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The relationship between cognitive profiles and proficiency in Spanish of first-year high school students

Cohen, Randi Weisberger, Ph.D.

The Ohio State University, 1987
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THE RELATIONSHIP BETWEEN
COGNITIVE PROFILES AND PROFICIENCY
IN SPANISH OF FIRST-YEAR HIGH SCHOOL STUDENTS

DISSertation

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of the Ohio State University

By

Randi Weisberger Cohen, B.A., M.A.

* * * * *

The Ohio State University
1987

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Approved by
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College of Education
DEDICATION

This dissertation is dedicated to my husband, Bill, who was crazy enough to insist we get married before I was even close to finishing my writing! The past few years would have been next to impossible without you, Bill, and I really believe people like you should receive a "Spousal Award" for supporting and encouraging people like me...working on Ph.D.s!
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My committee members:

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Dr. Barbara Thomson - Thank you for insisting at each turn that we needed to "get this thing in motion!" Your persistent belief in this project helped me to continue working.

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VITA

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FIELD OF STUDY

Major Field: Foreign Language Education
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CHAPTER 1
INTRODUCTION

Nature and Background of the Study

The teaching of foreign language is currently caught up in a paradigm shift. Over the past few years, the focus has begun to shift from a product-oriented point of view to a process-oriented point of view. Increasingly, researchers in foreign language teaching and learning are stressing the importance of the cognitive processes employed by an individual to understand information and incorporate the information into the existing knowledge base.

The principle features of the paradigm that have been the basis of foreign language instruction for the past several decades are characterized by an emphasis on the end result rather than the entire learning process. Formerly, many texts presented foreign language lessons as a series of dialogues that students were expected to learn by rote. Students remembered
dialogues but had no idea as to what the necessary components of the dialogue were or what made these dialogues comprehensible to speakers of that language.

Another approach formerly used was the monostructural approach. Beginning lessons usually contained several structures required to create sense-making utterances. The number of new elements introduced in each lesson was limited and each structure was drilled thoroughly as an isolated phenomenon. Subsequent lessons built upon earlier lessons using as little vocabulary as possible. For learners, the most obvious problem with this method was the oversimplification and unnatural use of language structures (Grittner, 1969).

The inductive and deductive methods were also used in language instruction. The inductive method relied upon the students' ability to observe differences in structures and spellings and to discern the differences without the teacher having to explain the rules. The deductive method provided explanations for these differences. For example, students learning a foreign language by the deductive method would have all the rules and vocabulary explained from the onset (Grittner, 1969).
The methods of language instruction discussed up to this point have referred to the learning environment, the classroom. These methods have not addressed the question of individual cognitive styles of the learners.

Cognitive styles are the relatively stable characteristics of learners (Messick, 1976). Students might be considered "impulsive," one of the cognitive style dimensions, if they raise their hands when a teacher begins to ask a question. Students who are always prepared to respond to unknown questions may be demonstrating their impulsiveness. These cognitive style dimensions, such as field dependence-independence or impulsivity-reflectivity, are believed to affect the degree of success with which individuals learn a second language (Bialystok and Frohlich, 1978).

Individual cognitive style dimensions are the factors involved in the information-processing habits that tend to function across a variety of content areas (Messick, 1976). These dimensions, and overall cognitive styles, generally represent the manner in which individuals receive and use information from the immediate learning environment (Ragan, 1979). The styles characterize the "way" of learning rather than the "what" of learning and therefore should be an especially important tool in the study of learning.
(Schwen, 1979). They also distinguish individuals who have the same goals (Bourne, 1971). In this case, the goal is having a successful language learning experience.

The majority of recent research has focused on correlations between one dimension of cognitive style and other variables (Santostephano, 1978). Reflectivity-impulsivity and reading ability have been correlated, for example, in primary grade children (Kagan, 1965). Describing the individual based on a single dimension does not provide the investigator with a complete picture of the cognitive processes being employed in a given intellectual task. Researchers have recently begun to investigate individual learner differences based on many dimensions. This type of investigation enhances the researcher's information of the cognitive processes employed by learners to complete specific tasks.

**Operational Definitions**

**Cognitive Style**

Cognitive style refers to consistent individual differences in the way a person organizes and categorizes information and experiences (Kagan, Moss and Segal, 1963; Messick, 1976).
**Field Dependence-Independence**

Field dependence-independence refers to the extent to which an individual is able to articulate figures as discrete from their backgrounds and to overcome the influence of an embedded context (Witkin, 1954), as measured by the Group Embedded Figures Test (GEFT) (Witkin, 1962).

**Field dependent** individuals have a difficult time distinguishing between simple figures that are part of a more complex background.

**Field independent** individuals have very little difficulty identifying simple figures that are part of a more complex background.

**Reflectivity-Impulsivity**

Reflectivity-impulsivity refers to the consistency of an individual's speed and accuracy with alternative hypotheses and how this information is processed (Messick, 1976), as measured by the Matching Familiar Figures Test (MFFT) (Kagan, 1964).

**Reflective** individuals will examine the details of a problem, think of the possible alternative hypotheses, and choose the most appropriate solution for the problem.

**Impulsive** individuals will respond quickly without considering the possibility of alternative hypotheses;
consequently, they will tend to have more erroneous answers.

**Leveling-Sharpening**

Leveling-sharpening refers to the extent to which an individual perceives and adapts to gradual changes in stimuli that are sequentially presented (Santostefano, 1964), as measured by the Square Lag Test (SLT) based on the Schematizing Test (Holzman, 1954).

**Levelers** are individuals who either combine similar (but not identical) memory items or deny their existence altogether. They also experience difficulty with retrieving information from long-term memory.

**Sharpeners** tend not to confuse or combine similar impressions, and may even magnify the difference so as to differentiate these similar impressions better at a later time. They have little difficulty with sequential information tasks.

**Scanning**

Scanning refers to the extent of an individual's ability to attend to specific elements of a task needed for accurate solutions, as measured by the Disc Focus Test (DFT) modeled after Schlesinger (1953).

**Focusing** individuals attend to specific elements when those elements have been designated as being
important, and can eliminate all irrelevant attributes not directly associated with the solution.

**Nonfocusing individuals cannot focus on a specific task and display a high degree of distractibility, often considering irrelevant aspects as important to complete the task.**

**Cognitive Profiles**


**Type 1:** A type 1 profile refers to an individual cognitive description indicating articulation in at least four of the following cognitive styles: field independent, focuser, narrow, complex, reflective, sharpener, tolerant (Letteri, 1980).

**Type 2:** A type 2 profile refers to an individual cognitive description at either extreme of type 1 (above) or type 3 (below), or is a mixed profile indicating an inconsistent pattern of articulation with no majority matching type 1 or type 3 profile (Letteri, 1980).

**Type 3:** A type 3 profile refers to an individual cognitive description indicating articulation in at
least four of the following cognitive styles: field
dependent, nonfocuser, broad, simple, impulsive,
leveler, intolerant (Letteri, 1980).

Purpose of the Study

The purpose of the study is to investigate
students' cognitive profiles, based on Letteri's model
(1976), in relation to the National Spanish Exam. In
addition, the researcher will identify the differences
in performance on the National Spanish Exam for
cognitive profile types 1, 2, and 3. The researcher
will also investigate relationships between cognitive
style dimensions and the scores on the National Spanish
Exam.

Research Questions

Research questions addressed through this approach
are:

1. Are there significant differences among the
total scores of the National Spanish Exam for groups
identified as having type 1, type 2, or type 3 cognitive
profile?

2. Are there significant differences among
subscale scores of the National Spanish Exam for groups
identified as having type 1, type 2, or type 3 cognitive
profile?
3. Is there a significant relationship between the total score of the National Spanish Exam and scores for each of the four cognitive style dimensions?

4. Is there a significant relationship between subscale scores of the National Spanish Exam and scores for each of the four cognitive style dimensions?

Justification for the Study

The chief justification for the study lies in its potential contribution of a deeper understanding of the cognitive processes involved in language learning. In addition, the study may contribute to better understanding of why certain individuals experience difficulty in language classes.

Wenden (1986) found that many of her students, because of previous educational experiences, "approach the learning of a language as they would biology or history" (p. 9). In other words, they viewed language learning as a content course, and when their language class did not provide them with new information about language they became bored and impatient. Wenden (1986) also noted that students did not always realize that learning a language means not only being able to use a language, but also knowing about it, and that "at a certain point it is no longer a matter of knowledge but of meaningful practice" (p. 9). More insight may also
be obtained by understanding individual learners' problems. The learners could then be helped to overcome their particular weaknesses, such as not remembering vocabulary or rules of the language.

Studies investigating individual dimensions of cognitive style have contributed to the body of knowledge regarding how individuals learn. Little attention, however, has been given to understand the interrelationships between an individual's cognitive style dimensions as a profile and the combined impact of performance levels in specific foreign language learning tasks. Studies have found significant relationships between cognitive style and certain intellectual tasks such as reading English prose (Kagan, 1965), serial learning (Long, 1962), general problem solving (Guetzkow, 1951), general language abilities (Defazio, 1973), as well as significant correlations between cognitive style and concept learning abilities (Davies, 1971). Consistency in these findings demonstrates a significant relationship between cognitive style and the ability to learn and perform in school.

Another compelling justification for this study is the researcher's own fascination with the learning process and its connection to second language learning. Because "the researcher lives what he studies" (Taylor,
1976), it seems important that personal interest and curiosity underlie this examination process. Because of the researcher's own dedication to further understanding and improving the teaching-learning processes of second language learning, this study makes her directly a part of the inquiry by creating a better understanding of the learning process. This study, then, contributes both to self-realization and to possible innovation in the instructional process.

**Methodology**

Quantitative research techniques were employed in this investigative study. Because the purpose of this study was to explore relationships, this research paradigm was well suited. The research model used in this study was devised by Letteri (1976) and consisted of four measures of cognitive style and one standardized language proficiency test, which were all administered by the researcher. The researcher used correlations to study relationships and used one-way analysis of variance to study differences among groups.

**Assumptions**

The feasibility of the present study is based on the establishment of several basic assumptions. It is assumed that:
1. individual dimensions of cognitive style and foreign language proficiency can be measured reliably and validly by using paper and pencil tests (Corbett & Smith, 1984) such as those used in this study.

2. relationships among the variables can be assessed from the data collection.

3. students' awareness of cognitive styles may be transferred to other subject matters (Letteri, 1977).

4. extraneous and possibly confounding subject variables such as sex, age, socio-economic status, race, motivational level, reading ability, attitude toward language learning, and cooperation among peers are normally distributed across the sample (Hinton, 1980).

Limitations

Cognitive styles may vary in individuals because of factors such as age, educational experiences, and socio-economic backgrounds. Because of individual differences, the researcher cannot imply that all members of the age group and language level studied will learn Spanish at the same rate of speed or with similar accuracy as other members of the same group; therefore,
the generalizability of the findings of this research will be limited exclusively to subjects of similar backgrounds and similar cognitive style dimensions.

This research is also limited by the fact that not all of the cognitive style dimensions used by Letteri (1977) were included in this investigation. The three tests that make up part of the cognitive profile that were not included are: breadth of categorization (modeled after Pettigrew, 1958), cognitive complexity-simplicity (modeled after Kelly, 1955), and tolerance for unrealistic experiences (modeled after Klein and Schlesinger, 1951). Languis (personal communication) and Letteri (personal communication) both stated that for the purposes of this type of investigation, the absence of these three tests will not hinder greatly the statistical significance of the results.

Another potential limitation exists with the methodology selected for this research. Lack of randomization, manipulation, and control, which characterize experimental studies, are all sources of weakness. Randomization of subjects to groups is the best single way to try to insure equality of groups (Gay, 1981). The groups used in this research already
existed in the form of Spanish classes and had already received the "treatment."

Summary

Chapter I contained the Nature and Background of the study. There was also a section on the Definition of Terms, Purpose of the Study, Research Questions, and Justification of the Study. The Methodology, Assumptions, and Limitations of the Study were also included in this first chapter.

Plan of the Study

The study will be presented in the following manner.

In Chapter II: Review of Related Literature, a presentation of theory and recent studies of cognitive style, field dependence-independence, reflectivity-impulsivity, leveling-sharpening, focusing-nonfocusing, and implications to education concerning each will be discussed.

In Chapter III: Procedures of the Study, the research methodology will include the research design, subject selection, instrumentation, research procedures, data analysis, and hypotheses.
In Chapter IV: Presentation and Analysis of the Findings, data will be reported and interpreted. Findings will be organized according to the research hypotheses.

In Chapter V: Summary, Conclusions, Implications, and Recommendations, research findings will be linked with a discussion of implications for educational practices.
CHAPTER II
REVIEW OF THE RELATED LITERATURE

Much of recent research has demonstrated that either directed training or modeling is effective in changing the cognitive style of an individual learner with change in the performance in learning tasks (Barrat, 1975; Denny, 1972). Schools do not focus on teaching these skills and strategies. Cuban (1982), in fact, describes the American high school as a resilient and remarkably invulnerable institution, quite immune to the instructional reforms that have attempted to penetrate its walls, an institution whose dominance has remained quite undisturbed for most of the 20th century. Curriculum itself does not develop how to learn or provide the training necessary for success in school. Jordan (1973) stated that the "how" to learn is, in itself, something that has to be learned, but schools rarely teach it.

The amount of information available on cognitive styles and learning is very abundant. To include in
this research document all the information ever written about cognitive styles would result in a chapter being many volumes in length. For that reason, a brief discussion of some of the more widely used instruments will be given, followed by a thorough discussion of the research that is directly connected to cognitive styles and foreign language learning.

The review of related literature follows a natural progression of inquiry, taking on several topics which interface in the study of cognitive styles and language learning. The first part of the review begins with an examination of the theories and research concerning cognitive styles. The next section in this chapter is a review of the literature, focusing on each of the cognitive style dimensions used in this research. A specific section concerned with educational implications follows each section of cognitive style dimensions.

Cognitive Style

The term cognitive style was coined in 1933 by Allport, and it refers to the consistent individual differences in organizing and processing what is seen, remembered, and thought about. Cognitive style characterizes the "way" rather than the "what" of learning, a method of processing information. It
represents stable attitudes, preferences, and strategies used repeatedly in the learning process (Schwen, 1979). The influence of cognitive styles extends to many areas of human activity that are connected with social or interpersonal relationships (Messick, 1976).

An individual's personality has many levels and dimensions of psychological functioning. According to Messick (1972), some of these dimensions of psychological functioning are motivational, intellectual, defensive, and affective. Messick also states that the manifestation of psychological functioning is cognitive style. These cognitive styles are just one aspect of how and why individuals learn the way they do.

