judging types had an average rank of 216.39, and perceiving types had an average rank of 145.38.

Item 13 targeted the SN preference using the statement "I enjoy discussions that are primarily devoted to the practical applications of the theories presented in class." Positive responses were elicited from both types. Sensing types responded with an average score of 3.81 (n = 222), and intuitive types responded with a higher average score of 4.03, (n = 136). Results of the Mann-Whitney U test were significant, z = -2.76, p = .006. The mean rank for the sensing types was 168.79, and the mean rank for the intuitive types was 196.66.

Item 14 targeted the SN preference with responses to the statement, "I am bored by lectures that go step-by-step." Results revealed that intuitive types agreed, whereas sensing types were mostly neutral. Intuitive types had an average response of 3.35 (n = 136), and sensing types had an average response of 2.99 (n = 222). Results of the Mann-Whitney U test were significant, z = -3.27, p = .001. The mean rank for the sensing types was 166.02, whereas the mean rank for the intuitive types was 201.50.

Item 15 targeted the JP preference using the statement, "I need deadlines in order to complete assignments." Both types was answered almost equally. Judging types had an average response of 3.63 (n = 172), and perceiving types had an average response of 3.74 (n = 186). Results of the Mann-Whitney U test were not significant, z = -1.05, p = .295. The mean rank for judging types was 173.97, and the mean rank for perceiving types was 184.61.

Item 16 targeted EI preferences with the statement, "Working alone is more important that working together." E types indicated a stronger disagreement to this statement with an average response of 2.40 (n = 162), whereas I types had an average response of 2.86,(n = 196). Results of the Mann-Whitney U test were significant, z = -5.01, p = .000. The mean rank for E types was 151.27, and the mean rank for I types was 202.83.

Item 17 targeted the sensing/intuitive preference by means of the statement "Listening to the lecture is more important than doing the homework." This statement elicited nearly equal responses from both types as each a neutral to a very slight disagreement with the statement. Sensing types responded with an average score of 2.92 (n = 222), and intuitive types responded with an average score of 2.98 (n = 136). Results

of the Mann-Whitney U test were not significant, z = -0.53, p = .600. The average rank for sensing types was 177.34, and the average rank for the intuitive types was 183.02.

Item 18 targeted the sensing/intuitive preference with the statement, "I like unexpected activities that are added to the class." Both types agreed with the statement; however, intuitive types had a stronger level of agreement. Their average response was 3.60 (n = 136), as compared to the sensing types average response of 3.25. Results of the Mann-Whitney U test were significant, z = -3.14, p = .002. Sensing types had a average rank of 166.72, whereas the intuitive types had an average rank of 200.36.

Item 19 targeted the TF preference with the statement "Grades should reflect the amount of effort I put into the project or report." Responses reflected a slightly higher level of agreement from feeling types than it did from thinking types. Feeling types had an average response of 3.95 (n = 93), whereas thinking types had an average response of 3.80 (n = 264). Results of the Mann-Whitney U test were not significant, z = -1.14, p - .254. Thinking types had an average rank of 175.57, whereas feeling types had an average rank of 176.85.

Item 20 targeted the TF preference. Both types indicated agreement with the statement, "Everyone in the class should be able to receive an 'A' for the course if they do similar work." Thinking types had a average response of 3.43 (n = 264), and feeling types had an average response of 3.56 (n = 93). Results of the Mann-Whitney U test were not significant, z = -1.01, p = .31. The mean rank for thinking types was 176.85, and the mean rank for feeling types was 188.74.

Item 21 used the statement, "The teacher should be in control of the class at all times and ensure the outline is followed regardless of anything else." This targeted the

SN preference. Whereas both types disagreed with the statement, intuitive types, with an average response of 2.69 (n = 136), showed a stronger level of disagreement than did sensing types who had an average response of 2.86 (n = 222). Results of the Mann-Whitney U test were not significant, z = -1.63, p = .102. The mean rank for sensing types was 186.12, and the mean rank for intuitive types was 168.70.

Item 22 also targeted the SN preference. The statement, "I think the details contained in the text are not important so long as I understand and can apply the concepts," elicited favorable responses from both types. Sensing types responded with an average score of 3.64 (n = 223), whereas intuitive types responded with an average score of 3.73 (n = 136). Results from the Mann-Whitney U test were not significant, z = -1.35, p = .177. Sensing types had an average rank of 174.73, and intuitive types had an average rank of 188.64.

Item 23 targeted the SN preference with the statement "I like essay tests where I have the freedom to express what I know in my own words." Different responses came from the targeted types. Intuitive types indicated agreement with the statement with an average response of 3.35 (n = 136), whereas sensing types showed neutral to slight disagreement with an average response of 2.97 (n = 223). Results of the Mann-Whitney U test were significant, z = -2.85, p = .004. The average rank for the sensing types was 168.21, and the average rank for the intuitive types was 199.33.

Item 24 targeted EI preferences with the statement "I like activities that allow me to apply what I have learned." Both types responded at similar levels, with the average response of E types being 4.17 (n = 163), and the average response of I types being 4.11

(n = 196). Results of the Mann-Whitney U test were not significant, z = -.088, p = .382. The average rank for E types was 184.57, and the average rank for I types was 176.20.

Item 25 targeted the JP preference. Both types agreed close to the same degree, with the statement "I expect the teacher to tell me most of what I will need to know." Judging types had an average score of 3.96 (n = 173), and perceiving types had an average score of 3.87 (n = 186). Results of the Mann-Whitney U test were not significant, z = -1.22, p = .223. The average rank for judging types was 186.44, and the average rank for the perceiving types was 174.01.

Because significant differences were found in the attitudes between the targeted types on items 1, 2, 3, 5, 8, 9, 10, 11, 12, 13, 14, 16, 18, and 23 the third research hypothesis must be rejected for these items. Because no significant difference was found in the attitudes between the targeted types on items 4, 6, 7, 15, 17, 19, 20, 22, 24, and 25, the third research hypothesis must be accepted.

General attitudes revealed are summarized in each of the four dichotomies. Questions that did not have a significant difference between the two preference groups are included because they do reveal attitudes towards teaching methods.

