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A STUDY OF THE EFFECTS OF CREATIVITY, INTELLIGENCE, AND DIVERGENT AND CONVERGENT PROCESSING TASKS ON A MEASURE OF RECALL OF CONCRETE SPANISH VOCABULARY

The Ohio State University

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A STUDY OF THE EFFECTS OF CREATIVITY, INTELLIGENCE, AND DIVERGENT AND CONVERGENT PROCESSING TASKS ON A MEASURE OF RECALL OF CONCRETE SPANISH VOCABULARY

DISSERTATION

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

By

Barbara Gale Snyder, B.S., M.A.

* * * * *

The Ohio State University

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To my parents

Mabel E. Gale (1909–1980)

Edwin E. Gale (1907–1976)
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"Accentuate the Positive" (The President's Corner), Hispania, September 1978, 482-483.

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Introduction

Language characterizes human communication, yet there are also computer and animal languages. What distinguishes the language of humans from other languages? Animals communicate. Computers have speed, accuracy, and memory beyond that of the humans who program them. What allows a human to learn and use language in ways that animals and computers cannot? One factor that has been identified with language ability in humans is intelligence. Computers, however, are often described as intelligent because of their ability to manipulate data, that is, convergent data that produces specific answers based on recombinations of data input. Another factor identified with language ability is creativity. Creativity often produces divergent data that goes beyond data input to provide extensions, implications, interpretations, tenuous connections, and completely novel output. These processes and interactions of the human mind make human language unique: it is creativity that distinguishes human communication.
Creativity and intelligence are important factors in first language ability and may help explain second-language acquisition and use.

Beginning with studies on intelligence done early in this century by Binet, Spearman and Pearson (Butcher 1973, p. 16), psychologists and educators have recognized and accepted intelligence as an important factor in linguistic ability. Some, in fact, believe that, "the psychological construct of 'intelligence' or IQ, at least insofar as it can be measured, may be no more than language proficiency" (Oller 1979, p. 2). Since Guilford's landmark presidential address to the American Psychological Association in 1950, there has also been considerable attention focused on the topic of creativity as a factor in cognitive ability, and, to a lesser extent, linguistic ability. Although interest in creativity has increased substantially in other areas of education and psychology, interest in creativity has emerged more slowly in foreign language education and has coincided with the shift in emphasis from linguistic proficiency to communicative proficiency. DeSelms (1980) indicates that the creative use of language should receive greater attention in the foreign-language classroom so that neither the language-acquisition process nor language experience is restricted. She provides a rationale for increased attention to creative expression in language classrooms:
We can and do play with language, creating puns, double meanings, and plays on words. We invent alliterative phrases; play with the world and ideas through language; toy with other interpretations of life, things, and relationships; lift ourselves from the day-to-day and from the expected by juxtaposing perceptions and images in surprising, amusing or elevated ways. We devise novel, yet meaningful, situations and problems. That is, we interpret experience (pp. 2-3).

In enumerating language universals, Hockett (1966) indicates that "new linguistic messages are coined freely and easily" (p. 11) and calls this creative aspect of language "openness." Slobin (1979), who refers to the "productive" nature of language, maintains that it is impossible to learn all the sentences of a language, and says that "we are continually being called on to create and understand new sentences....Sentences are, by and large, novel events" (Slobin 1979, pp. 4-5). Clark and Clark (1977) discuss the phenomenon of lexical creativity: "People are not content to leave language alone. When it leaves them too little room to maneuver efficiently, they invent new uses for old words and sometimes invent new words altogether" (p. 446). Finding a way to characterize and account for this creativity is a central concern of linguists and psycholinguists according to Foss and Hakes (1978).

One explanation provided to account for creativity is hemisphericity of the brain, the theory that various
skills and abilities are located in one specific hemisphere of the brain or the other. Gowan (1979), for example, believes that right-hemispheric imagery produces creativity. Another explanation of the creative process is that of divergent rather than convergent thought processes. According to Guilford (1968, 1970, 1975, 1979), the major component of creativity (though not the only one), is divergent production. Divergent production emphasizes the generation of a variety and quantity of information; it is often contrasted with convergent production that emphasizes a search for single previously-determined answers. While such distinctions refer to cognition in general as studied and measured in a first language, a similar concern is also necessary for an understanding of the foreign-language acquisition process.