Since 1933, many researchers have used the term cognitive style to refer to individual ways of cognitive functioning in both children and adults. Witkin (1962) developed and defined the cognitive style dimension of field dependence-field independence. This dimension is often also referred to as global-analytical. Gardner, Holzman, Klein, Linton, and Spence (1959), while with the Menninger Foundation, developed the cognitive style dimensions of leveling-sharpening and tolerance for unrealistic experiences. In 1956, Bruner's work led him to decide that individuals could be classified as
focusers or nonfocusers, also referred to as scanners, with regard to strategies that these individuals used in order to complete Bruner's tasks (Bruner, Goodenough & Austin, 1956). Kagan, Rosman, Day, Albert, and Phillips (1964), while with the Fels Institute, articulated the cognitive style dimension of conceptual tempo, which is the tendency of individuals to respond in a reflective or an impulsive manner while attending to tasks with similar stimulus alternatives.

Researchers from different areas have used the term "style" to represent many varied cognitive processes. These processes are labeled in a specific manner and describe researchers' conceptualizations of their particular construct of style. For example, the term field independence has many different meanings.

Witkin uses the term analytic to denote a person who is field independent in his perceptual orientation, while Kagan, Moss, and Sigel use analytic as a label for these people who tend to categorize environmental stimuli on the basis of objective parts of that environment rather than on the whole of the environment. These identical labels rarely denote the same perceptual or conceptual operations, since each investigator utilizes different experimental tasks and materials to elicit the behavior on which he classifies his subjects (Coop & Sigel, 1971, p. 1153).
Whatever tasks the investigator chooses to be performed and whatever methods the investigator uses in the research determine basically how the researcher conceptualizes "cognitive style."

Cognitive styles are not directly responsive to the principles of acquisition and retention. Although cognitive styles are viewed as habitual modes of information processing, they are not "habits" in the technical sense of learning theory. These styles develop slowly and experimentally and do not appear to be easily modified by training (Kagan & Kogan, 1970).

It is important to differentiate between cognitive styles, which are high-level processes used to organize and manage behavior across a variety of situations, and cognitive strategies, which are decision-making regularities that are more a function of the conditions of a particular situation (Messick, 1970).

Cognitive strategies are chosen, organized, and controlled in part as a function of higher-level, more general cognitive styles. Strategies are also determined by the specific task requirements, the content of the problem being solved, and situational constraints. Cognitive strategies are selected by individuals based on what technique the individuals know
best and are most comfortable with. Strategy selection has nothing to do with what actually works best for individuals with specific tasks (Messick, 1976). For example, a student trying to solve a particular mathematical problem will decide upon a certain problem-solving strategy. This strategy is chosen partly on the basis of the problem's qualitative characteristics, but, just as important, the strategy is also chosen as a function of how the student actually perceives the problem. The student's perception of the problem is the essence of the student's particular cognitive style.

Strategies are more easily accessible to change than are styles because strategies are lower-level functions. Messick (1976) suggests that individuals may be able to change from their comfortable strategies to less compatible strategies that are more effective for a particular task. Students may learn to utilize different strategies for various problem-solving situations.

Cognitive styles can also be differentiated from intellectual ability in a number of ways. Ability dimensions essentially refer to the content of cognition, that is, what kind of information is being processed by what operation and in what form. Cognitive
styles, in contrast, bear on the question of how, that is, the manner in which the behavior occurs. The idea of ability implies the measurement of capacities with an emphasis upon determining a certain level of accomplishment. The concept of style implies the measurement of characteristic modes of operation with an emphasis upon determining the process used (Messick, 1976).

Styles and abilities also differ in that abilities are usually regarded as unipolar, ranging from zero to some larger number, with increasing levels indicating higher and higher levels of the same facility (Vernon, 1973). For example, a high level of abstract reasoning ability would indicate that a person could achieve well with problems requiring such ability, but lack of that ability would only indicate that an individual would be very likely not to succeed. Cognitive styles, however, range from one extreme to an opposite extreme, with each end of the continuum having different implications in regard to functioning. In fact, many of the styles to be discussed later in this chapter are presented in terms of opposites, for example, reflective versus impulsive. In this particular case, a reflective person is seen to be deliberate and methodical in solving problems which have response uncertainty, whereas an
impulsive person is more impetuous, is prone to make errors, and usually does not regard error-making an important characteristic to be avoided.

Other researchers have partitioned cognitive styles along dimensions which are not necessarily bipolar, but which describe how individuals see themselves as learners. These descriptors have been identified through the administration of subjective, self-analysis inventories and range in number from four to 28 cognitive style dimensions. Examples of such inventories, referred to as preference tests, include the Myers-Briggs Type Indicator, the Kolb Learning Style Inventory, the Hill Cognitive Style Mapping Inventory, the McCarthy 4MAT Model, and the Grash-Riechmann Student Learning Style Scale.

The author has based the foundation for her research study on the theoretical contributions of Letteri (1976, 1977, 1979, 1980, 1982, 1985, 1986) to the field of cognitive style. Letteri (1976) has developed a model of three cognitive profiles. These profiles describe individual learning styles based not just on how an individual scores on one particular cognitive style dimension. Instead, the profiles describe learning styles based on a compilation of seven different cognitive style dimensions. Those dimensions
are: field dependence versus field independence, reflective versus impulsive, leveling versus sharpening, focusing versus nonfocusing, complexity versus simplicity, category width, and tolerance for unrealistic experiences. In the following discussion, some of the more widely used cognitive style instruments will be discussed, followed by an in-depth examination of the first four dimensions of Letteri's model. Additionally, the implications of these four dimensions to education will be explored.

**Myers-Briggs Type Indicator**

The Myers-Briggs type indicator (MBTI) was developed during two major construction periods occurring in 1942-1944 and 1956-1958 (Myers, 1962). In 1962 the MBTI was published by the Educational Testing Service and distributed for research purposes only. The MBTI is based on Jungian theory and attempts to measure the performances including: extroversion-introversion, sensing-intuition, thinking-feeling, and judging-perceiving.

A forced-choice, self-report preference inventory format was selected to measure the preference scales. The purpose of the forced choice is to measure relative preference for two important but opposite functions (McCaulley, 1977).
The MBTI includes 16 different personality types due to the various combinations of the four indices. These indices are dichotomous by definition and are independent of each other (McCaulley, 1977).

Lotas Model

Jung's theories also had a great influence on the Lotas Model. In Jung's theory, each individual has a preferred attitude. They are either introverted or extroverted. Each person also has a preferred function of perceiving, either sensing or intuitive. Also included in Jung's theory is the belief that each person possesses a preferred function of judging, either thinking or feeling (Mattoon, 1981). Individual psychological types, therefore, are theoretically a combination of these preferences.

Lotas focused on the functions of perceiving and judging. While maintaining these two functions as a basis, Lotas developed areas of learning and teaching styles using the four combinations of the functions of perceiving and judging. Lotas called these domains Affective I for the sensing-feeling combination, Affective II for the intuitive-feeling combination, Cognitive I for the sensing-thinking combination, and Cognitive II for the intuitive-thinking combination (Thompson, 1984).
Kolb Learning Style Inventory

Jungian theory also influenced Kolb, who developed a learning style inventory published in 1976. This learning style inventory attempts to measure how people learn and what their strengths and weaknesses are. Kolb's inventory identifies four learning models for each subject. They are feeling (concrete experiences), watching (reflective observation), thinking (abstract conceptualization), and doing (active experimentation).

Like the Jungian theory (1923), Kolb's concept is holistic in its make-up and includes such concepts as creativity, problem solving, decision making, and attitude change (Kolb, 1981). This inventory then provides two primary dimensions, creating tension between polar opposites of each dimension as well as between the two separate scales: (a) concrete experience-abstract conceptualization and (b) active experimentation-reflective observation. Respondents are asked to rank-order series of words and phrases. Scores are then derived from this ordering, providing measures of the two dimensions.

McCarthy's Model

McCarthy used Jung's theory of psychological types and Kolb's Experiential Model. McCarthy combined learning style research with brain hemisphere dominance.
Sperry (1950) revealed that the brain had two hemispheres: the right hemisphere, used for global processing, and the left hemisphere, used for sequential processing techniques (McCarthy, 1982). The McCarthy 4MAT Model, then, suggests that each learning style is a developmental strategy and is implemented by using both the right and the left brain functions.

Two instruments are used in order to identify an individual's style. The first is a learning style assessment inventory, and the second is a brain dominance assessment inventory. By using the results of both instruments, an individual can determine his or her own style. McCarthy's learning styles are labeled Type I, Type II, Type III, and Type IV. The descriptions of these learning styles also include whether the individual is left or right brain dominant (Huelsman, 1983).

**Field Dependence-Independence**

Of all the cognitive style dimensions, the field dependence-independence dimension is unquestionably the most widely known and researched (Kogan, 1971; Ragan, 1979). The extensive work by Witkin and his colleagues (1954, 1962, 1976, 1977, 1981) has contributed an almost overwhelming amount of information concerning this cognitive style construct.
The field dependent-independent dimension refers to the extent to which an individual is able to articulate figures as discrete from their backgrounds and to overcome the influence of an embedded context (Witkin, 1954; Kogan, 1971; Messick, 1976; Ragan, 1979). The original research conducted by Witkin in the late 1940s and early 1950s investigated individual differences in the perception of an upright object. Certain individuals relied on the visual field, paying particular attention to horizontal and vertical cues as aids in the determination of which objects were completely upright. Others were more inclined to use their own body cues from the pull of gravity in determining the upright position. Witkin saw the combination of these two factors as what customarily gave most individuals a perception of the true upright in space. He therefore attempted to experimentally separate these two sets of cues in order to better understand the extent to which individuals use each in the perception of the upright position.

Body Adjustment Test (BAT)

Witkin's first experimental technique is referred to as the Body Adjustment Test (BAT). In the BAT, subjects are seated in a small tilted room that can be displaced either clockwise or counterclockwise; the
subjects' own chairs can be displaced in a similar fashion by the experimenter. Subjects are given the task of adjusting their chairs (and hence their bodies) from a tilted position to an upright position. The surrounding room is also in a tilted position. Truly field dependent individuals are more likely to align their bodies with the tilted room, thus indicating evidence of a dependence on visual cues from the surrounding field, in this case, the tilted room. However, truly field independent subjects are usually able to bring their bodies to a true upright position through the use of gravitational sensations on the body, hence not relying on visual cues. These individuals are independent of the surrounding field. Witkin found that most subjects brought their bodies to a position somewhere between these two extremes (Witkin & Goodenough, 1981).

**Rod and Frame Test (RFT)**

Witkin's second test of field dependence-independence is the Rod and Frame Test (RFT). In the RFT, subjects are seated in a totally darkened room and are shown a tilted, luminous frame. Within the lighted frame is a luminous rod, pivoted at the center of the frame. The subjects are instructed to adjust the position of the rod within the tilted frame until the
The rod is in a perceived upright position. Again, the relative level of field dependence or field independence of subjects brought about very different results as to how much these individuals relied upon external or internal cues. Field dependent subjects tended to align the rod with the parallel right and left sides of the luminous frame, while field independent subjects were able to align the rod with their bodies, which were believed to be aligned vertically with the force of gravity.

**Rotating Room Test (RRT)**

In the third test, the Rotating Room Test (RRT), an attempt is made to change the direction of force on the body, the primary cue for field independent individuals, while maintaining the visual field upright. In the RRT, subjects are seated in a chair. Each chair can be adjusted with regard to uprightness. The chair is in a small upright room rotated around a circular track. In this experiment, the normal downward pull of gravity is altered by the outwardly acting centrifugal force. Once again the subjects are instructed to bring their bodies from a tilted position to one which is considered to be upright, through the use of visual or kinesthetic cues.

All three tests accomplish the same thing. They change the usual relationship between individuals' cues.
of perception. Furthermore, Witkin noted that individuals are self-consistent in regard to reliance upon visual or kinesthetic cues across each test (Ragan, 1979). Thus, subjects who tilted their bodies toward the tilted room in the BAT would also tend to tilt the rod toward the frame in the RFT. Conversely, subjects who were able to align their bodies with the true upright position on the BAT also were able to adjust the RFT rod to the upright position with the frame in the same manner (Witkin & Goodenough, 1981).

Embedded Figures Test (EFT)

Further research into the results of these tests allowed Witkin to consider the possibility that, while each test addressed reliance on visual (field) cues or kinesthetic (body) cues, the tests could also be thought of as involving the subjects' abilities to separate an item (body or rod) from an organized field (room or frame). Thus, in 1950, Witkin developed the Embedded Figures Test (EFT). This test does not involve a conflict between bodily and visual cues, but rather involves the disembedding of a figure from some organized visual field. With the EFT, subjects are instructed to find a simple geometric figure within a much more complex design. The design is patterned so each component of the simple figure is made an integral part of the complex, larger design.
In administering the EFT, an important discovery was made. Subjects who experienced difficulty separating the simple figure from the complex design were the same subjects who experienced difficulty in keeping the body or rod separate from the room on the BAT or from the frame on the RFT. In other words, these subjects were also field dependent on the EFT. They were dependent upon the visual cues of the embedded context of the complex figure and had difficulty overcoming those cues to locate the simple figure. The opposite was true for individuals identified as field independent on the BAT, RFT, or RRT. Those individuals experienced little or no difficulty separating the embedded figures from the more complex designs (Witkin & Goodenough, 1981).

These findings suggested to Witkin (1954) that the field dependence-independence dimension was more general than body orientation and that this dimension might involve some perceptual analytical ability which is part of each individual's perceptual function. Further research on the results of the EFT indicated that separating a part from an embedded context was very similar to a characteristic of many problem-solving tasks. Thus, subjects who were identified as being field independent in perception were found to have little or no difficulty in completing problem-solving
tasks which required, for successful completion, the removal of some critical element from the original context and the restructuring of the problem material in a different context (Witkin, Dyke, Faterson, Goodenough, & Karp, 1962).

The evidence linking field dependence-independence to the ability to overcome embedded contexts in problem-solving tasks substantially broadened the scope of individual differences that Witkin was investigating (Witkin & Goodenough, 1981). As a result, Witkin broadened the original field dependent-independent dimension and renamed the extremes of the field dependent-independent perceptual dimension as analytic and global. Analytic functioning represents both analysis and synthesis of perceptual and cognitive activities. Global functioning represents a more passive manner of functioning, a tendency to accept the field "as is," and to impose little structure on the field. To this day, most researchers still refer to this dimension as field dependence-independence, but in using this older terminology, one should bear in mind the expanded nature of its implications.