The findings from this survey suggest that both extraverts and introverts do not enjoy lectures and prefer group discussion. Extraverts revealed a stronger preference toward group discussion than did introverts. Findings also revealed a preference for group learning activities, activities that allow for application of the material covered, and classes that focus on the uses of the material rather than specific details. Both types indicated a dislike for in-class writing assignments and disagreed that working alone is more important that working together. Introverts indicated they like independent work

assignments whereas extraverts did not. Findings are consistent with the expectations based upon the literature (Barger, Barger, & Cano, 1994; DiTiberio & Hammer, 1993; Myers & McCaulley, 1985; Provost & Anchors, 1987) with the exception of introverts disliking lectures, liking group discussions, and disagreeing that working alone is more important that working together.

Results of the questions targeting the SN preference reveal both types prefer multiple choice questions over essay questions. Intuitive types like essay tests where they have the freedom to express their answers in their own word whereas sensing types were neutral. The is consistent with type theory (DiTiberio & Hammer, 1993). Both types said they were bored by lectures that go step-by-step, like discussions that are devoted to the practical application of the material, and understanding concepts was more important that the details. Both types were neutral as to whether or not listening to lectures is more important than doing homework. The fact that sensing types revealed they are bored with lectures that go step-by-step was not expected (Provost & Anchors, 1987).

Both types liked classes that moved through the subject in a methodical, step-by-step manner, and also revealed a preference for open-ended assignments that allow for flexibility and individual creativity. Both types disagreed that the teacher should be in control of the class at all time and follow the outline regardless of all else and that they did like unexpected activities that are added to the class. It was expected that sensing students would have a stronger preference for control, specific assignments, and closer adherence to the course schedule than they indicated (Barger, Barger, & Cano, 1994, DiTiberio & Hammer, 1993, Myers & McCaulley, 1985; and Provost & Anchors, 1987).

Two questions targeted the TF preference. Only two questions regarding this dichotomy were used because the TF preference does not have as an great impact on learning as do other preferences (Myers & McCaulley, 1985). These questions revealed that both types agreed that grades should reflect the amount of work put into an assignment and that everyone should be able to achieve the grade of A assuming similar work. It was expected that thinking types would not agree as strongly with these issues as would feeling types (Ditiberio & Hammer, 1993).

Questions that dealt with the JP preference dichotomy revealed both types did like structured classes with the outlines followed, classes that contained a lot of activities involving problem solving or application of skills, and they expected the teacher to tell them most of what they will need to know. Both types indicated they like to complete assignments early however, they prefer to have deadlines.

Results were all consistent with the expectations derived from the literature (Barger, Barger, & Cano, 1994; DiTiberio & Hammer, 1993; Fairhurst & Fairhurst, 1995; Myers & McCaulley, 1985; and Provost & Anchors, 1987).

In summary, findings reveal that there is a significant difference between in the type distribution among the students in the study and those in the comparison group. The findings did not reveal any significant change in the distribution of types between students of different classifications. The survey indicated, in some cases, there were significant differences in the attitudes, or at least the strength of the attitude, towards various teaching methods while there was no significant difference in other cases. The survey also revealed insight into the attitudes of the sample as a whole and can provide the basis for some decisions regarding teaching methods.

CHAPTER V

DISCUSSION

This study investigated: 1) whether there were significant differences in the distribution of type preferences of students in a professional pilot undergraduate degree program when compare to the general population of traditional age college students, 2) whether significant differences occurred in the type distributions among the various classifications of students within the degree program, and 3) whether any significant differences occurred between students who have different psychological preferences and their attitudes towards various teaching methods.

Sufficient evidence exists in the literature to support the theory of psychological types and associated preferences towards learning environments. Sufficient evidence also exits to support the theory that distribution of types among student populations in differing college programs are different. Individuals are attracted to different professions for many reasons, one of which is congruent with type theory.

Educators must understand the different preferences that students bring into the classroom for many reasons. If a teacher has one primary method of teaching, then it stands to reason that that educator may not be effective for all students. The literature suggests (Barrett, 1989; Butt, Miller, Sutton, & Zang, 1996; Dunn, 1990; Montgomery, Simpson, & Lindholm, 1993; Perry, 1994; Winters, 1996; Wood, 1993) that teachers who

use various methods of instruction are more effective than those that do not. An awareness of the type distribution of students in a particular college program can be valuable to faculty and instructors who teach in that program. This awareness can also be valuable to faculty and instructors of other departments and disciplines who teach those students. Lynch and Sellers (1996) noted learning can be improved by teaching with methods that accommodate students' learning styles and preferences.

Summary of Findings

The findings of this study indicate that a significant difference occurred in the distribution of types. Because the first research hypothesis was rejected, the first objective, or hypothesis of this study is accepted. The type distribution of students in the study was significantly different from the type distribution of the general population of traditional age college students.

The findings also indicate that no significant difference occurred between the type distributions and classifications of these students. Because the second research hypothesis was accepted, the second objective, or hypothesis of this study is rejected. The major implication of this finding is that there is not a loss of any particular type of student during normal attrition. This suggests that particular teaching methods and strategies that are actually employed do not have any effect on the attrition of particular types. The only way to be fully confident of this finding would be a longitudinal study following one or more cohorts through the entire program. A second implication of this finding, because the types are distributed the same across classifications, is teaching

strategies should affect all classifications of students the same. Again, a study is warranted to fully investigate this possibility.

The results of the survey found that some significant differences occurred in attitudes, or in the strength of those attitudes among the four basic preference dichotomies. These attitudes provide insight into how students perceive various teaching methods, strategies, and policies. These insights give guidance to the development of effective teaching practices. Because these differences were significant in some cases, the third objective of the study is accepted. Because there were cases where there was no significant difference, further study is needed to determine which attitudes can be predicted and to develop appropriate instruments.