Although intelligence and creativity are two factors that have been shown to be relevant to linguistic knowledge, the relationship between creativity and intelligence is not completely clear (nor the relationship between the right and left brain functions nor between divergence and convergence). Until 15 years ago, "the common opinion among psychologists was probably that anything describable as 'creativity,' except at the level of genius or in particular specialised fields, was largely accounted for by known and measurable abilities" (Butcher, 1968, p. 93) that were all within the factor or factors of general
intelligence. Other influential psychologists who have held this view include Spearman (Butcher 1968), Burt (Butcher 1968), Ausubel (Ausubel, Novak, and Hanesian 1978), and Jensen (1980).

Getzels and Jackson (1962), on the contrary, argued that IQ as a construct emerged from the classroom setting, but that if intelligence had originally been measured beyond the classroom setting, creativity might have emerged as a standard by which to judge intelligence. Their study involving highly intelligent students distinguished between high IQ and high creativity. They argue, therefore, that intelligence (as measured by IQ tests) and creativity are separate and distinct constructs, and there is support for this position among psychologists such as Torrance (1962a) and Wallach and Kogan (1973). Torrance, in fact, has created a series of widely-used tests that measure the concept of creativity much as IQ tests measure intelligence. He believes that "one of the most important consequences thus far of the development and research use of measures of creative thinking has been an expanded concept of the human mind and its functioning" (1977, p. 19).

Jackson and Messick (1973) state that "although there are many ways to describe man's mental complexity--and particularly to depict his cognitive strengths--the two terms "intelligence" and "creativity" seem to have the greatest summary power" (p. 339). Getzels and Jackson
provide an historical account of the development of these concepts as differing accounts of mental abilities. They mention a casual observation by Dearborn in 1898 that "logical power" and "spontaneity" did not seem to be related. They also refer to tests of imagination developed by Andrews in 1930 that had little correlation with intelligence test scores, the 1931 test of re-creative imagination by McCloy and Meier, and Guilford's 1950 address to the American Psychological Association in which he observed that the content of intelligence tests revealed little of an obviously creative nature. More recently, Kaufman (1979) cites the tremendous advances that have been made in cognitive psychology and neurology in recent years to indict IQ tests as measures of intelligence, characterizing them as "inefficient and incomplete estimates of general or global intelligence" (p. 96) and cautions that they are "decidedly not estimates of an individual's total mental functioning" (p. 104). Although there is widespread recognition of the roles of intelligence and creativity in cognitive functioning, Roweton (1976) reflects a general consensus when he states that "no fully matured, comprehensive theoretical statement has been developed which is directed specifically toward creativity" (p. 228), and there is no general agreement on any one of a number of different theories of intelligence (Rutcher 1968). Rutcher, however, describes what has
become a commonly accepted distinction between them: Creativity "implies a high degree of ability at divergent-type thinking (probably allied to a particular kind of temperament and motivation), enabling us to reserve 'intelligence' as a description of convergent thinking" (p. 97).

Little is presently known, however, about the relationships between intelligence and creativity in the acquisition of a second language. Does the highly intelligent student learn a second language differently than a student who is highly creative? What kinds of cognitive processes are best utilized by the highly intelligent and by the highly creative?

Bogen's delineation of two kinds of intelligence and Guilford's Structure-of-Intellect model provide useful theoretical bases for investigation of cognitive differences in the second-language acquisition process. Craik and Tulving's spread-of-processing explanation of mental operations lends an additional and important dimension to the study of different types of cognitive processing in second-language learning.