Many researchers have investigated the characteristics of the field dependent-independent dimension and have confirmed specific similarities of
those individuals tested as field dependent or field independent. What has resulted is a complete description of what might be referred to as the typical field dependent or field independent subject. Along social-interpersonal lines, Witkin and Goodenough (1976) ascribe several distinct attributes to field dependent individuals. "They like being with others, are gregarious, are affiliation-oriented, are socially outgoing, prefer interpersonal and group to intrapersonal circumstances, seek relations with others, show participativeness, show a need for friendship...know many people and are known to many" (p. 24). On the other end of the continuum, field independent individuals are described by Witkin and Goodenough (1976) as "individualistic, cold and distant in relations with others, aloof...not interested in humanitarian activities...concerned with ideas and principles rather than people, task-oriented" (p. 25).

Relatively field independent individuals are likely to show interest in those domains where their cognitive skills and aptitudes are required and where relations with people are not particularly involved. In contrast, relatively field dependent individuals are likely to favor domains where there is an emphasis on people. Also, field dependent individuals tend to have less
concern about the analysis and synthesis of ideas (Witkin, Moore, Goodenough, & Cox, 1977).

**Educational Implications**

According to Ragan (1979), the field dependence-independence cognitive style dimension holds much promise for researchers in education. The implication of research in this area can lead to predictors of success in many academic areas. In fact, in the past several decades, a vast amount of research has been conducted on this cognitive style dimension which can be applied to a wide variety of psychological and educational issues.

Individuals who cannot keep an item separate from the surrounding field (i.e., field dependent) are also likely to experience difficulty with problems that require removing some critical element from a context in which it is presented and restructuring the problem so that the element can be used in a different manner. This restructuring is often the case with foreign language learning. Learning a second language is considered to be a very complex process because the learner must learn new grammatical rules, new vocabulary, new concepts of the language that relate directly to the culture, and in many cases, a new system of sounds. Language learners, of course, will always
vary in their capacities to overcome the complexities and ambiguities of the second language. Some language students will find the new language less difficult than others.

Naiman, Frohlich, Stern, and Todesco (1978) examined the cognitive style dimension of field dependence-independence as an ability to disambiguate or to restructure, which they believe affects the performance of students. Naiman et al. conducted their research using high school students in Canada who were studying French as a second language. These researchers believe that successful language learners are able to break up the field of linguistic stimuli and isolate specific components needed to successfully complete the task and to avoid irrelevant or distracting stimuli, characteristic of field independent individuals. Less successful language learners, however, "will be distracted by irrelevant cues that produce an overall effect of noise" (p. 30). These learners will be bound to the entire field of linguistic stimuli, a characteristic of field dependence.

In this research study, Naiman et al. (1978) obtained a significant positive correlation between field independence and performance on imitation and listening comprehension tasks. They also found that the
field dependent language learners depend on the entire stimulus field and cannot select the proper cues necessary for successful completion of a task. If field dependent learners do choose from the various stimuli, they select the stimulus which attracts their attention and may or may not be the correct choice. They also tend to select cues that they recognize from past experiences. "If these are cues that have been overlearned in the past, they are likely to be related to aspects of the first language and may be inappropriate for the second" (p. 30).

Bialystok and Frolich (1978) found that field dependence-independence was a fairly weak prediction of success in second language learning. They concluded that the field dependence-independence construct was not significantly related to or predictive of success with the second language learning tasks selected for their research. Tucker, Hamayan, and Genesee (1976) report field independence to be a significant predictor of success on a general achievement test of French in grade 7, though they found no significant relationship on tests of reading comprehension, listening comprehension, or oral production. They did, however, find that field independence correlated with higher performance on an achievement test of general language skill.
In more recent investigations, Hansen and Stansfield (1981, 1982) examined the relationship between field dependence-independence and the language proficiency of college students in a beginning-level Spanish course. The correlations obtained were modest (.20 to .43), yet were significant (p < .001). These investigators concluded that the field dependent-independent construct plays a minor role in learning a second language. In this specific case, field independence was found to be most strongly associated with linguistic competence and integrative competence in Spanish, while the association was negligible in communicative competence.

These investigations provide somewhat conflicting findings about the role of field dependence-independence in the process of learning a second language. These mixed findings may be due to different measures of the construct of field dependence-independence, the choice of criterion measure of second language proficiency, or the lack of homogeneity of subjects. Whatever the reason for conflicting results, evidence is strong enough to encourage further investigation into the construct of field dependence-independence in relation to second language learning.
Reflectivity-Impulsivity

This cognitive style dimension is a measure of individuals' consistency of speed and accuracy with which alternative hypotheses are formulated and information processed (Messick, 1976). Impulsive individuals tend to offer the first answer that occurs to them, even though the answer given is frequently incorrect. Reflective individuals, on the other hand, examine the problem in detail, considering all aspects of the problem. These individuals consider alternate hypotheses, select one that satisfies all problem requirements, and finally offer a response.

Tasks used to measure reflectivity-impulsivity present individuals with several highly plausible alternatives, only one of which is correct. Individuals who respond quickly and often commit errors are classified as being impulsive, while individuals who pause to reflect on response alternatives and are often correct are classified as being reflective (Messer, 1976). As a result, the two major aspects of this cognitive style dimension are latency, i.e., speed of response, and error (Ragan, 1979). In addition to the reflective-impulsive modes of slow-accurate and fast-inaccurate, there are two other possible conceptual tempo modes: slow-inaccurate and fast-accurate.
Matching Familiar Figures Test (MFFT)

The testing instrument most commonly used to assess the reflective-impulsive cognitive style dimension is the Matching Familiar Figures Test (MFFT) (Ragan, 1979) developed by Jerome Kogan in 1964. This instrument has become the basic index in measuring this dimension (Kogan, 1971). The MFFT is given individually, and subjects are asked to examine a picture of some familiar figure (e.g. a cowboy, ship, or flower) known as the "standard." At the same time, they are shown a picture of eight very similar figures, each differing in only one detail from the standard. The subjects are asked to select the standard's exact duplicate from the eight variants. The subjects are scored on latency, that is, the amount of time taken for the initial response for each group of pictures and standard, and the total number of errors. Individuals classified as impulsive score above the median on errors and below the median on latency. Conversely, subjects classified as reflective score below the median on errors and above the median on latency. Kagan Moss and Sigel (1966) have noted that the MFFT is the most appropriate test along the latency-error dimension due to the high negative correlations (-0.57 for males and -0.51 for females).
This "median split" method of classification defines a 2x2 matrix in which reflectives and impulsives are those who fall in the two diagonal cells. Approximately two thirds of individuals are either impulsive or reflective by definition. The remaining one third of the subjects fall into the fast-accurate and slow-inaccurate cells, and according to Messer (1976), these subjects have been studied much less often. Because not all individuals have been considered and less attention has been paid to fast-accurate and slow-inaccurate individuals, this technique has produced some criticism. Kagan (1975), however, has responded to this criticism by noting that the other two cells are not part of the basic reflective-impulsive construct.

The reflective-impulsive cognitive style dimension appears to have implications for many tasks. Kagan, Rosman, Day, Albert, and Phillips (1964) report a tendency for subjects to respond in an impulsive or reflective manner across all tasks that involve a relative degree of response uncertainty. Kogan (1971) reports correlations of .40 and higher among such tasks of uncertainty.

While research has shown a generalizability of cognitive tempo across tasks, it also has demonstrated stability over time (Ragan, 1979). Kagan, et al. (1964)
have found that when impulsivity is present in a young child, it may continue to be characteristic of that child through the following years. The same is true for reflectivity in an individual. From ages five through eleven, there is an increase in latency and a decrease in errors for tasks which involve response uncertainty (Kogan, 1971). Since individuals are assessed by comparison to a group of peers, the tendency toward impulsivity or reflectivity relative to an age group remains stable over time (Kagan, et al., 1964).

**MFFT and Anxiety**

Kogan (1971) suggests two possible explanations for individual differences relative to the dimensions of reflectivity versus impulsivity. Both explanations propose that anxiety is a major factor influencing individual functioning. One explanation is that the reflective child is very anxious to avoid errors with responses and, as a consequence, takes his time in answering so as to minimize errors. The impulsive child, in contrast, is believed to be the type of individual who has learned that answering quickly results in reward, while hesitating may result in teacher (adult) dissatisfaction or punishment to the child. The second possible explanation is that the child who responds impulsively has less anxiety towards
possible errors, while reflective performance, again, indicates a desire on the part of the child to avoid all possible errors.

Kagan (1966) conducted a study that indicated that with induced anxiety, both reflective and impulsive subjects took a longer amount of time for their responses than did the subjects without the anxiety. Another observation noted was that when impulsive subjects took more time to answer, the result was fewer errors. This study supports the belief that impulsive performance is the result of lack of anxiety concerning errors.

According to Messer (1976) there is a connection among anxiety, conflict, and attitudes to individual differences. Campbell and Douglas (1972) compared test results of field dependence-independence (using the EFT), reflectivity-impulsivity (using the MFFT), and a story completion test that was designed to elicit responses to threats of frustration. These tests were given to 60 subjects. The findings indicate a relationship among field independence, reflectiveness, and optimism when faced with frustration. The association between reflectivity-impulsivity, and field dependence-independence may be, in part, the similarity of requirements of the MFFT and the EFT. Both tests
contain response uncertainty and require an individual to scan and analyze a visual field.

Additional Research

In another study, nine 13-year-old children were asked to identify a concealed pattern from among eight possibilities by opening up clue-containing shutters. The object of the task was to open as few shutters as possible. Reflective and field independent subjects solved the problems more efficiently than did impulsive, field dependent subjects (Neimark, 1975).

Delay in response time with reflective and impulsive individuals is associated with fewer errors only after entrance into school. Very young children may not realize the usefulness of delay in problem solving, and therefore, may not utilize these strategies. Ward (1973) suggested that the preschooler is more oriented to the tester than to the task itself because children have been observed talking to the tester and daydreaming. Implied in this research is the idea that the very young child generally does not possess the motivation for performing well. Thus, the child does not realize the need to reflect on his own responses (Ward, 1973).

In other research, Parry (1984) examined the relationship between foreign language proficiency
(based on various foreign language aptitude tests and proficiency exams) and reflectivity and impulsivity. Significant correlations were found between both response-accuracy (number of errors) and response-latency (speed) and various measures of foreign language proficiency. Based on the results of such tests, it is possible that these tests might be used as indicators of various learning styles and cognitive activities.

Kagan, Pearson, and Welch (1966) reported that MFFT response time was directly related to the number of glances at the standard figure and variants. The longer the response time was, the greater was the number of distinct glances at the figures. These findings imply that reflective subjects evaluate the stimuli more actively. Seigelman (1969) devised an apparatus whereby subjects had to depress a button to focus each figure they wanted to see, one at a time. The experimenter was able to examine exactly what the subjects wanted to see. Reflective individuals looked more often and longer at all the figures than did the impulsive individuals.

Drake (1970) used the Mackworth eye camera to determine where each subject looked most often and how often he looked at each part of a figure. With this camera, a short bright line of light projects a spot of
light on the subject's left eye. The light spot is reflected off the cornea, and this corneal reflection, or eye marker, is led to the camera where it is superimposed optically on a filmed picture of the stimulus display. As long as the camera is properly aligned with the subject's eye, the eye marker appears on the optical reproduction of the scene in the same place where the subject was looking on the original display. In order to prevent head movement, which reduced the accuracy of the experiment, the subject had to brace his head on a forehead rest and bite on a bar that holds an impression of his teeth. In Drake's experiment, two-second time exposures were taken with 16 mm plus-x negative movie film. Each frame of the film provided a record of the fixations that a subject made during any given two-second period.

By using this camera, Drake found that reflective subjects consistently observed longer and accrued more information about the stimuli before answering than did the impulsive subjects. This was gauged by the mean number of looks per figure, amount of eye coverage of the figure, and extent of comparison of homologous features of two or more figures. The findings have been confirmed by other researchers to indicate that the reflective subject not only spends more time evaluating
his hypothesis but also gathers more information on which to base his decisions. He also gathers the information in a more systematic manner than does the impulsive subject.

In another study, Seigelman (1969) noted that the impulsive subjects looked at significantly fewer alternatives than did the reflective subjects. Seigelman also reported that impulsive students displayed a greater biasing of attention in scanning (spending proportionally less time on alternatives) and in the number of alternatives ignored than did reflective students. In this study, the impulsive subjects favored one or two alternatives and gave little attention to the others.

Seigelman's research implies that reflective individuals compare alternatives and consult the standard for confirmation, selection, or elimination. Since each variant differs from the standard in only one aspect, the quickest and most direct route to take is to find the differences and compare them with the standard, which in turn, is the most efficient algorithm in this match-to-sample task. Impulsive individuals, in contrast, generally compare the standard in a global manner looking at one alternative at a time. They interpret the task as a series of up to six binary
decisions (e.g. same or different). When they fail to find a difference between an alternative and a globally memorized standard (even if the difference does not actually exist) they choose that alternative without proceeding to the other alternatives. They also neglect to continually check the standard for confirmation of what they are seeing. This strategy, used by impulsive individuals, is inefficient for this particular task.

The following is an example of how individuals might complete the task. The impulsive student might look at each part of each alternative (like pictures of a teddy bear) one at a time, and study each alternative (and parts of each alternative) one at a time. The subject then compares the part of the alternative with the image that he has in mind of what the standard looks like. Seldom does the impulsive individual take another look at the standard. Neither does he globally look at all the alternatives. Rather, he focuses on just small pieces of each alternative, in an attempt to find the differences that are part of the original task. The most efficient way to do this task is to glance at all the alternatives, and then compare them with the standard. Reflective individuals tend to recheck the standard more frequently than do impulsive individuals.

Often in the type of research conducted with the MFFT, only the latency measure is used to define the
construct. Kagan and Messer (1975) note that both speed and accuracy are needed to operationally define reflectivity-impulsivity and that both are equally important when considering this cognitive style and problem solving tasks.

Educational Implications

The reflective-impulsive cognitive style dimension is directly associated with education and the learning process. Impulsive individuals, as demonstrated by the research, have a great deal more difficulty in school simply because they have more of a tendency to answer quickly and have more erroneous responses than do individuals who are considered to be reflective. Messer (1976) found that among school-aged children, reflective and impulsive characteristics are stable and predictive of performance in a variety of problem-solving situations. Research has shown that characteristically impulsive individuals are at an academic disadvantage. Kagan et al. (1966) noted that the reflective subjects had better recall than impulsive subjects. He attributed this tendency to the fact that they worked longer in their attempts to produce a better cognitive product. Kagan et al. (1966) also stated that "this suggestion matches other data on reflective and impulsive children which indicate that reflective
children persist longer with difficult, intellectual
tasks than do their impulsive counterparts with the same
verbal ability" (p. 23).

Kagan (1971) also suggests that impulsive subjects
may perform more poorly on tasks of intelligence than
reflective subjects because often these tasks of
intelligence include subtests involving inductive
reasoning. In 1966, Kagan et al. conducted a study
involving 155 first-grade children. They were all
given the MFFT as a measure of reflectivity-impulsivity.
They were also given the Picture Completion Reasoning
Test and the Extrapolation Reasoning Test to measure
performance on inductive reasoning.