Discussion

The SRTT of the total study sample revealed six types that are over-represented. This means that students of that type are found in the study program in higher percentages than expected based on the general college sample. This is consistent with the findings of studies of other specific college programs (Barrett, 1989; Boreham & Watts, 1998; Borg & Shapiro, 1996; Cano & Garton, 1994; Laribee, 1994; Nourayi & Cherry, 1993; Myers & McCaulley, 1985; Raven, Cano, Garton, & Shelhamer, 1995; Rosati, 1997; Stewart & Felicetti, 1992; Tharp, 1993, Wahl, 1992). The SRTT also revealed that six types are under-represented. This means students with those type preferences are found in lower percentages in the study program than is expected based on the general college sample. A closer look at the data reveals that the main difference lies in the TF preference. The six

that are over-represented in the population are all thinking types whereas the six that are under-represented are all feeling types, both by a factor of more than 50%.

The major implication of this difference has to do with the types of feedback and evaluations given to students at the end of a lesson. Flight training is a one-on-one instructional setting between the student pilot and the instructor pilot. One of the key facets of the thinking preference is that people with this preference tend to spontaneously critique, whereas people with a preference for feeling spontaneously appreciate. Thinking types tend to be impersonal, whereas feeling types value relationships (Myers, with Myers, 1980/1995). Smith (1993) found this to be true in a study of grading styles based upon the TF preferences. Thinking types use a different language indicating they have a different concept of their role. Feeling types offer more praise and suggestions. Smith suggested these findings could be because thinking types focus more on problem-solving, whereas feeling types focus more on student motivation.

Because feeling types are in the minority of the sample, a feeling type student will have a greater probability of having a thinking type for a flight instructor. If flight instructors do not understand the needs of feeling type students, then such students may develop the impression that their efforts are not valued in such a program and cause a reduction in student esteem and motivation.

Results of this study also revealed differences in the EI preference. Introverts were over-represented among the study sample whereas extraverts were under-represented by a factor of close to 30% of what is expected in college populations. Several characteristics of extraverts and introverts occur that faculty need to understand. With a larger percentage of introverts in the classroom, teachers may find it somewhat

difficult to use class discussions. Introverts are less likely to speak in class until they have had time to reflect on the topic whereas extraverts readily initiate discussions (Jensen, 1987). Teachers who weight grading criteria on class participation may be placing undue stress on students with a preference for introversion. Because this study indicates a higher percentage of introverts than expected, faculty who teach in the program in this study and who use class participation as a grading criteria need to make adjustments.

Perceiving types were found to be over-represented by a significant margin, whereas the judging types were found to be under-represented. Perceiving types had a higher percentage than was expected based on the general college sample. Judging types are usually found in higher percentages than perceiving types in the population in general (Hammer & Mitchell, 1996). Because professional flying involves following precise procedures and attention to detail, it is easy to assume that judging types would be more attracted to flying. The results from three flight instructor MBTI workshops conducted during the summer of 1997 (for 94 newly hired flight instructors) revealed that 67% had a judging preference, whereas 33% had a perceiving preference (Wiggins, 1997). Because these flight instructors were all graduates of the program being studied, it was expected that similar percentages would show in the study sample. In fact, similar differences did not result. The percentage differences between the groups may be the result of biases in the flight instructor selection process. This presents questions that could be the basis for a future study.

A majority of students have a preference for the perceiving which suggests that care needs to be taken during the teaching of flight procedures and checklists. Perceiving

type students generally do like to repeatedly follow routine procedures (Lawrence, 1993; Provost & Anchors, 1987). It may be necessary to help perceiving students understand the underlying reasons for those routine procedures and checklists to reinforce the students' motivation to use them in the prescribed manner.

Higher than expected percentages of introverts is worth noting because the aviation industry is currently emphasizing crew resource management and effective team skills. Cook (1995) noted that colleges need to find pedagogical methods to facilitate development of these skills. One way of developing the necessary skills is through activities using collaborative and cooperative learning methods. Fairhurst and Fairhurst (1995) suggest this as an effective technique. They note that, whereas introverts may not necessarily favor this technique, effective cooperative learning activities help develop skills necessary to function effectively and efficiently in a team-oriented work environment. Of course the need to learn effective team skills is not limited to introverts but is needed by all students.

Many interesting insights were reflected in responses to the survey items.

One significant insight relates to the use of the lecture as a primary teaching method. Bonwell and Eison (1991) state that lecturing is the primary mode of teaching at most colleges and universities. Results of this survey show that introverts and extraverts do not prefer classes that are primarily lecture. Extraverts indicate a stronger dislike. When asked about group discussions, both types favor such activities, but extraverts are more positive. When asked about group learning activities, both types indicated that they like them, again, with extraverts more positive. Even though no significant differences occurred in their attitude, both types clearly liked activities during which they could apply

what they have learned. This is consistent with type theory and suggests that, whereas lectures are a valuable teaching tool, student satisfaction among extraverts can be increased by using active learning methods, especially those that involve practical application of the material. Such activities do not have a negative effect on the satisfaction of introverts.

An additional interesting insight of the survey concerns student attitudes towards writing assignments. Both introverts and extraverts indicated that they do not like in-class writing assignments, although the difference between the two groups was not significant. Intuitive types indicated a stronger preference for open-ended assignments that allow for creativity and flexibility than did the sensing types, although both types indicated a positive response.

With regards to testing, an interesting insight became apparent. Sensing types had a higher level of preference for multiple choice testing than did intuitive types, although both indicated a preference for multiple choice over short answer or essay. When asked about essay tests, intuitive types responded favorably, but sensing types responded with a very slight negative response. This suggests that whereas multiple choice tests are preferred, intuitive types will be more comfortable with essay tests. This finding is consistent with type theory. Because sensing types outnumber intuitive types almost two to one, this finding suggests that teachers who plan to give essay tests should consider providing additional strategies for success. Rubrics, which outline specific grading criteria for written assignments, may be a useful tool to help students overcome some of their apprehensions about writing.

One additional insight with regards to tests is that most all of the students, without regard to type preferences, indicated that they expect the teacher to tell them most of what they will need to know for a test. This attitude is consistent with the concept of duality (Erickson & Strommer, 1991) in which students view knowledge as truth and seek the one correct answer consistent with what the teacher told them. This may help explain the overwhelming preference towards multiple choice tests over essay tests.