Using correlational techniques, the data collected
supported the hypothesis that reflective children make
fewer errors in inductive reasoning than impulsive
children (Pommershein, 1984). It was suggested, too,
that impulsive children make more errors than reflective
children because the impulsive children do not pause to
evaluate the quality of the inferences.

Drake (1970) also used the MFFT with the Mackworth
eye camera and noted that subjects who were considered
to be impulsive not only chose their answers more
quickly than reflective subjects, but that they also
looked until they saw an alternative they thought was
almost the same, or very similar to the standard, and selected that one. They did not look at all the alternatives prior to making their initial selection.

In a later study conducted by Alt, Crawford, and Jeffery (1972), they noted that all groups tested in their research used basically the same strategy as the subjects Drake tested. This strategy consisted of looking at the standard and only one or two of the variants. The fast-accurate and reflective subjects were observed to be more systematic with their choices and to make more comparisons between the standard and the variants than were the slow-inaccurate and impulsive subjects. Teacher ratings of these students suggested that only the reflective subjects were considered to be highly attentive students.

According to Kagan et al. (1966), impulsivity in a student may affect the teacher's perception of that student. Impulsive students are often misunderstood as not caring about their schoolwork because they make so many seemingly careless and incorrect responses. A teacher who perceives a student to be careless, instead of impulsive, may contribute to that student's academic failure by treating the impulsive student unfairly or by possibly reinforcing the student's lack of self-confidence. Kagan et al. (1966) stated that "this
disposition is often a handicap in the typical school situation, for most teachers do not have a high tolerance for incorrect replies, and the peer group is prone to jeer at the child who impulsively blurts out obviously incorrect answers" (p. 361).

As a result of research conducted in the area of reflectivity-impulsivity, a concerted effort has been made to better understand the modifiability of conceptual tempo so as to assist the impulsive learner in experiencing more successful academic performance. Seigelman (1969) observed that "simply enforcing experimental delay may not be enough to change deep-seated attentional strategies, but rather that deliberate attempts to train algorithms or attention-deployment paradigms may be required to modify the effect of cognitive styles" (p. 1221). Simply delaying a student's response may not alter the manner in which the student perceives and answers.

The idea of modifiability is connected with other research. Letteri (1985) suggests that students must understand how they learn before any changes occur. If individuals are consciously aware of how they learn, what is effective and what is not for specific situations, individuals have more of an opportunity to take an active part in learning. Learning, then, is not
a passive activity where the students sit back and simply absorb. Students make decisions that will affect their own learning. Individuals can also modify their learning style to best suit various learning tasks and situations.

Meredith (1976) designed a study to observe whether any imposed latency would assist the students in learning a second language. Meredith suggested that the imposed latency may be controlled by the teacher and might successfully be designed to inhibit premature responses from impulsive subjects.

The imposition of latency and the modification of conceptual tempo of impulsive second language learners may assist students in class as well as improve their test-taking strategies. Holly and King (1971) studied classroom correctional techniques and teacher strategies in the teaching of German. In their study, German teachers were asked to say nothing and do nothing for a five-to-ten second period of time while working with students who hesitated with their responses. The teachers were also instructed to give two corrective options if the student responded incorrectly. In more than 50% of the observed cases, neither corrective measure was needed. The students answered correctly the first time. Holly and King
(1971) believe the pauses represent teachers' nonverbal expectations of performance from the students. The pauses also created an atmosphere whereby responding was not only expected, but encouraged in a thought-provoking manner. This imposed latency allowed reflective subjects to test out their responses in their own minds before venturing forth with a verbal response. This also prevented impulsive subjects from "blurting out" the first thought that came into their minds. They had to wait until the latency period had ended.

Letteri (1985) expanded the imposed latency period an additional step. He believes that the major problem with students who have difficulty in learning is that these students do not understand the learning process. He also believes that individuals are central in the learning process because the responsibility for engaging learning belongs to the individuals alone. In order for the individuals to make the effort to learn, they must understand the learning process, which includes controlling and directing it.

Letteri administered a battery of tests to one group of students who were classified as reflective and to another group classified as impulsive. The impulsive students responded in a disorganized manner employing a search and scan process with poor results. The students
were then given a series of exercises with instructions provided to help the students develop better control of their analyses of presented information. The students were encouraged to use different selection processes. For example, they were asked, "is there another way you could look at the parts of the circle? Could you start at the top and move to the bottom? Do you see different segments if you look at the circle diagonally?" (p.118). These questions and other similar questions were used as guidelines to assist the students in making a decision based on thought, not just whatever spontaneously popped into their heads. This type of questioning also assisted the student in learning to pose questions pertaining to a specific problem. In this manner, students became aware of alternative methods to problem-solving situations and increased their grade-level performance up to 3.65 grades (Letteri, 1985).

Letteri's study involved working with students in all the cognitive style dimensions. Working specifically with reflectivity-impulsivity, Letteri found that in each instance, the impulsive students needed to be encouraged not to give quick answers, and to carefully compare each alternative, feature by feature, before selecting the matching figure.
Letteri's study supports Seigelman's observation that encouraging students to take their time may be useful. Significant improvement in responses does not result, though, until new thinking strategies are taught. Letteri encouraged the above-mentioned students to continually verbalize the thought processes of their comparisons. Using instructions and questions, Letteri also directed the students to be more accurate and careful in their analysis, focusing, and comparisons.

**Leveling-Sharpening**

The bipolar dimension of leveling-sharpening refers to individual differences and variations with regard to assimilation of information into the memory. It is a continuum that reflects the degree to which an individual perceives, adapts, and uses gradual changes in sequentially experienced stimuli (Santostefano, 1964). Gardner (1962) defines leveling-sharpening as follows:

The leveling-sharpening principle is currently defined in terms of individual consistencies in the degree to which new experiences and memory traces of earlier experiences interact or "assimilate." Subjects at the sharpening end of the continuum are those who show a minimum of such mutual assimilation. Subjects at the leveling end show relatively great assimilation (p. 195).

With sharpeners, impressions and memories remain more clear and distinct than with levelers. This is indicated by their ability to keep stimuli distinct and
accurate within memory. Levelers tend to minimize perceived differences and blur experiences together which stress sameness rather than difference. Levelers also tend to merge perceived stimuli with similar but not identical events recalled from previous experiences (Holzman, 1952, 1959, 1960; Gardner et al., 1959).

The schematizing test, developed by Holzman (1952), is the instrument most widely used for assessing the leveling-sharpening dimension (Kogan, 1971). This test is composed of 10 series of squares projected onto a screen. Each series is composed of five squares of regularly increasing sizes. Each series is projected randomly, but the increase in size from one series to the next is systematic in nature. The first series consists of the five smallest squares presented in ascending order. Then, the smallest square is omitted and the next biggest square, not yet seen by the subject, is added to the series. The subject is not told of the replacement. Substitutions are made, removing the smallest square of the sequence and adding the next larger square of the next sequence of five, until the largest square has been projected onto the screen.
The test yields two scores: ranking accuracy (the number of correct placements in a size sequence) and increment error (the extent to which the subject lags behind the size increases that occur). The ranking accuracy consists of the percentage of correct ranks when attained by the subject on the entire test, when ranking is considered within each subgroup of five stimuli. The increment-error, or lag score, is defined as the difference between the slope of the line fitted to the logarithms of the average of the actual stimulus sizes (Gardner & Moriarity, 1968).

The leveling-sharpening dimension of cognitive style may be important to learning and recall in specific situations (Ragan, 1979). Gardner and Long (1960) studied the relationship of leveling-sharpening to a memory task involving the serial learning of lists of words that are similar in sound. Their subjects were 10 levelers and 10 sharpeners, identified as such by the Schematizing Test, and selected from several groups of women. Each subject was given two eight-word lists, printed in capital letters, with each word being two syllables, beginning with the letter "P" and ending in "ED." Each word was exposed for three seconds, followed by an eight-second interval. After eight words from the first list were shown, there was an
eight-second pause, and then the subject was shown the eight words from the second list in a similar manner. Thirty seconds after the last trial on the second list, each subject was handed a sheet of paper and was asked to write out, sequentially, the words from the first list. The subjects were given as much time as needed to complete the task. They were then asked to repeat the task for the second list. The similarity of the words on the two lists, the brief time interval between lists, and the recall of the first list before the second list were all intended to maximize the possibility of item interaction within and between lists.

Gardner and Long (1960) found that sharpeners tended to give more responses and make fewer errors in the first list. With regard to the responses on the list (backward errors), sharpeners made significantly (p. < .02) fewer errors than levelers. Although the two groups were not significantly different in the number of responses that would have been correct at later points on the list (forward errors), these researchers found that 81% of the forward errors made by sharpeners were misplaced by only one position, whereas 58% of the levelers made similar errors. This difference was found to be significant at less than the .01 level. The two groups, furthermore, showed no significant differences
on any of the measures for the second list of words. Gardner and Long (1960) suggest that the cognitive style of leveling-sharpening can affect the nature and number of errors in a classical situation involving memorization of two lists of similar words.

Staines (1968) hypothesized that sharpeners should be more accurate in the perception of academic data, particularly when such data involves small modifications and variations. His subjects were 160 adolescent females who were given the Schematizing Test to identify levelers and sharpeners. A Pearson product-movement correlation, performed between Schematizing Test scores and IQ, as measured by the Otis-Lennon test, was found to be 0.07. Each subject was also given nonstandardized, half-year academic examinations on all subjects taken in school.

A statistical analysis of the difference of mean scores of levelers and sharpeners in various academic tests showed that significant differences existed in English (p. < .01), mathematics (p. < .05), and science (p. < .05). Sharpeners did significantly better in these subjects than did levelers. Staines (1968) argues that the perceptual processes and memory structures of levelers are less efficient than those of sharpeners. He notes that "it would appear that leveling-sharpening
is a dimension related to learning" (Staines, 1968, p. 126).

In other studies, Holzman and Gardner (1960) showed that sharpeners were superior to levelers on recall of a story heard years earlier that was not intentionally committed to memory. Despite the small sample size used in this study, the results provided evidence of the superior ability of sharpeners relative to tasks directly related to long-term memory function. In another study demonstrating differences in short-term memorization function, Gardner and Lohrenz (1969) showed that groups of extreme levelers and extreme sharpeners were markedly different in the number of elements accurately recalled, and in the number of elements that were changed as a story was passed from one member of a group to another member of the same group. These studies all demonstrate the high degree of relationship between leveling and sharpening as measured by the Schematizing Test and other memory factors.

In summary, leveling-sharpening measures the ability of an individual to organize images within the memory and to relate those images to current information. Leveling-sharpening also measures an individual's ability to maintain sequential information in the original order. Those individuals identified as
sharpeners tend to experience ease with tasks that require the organization of sequential information that may or may not undergo changes during the learning process. Sharpeners also tend to excel in those areas requiring memorization (Gardner & Long, 1960).

Sharpeners can maintain memory information that is distinct, clear, stable, and that represents learned information to a high degree of exactness. This information can then be easily and readily recalled for use in problem situations.

Levelers, on the other hand, tend to blur and merge those memory items having highly similar qualities. Also, they do not notice that sequentially-presented information is undergoing subtle change. A change in a story line, character, or tense in reading may not be noticed. Therefore, these changes go unlearned. Letter pronunciation from one word to another or subtle direction changes from one situation to another similar one may all go unobserved. Learning in such areas may be impaired. In addition, leveling individuals may experience problems with tasks that require long-term memory storage and retrieval, resulting in difficulty with learning new data.
Educational Implications

While there is no empirical evidence in the literature as to how the construct of leveling-sharpening directly relates to the process of learning a second language, there is evidence that learning a second language requires a significant demand on memory and memory function in learners. If learning a second language is seen by advocates of the more recent cognitive methodologies as being new information "linked" to already existing cognitive structures (Ausubel, 1978), then the construct of leveling-sharpening in individuals is an important factor. Whether learners are levelers or sharpeners, influences how much of the material they learn and in what capacity they go about learning. The leveling or sharpening tendencies influence the learning and retention of meaningful new material.

According to the research, levelers encounter more difficulty in learning new material because of their tendency to assimilate new information to previously learned materials, and to merge similarities in the memory, instead of differentiating between them. In addition, they do not notice or realize that sequentially presented information is undergoing subtle, yet substantial change. Thus, the leveler may
experience difficulty in recalling specific rules needed to produce accurate responses necessary for communication in a foreign language or completion of a specific task. The new information for a leveler is "leveled" out and merged with aspects of the first language or with previously learned material that is similar but different. In other words, this new information may become confused with the existing information.

Sharpeners, on the other hand, because of their ability to maintain a separation of new materials from existing information, tend to recall readily and assimilate correctly new information for accurate task performance (Gardner & Long, 1960). The research also indicates that sharpeners are more successful in task performance and oral production of the second language because the sharpeners have not blurred the new information but have actually assimilated correctly the information into the existing cognitive structure. Sharpeners are more apt to separate successfully "old" and "new" information and are able to combine the two, as needed, to speak and understand the second language and to complete correctly the tasks required.
**Scanning (Focusing-Nonfocusing)**

Scanning refers to the dimension of individual differences in the extensiveness and intensity of attention deployment, leading to individual variation in the vividness of experience and the span of awareness (Messick, 1970). This test measures the ability of subjects' attention to detail, how meticulous the subjects are with the task in relation to successful completion of an accurate solution, and sharp, yet, wide-ranging, focus of attention.

This cognitive style measures individuals' level of distractability and the tendency to control selectively attention deployment or to use disorganized procedures of attention deployment in any given task. In other words, it measures how capable subjects are of making the discrimination called for and how capable they are of adopting and maintaining a set for directed and selective attention.

Focusing subjects, when instructed, can focus and attend to specific elements of a task, especially when those tasks have been identified as being important and relevant. Focusers are able to exclude any irrelevant information and are capable of accurately identifying the problem at hand, finding an appropriate solution, and giving a correct response.
Nonfocusers, on the other hand, have difficulty attending to specific elements of a task and show a high degree of distractability, often concentrating on irrelevant aspects of a task. Nonfocusers are usually drawn to the irrelevant aspects due to the fact that the irrelevant aspects are more familiar, seem more appealing, or appear more simple than the relevant aspects. Focusers use this insignificant information in an attempt to find a solution to the task at hand. Concentrating on the irrelevant information leads to confusion for nonfocusers, and the end result is higher error rates. The inability to identify and attend to relevant aspects of any given task may become evident in mathematical word problems, reading comprehension, spelling, punctuation, and language learning.

Nonfocusers are more aware than focusers of all aspects of a field, irrelevant as well as relevant, because they are attending to and scanning the entire field. Nonfocusers, therefore, experience more difficulty with the tasks than do focusers, whose use of attention is much more narrow (Benfari, 1966). The nonfocuser is not able to mentally eliminate the irrelevant fact and sees the whole as the solution, not paying attention to the specific problem at hand.
Schlesinger (1953) is one of the pioneers of the cognitive style of scanning. He noted that individuals demonstrate different cognitive organizational structures, which he referred to as "cognitive attitudes." He developed a Size Estimation Test in which a subject was asked to estimate the size of various discs that had individual distracting cues such as colors and textures. The test was designed to observe if subjects could narrow their attention to the relevant data. Schlesinger (1953) identified the focuser as a person who maintained a "narrow attitude that favors concentration on relevances and ignores irrelevancies" (p. 356). The focuser in Schlesinger's research, for example, was not confused by the difference in colors and textures and would be able to focus on the problem of size. Focusing means more than just the ability to maintain a cognitive attitude for accuracy while attempting to find a solution. Focusing also means an underlying preference for experiencing the world in a narrow, discriminative manner even when the task does not demand such an approach.

Individuals who easily adopt a set for directed, focused attention will not necessarily be unable to relinquish it when it is clearly inappropriate. The more the adoption of such a set is based upon the
cognitive construct of focusing, however, the less easily it will be relinquished when inappropriate.

The second aspect of focusing—separation of affect from idea—was measured by the Picture Sorting Test. This instrument consists of sexual, aggressive, and neutral pictures. Researchers assumed that focusers do not commit themselves to a clear-cut, affective experience, and sort out many pictures into an "indifferent" category because they are able to separate emotion (subjectivity) from idea (objectivity).

The nonfocusers, according to Schlesinger (1953), are any "persons who are inclined to experience the world far more inclusively than do focusers" (p. 356). Nonfocusers are individuals who are less intent upon checking their inner experience against some objective standard, and they are more apt to accept what they see without critically looking or comparing the information with a standard. In Schlesinger's research, for example, nonfocusers became confused by the colors and textures and lost sight of the initial problem of size. Nonfocusing individuals chose answers based on color and texture, and not on size. In one sense, the nonfocuser has less of a tendency to have a cognitive set for accuracy leading to a higher incidence of interference that task-irrelevant stimuli might prompt.
Schlesinger (1953) also noted that, while accuracy is not synonymous with focusing, one should be able to use accuracy in the presence of irrelevant characteristics as a means of ranking individuals along a focusing continuum.

The results from Schlesinger's research demonstrated that performance on the Size Estimation Test was related to performance on the Picture Sorting Test. Focusers (low-error subjects) made an average of 25.5 "indifferent" choices, whereas nonfocusers (high-error subjects) made an average of 15.5 "indifferent" choices. The results of this test suggest that nonfocusers were not able to distinguish between their feelings—a subjective response—and the picture itself—an objective response. Schlesinger (1953) also found differences between extreme groups on a personality inventory, with focusers more attuned to "objective" characteristics of a given situation and less aware of their feelings.

Educational Implications

As Ragan (1979) stated, the implications for the cognitive style dimension of focusing-nonfocusing are somewhat vague. The vagueness is primarily due to the fact that Gardner, Holzman, Klein, Linton, and Spence (1959), who have done most of the work in investigating
this style, have been more concerned with the relationship of scanning from a psychological point of view. Their interest was to look specifically at personality structures and not to work in conjunction with the results as compared to the educational implications. This type of study involving the focusing-nonfocusing bipolar dimension could be linked easily to education because of the importance of the extent and intensity of attention deployment. How individuals respond to problem-solving situations is vitally important to their success with the content area and self-image in school as well as with daily situations that will arise outside of school.

Gardiner et al. (1959) noted that individuals originally labeled as focusers actually deploy attention to relatively many aspects of the stimulus field. Focusers were observed to be broadly aware of all the components of the stimuli field because they continuously scanned the field, whereas nonfocusers were more narrow in their focusing of attention. As a result of these observations, Gardner et al. (1959) noted that due to the individual consistencies originally observed by Schlesinger, a more precise term for focusing-nonfocusing might be "scanning."
Summary

The relationship between cognitive styles and foreign language proficiency has received little attention until recently. Exactly how different dimensions affect individuals' abilities to learn a second language is unknown. However, some relationships do exist between individual cognitive style dimensions and language learning. The more research that is conducted on how these individual dimensions interact with each other and how they are connected with foreign language learning, the more insight educators will have in teaching foreign languages.

In Chapter II the literature and research relevant to cognitive styles were discussed. In addition, the chapter contained separate sections describing literature and research directly related to the four cognitive style dimensions used in this study. They are: field dependence versus field independence, reflectivity versus impulsivity, focusing versus nonfocusing, and leveling versus sharpening. Following each discussion of the individual dimensions was a section on educational implications directly relating to that specific dimension and learning a foreign language.
CHAPTER III
PROCEDURES OF THE STUDY

This research study focused on cognitive dimensions, specifically the relationships between four cognitive style dimensions and the proficiency in Spanish of students studying this foreign language for the first time. The purpose of this study was to examine the relationships between students' cognitive profiles and the results of a standardized Spanish test taken by these students. In addition, the researcher investigated differences between the cognitive profile groups (type 1, type 2, type 3) relative to performance on the standardized test. Objectives of this study included gaining further insight into foreign language learning and identifying cognitive style dimensions hypothesized to be closely related to second language learning.

This chapter will present a discussion of the methodology. Included in this discussion will be the
Research design, subjects chosen for the investigation, the instrumentation used to collect the data, the research procedures, and the technique used to analyze the data.

**Research Design**

The design used in this research was an ex post facto design. Such research is referred to as "ex post facto" (Latin-"after the fact") because both the effect and the alleged cause have already occurred and are studied by the researcher in retrospect. In ex post facto research, groups differ on a variable and the researcher attempts to identify the major factor that has led to this difference. In this research, the major differing factors were the cognitive profile types 1, 2, and 3. The researcher assessed the difference of the cognitive profile types with respect to the students' scores on the National Spanish Exam.

**Subjects for the Investigation**

The population for this study consisted of students enrolled in first-year Spanish classes at Upper Arlington High School in Upper Arlington, Ohio. Upper Arlington is a suburb of Columbus, of approximately 36,000 inhabitants, with an average household income of approximately $38,000. This middle- to upper middle-class community has a
limited ethnic population of approximately 5% who speak a language other than English in the home. Over half of the residents have completed four or more years of college (U.S. Department of Commerce, 1983).

The decision to use first-year Spanish language students was made based on the assumption that by the end of the first year of language study, students have had one year of experience learning the foreign language, and by that time, the students have developed a style for learning the language. First-year students have generally acquired sufficient background in the language at the end of the first year to be tested for their language proficiency. Students, after one year of study, have become familiar enough with the language and language testing so as not to be intimidated by testing procedures.

All first-year Spanish students were tested. The students who were studying first-year Spanish were freshmen, sophomores, juniors, and seniors, but the majority of these students were freshmen. All students were given the same tests.

A purposeful sampling technique was employed because the researcher used only first-year Spanish students, and all of them were included. The students were asked to participate in the individual testing
during their free periods. Special consideration was given to those students who did not have a free period, and the Spanish teachers all agreed to allow these students to miss one Spanish class in order to be tested. All students who completed the series of tests were given extra credit. Consent forms were sent home for parents to sign, giving parents an opportunity to refuse to allow their children to participate.

Initially, 67 students were identified to participate in the study; however, because three students were unwilling to use one of their free periods for testing, they were deleted from the sample. Over the term of the study, three additional students were absent, which further decreased the sample size. The final sample size for this study was 61.

This researcher has given careful attention to sample size. On the one hand, it was important to select enough participants to provide a valid and reliable account of the cognitive processes under investigation. On the other hand, the sample size had to be manageable because the researcher gave three of the tests individually to each participant. According to Johnson (1976), a minimum sample size of 30 is needed for research studies similar to this one.
Cognitive Style Test Instruments

Each subject in the study was administered four cognitive style tests in order that a nucleus profile for that subject could be determined. In the scoring procedures, half-standard deviations were used as delimiters by Letteri to classify students according to each cognitive style dimension. In doing so, Letteri discovered that using half-standard deviations was a more realistic manner in which to classify the students than using whole-standard deviations. Because this researcher is following Letteri's model, and because of the distribution of sample scores, she, too, has elected to use half-standard deviations as a means of identifying cut-off points for students' scores. The half-standard deviations reported reflect this researcher's data. The four tests are as follows:

1. Group Embedded Figures Tests (GEFT, Oltman, Raskin, & Witkin, 1971)—GEFT is a group-administered test used to determine an individual's articulation along a field-independent (global-analytical) continuum. The test is divided into three sections. The first section is designed for practice. The subjects are given two minutes to complete as much of the practice section as they can. This practice section is used in order for the researcher to be certain that the
students understand what is expected of them. It is also for the students to be certain that they understand the instructions. This section enables the students to look for the figures and to experience what type of answers are needed for successful completion of this task. This practice section is beneficial because students are not accustomed to taking tests of this nature. If students have questions about the test, they are allowed to ask them during this first part. The second and third sections consist of nine problems each. The subjects are given five minutes to complete the second part before being told to continue to the third. For each problem, the subject is asked to identify and locate a simple geometric figure embedded within a more complex geometric figure. These problems are then scored to determine the number of correct responses. Subjects who score one-half standard deviation (2.44) above the mean of 11.00 are designated as field-independent or analytical, whereas subjects scoring one-half standard deviation (2.44) below the mean of 11.00 are designated as field-dependent or global. This procedure yielded a Cronbach's alpha of .86.

2. Matching Familiar Figures Test (MFFT) (Kagan, 1964)—MFFT is a test used to determine a subject's
articulation along a reflective-impulsive continuum. In this test, the examiner shows the subject a picture of a familiar object, such as a flower or a cowboy, and the subject is asked to select from eight alternatives the one that is the exact duplicate of the presented picture. There are 12 such items on the test. The pictures are bound in book form, and the book is open at all times. In this manner, the subject is able to refer to the standard as often as he or she wishes. The eight alternatives are on the facing page from the standard. (See figure 2.) This test yields a latency score and an error score. The latency score is the time, in half-seconds, the subject takes to make a first choice of alternatives. The error score is the total number of erroneous alternatives selected across all 12 items. Subjects scoring one-half standard deviation (278.82) above the mean of 987.00 on time and one-half standard deviation (5.97) below the mean of 13.00 on error are designated as being reflective. The Cronbach's alpha for this test was .76. Subjects scoring one-half standard deviation (278.82) below the mean of 987.00 on time and one-half standard deviation (5.97) above the mean of 13.00 on error are labeled as impulsive. The Cronbach's alpha for time was .92.
3. Square Lag Test (SLT based on the Schematizing Test, Holzman, 1952)—SLT is a test used to determine an individual's articulation along a leveling-sharpening continuum. During the initial practice session of the test, the subject is shown a four-inch square and is told the size of the square. The subject is then shown a two-inch square and is asked to estimate the size of this square. At the end of three trials, if the subject has not answered correctly, the subject is told the correct size of the two-inch square. The practice session is then repeated with a six-inch square. All nine squares in the test are then hidden from the subject and are presented to the subject, one at a time in a predetermined sequence, for three seconds each. The subject is allowed up to eight seconds to make a size determination of each presented square. During the initial series, squares ranging from one-inch to five-inches are used. Then, the one-inch square is removed and a six-inch square is added. The removal and addition are done in a way that the subject does not become aware of the exchanges. After this series of five, the two-inch square is removed, and the seven-inch square is added. This process is continued until the smallest square in the series is the five-inch square and the largest is the nine-inch square. There are five
series of presentations in each of which five squares are shown to the subject.

The test yields an overall accuracy (OA) score that measures the subject's ability to maintain accuracy in relation to the size of the five choices in three trials for the five series of presentations. The total number of inaccurate size proportion estimates for the series is multiplied by 1.3 and then subtracted from 100 to produce the OA score for the subject. The test also yields a loss accuracy (LOA) score which is a measure of the subject's ability to notice accurately the decreasing relative size proportion or square number five (the five inch-square) as it is presented in the five series of presentations. In other words, the test demonstrates the subject's ability to observe that the number five square moves from being the largest square in the first series of trials to being the smallest square in the fifth and last series of trials. The total number of inaccurate reports is multiplied by 6.6 to produce the subject's LOA score.

Subjects scoring one-half standard deviation (4.11) above the mean of 87.00 for OA and one-half standard deviation (10.11) below the mean of 29.00 for LOA are designated as being sharpeners. Subjects scoring one-half standard deviation (4.11) below the mean of
87.00 for OA and one-half standard deviation above the mean of 29.00 for LOA are designated as being levelers. Using a Cronbach's alpha to determine reliability coefficients, the results are the following: overall accuracy score yielded a reliability coefficient of .72, and the loss of accuracy scores yielded a reliability coefficient of .73.

4. Disc Focus Test (DFT) (Schlesinger, 1956) -- DFT is a test used to determine an individual's articulation along a focusing-nonfocusing cognitive style continuum. The adolescent version of the test consists of 10 discs ranging in diameter from four to eight and one-half inches. Five of the discs are covered with distracting and irrelevant designs, such as cartoons and starbursts, and are labeled emotionally loaded (EL). The five remaining neutrally loaded discs are covered with muted colors or textures and are labeled neutrally loaded (NL).

During the administration of the test, a six-inch disc, referred to as the standard, is displayed three feet from the subject. The subject is told the size of the standard and may, upon asking the examiner, be reminded of the size of the disc that remains visible during the test. Each of the ten discs is shown to the subject by the examiner, one at a time, during four
trials. The subject is asked to guess the size of the disc being displayed by the examiner. The subject may look at the standard disc at any time to use it as a reference in order to guess the size of the disc held by the examiner. Thus, the subject examines each disc four times during the course of the test with a total of forty responses.

The test yields three scores. Total Error (TE) for the test is computed by noting the differences between the subject's response of size estimation and the actual size of the disc. The total difference between estimation and actual size across all trials is the subject's TE score. Emotionally loaded Error (ELE) is determined by computing the difference between estimations and actual size on the Emotionally loaded (EL) discs only. Neutrally loaded Error (NLE) is determined by computing the difference between size estimation and actual disc size for the neutrally loaded (NL) discs only. The subjects scoring one-half standard deviation (8.89) above the mean (37.00) on TE and one-half standard deviation (4.54) above the mean (19.00) of EL scores are designated as nonfocusers. Subjects scoring one-half standard deviation (8.89) below the mean (37.00) on the TE score and one-half standard deviation (4.54) below the mean (19.00) on the
ELE score are designated as focusers. The Cronbach's alpha yielded a reliability coefficient for TE of .94, and a reliability coefficient for ELE of .89.