Results of the survey show that while introverts do not mind working alone, they do not value independent work over group work. Extraverts did not enjoy working alone and favor group activities. Both types indicate a desire to engage in activities that allow for the practical use of the material covered in the course. The implication is that group activities will increase the satisfaction of extraverts without decreasing the satisfaction of introverts. This is consistent with type theory.

An important insight gained from the survey is that sensing types have a stronger preference for step-by-step instruction than intuitive types. Both types revealed a preference for structure in the course, yet both types indicated a desire for some flexibility in assignments and activities, intuitive types more than sensing types. Whereas both sensing and intuitive types liked the idea of unexpected activities being added to classes, intuitive types showed a stronger level of interest in this than did sensing types. Both sensing types and intuitive types disagreed, but intuitive types having a significantly stronger level of disagreement, that teachers should be in control of the class at all times and follow the course outline regardless of anything else. These results are similar to those found by results based upon the judging and perceiving preference.

A suggested strategy for teachers is flexibility while following a course outline. Teachers could allow for unexpected activities, especially those which allow practical applications of the course material. Students seem to prefer structure, yet are willing to accept changes germane to the course. Acceptance is higher if these changes contain practical applications of course material.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Results of this study indicate students in a professional pilot baccalaureate degree program have a significantly different distribution of psychological type preferences than other college undergraduate degree programs. Results also indicate that no significant differences occur in the distribution of those psychological types between classifications of students within the study sample. This suggests that attrition is not significantly related to type. Results also reveal significant differences among the students attitudes toward various teaching methods and practices and these attitudes appear to be predicated on type preferences.

Results suggest faculty and instructors can make changes to their teaching strategies and tactics to increase the satisfaction of certain types without negatively impacting the satisfaction of opposite types. Although this and other studies indicate active learning and group learning are typically more effective than lectures (Bonwell & Eison, 1991; Davis, 1993, Fairhurst & Fairhurst, 1995; Lawrence, 1993), faculty continue to use lecture as the primary means of instruction. Active learning strategies and group activities enhance the traditional lecture method and can even have an effect on improving student satisfaction with the course. This could, in turn, have a positive

impact on student evaluations of the course. One caution is important. A change in teaching methods needs to be clearly explained to the students affected by those changes.

Whereas differing attitudes exist toward various teaching methods and practices among aviation students with differing preferences, adopting different teaching methods can increase satisfaction among students of one type preference without adversely affecting other types. Because type theory and learning styles based on type theory are not specific to any one degree, the attitudes discovered in this study should apply to students in other degree programs.

Recommendations

1. Faculty and instructors should learn about psychological type preferences and the relationship between these preferences and learning styles. The insights gained can be valuable tools when developing course materials and teaching strategies.
2. Faculty and instructors should determine the psychological type of students in their courses and degree programs. This will provide a basis for a better understanding of the students and some of their expected attitudes towards teaching. As this study suggests, it can not be expected that students in one particular program will mirror students in other programs nor will they share the same attitudes for various teaching methods and practices.
3. Psychological types of faculty and instructors need to be determined to build a bridge of understanding between faculty preferences and student

preferences. Differences between teachers and students can be better anticipated and understood, and strategies can be developed for more effective teaching. Workshops devoted to the development and applications of various teaching methods should consider attitudes associated with psychological type preferences.

4. A longitudinal study needs to be conducted to determine if any particular types in a cohort are more at risk than another. Whereas this study suggests that there is not, it provides only a snapshot view.
5. A study of the hiring practices of flight instructors could determine if biases exist. A balance of types among flight instructors could provide for a more effective learning environment.
6. Type distribution among faculty needs to be determined at the department and university level. Comparisons of the faculty SRTTs and the student SRTTs could reveal areas where conflict and misunderstanding are likely. Faculty could then develop strategies to minimize the impact of their own particular type to provide a more balanced environment for student learning.
7. A study should be conducted to determine if any correlation occurs between type and achievement in collegiate aviation programs.
8. A study should be conducted to determine the predominant teaching method of faculty and check for any correlation to type. This study could address grading and class policies to determine any correlation to type.

Final Considerations

Type is a powerful tool that facilitates understanding of faculty and students. The preponderance of evidence suggests that to ignore type is to do a great disservice to students. Type provides a basis for understanding the differences in which people use their minds processing information and making decisions. Type gives insight into how people relate to one another and how they organize their lives. All of these factors are critical to education.

Particular types, drawn to a profession or field of study, is neither good nor bad. This concept must be considered if faculty and instructors are to provide the best education possible. In other words, students deserve their money's worth. Faculty who understand type and how its relationship to teaching styles will create balanced learning environments. Only balanced environments allow the majority of students the opportunity to experience supportive learning.

As an old saying goes, " If your only tool is a hammer, then soon everything begins to look like a nail." If faculty use only one tool from their teaching toolbox, then soon all students will begin to look like that nail. Understanding the relationship between type and learning styles is essential to the development of new tools for the educator's toolbox. The true beneficiaries will be those facing the front of the room.

REFERENCES

Barrett, L. A. (1989). Impact of teacher personality on classroom environment. Journal of Psychological Type, 18, 50-56.

Barrett, L. A. (1991). Relationship of observable teaching effectiveness behaviors to MBTI personality types. A paper presented at the International Conference of the Association for Psychological Type, Richmond, VA. (ERIC Document Reproduction Service No. 336 357)

Barrett, L. A., & Kepler, S. J. (1991). Impact of a sustained three-year program of in-service on teacher effectiveness using knowledge of teaching and learning styles, classroom environments and observational feedback. A paper presented at the Annual Meeting of the Educational Research Association, Chicago, IL. (ERIC Document Reproduction Service No. 335 342)

Bloom, B. S. (1956). Taxonomy of educational objectives: Handbook I: Cognitive domain. New York, NY: David McKay Company.