National Spanish Exam

The National Spanish Exam (NSE), level one, first-year Spanish, was designed specifically to assess the linguistic abilities of high school students studying first-year Spanish. It is updated annually and is published by the American Association of Teachers of Spanish and Portuguese. The test is given annually, nationwide, in connection with national competition.

This exam consists of components to test students' abilities in listening comprehension, vocabulary, and reading comprehension. This test was chosen by the researcher to assess foreign language proficiency especially because of its ability to measure listening skills. Other standardized tests do not include a listening comprehension section. The test is aimed at the very few best students in each first-year class who, at the end of the school year, wish to compete for national recognition for scholarship in Spanish.

All items on the NSE are in a multiple-choice format. The tasks include a section on listening, where the students look at a picture, hear statements, and choose the best response from a choice of written
responses. Also included in the listening section is a cassette recording of a native speaker asking questions to which the students have to look at a picture and choose the best response to a series of questions about that picture. Another task is hearing a dialog and having to respond by selecting the best answers to the questions asked. The second portion of the NSE is made up of grammar and vocabulary tasks, as well as a reading passage, about which the students must answer questions.

A Cronbach's alpha was performed on each portion of the NSE: (a) listening portion, resulting in a reliability coefficient of .70, (b) writing portion, resulting in a reliability coefficient of .81, and (c) total test, resulting in a reliability coefficient of .84.

Research Procedures

In the search for an organizing principle by which to understand relationships between various cognitive dimensions, review of the literature led the researcher to base the research model on Letteri's (1980) cognitive profile. The cognitive dimensions selected for this research are: field dependent-field independent, reflective-impulsive, leveling-sharpening, and focusing-nonfocusing. The researcher chose to use a shortened version, referred to as the nucleus profile,
of Letteri's initial cognitive profile, in which seven dimensions are included.

Although the nucleus profile may not yield the exact same results as the complete cognitive profile, "to shorten and simplify the diagnosis process would enable teachers to utilize this type of evaluation as part of an overall diagnosis of each student at the beginning of the school year" (Letteri, 1982, p. 2). This research model was chosen because of the potential accessibility of these tests for teachers to use in the schools. This researcher wished to test students as they potentially could be tested in the schools.

The first test to be given was the National Spanish Exam. This test was administered during two class periods because it took one hour to complete and classes were only 48 minutes long. The first section on the National Spanish Exam was listening skills comprehension. This section was timed in the sense that students listened to a voice on a cassette tape and responded to questions in their test booklets. (See Figures 3 and 4.) On the second section, students were allowed to work at their own speed and had to answer questions written in the test booklets.

The only cognitive style dimension test given in a group setting was the Group Embedded Figures Test. This
test was given to students during their usual Spanish
classes and took approximately 20 minutes to administer.
The other three cognitive dimension tests, the Matching
Familiar Figures Test, the Square Lag Test, and the Disc
Focus Test, were all administered to students on an
individual basis. The students were assigned a specific
day and time to report to the testing area. Passes for
the students were given to them a day in advance, and a
list informing the students of the day and time of their
tests was posted in each Spanish class before the
testing occurred.

Data Analysis

Analysis of data in ex post facto studies involves
a variety of descriptive and inferential statistics.
One of the commonly used inferential statistics is
analysis of variance, which was used in this research to
assess differences between group means. The Scheffe' post hoc test was used to determine differences between
paired comparisons. If the underlying assumptions for
parametric procedures are violated (i.e. homogeneity of
variances, lack of normality of distribution) a
nonparametric analysis of variance should be performed.
Because the aforementioned assumptions were violated,
the Kruskal-Wallis was used in place of the parametric
analysis of variance. Ex post facto studies identify
relationships (Gay, 1981). Because data were neither interval nor ratio, but were rank ordered, the Spearman correlation coefficient was used to measure relationships between identified variables. The SPSS-X (Norusis, 1983) was used to perform the appropriate statistical analysis. A reliability coefficient, Cronbach's alpha, was determined for each of the ten measurements used in this study.

**Hypotheses**

The specific research questions resulted in the following hypotheses to be tested. Stated in the null form they are:

**Hypothesis 1**: There are no significant differences among the total scores of the National Spanish Exam for groups identified as having type 1, type 2, or type 3 cognitive profiles.

**Hypothesis 2**: There are no significant differences among the writing scores of the National Spanish Exam for groups identified as having type 1, type 2, or type 3 cognitive profile.

**Hypothesis 3**: There are no significant differences among the listening scores of the National Spanish Exam for groups identified as having type 1, type 2, or type 3 cognitive profile.
Hypothesis 4: There is no significant relationship between the total score of the National Spanish Exam and scores for each of the four cognitive style dimensions.

Hypothesis 5: There is no significant relationship between the writing scores of the National Spanish Exam and scores for each of the four cognitive style dimensions.

Hypothesis 6: There is no significant relationship between the listening scores of the National Spanish Exam and scores for each of the four cognitive style dimensions.

Summary

In this chapter, the subjects for the investigation were discussed in detail as well as the cognitive style test instruments, standardized Spanish test, research procedures, and data analyses. The statement of the null hypotheses concluded the chapter.
CHAPTER IV

ANALYSIS OF THE DATA

The purpose of this research was to identify relationships between cognitive style dimensions and performance on the National Spanish Exam. In addition, an examination of the nature of selected cognitive style dimensions was made as they related to writing and listening skills in foreign language proficiency. Another purpose of this investigation was to identify differences not only in performance on the National Spanish Exam, but in writing and listening skills for cognitive profile types 1, 2, and 3.

This chapter will present a descriptive summary along with a discussion of the statistical results obtained relative to the null hypotheses. The hypotheses will be presented individually followed by the statistical methods used in analyzing these hypotheses. The results for each hypothesis will be discussed, and the chapter will conclude with a presentation of reliability coefficients for measurements used in this study.
Descriptive Summary

The first dimension to be discussed is reflectivity versus impulsivity. The Matching Familiar Figures Test was used to measure this dimension. With this test, the researcher is interested in not only the time required to complete this task, but also the number of errors committed while completing the task. The mean number of seconds required for this sample of 61 high school students in first-year Spanish is 947 seconds. This compares to the mean of 353 seconds for the norm high school students. The sample under investigation required almost three times the number of seconds to complete the test as did the norm group. The mean number of errors committed by the student sample is 13. The norm high school students' mean number of errors is 10.

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>MEAN SCORE AND STANDARD DEVIATION FOR MEASUREMENTS OF MFFT FOR SAMPLE AND NORM GROUPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFFT</td>
<td>MEAN TIME</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>987</td>
</tr>
<tr>
<td>NORM</td>
<td>353</td>
</tr>
</tbody>
</table>

As discussed in Chapter 3 (page 78), students who score greater than 11.2 errors in less than 212 seconds
are classified as impulsive. On the other hand, students who commit less than 8 errors but take more than 494 seconds to complete the task are considered reflective. The data for the sample under study indicate that this sample is reflective when time is considered. Yet, these same students are considered impulsive when the number of errors is considered. Therefore, the student sample, on the average, is placed in the category of non-articulating, which means that they are neither impulsive nor reflective.

The leveler-sharpener dimension, as measured by the Square Lag Test, was used to examine the students' abilities to perceive gradual changes. The Square Lag Test examines the students' overall accuracy (OA) as well as the students' loss of accuracy (LOA). The OA tests the students' abilities to place five proportionately sized squares in the correct order by size. The LOA tests the students' abilities to recognize that the five-inch square goes from being the largest square in the first series of five squares to the smallest square in the last series of five.

As indicated in Table 2, the mean score for overall accuracy for the sample under study is 87. This compares favorably with the norm mean, which is 89. In contrast, the mean loss of accuracy for the student
sample is 29. This score is almost two times the mean for the norm high school subjects, which is 15. The parameters for the Square Lag Test indicate that students with an LOA greater than 19 and an OA of less than 85 would be classified as levelers. Given these scores, the sample under study, on the average, would be described as nonarticulating.

<table>
<thead>
<tr>
<th></th>
<th>1/2 S.D.</th>
<th>1/2 S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OA</td>
<td>LOA</td>
</tr>
<tr>
<td><strong>SAMPLE</strong></td>
<td>87</td>
<td>29</td>
</tr>
<tr>
<td><strong>NORM</strong></td>
<td>89</td>
<td>15</td>
</tr>
</tbody>
</table>

The next dimension, focusing-nonfocusing, is measured by the Disc Focus Test. The test measures students' abilities to concentrate on a specific problem and not be distracted by irrelevant or unnecessary information. The total error (TE) measures the students' abilities to identify similarly sized discs. The emotionally loaded error (ELE) measures the students' abilities to identify similarly sized discs and not be confused by irrelevant information. The mean TE for the student sample is 37. The mean ELE is 19 for this same sample. The mean TE for the norm group is 26,
and the mean ELE is 13. The parameters for the Disc Focus Test indicate that students with a TE score of greater than 32 and an ELE score of greater than 16 would be identified as nonfocusers. At the same time, students with a TE of less than 21 and an ELE of less than 11 would be classified as focusers. Given these parameters, on the average, the student population involved in this study is classified as nonfocusing.

<table>
<thead>
<tr>
<th>TABLE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN SCORE AND STANDARD DEVIATION FOR MEASUREMENTS OF DFT FOR SAMPLE AND NORM GROUPS</td>
</tr>
<tr>
<td>1/2 S.D.</td>
</tr>
<tr>
<td>MEAN TE</td>
</tr>
<tr>
<td>SAMPLE</td>
</tr>
<tr>
<td>NORM</td>
</tr>
</tbody>
</table>

Analytical versus global, the last dimension to be discussed in this research, is measured by the Group Embedded Figures Test (GEFT), which tests students' abilities to distinguish a simple figure embedded in a more complex background. There is one score for the GEFT indicating the number of correct responses. The mean GEFT score for the study sample is 11. This mean score is identical for the norm group. Students with scores greater than 13 would be identified as analytical. Students with scores less than 9 would be identified as global. The sample population, on the
average, would be described as non-articulating with regard to the analytical-global dimension.

TABLE 4
MEAN SCORE AND STANDARD DEVIATION FOR MEASUREMENT OF GEFT FOR SAMPLE AND NORM GROUPS

<table>
<thead>
<tr>
<th></th>
<th>MEAN</th>
<th>1/2 S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLE</td>
<td>11</td>
<td>2.44</td>
</tr>
<tr>
<td>NORM</td>
<td>11</td>
<td>1.65</td>
</tr>
</tbody>
</table>

The National Spanish Exam (NSE) was used to test students' abilities with Spanish. There are two parts to the test: a writing portion and a listening portion. The researcher was interested in three scores from the NSE: writing, listening, and total. The first score to be discussed is the writing score of the NSE, which is comprised of 55 questions.

On the 55-question writing portion of the NSE, the student sample mean is 22. The national norm means for the individual parts of the test are not available, and therefore, cannot be compared to sample scores. What is identifiable, though, is that the student sample answered only 40% of the questions correctly.

The listening section is comprised of 25 orally presented questions to which the students responded by marking the answer sheets with the letter (a, b, c, d, e) that best represented the students' responses. Of 25
questions, on the average, the students responded correctly to 17. This student sample answered approximately 70% of the questions correctly.

The final score in this section is the total score on the NSE. This score is an aggregate of correctly answered questions of both the writing and the listening sections of the NSE. In all, there are 80 questions on the NSE.

### TABLE 5
MEAN SCORE AND STANDARD DEVIATION FOR MEASUREMENT OF TOTAL NSE FOR SAMPLE AND NORM GROUPS

<table>
<thead>
<tr>
<th>MEAN TOTAL</th>
<th>1/2 S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLE</td>
<td>39</td>
</tr>
<tr>
<td>NORM</td>
<td>56</td>
</tr>
</tbody>
</table>

As reflected in Table 5, the total mean score of the student sample is 39. The total mean score for the national norm group is 56. The student sample scored 17 points or 30% lower than the national norm for the same test during the same year. The national norm for this test is 70% correct, the student sample answered only 48% correctly.

Null Hypothesis 1: There are no significant differences among the total scores on the National Spanish Exam for groups identified as having type 1, type 2, or type 3 cognitive profile.
In determining whether or not to reject this hypothesis, all subjects \((N = 61)\) were classified as having type 1, type 2, or type 3 cognitive profile, as those profiles were defined in Chapter 1. A one-way analysis of variance (ANOVA) was computed at a .05 level of significance. Because the underlying assumptions for analysis of variance were violated, a Kruskal-Wallis one-way analysis of variance was run.

The group identified as having a type 1 cognitive profile scored higher \((\bar{X} = 44.83)\) than the type 3 cognitive profile group \((\bar{X} = 29.50)\). The mean total NSE score for those with cognitive profile type 2 \((\bar{X} = 38.43)\) fell between the mean total NSE score for groups with type 1 and type 3 cognitive profiles. The group with the type 1 cognitive profile scored highest among the three groups tested \((\bar{X} = 44.83)\); their mean score, nevertheless, fell well below the mean of the national norm group \((\bar{X} = 55.67)\) (Hernandez, 1985).

<table>
<thead>
<tr>
<th>TYPE</th>
<th>N</th>
<th>DF</th>
<th>MEAN RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>2</td>
<td>40.75</td>
</tr>
<tr>
<td>2</td>
<td>54</td>
<td>2</td>
<td>31.22</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>2</td>
<td>13.63</td>
</tr>
</tbody>
</table>
The null hypothesis of no significant difference among means is not rejected. (Chi square = 5.66, p > .05).

Null Hypothesis 2a: There are no significant differences among the writing scores on the NSE for individuals identified as having type 1, type 2, or type 3 cognitive profiles.

The mean scores for cognitive profile type 1 ($\bar{x} = 25.50$), type 2 ($\bar{x} = 22.08$), and type 3 ($\bar{x} = 15.50$) are similar. Students identified as having cognitive profile type 1 answered correctly 46% of the writing portion of the NSE. Students identified as having cognitive profile type 2 answered correctly 40% of the writing portion. The final cognitive profile, type 3, correctly answered only 28% of the questions.

<table>
<thead>
<tr>
<th>TYPE</th>
<th>N</th>
<th>DF</th>
<th>MEAN RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>2</td>
<td>39.42</td>
</tr>
<tr>
<td>2</td>
<td>54</td>
<td>2</td>
<td>31.35</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>2</td>
<td>13.88</td>
</tr>
</tbody>
</table>

Because the chi square (5.11, p > .05) was not significant, there were no significant differences found among mean ranks of writing NSE scores for
cognitive profile types 1, 2, or 3. This resulted in failure to reject the null hypothesis.