Bokoros, M. A., Goldstein, M. B., & Sweeny, M. M. (1990). Common cognitive personality factors in non-clinical measures. Paper presented at the Annual Convention of the American Psychological Association, Boston, MA. (ERIC Document Reproduction Service No. 328 819)

Bonwell, C. C., & Eison, J. A. (1991). Active learning: Generating excitement in the college classroom. ASHE-ERIC Higher Education Report No. 1. Washington, D.C.: The George Washington University, School of Education and Human Development.

Boreham, B. W., & Watts, J. D. (1998). Personality type in undergraduate education and physics students. Journal of Psychological Type (44), 26-31.

Borg, M. O., & Shapiro, S. L. (1996). Personality type and student performance in principles of economic education. Journal of Economic Education, 27,1, 3-25.

Butt, M., Miller, B., Sutton, K., & Zhang, W. (1996). Helping students teach in a diverse world: A rationale and course. A paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education, Chicago, IL. (ERIC Document Reproduction Service No. 394 917)

Braio, A., Beasley, M. T., Dunn, R., Quinn, P., & Buchanan, K. (1997). Incremental implementation of learning style strategies among urban low achievers. The Journal of Educational Research 91(1), 15-25.

Cano, J., & Garton, B. L. (1994). The learning styles of agriculture preservice teachers as assessed by the MBTI. Journal of Agricultural Education, 35(1), 8-12.

Carlson, J. G. (1985). Recent assessments of the Myers-Briggs Type Indicator. Journal of Personality Assessment, 49, 356-365.

Carthey, J. H. (1993). Relationships between learning styles and academic achievement and brain hemispheric dominance and academic performance in business and accounting courses. (Masters thesis, Winona State University). (ERIC Document Reproduction Service No. 374 412)

Claxton, C. S. & Murrell, P. H. (1987). Learning styles: Implications for improving education practices. ASHE-ERIC Higher Education Report No. 4. Washington, D.C.: Association for the Study of Higher Education.

Cook, G. N. (1995). Cockpit resource management: Are current instructional methods likely to be successful? Journal of Aviation/Aerospace Education & Research, 5(2), 26-34.

Cornesky, R. A. (1994). Quality classroom practices for professors. Port Orange, FL: Cornesky & Associates.

Cornwell, J. M., & Manferdo, P. A. (1994). Kolb's learning style theory revisited. Educational and Psychological Measurement, 54(2), 317-327.

Cromwell, R. R. (1996). Who are we as instructional leaders: A statistical analysis. A paper presented at the Annual Meeting of American Association of Colleges for Teacher Education, Chicago, IL. (ERIC Document Reproduction Service No. 393 830)

Davis, J. R. (1993). Better teaching, more learning: Strategies for success in postsecondary settings. Phoenix, AZ: Oryx Press.

DiTiberio, J. K., & Hammer, A. L. (1993). Introduction to type in college. Palo Alto, CA: Consulting Psychologist Press.

Dunn, R.(1990). Rita Dunn answers questions on learning styles. Educational Leadership, 48(2), 15-18.

Dunn, R.(1993). Learning styles of the multiculturally diverse. Emergency Librarian 20(4), 24-32.

Dunn, R., Dunn, K., & Price, G. E. (1975, 1989). Learning style inventory. Lawrence, KS: Price Systems.

Dunn, R. Dunn, K., & Price, G. E. (1982, 1990). Productivity environmental preference survey. Lawrence, KS: Price Systems.

Dunn, R., Griggs, S. A., Olson, J., Beasley, M., & Gorman, B. S. (1995). A meta-analytic validation of the Dunn and Dunn model of learning preferences. Journal of Education Research, 88(6), 353-362.

Elliott, G. R., & Sapp, G. L. (1988). The relationship between the Myers-Briggs Type Indicator and the Grasha-Riechmann Student Learning Styles Questionnaire. Journal of Psychological Type, 14, 46-50.

Erickson, B. L., & Strommer, D. W. (1991). Teaching college freshmen. San Francisco, CA: Jossey-Bass.

Fairhurst, A. M., & Fairhurst, L. L. (1995). Effective teaching, effective learning: Making the personality connection in your classroom. Palo Alto, CA: Davies-Black.

Federal Aviation Administration. (1977). Aviation Instructor's Handbook. (AC 60-14) Washington, DC: U.S. Government Printing Office.

Fisher, N. M. (1994). MBTI type and writing-across-the- curriculum. Journal of Psychological Type, 28, 43-47.

Gay, L. R. (1992). Educational research: Competencies for analysis and application (4th. ed.). New York, NY: Merrill.

Gardner, H. (1983). Frames of mind: The theories of multiple intellegences. New York, NY: Basic Books.

Golay, K. (1982). Learning patterns and temperament styles: A systematic guide to maximizing student achievement. Fullerton, CA: Manas-Systems.

Granande, G. J., & Briggs-Myers, I. (1987). Selection Ratio Type Table PC Software (Version 1) [Computer software]. Gainesville, FL: Center for Applications of Psychological Type.

Grasha, A. F. (1996). Teaching with style. Pittsburgh, PA: Alliance.

Gregorc, A. F. (1982). An adult's guide to style. Columbia, CT: Gregorc and Associates.

Gregorc, A. F., & Ward, H. G. (1977). Implications for learning and teaching: A new definition for individuals. NASSP Bulletin, 61(406), 20-26.

Hammer, A. L., & Mitchell, W. D. (1996). The distribution of MBTI types in the U.S. by gender and ethnic group. Journal of Psychological Type, 37, (2-15).

Harkin, J. B., & Reynierse, J. H., & Komisin, L. (1998). Independent observer ratings and the correlates of MBTI preferences with their behavioral descriptors. Journal of Psychological Type, 45, 5-20.

Harvey, R. J., Murry, W. D., & Stamoulis, D. T. (1995). Unresolved issues in the dimensionality of the Myers-Briggs Type Indicator. Educational and Psychological Measurement, 55(4), 535-544.