The differences are not significant; however, the pattern still exists that students with cognitive profile type 1 scored better than those with cognitive profile type 2, who scored better than those with cognitive profile type 3. (See Table 7).

**Null Hypothesis 2b:** There are no significant differences among listening scores on the NSE for individuals identified as having type 1, type 2, or type 3 cognitive profile.

Students identified as having cognitive profile type 1 correctly answered, on the average, 77% of the questions on the listening portion. Students identified as having cognitive profile type 2, however, correctly answered only 65% of the questions. Cognitive profile type 2 students, on the average, again performed somewhat better than cognitive profile type 3 students in that the type 3 students correctly answered 56% of the questions.
TABLE 8
SUMMARY TABLE FOR COGNITIVE PROFILE TYPE
BY LISTENING SCORE ON THE NATIONAL SPANISH EXAM

<table>
<thead>
<tr>
<th>TYPE</th>
<th>N</th>
<th>DF</th>
<th>MEAN RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>2</td>
<td>43.67</td>
</tr>
<tr>
<td>2</td>
<td>51</td>
<td>2</td>
<td>30.54</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>2</td>
<td>17.88</td>
</tr>
</tbody>
</table>

There were no significant differences found among the mean rank listening scores for cognitive profile types 1, 2, and 3. (Chi square = 5.32, p > .05). The null hypothesis that there are no significant differences among the mean listening scores on the NSE for groups identified as having type 1, type 2, or type 3 cognitive profiles may not be rejected.

Students identified as having a type 1 cognitive profile scored, as a group, higher than those identified as having a type 2 cognitive profile. The mean rank listening score on the NSE for the group identified as having a type 2 cognitive profile fell between the groups identified as having a type 1 and type 3 cognitive profiles. (See Table 8).

Null Hypothesis 3: There are no significant correlations between the total score on the NSE and the scores on the MFIT, DFT, SLT, and GEFT.

A Spearman correlation coefficient was computed at the .05 level of significance. There were no
significant relationships found between the total NSE score and the scores on the cognitive dimensions SLT, or DFT. However, the correlation between the scores on the total NSE and the GEFT and the MFFT produced significant relationships (GEFT, $r_S^* = .31$; MFFT, $r_S^* = -.25$). Therefore, the null hypothesis that there is no relationship between the total score on the NSE and the scores on the GEFT and the MFFT must be rejected. These data would indicate that the higher the students' score on the GEFT, the higher their total score on the NSE would be. These data also indicate that the lower the students' score on the MFFT, the higher their total score on the NSE would be. (See Table 9).
TABLE 9
SPEARMAN CORRELATION COEFFICIENTS
FOR COGNITIVE DIMENSIONS AND
FOREIGN LANGUAGE PROFICIENCY SCORES (N=61)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>WRTNSE</th>
<th>LISTNSE</th>
<th>MFPT</th>
<th>SLT</th>
<th>DFT</th>
<th>GEFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>WR1TNSE</td>
<td>.9514</td>
<td>.6434</td>
<td>-.2522*</td>
<td>-.2170</td>
<td>.1485</td>
<td>.3089*</td>
</tr>
<tr>
<td>LISTNSE</td>
<td></td>
<td></td>
<td>-.2760*</td>
<td>-.1197</td>
<td>.1917</td>
<td>.3506*</td>
</tr>
<tr>
<td>MFPT</td>
<td></td>
<td></td>
<td></td>
<td>-.3502*</td>
<td>.0549</td>
<td>.1939</td>
</tr>
<tr>
<td>SLT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.1384</td>
<td>-.2776</td>
</tr>
<tr>
<td>DFT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.0342*</td>
</tr>
<tr>
<td>GEFT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p = .05

TOTNSE - Total scores on the National Spanish Exam
WRTNSE - Writing scores on the National Spanish Exam
LISTNSE - Listening skills scores on the National Spanish Exam
MFPT - Matching Familiar Figures Test
SLT - Square Lag Test
DFT - Disc Focus Test
GEFT - Group Embedded Figures Test

Note: The level of statistical significance for a two-tailed test is in parentheses.
Null Hypothesis 4a: There are no significant relationships between the writing scores on the NSE and the scores on the MFPT, DFT, SLT, and GEFT.

A Spearman correlation coefficient was computed at the .05 level of significance. There were no significant relationships found between the writing scores on the NSE and scores on the DFT, and SLT (refer to Table 9). There was, however, a significant relationship between the writing scores of the NSE and the GEFT \( r_s = .35 \) as well as the MFPT \( r_s = -.28 \). Therefore, the null hypothesis that there is no relationship between the writing scores on the NSE and the scores on the GEFT and the MFPT must be rejected.

These data suggest that the higher the students' score on the GEFT, the higher their score on the writing portion of the NSE would be. These data also indicate that the lower their scores on the MFPT, the higher their scores on the writing portion of the NSE would be.

Null Hypothesis 4b: There are no significant relationships between the listening scores on the NSE and scores on the MFPT, DFT, SLT and GEFT.

A Spearman correlation coefficient was computed at the .05 level of significance. There was a significant negative relationship found between the listening NSE score and the SLT score \( r_s = -.35 \).
However, there were no significant relationships between listening performance on the NSE and the GEFT, the MFPT, or the DFT. Because a significant relationship was found, the hypothesis that there are no significant relationships between the listening scores of the NSE and the scores on the SLT must be rejected.

These data indicate that as listening skill performance decreased, scores (number of errors) on the SLT increased. Therefore, as performance on the NSE increased, performance on the SLT increased.

Additional Analyses

The researcher chose to further investigate the possible differences between polar extreme scores for each dimension for the total NSE, the writing portion, and the listening portion of the NSE. A t-test was performed to identify significant differences. As indicated in Table 10, there were no significant differences between the polar extremes of each cognitive style dimension on the total NSE, the writing portion or the listening portion of the NSE.
### TABLE 10

**t-Tests Between Polar Opposites of Cognitive Style Dimensions on the Total NSE and the Writing and Listening Portions of the NSE.**

<table>
<thead>
<tr>
<th>NSE</th>
<th>TOTAL</th>
<th>N</th>
<th>MEAN</th>
<th>S.D.</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GEFT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field independent</td>
<td>24</td>
<td>44.25</td>
<td>10.76</td>
<td>1.27</td>
<td>.25</td>
</tr>
<tr>
<td></td>
<td>Field dependent</td>
<td>26</td>
<td>35.62</td>
<td>8.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MPFT Reflective</td>
<td>9</td>
<td>45.33</td>
<td>13.68</td>
<td>1.77</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td>Impulsive</td>
<td>11</td>
<td>34.73</td>
<td>7.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SLT Sharpener</td>
<td>12</td>
<td>43.08</td>
<td>10.67</td>
<td>1.13</td>
<td>.70</td>
</tr>
<tr>
<td></td>
<td>Leveler</td>
<td>12</td>
<td>39.92</td>
<td>12.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DFT Focuser</td>
<td>22</td>
<td>37.09</td>
<td>10.60</td>
<td>1.08</td>
<td>.80</td>
</tr>
<tr>
<td></td>
<td>Nonfocuser</td>
<td>14</td>
<td>40.64</td>
<td>9.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GEFT WRITING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Field independent</td>
<td>24</td>
<td>25.88</td>
<td>8.16</td>
<td>1.40</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td>Field dependent</td>
<td>26</td>
<td>19.58</td>
<td>5.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MPFT Reflective</td>
<td>9</td>
<td>26.33</td>
<td>10.20</td>
<td>1.73</td>
<td>.11</td>
</tr>
<tr>
<td></td>
<td>Impulsive</td>
<td>11</td>
<td>18.45</td>
<td>5.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SLT Sharpener</td>
<td>12</td>
<td>24.00</td>
<td>7.41</td>
<td>1.17</td>
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</tr>
<tr>
<td></td>
<td>Leveler</td>
<td>12</td>
<td>21.92</td>
<td>8.96</td>
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<tr>
<td></td>
<td>DFT Focuser</td>
<td>22</td>
<td>20.73</td>
<td>7.89</td>
<td>1.25</td>
<td>.41</td>
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<td>23.86</td>
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<td>GEFT LISTENING</td>
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<td></td>
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<tr>
<td></td>
<td>Field independent</td>
<td>24</td>
<td>18.38</td>
<td>3.59</td>
<td>1.10</td>
<td>.65</td>
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<tr>
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<td>Field dependent</td>
<td>26</td>
<td>16.04</td>
<td>3.27</td>
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<td>MPFT Reflective</td>
<td>9</td>
<td>19.00</td>
<td>4.09</td>
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<td>.82</td>
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<tr>
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<td>Impulsive</td>
<td>11</td>
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<td>16.79</td>
<td>3.95</td>
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</tbody>
</table>
Summary

Included in Chapter IV was a descriptive summary of the results for each cognitive style dimension and the performance on the National Spanish Exam. Each hypothesis was stated, followed by a discussion of the respective results.
This investigation was designed to learn more about how individual learner styles relate to learning a foreign language. The primary purpose, therefore, was to identify cognitive style profiles and to examine the nature of selected cognitive style dimensions as they relate to writing and listening skills in foreign language proficiency. The cognitive style dimensions studied included field-dependence (analytical-global), reflectivity-impulsivity, focusing-nonfocusing, and leveling-sharpening. Foreign language proficiency tasks included measures of Spanish grammar, language structure, vocabulary, and reading comprehension to make up the writing score, and listening comprehension to make up the listening score.

This chapter includes a summary of the results, analyses, and interpretations of the conclusions. The chapter will conclude with recommendations for future research.
The subjects involved in this research were 61 students enrolled in first-year Spanish classes at a large suburban high school. These students varied in grade level from freshmen to seniors. The students took five tests, two of which were administered by the researcher in the Spanish classes, and three of which were administered by the researcher individually during the students' free periods.

The student sample was non-articulating relative to the reflexive-impulsive dimension, leveling-sharpening, and the field dependent-independent dimensions. The sample was also found to be nonfocusing. The students' performance on the NSE, in relation to the national norm, was relatively low; the students scored 22% lower than the national norm.

Cognitive profile type 1 scored higher than cognitive profile types 2 and 3 on the total NSE. Cognitive profile type 1 also scored higher on the listening portion of the NSE than cognitive profile types 2 and 3. Once again, a similar pattern existed whereby cognitive profile type 1 scored higher than cognitive profile type 2, which scored higher than cognitive profile type 3 on the writing portion of the NSE.
There were significant positive relationships noted between the GEFT scores and the writing scores, as well as the total NSE scores. There were significant negative relationships noted between scores on the MFFT and writing scores of the NSE, as well as total NSE scores. A significant negative relationship was also noted between the listening scores of the NSE and the SLT scores. No other statistically significant relationships were identified.

**Discussions and Interpretations**

From the findings discussed in Chapter IV, there is sufficient evidence to conclude that cognitive style dimensions are related to learning a foreign language at the first-year high school level. This research is exploratory, and therefore, relies heavily upon correlational techniques. The results have not been shown to be causal and only indicate that there are certain relationships between cognitive style dimension scores and the scores on the National Spanish Exam used in this investigation.

Results of this study indicated a significant relationship between the total NSE and the GEFT ($r = .31$). The GEFT tests an individual's ability to articulate figures as discrete from their backgrounds and to overcome the influences of embedded context. The
total score on the NSE is a result of both writing and listening skill scores. According to Hansen and Stansfield (1980), the dimension of field independence is closely related to linguistic competence. Because 50 out of the 80 questions on the NSE are related to linguistic competence, it may be concluded that students who demonstrated high articulation towards field independence would score high on the total section of the NSE.

Students who perform well are able to perceive small differences, as exemplified in the GEFT. These same students also perform well in foreign language study. This could be attributed to the students' abilities to isolate elements embedded within a more complex context. Results from this study support previous research relative to relationships found between learning a foreign language and the construct of field dependence-independence, as measured by the GEFT (Naiman et al., 1978).

An additional significant relationship ($r = .35$) was found for the writing NSE scores and the GEFT. This relationship could be attributed to the fact that field independence has been shown to play a noticeable role in the area of second language acquisition, particularly with linguistic competence (Hansen and Stansfield,
Significant negative relationships were found between the MFPT and the writing scores and the total NSE scores. The MFPT tests the consistency of an individual's speed and accuracy with alternative hypotheses. The writing part of the NSE consisted of grammar, vocabulary, and reading comprehension.

The score on the MFPT was calculated by adding together the total number of errors an individual committed, as well as summing the time the individual took to respond to the picture. The significant negative correlation may be explained by looking at the number of errors, the time the individual needed, and the score on the total and writing portions of the NSE. The significant negative relationship reported by this researcher would indicate that the student who committed a great number of errors and took a long time to answer on the MFPT, would also commit many errors on the writing portion and total NSE.

The final significant relationship to be discussed is between the listening scores on the NSE and the different cognitive style dimensions. A significant negative relationship ($r_s = -.35$) was found between the listening NSE score and the SLT score.
The listening skills section on the NSE is comprised of various questions recorded on tape. The individual must then look at various pictures in the test booklet to select the correct response. Another part of the same test requires students to look at one picture and answer questions in sequence about that one picture. The SLT measures how an individual perceives and adapts to gradual changes in stimuli. The negative correlation found between the SLT and the listening portion of the NSE might be due to the fact that these individuals who score low on the SLT combine new information with previously learned (or in this case previously heard) information. What the students hear, or think they hear, may be very different from what is actually being said. Students with a low SLT score may combine unfamiliar words that are said with words that the students may already know, resulting in different questions than the ones asked on the exam. The higher the student scored on the loss of accuracy (LOA), the lower the same student scored on the listening skills part of the NSE.

While no significant differences were indicated, results of this research approached significance. When looking for differences between cognitive profile types 1, 2, and 3, and the total NSE scores, the
Kruskal-Wallis one-way analysis of variance resulted in a chi square of 5.66 with a probability of .059. Results of the Kruskal-Wallis would indicate a difference exists between cognitive profile types 1 and 3. Cognitive profile type 1 differs from cognitive profile type 3 in that the individuals who have a cognitive profile type 1 perform with more accuracy than do individuals with a cognitive profile type 3.

Cognitive profile type 1 was described in Chapter One as having four of the following cognitive style dimensions: field independent, reflective, sharpener, focuser, complex, tolerant, and broad categorizer. Cognitive profile type 3 was described as the following: field dependent, impulsive, leveler, nonfocuser, simple, intolerant, and narrow categorizer.

Upon further investigation, the researcher performed $t$-tests on the total NSE between the polar extremes for each of the cognitive style dimensions. While the measures of the cognitive style dimensions indicated no significant differences on the total NSE, the MFFT reflected the strongest tendency to differentiate the reflective students from the impulsive students ($p = .10$).