Haygood, E. L., & Iran-Nejad, A. (1994). A study of the relationship between learning conceptions and learning styles among college students. A paper presented at the Annual Meeting of the Mid-South Educational Research Association, (Nashville, TN, November 9-11, 1994). (ERIC Document Reproduction Service No. 387 029)

Herbster, D. L., Price, E., & Johnson, V. R. (1996). Comparing university students and community college students learning styles and Myers-Briggs Type Indicator preferences. Paper presented at the Annual Meeting of the Association of Teacher Educators, St. Louis, MO. (ERIC Document Reproduction Service No. 395 907)

Hettich, P. I. (1993). Inducing students to think about their learning: Four approaches. A paper presented at the Annual Meeting of the American Psychological Association, Toronto, Ontario, Canada. (ERIC Document Reproduction Service No. 372 039)

Higgs, G. E., Givonetti, R. M., & Williams, R. L. (1995). Preferences of participating and non-participating students for different pedagogical methods. A paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA. (ERIC Document Reproduction Service No. 384 604)

Hirsh, S., & Kummerow, J. (1989). Lifetypes. New York, NY: Warner Books.

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

Jensen, G.H. (1987). Learning styles. In J. A. Provost & S. Anchors (Eds.), Applications of the Myers-Briggs Type Indicator in higher education. (181-206). Palo Alto, CA: Consulting Psychologists Press.

Jones, A. C., Courts, F. J., Sandow, P. L., & Watson, R. E. (1997). Myers-Briggs Type Indicator and dental school performance. Journal of Dental Education 61(12), 928-933.

Jung, C . G. (1923/1971). Psychological types. (H. G. Baynes, Trans., Revised by F. C. Hull) Princeton, NJ: Princeton University Press. (Original work published in 1921).

Kariuki, P. N. (1995). The relationship between student and faculty learning style congruence and perceptions of the classroom environment in colleges of teacher education. A paper presented at the Annual Meeting of the Mid-South Educational Research Association, Biloxi, MS. (ERIC Document Reproduction Service No. 393 819)

Keefe, J. W. (1987). Learning style: Theory and practice. Reston, VA: National Association of Secondary School Principals.

Keirsey, D., & Bates, M. (1984). Please understand me: Character and temperament types. Del Mar, CA: Prometheus Nemesis.

Kerlinger, F. N. (1992). Foundations of Behavioral Research (3rd. ed.). Fort Worth, TX: Harcourt Brace College Publishers.

Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. New York, NY: Prentiss-Hall.

Kolb, D. A. (1985). Learning-style inventory. Boston, MA: McBer.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30, 607-610.

Laribee, S. F. (1994). The psychological types of college accounting students. Journal of Psychological Type, 28, 37-42.

Lawrence, G. L. (1984). A synthesis of learning style research involving the MBTI. Journal of Psychological Type, 8, 2-15.

Lawrence, G. L. (1993). People types and tiger stripes (3rd ed.). Gainesville, FL: Center for Applications of Psychological Type.

Leedy, P. D. (1993). Practical research: Planning and design (5th ed.) New York, NY: McMillan Publishing Company.

Lynch, A. Q., & Sellers, P. A., (1996). Preferences for different educational environments and psychological type: A comparison of adult learners and traditional age college students. Journal of Psychological Type, 39, 18-29.

Macdaid, G. P., McCaulley, M. H., & Kainz, R. I. (1995). CAPT atlas of type tables. Gainesville, FL: Center for Applications of Psychological Type.

Malloy, C. E., & Jones, M. G. (1998). An investigation of African-American students' mathematical problem solving. Journal for Research in Mathematics Education, 29(2), 143-163.

McCarthy, B. (1987). The 4MAT System: Teaching you learning styles with right/left mode techniques. Barrington, IL: Excel

McCaulley, M. H. (1985). The selection ratio type table (SRTT): A strategy for comparing type distributions. Journal of Psychological Type, 10, 46-56.

Mertz, N. T., & McNeely, S. R. (1992). Pre-existing teaching constructs: How students "see" teaching prior to training. A paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA. (ERIC Document Reproduction Service No. 346 075)

Montgomery, J. L., Simpson, J., & Lindhold, J. (1993). Honoring diversity in teacher education: Infusing multicultural nonsexist education into the student teaching semester. A paper presented at the Annual Meeting of the Association for Teacher Educators, Los Angeles, CA. (ERIC Document Reproduction Service No. 359 144)

Myers, I. B., with Myers, P. B. (1980/1995). Gifts differing. Palo Alto, CA: Davies-Black.

Myers, I.B., & McCaulley, M. H. (1985). A guide to the development and use of the Myers-Briggs Type Indicator. Palo Alto, CA: Consulting Psychologists Press.

Myers, I.B. (1993). Introduction to type: A guide to understanding your results on the Myers-Briggs Type Indicator (5th. ed.). (Revised by L. K. Kirby, & K. D. Myers). Palo Alto, CA: Consulting Psychologists Press.

Moody, R. (1993). Motivation, learning strategies, and personality. Journal of The Freshman Year Experience, 5(1), 37-75.

Murk, P. J., Place, A. W., & Giever, L. (1994). Learning styles and lessons from the medicine wheel: A Native American philosophy, a proposed integrated model. A paper presented at the annual meeting of the American Association for Adult and Continuing Education, Nashville, TN. (ERIC Document Reproduction Service No. 378 387)

Murray, H. G., Rushton, J. P., & Paunonen, S. V. (1990). Teacher personality traits and student instructional ratings in six types of university courses. Journal of Educational Psychology, 82(2), 250-261.

Nasca, D. (1994). The impact of cognitive style on communication. NASSP Bulletin, 7(559), 99-107.

National Association of Secondary School Principals. (1979). Student learning styles: Diagnosing and prescribing programs. Reston, VA: Author.

Nourayi, M. M., & Cherry, A. A. (1993). Accounting students' performance and personality types. Journal of Education for Business, 69(2), 111-115.

Perry, C. (1994). Students' learning styles: Implications for teacher education. A paper presented at the Annual Meeting of the Australian Teacher Education Association, Brisbane, Queensland, Australia. (ERIC Document Reproduction Service No. 375 136)

Pittenger, D. J. (1993). The utility of the Myers-Briggs Type Indicator. Review of Educational Research, 63(4), 467-488.

Power, S. J., & Lundsten, L. L. (1997). Studies that compare type theory and left-brain/right-brain theory. Journal of Psychological Type 43, 22-28.

Price, E. C. (1992). Strength through diversity: Utilizing diverse learning styles study groups to strengthen teaching and learning skills. A paper presented at the Summer Conference of the Association of Teacher Educators, Racine, WI. (ERIC Document Reproduction Service No. 370 886)

Prorak, D., Gottshalk, T., & Pollastro, M. (1994). Teaching method and psychological type in bibliographic instruction: Effect on student learning and confidence. RQ,33(4), 484-495.

Quilty, S. M. (1996). Cognitive learning bias of college students in an aviation program. Journal of Air Transportation World Wide, 1(1), 51-62.

Raven, M. R., Cano, J., Garton, B. L., & Shelhamer, V. (1993). A comparison of learning styles, teaching styles, and personality types of preservice Montana and Ohio agriculture teachers. Journal of Agricultural Education, 3(1), 40-50.

Reiff, J. C. (1992). Learning styles: What research says to the teacher. Washington, DC: National Education Association (ERIC Document Reproduction Service No. 340 506)

Reigstad, T. (1991). Teaching basic writers: The personality factor. Research & Teaching in Developmental Education 8,(1), 57-64.

Richter, R. (1992). A critical evaluation of cognitive style assessment. Pretoria, South Africa: Human Sciences Research Council. (ERIC Document Reproduction Services No. 355 016)

Rosati, P. (1997). Psychological types of Canadian engineering students. Journal of Psychological Type (41), 33-37.

Rothschild, J., & Piland, W. E. (1994). Intercorrelates of postsecondary students' learning styles and personality traits. Community College Journal of Research and Practice, 18, 177-188.

Sadler-Smith, E. (1996). 'Learning styles' and instructional design. Innovations in Education and Training International, 33(4), 185-193.

Sarasin, L. C. (1998). Learning style perspectives: Impact in the classroom. Madison, WI: Atwood.

Schurr, K. T., Ruble, V., Paloma, C., Pickerill, B., & Moore, D. (1997). Relationships between the MBTI and selected aspects of Tinto's model for college attrition. Journal of Psychological Type 40, 31-42.

Scott, H. V. (1994) A serious look at the 4MAT model. (ERIC Document Reproduction Service No. 383 654)

Smith, J. B. (1993). Teacher's grading styles: The language of feeling and thinking. Journal of Psychological Type, 26, 28-36.

Soliday, S. F., & Sanders, R. E. (1993). A comparison of personality types/learning styles of secondary vocational and nonvocational students. Journal of Vocational Education, 18(2), 69-86.

Stewart, K. L., & Felicetti, L. A. (1992). Learning styles of marketing majors. Educational Research Quarterly,(2), 15-23.

Stice, C. F., Bertrand, N. P., Leuder, D. C., & Dunn, M. B. (1989). Personality types and theoretical orientation to reading: an exploratory study. Reading Research and Instruction, 29(1), 39-51.

Sudol, R. A. (1991). Personality influence on student use of word processing. A paper presented at the Annual Meeting of the Conference on College Composition and Communication, Boston, MA. (ERIC Document Reproduction Service No. 331 062)

Swanson, L. J. (1995). Learning styles: A review of the literature. (ERIC Document Reproduction Service No. 387 067)

Tharp, G. D. (1993). The connection between personality type and achievement in college biology. Journal of College Science Teaching, 22(5), 276-278.

Thompson, B., & Melancon, J. G. (1996). Measuring Jungian psychological types: Some confirmatory factor analysis. A paper presented as the Annual Meeting of the Southwest Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. 393 872)

Thompson, M. J., & O'Brien, T. P. (1991). Learning styles and achievement in postsecondary classrooms. Paper presented at the annual conference of the American Educational Research Association, 72nd, Chicago, IL. (ERIC Document Reproduction Service No. ED 331 554)

Thompson, T. C. (1992). De-programming our responses: The effect of personality on teacher responses. A paper presented at the Conference on College Composition and Communication, Cincinnati, OH. (ERIC Document Reproduction Service No. 353 577)

Thompson, T. C. (1993). Personality preferences and student responses to teacher comments. A paper presented at the Annual Conference on College Composition and Communication, San Diego, CA. (ERIC Document Reproduction Service No. 357 392)

Torkelson, K. (1992). Using imagination to encourage ITAs to take risks. A paper presented at the Teachers of English to Speakers of Other Languages Annual Convention and Exposition, Vancouver, British Columbia, Canada. (ERIC Document Reproduction Service No. 349 898)

Wahl, S. C. (1992). The learning styles of registered nurse baccalaureate students based upon the Myers-Briggs Type Indicator: Implications for teaching. Doctoral Research and Evaluation Practicum, Nova University (ERIC Document Reproduction Service No. 390 355)

Wheeler, P. J. R. (1991). Style mismatch or learning disability: A case study. A paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL. (ERIC Document Reproduction Service No. 336 359)

Wiggins, M. E. (1997) [Workshop on teaching effectiveness for flight instructors conducted at Embry-Riddle Aeronautical University, Summer 1997]. Unpublished raw data.

Willis, S. (1991). Teaching to the brain. Update 33(8), 1-3.

Winer, J. L., & Bellando, J. (1989). Computer anxiety, mathematics anxiety, and Holland vocational-personality types. Journal of Computers in Mathematics and Science Teaching, 8(3), 22-24.

Winters, Clyde A. (1996). Adult learning and multisensory teaching. (ERIC Document Reproduction Service No. 393 966)

Wood, D. R. (1993). Models for learning and how they're connected-relating Bloom, Jung, and Perry: Sound lessons in teaching-adaptation strategies. Journal of College Science Teaching, 22(4), 250-254.

Zeisset, R. M. (1996). Statistics and measurement: An introduction for MBTI users. Gainesville, FL: Center for Applications of Psychological Type.

APPENDIXES

APPENDIX A

ATTITUDES TOWARDS TEACHING METHODS SURVEY

ID Number _____ (Found on MBTI)

Attitudes Toward Teaching Methods Survey

This survey contains several statements regarding teaching methods. Please indicate how closely each statement reflects your attitude by marking the appropriate response. Remember to base your answer on how you feel about classroom courses, either academic or ground schools. Do not consider flight instruction. Do not limit your answers to one specific department or teacher. Your responses should reflect your general attitudes towards all classes.