The results of this investigation are comparable to Letteri's study (1980) in that cognitive profile
type 1 performances were higher than cognitive profile type 3 performances on standardized test scores. According to Messer (1976), type 1 profiles by definition are reflective and type 3 profiles are at an academic disadvantage due to their impulsive characteristics. For type 3 profiles, this academic disadvantage is characterized by the students' inability to complete successfully studies that involve separation of ideas and thoughts. In many instances, the notion of abstract ideas or concepts confuses the students, and they answer questions based on the knowledge they have. They do not answer based on the information given to them during the exam. It would appear that similar attributes present in students who are successful with computer programming (Pommersheim, 1983) are relevant in foreign language learning. As was true with Pommersheim's research, type 1 individuals scored the highest. Type 2 cognitive profiles, non-articulating individuals, are differentiated in that they are a combination of type 1 and type 3 dimensions. As the name "non-articulating" suggests, one would predict that these individuals' scores would fall between type 1 and type 3 scores.

Further results showed a difference between mean listening NSE scores for cognitive profile types 1, 2,
and 3. As was characteristic throughout this research, cognitive profile type 1 scored higher than cognitive profile type 2, which scored higher than cognitive profile type 3. Results of this research support the work of Messer (1976) and Letteri (1980). Again, the results of the Kruskal-Wallis one-way analysis of variance approached significance with a chi square of 5.11 and an associated probability of .08. The t-test performed between the extremes on each of the cognitive style dimensions and the listening portion of the NSE produced no significant differences.

The results of the writing portion of the NSE typically followed the same pattern where cognitive profile type 1 scored the highest, cognitive profile type 2 scored in the middle of types 1 and 3, and cognitive profile type 3 scored the lowest. The Kruskal-Wallis one-way analysis of variance resulted in a chi square of 5.32 with an associated probability of .07. When the t-test on the writing portion of the NSE was performed between the polar extremes of each of the four cognitive style dimensions, two measures identified potential differences. The GEFT with an associated p value of .10, reflected the apparent differences between field independent and field
dependent individuals. Likewise, the MFFT with its associated p value of .11, indicated similar differences between the reflective and impulsive individuals.

The apparent inability of this researcher to find significant differences may be attributed to the abnormally large size of cognitive profile type 2 (n = 51). By definition, type 2 cognitive profile is a combination of cognitive profile type 1 and cognitive profile type 3. Because students are labeled cognitive profile type 2 (nonarticulating) does not indicate that the students are nonarticulating in each cognitive style dimension. For example, upon examination of the GEFT scores, 24 of the 61 students were found to be analytical (field independent). 26 of the 61 students were found to be globally oriented (field dependent). The remaining 11 students were categorized as nonarticulating. On the other hand, the SLT scores revealed that only 12 of 61 students were categorized as sharpeners. Another 12 students were categorized as levelers. The remaining 37 students were categorized as nonarticulating. As illustrated, not every cognitive profile type 2 subject (nonarticulating) was categorized as nonarticulating for each cognitive style dimension measured.
The fact that no significant differences were found may be attributed to several factors. One alternative may be that the nucleus profile is not appropriate with this particular sample. Letteri (1979) used seven cognitive style dimensions to create profiles in his research. More recently, Letteri (1982) suggested a nucleus profile using four of the seven cognitive style dimensions. The researcher may have needed to use all seven cognitive style dimensions with this particular sample to achieve more accurate classification in order to obtain statistical significance. Another alternate explanation for failure to reach significance may be to have used a different combination of four cognitive style dimensions to create the nucleus profile.

Recommendations for Further Research

Based upon the findings of this study and what is already known about language learning and cognitive styles, the following recommendations for further research are offered.

1. Researchers should isolate type 1 and type 3 individuals and compare group successes (by type) in specific areas such as mathematics, language learning, creative writing, art class and other subjects in school.
2. Researchers should divide the writing portion of the NSE into the various subsections (grammar, vocabulary, and reading comprehension), and look for any possible relationships that may exist between subsections and cognitive style dimensions. Based on this research, significant relationships were found between the writing portion and the GEFT and the MFPT. Other research should include testing for relationships between the subsections and the DFT, SLT, MFPT, and GEFT.

3. Researchers should use a smaller standard deviation, such as 1/4 standard deviation, when analyzing results similar to those reported in this research. Based on this research, 51 out of 61 students were labeled as nonarticulating (profile type 2). By using a smaller standard deviation, the researcher would increase the sample size at each of the extremes.

4. Researchers should include other variables such as students' I.Q., creativity, and other background information, for example, socio-economic status, educational level of the parents, students' exposure to other languages and cultures, when looking for relationships with foreign language learning.

5. Using another cognitive style measurement, such as the Myers-Briggs Type Indicator, researchers should identify relationships that exist between these cognitive styles and foreign language learning.
6. Researchers should use more communicative type tests, such as the ACTFL Oral Proficiency Guidelines or the Foreign Service Interview to test for communicative competence and look for relationships that may exist between these test scores and the results of cognitive style testing.

7. As part of this research, correlations between the cognitive style dimensions and performance on a standardized Spanish test were determined. Results were obtained from the group as a whole. Further research should include determining relationships between cognitive style dimensions and performance on a standardized test for each cognitive profile type. Following this procedure, a test of significance could be conducted to look for the significant differences between correlations for cognitive profile type 1 versus the calculated correlations for cognitive profile type 3.

8. While the cognitive profile concept is theoretically appealing, in view of the results of this research, future endeavors should explore alternative methods for identifying students' cognitive abilities.

These recommendations should help further enhance the findings of this study. With additional information as to how individuals use their cognitive styles in a
variety of learning situations, it may be possible to develop more meaningful teaching methodologies and supportive materials.

While the results of this research were not statistically significant, this researcher would hope that the results of this study would contribute to a deeper understanding of the cognitive processes involved in foreign language education. Furthermore, because type 1 individuals in this research, consistently out performed cognitive profile type 3 individuals, this research has contributed to the better understanding that there are certain individuals who experience more difficulty than other individuals in learning a foreign language.
APPENDIX
INSTRUCTIONS: This is a test of your ability to find a simple form when it is hidden within a complex pattern.

Here is a simple form which we have labeled "X":

\[ X \]

This simple form, named "X", is hidden within the more complex figure below:

Try to find the simple form in the complex figure and trace it in pencil directly over the lines of the complex figure. It is the SAME SIZE, in the SAME PROPORTIONS, and FACES IN THE SAME DIRECTION within the complex figure as when it appeared alone.

FIGURE 1
EXAMPLE OF THE GROUP EMBEDDED FIGURES TEST
Which rose matches the top rose?

FIGURE 2
EXAMPLE OF THE
MATCHING FAMILIAR FIGURES TEST
1985 AATSP NATIONAL SPANISH EXAMINATIONS

LEVEL I

Part A

For each question in this part you will hear a single sentence. From the four pictures in your test booklet, choose the one which corresponds to the spoken sentence and mark your answer on your answer sheet. For example, you hear: El chico camina en el nieve. Now look at the four pictures printed in your test booklet.

The correct answer is picture C, so you would mark the letter C on your answer sheet.

FIGURE 3
EXAMPLE OF THE LISTENING PORTION
OF THE NATIONAL SPANISH EXAM
Part B

In this part you will see two pictures. You will hear several questions based on each one of them. In the pause following each question, you are to select the best answer from the four choices printed in your test booklet. You will have five seconds to look at each picture before the questions begin.

11. (A) En la cocina.
   (B) En el comedor.
   (C) En el café.
   (D) En la sala.

12. (A) Está comiendo frutas.
    (B) Habla por teléfono.
    (C) Está lavando los platos.
    (D) Limpia la ventana.

13. (A) Quiere tomar un refresco.
    (B) Sale a dar un paseo.
    (C) Está hablando por teléfono.
    (D) Está limpiando la sala.

14. (A) El padre.
    (B) El niño.
    (C) La hija.
    (D) La madre.

FIGURE 4
EXAMPLE OF THE LISTENING PORTION
OF THE NATIONAL SPANISH EXAM
This part has a number of incomplete statements, each having four suggested completions. Choose the best completion and mark the corresponding space on your answer sheet.

31. La familia es grande y vive en una casa que tiene diez ...
   (A) comedores
   (B) cuartos
   (C) cocinas
   (D) salas

32. Es el cumpleaños de Lolita y recibe muchos ... de sus amigos y parientes.
   (A) anuncios
   (B) colores
   (C) partidos
   (D) regalos

33. Roberto vive en España y escribe muchas ... a su familia.
   (A) revistas
   (B) tertulias
   (C) cartas
   (D) letras

34. En el parque hay flores bonitas y ... altos y verdes.
   (A) árboles
   (B) campos
   (C) lagos
   (D) pisos

FIGURE 5
EXAMPLE OF THE WRITING PORTION OF THE NATIONAL SPANISH EXAM
Part E

In this part you are to choose the word or phrase that will make the sentence grammatically correct, and mark the corresponding space on your answer sheet.

51. Mi madre y mi tía van a -------- al desayuno para todos.
   (A) preparando
   (B) preparar
   (C) preparan
   (D) prepara

52. La primera clase comienza -------- las siete y media de la mañana.
   (A) de
   (B) a
   (C) en
   (D) por

55. Mi prima y yo -------- salir con ustedes esta noche.
   (A) puedo
   (B) puede
   (C) podemos
   (D) pueden

57. Manuel levanta -------- mano para contestar la pregunta que hace la maestra.
   (A) este
   (B) su
   (C) el
   (D) la

FIGURE 6
EXAMPLE OF THE WRITING PORTION OF THE NATIONAL SPANISH EXAM
<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>RAW SCORE</th>
<th>PROFILE</th>
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<tbody>
<tr>
<td>Tolerance for Ambiguous Information</td>
<td>Tolerant</td>
<td>Intolerant</td>
</tr>
<tr>
<td>Analysis</td>
<td>Analytical</td>
<td>Global</td>
</tr>
<tr>
<td>Focus</td>
<td>Focus</td>
<td>Non-Focus</td>
</tr>
<tr>
<td>Reflective</td>
<td>Reflective</td>
<td>Impulsive</td>
</tr>
<tr>
<td>Cognitive Complexity</td>
<td>Complex</td>
<td>Simple</td>
</tr>
<tr>
<td>Breadth of Category</td>
<td>Narrow</td>
<td>Broad</td>
</tr>
<tr>
<td>Memory Sharpening</td>
<td>Sharpener</td>
<td>Leveler</td>
</tr>
</tbody>
</table>

Cognitive Profile Type

*NA - scores in mid-range of each dimension are non-articulated.*

CENTER FOR COGNITIVE STUDIES
DR. CHARLES A. LETTERI

FIGURE 7
COGNITIVE PROFILE TEST BATTERY
FIGURE 8
EXAMPLE OF THREE INDIVIDUALS WITH
different cognitive profiles
Dear Parents:

My name is Randi Cohen, and I am conducting research in the area of how students learn. I need your help.

Recent research has shown that students have certain thinking habits or learning styles. Students use the same learning style for almost everything. I am interested in finding out if certain types of learning styles work better than others when it comes to learning languages.

The key point: If students are aware of their own individual learning styles, they can also become aware of other styles that work better in helping them master a foreign language.

In order to determine each student's thinking habits, I will need to give a series of tests. Each test is short (10 to 30 minutes) and there are four tests in this series. The tests ask the students to estimate the size of objects, choose the picture that is different, and match items. None of these tests deal with school subject matter. They only test how each student thinks. I will also be giving a Spanish test (which is used nationally and in Upper Arlington) to compare each student's learning style with the results of the Spanish test.

The names of the students taking these tests will not be found on any reports or documents. Each student will be identified by number in order to maintain anonymity. The tests also will have no effect whatsoever on your child's grades.

These tests will not interfere much with regularly scheduled classes and will mainly be given during the students' free periods.

I am asking for your help in this research so we may begin to help students learn foreign languages more easily. If you will not permit your child to participate in the testing, please return the attached permission form to Mr. Kanter immediately. Thank you very much.

Randi W. Cohen
TABLE 11
KRUSKAL-WALLIS ANALYSIS OF VARIANCE OF COGNITIVE PROFILE TYPE BY TOTAL SCORE ON THE NATIONAL SPANISH EXAM

<table>
<thead>
<tr>
<th>TYPE</th>
<th>N</th>
<th>MEAN RANK</th>
<th>CHI SQUARE</th>
<th>PROB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>40.75</td>
<td>5.64</td>
<td>.059</td>
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<tr>
<td>2</td>
<td>51</td>
<td>31.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>13.63</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**TABLE 12**

**KRUSKAL-WALLIS ANALYSIS OF VARIANCE OF COGNITIVE PROFILE TYPE BY WRITING SCORE ON THE NATIONAL SPANISH EXAM**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>N</th>
<th>MEAN RANK</th>
<th>CHI SQUARE</th>
<th>PROB</th>
</tr>
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<td>.077</td>
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<td>3</td>
<td>4</td>
<td>13.88</td>
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TABLE 13
KRUSKAL–WALLIS ANALYSIS OF VARIANCE OF COGNITIVE PROFILE TYPE BY LISTENING SCORE ON THE NATIONAL SPANISH EXAM

<table>
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<tr>
<th>TYPE</th>
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<th>MEAN RANK</th>
<th>CHI SQUARE</th>
<th>PROB</th>
</tr>
</thead>
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<tr>
<td>2</td>
<td>51</td>
<td>30.54</td>
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<td>3</td>
<td>4</td>
<td>17.88</td>
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TABLE 14  
ANALYSIS OF VARIANCE OF COGNITIVE PROFILE TYPE BY TOTAL SCORE ON THE NATIONAL SPANISH EXAM

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>D.F.</th>
<th>SUM OF SQUARES</th>
<th>F RATIO</th>
<th>F PROB</th>
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<td>TOTAL</td>
<td>60</td>
<td>6089.2131</td>
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TABLE 15
ANALYSIS OF VARIANCE OF COGNITIVE PROFILE TYPE BY WRITING SCORE ON THE NATIONAL SPANISH EXAM

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>D.F.</th>
<th>SUM OF SQUARES</th>
<th>F RATIO</th>
<th>F PROB</th>
</tr>
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<tr>
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<td>WITHIN GROUPS</td>
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<td>2886.1863</td>
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<tr>
<td>TOTAL</td>
<td>60</td>
<td>3128.9836</td>
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</table>
TABLE 16
ANALYSIS OF VARIANCE OF COGNITIVE PROFILE TYPE
BY LISTENING SCORE ON THE NATIONAL SPANISH EXAM

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>D.F.</th>
<th>SUM OF SQUARES</th>
<th>F RATIO</th>
<th>PROB</th>
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<td>WITHIN GROUPS</td>
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<tr>
<td>TOTAL</td>
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Letteri, C. A. (1986). Personal communication, Columbus, Ohio.