Remember there are no right or wrong choices.

1. I enjoy classes that are primarily lecture.

Strongly agree Agree Neutral Disagree Strongly Disagree

2. I look forward to group discussions.

Strongly agree Agree Neutral Disagree Strongly Disagree

3. I enjoy classes that requires a lot of independent, or self-study.

Strongly agree Agree Neutral Disagree Strongly Disagree

4. I like classes that contain a lot of in-class writing assignments.

Strongly agree Agree Neutral Disagree Strongly Disagree

5. I like classes with a well-structured course outline that is rigidly followed.

Strongly agree Agree Neutral Disagree Strongly Disagree

6. I like classes that have a lot of activities, such as problem solving, flight planning, or chart interpretation.

Strongly agree Agree Neutral Disagree Strongly Disagree

7. I like classes that focus on the possible uses of the information more than on the specific details of the information.

Strongly agree Agree Neutral Disagree Strongly Disagree

8. I prefer multiple choice tests over short answer or essay tests.

Strongly agree Agree Neutral Disagree Strongly Disagree

ID Number _____ (Found on MBTI)

9. I like classes that move through the subject in a methodical step-by-step manner.

Strongly agree Agree Neutral Disagree Strongly Disagree

10. I like classes that have a lot of group learning activities.

Strongly agree Agree Neutral Disagree Strongly Disagree

11. I like assignments that are open-ended and allow for a lot of flexibility and individual creativity.

Strongly agree Agree Neutral Disagree Strongly Disagree

12. I like to complete assignments early.

Strongly agree Agree Neutral Disagree Strongly Disagree

13. I enjoy discussions that are primarily devoted to the practical applications of the theories presented in class.

Strongly agree Agree Neutral Disagree Strongly Disagree

14. I am bored by lectures that go step-by-step.

Strongly agree Agree Neutral Disagree Strongly Disagree

15. I need deadlines in order to complete assignments.

Strongly agree Agree Neutral Disagree Strongly Disagree

16. Working alone is more important than working together.

Strongly agree Agree Neutral Disagree Strongly Disagree

17. Listening to the lecture is more important than doing the homework.

Strongly agree Agree Neutral Disagree Strongly Disagree

18. I like unexpected activities that are added to the class.

Strongly agree Agree Neutral Disagree Strongly Disagree

ID Number _____ (Found on MBTI)

19. Grades should reflect the amount of effort I put into a project or report.

Strongly agree Agree Neutral Disagree Strongly Disagree

20. Everyone in the class should be able to receive an "A" for the course if they do similar work.

Strongly agree Agree Neutral Disagree Strongly Disagree

21. The teacher should be in control of the class at all times and ensure that the outline is followed regardless of anything else.

Strongly agree Agree Neutral Disagree Strongly Disagree

22. I think that the details contained in the text are not important so long as I understand and can apply the concepts.

Strongly agree Agree Neutral Disagree Strongly Disagree

23. I like essay tests where I have the freedom to express what I know in my own words.

Strongly agree Agree Neutral Disagree Strongly Disagree

24. I like activities that allow me to apply what I have learned.

Strongly agree Agree Neutral Disagree Strongly Disagree

25. I expect the teacher to tell me most of what I will need to know.

Strongly agree Agree Neutral Disagree Strongly Disagree

APPENDIX B

INSTITUTIONAL REVIEW BOARD FORM

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 10-17-97 **IRB#:** ED-98-022

Proposal Title: PSYCHOLOGICAL TYPE DISTRIBUTIONS OF STUDENTS IN A PROFESSIONAL PILOT BACCALAUREATE DEGREE PROGRAM AND ASSOCIATED ATTITUDES TOWARDS TEACHING

Principal Investigator(s): Steve Marks, Michael E. Wiggins

Reviewed and Processed as: Expedited

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING, AS WELL AS ARE SUBJECT TO MONITORING AT ANY TIME DURING THE APPROVAL PERIOD.
APPROVAL STATUS PERIOD VALID FOR DATA COLLECTION FOR A ONE CALENDAR YEAR PERIOD AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Disapproval are as follows:

Signature: _____ Date: October 23, 1997
Chair of Institutional Review Board
cc: Michael E. Wiggins

v

VITA

Michael E. Wiggins

Candidate for the Degree of

Doctor of Education

Thesis: DISTRIBUTION OF PSYCHOLOGICAL TYPES AMONG STUDENTS IN A PROFESSIONAL PILOT BACCALAUREATE DEGREE PROGRAM AND ASSOCIATED ATTITUDES TOWARDS TEACHING

Major Field: Applied Educational Studies

Biographical:

Personal Data: Born in Troy, Alabama, on December 17, 1954 to Kenneth and Margaret Wiggins.

Education: Graduated from C. E. Donart High School, Stillwater, Oklahoma in May, 1973; received an Associate in Science in Aviation Management, Bachelor of Science in Aeronautical Science in December, 1976, and Master of Business Administration in Aviation in May, 1981, from Embry-Riddle Aeronautical University; completed the requirements for the Doctor of Education degree from Oklahoma State University in December 1998.

Professional Experience: Faculty member of Flight Technology Department, January 1977 to December 1994, tenured in 1981, professor in 1989. Training manager from 1982-92 and Assistant Department Chair from 1992-94. Member of the Aeronautical Science Department, January 1995; Associate Department Chair, January 1996; Department Chair in February 1998.

Professional Organizations: National Intercollegiate Flying Association, National Association of Flight Instructors, University Aviation Association, National Air Transport Association, International Alliance for Teacher Scholars, Association for Psychological Type, Association for Supervision and Curriculum Development, Omicron Delta Kappa, and Alpha Eta Rho.

FAA Certificates: Commercial Pilot Certificate and Flight Instructor Certificate with ratings in single-, multi-engine, and instrument airplane. Ground Instructor, Advanced and Instrument.