Theoretical considerations

Numerous scholars have concluded that individuals "commonly employ two different kinds of intelligence or modes of knowing or (in a more modern vocabulary) two different sets of information-processing rules" (Bogen 1977,
Bogen points out that classifying intelligence in two dichotomous categories has the important advantage of conforming to the physiology of the brain. Each hemisphere of the brain has its own information-processing rules that differ in numerous respects from each other, and studies of these differences have provided the various dichotomies noted by Bogen. Bruner, for example, differentiates between rational and metaphoric processing, while Maslow makes a distinction between rational and intuitive modes of knowing. Bateson and Jackson describe intelligence as digital or analogic, DeBono as vertical or horizontal, and Guilford, who provides the distinction that will be used in this study, describes convergent and divergent mental operations. (For a more complete list of Bogen's scholars and their terminology, see Appendix A, p. 96).

Regardless of the terminology used to describe the two kinds of processing, it is clear that hemisphericity plays an important role in making these distinctions since various skills and abilities seem to depend more on one side of the brain than the other. The left brain is apparently characterized by verbal production, linear thinking, analytic thinking, rational thinking, time-orientation, and attention to details; the right brain is apparently characterized by visual-spatial ability, synthesis, parallel thinking, affective thinking, intuitive thinking,
imagery, and attention to the whole (Bogen 1977, Gazzaniga 1977, Krashen 1977, Nebes 1977, Kaufman 1979). Mental activity seems to occur in the right or left side based on the kinds of tasks that each side is able to perform. Haggard and Parkinson (1971, cited in Foss and Hakes 1978), for example, found that in a dichotic presentation of spoken language, a subject's identification of the content of speech was processed by the left brain, but the perception of the emotional tone of the same speech was processed by the right brain. Bever and Chiarello (1974, cited in Foss and Hakes 1978) found that recognition of melodies is done by the left brain in most subjects but by the right brain in subjects with a moderate amount of musical training. Foss and Hakes (1978) conclude that "these and a number of other findings suggest that the nature of the hemispheric difference lies not in the stimuli the subjects are processing, but in the kind of processing they are performing" (p. 365).

There is evidence that these different kinds of processing are a significant factor in learning. Craik and Lockhart (1972), for example, introduced the concept of levels of processing, which implies that the deeper the rehearsal during learning, the better and more durable is that learning. Depth in their experiments was defined according to the degree of semantic involvement. There are indications, however, that more than just semantic
meaningfulness may be involved in the processing. In a study by Kolers (1973), subjects asked to read sentences upside down were able to recall more than those who read normal typography. Knorre (1975) failed to find significant differences as a result of levels of processing in tasks requiring morphological-syntactic or semantic processing of Spanish vocabulary, grammar, and paragraph completion. In tasks requiring similar morphological-syntactic or semantic processing of French, results did not suggest any clear superiority for either of these, although a slight advantage was noted on the semantic subtest of vocabulary (Birckbichler 1975).

During subsequent experiments by Craik and Tulving (1975), one group of subjects attended to the physical nature of words by noting whether or not they were capitalized (shallow processing), another group attended to phonemic differences by judging whether or not words rhymed (intermediate processing), and a third group processed words semantically by deciding whether the words fit into sentence blanks (deep processing). The results indicated that recall of words and semantic processing were positively related. In an effort to clarify "depth," a number of other experiments were performed in which variables such as time, incidental versus instrumental conditions, laboratory versus classroom location, and motivation were manipulated. Craik and Tulving conclude:
It is abundantly clear that what determines the level of recall or recognition of a word event is not intention to learn, the amount of effort involved, the difficulty of the orienting task, the amount of time spent making judgments about the items, or even the amount of rehearsal the items receive (Craik & Watkins, 1973); rather it is the qualitative nature of the task, the kind of operations carried out on the items that determines retention (p. 290).

Craik and Tulving suggest that spread of processing may be a better description of the qualitative nature of encoding. They also use such explanations as congruence, uniqueness, richness, and elaborateness of encoding to explain differences observed within the semantic-processing level.

If, as Craik and Tulving suggest, it is the nature of the encoding task, "what they did during the encoding" (p. 292), that is important, and if, as Bogen suggests, different kinds of cognitive tasks are characteristic of different parts of the brain, then investigation of learning tasks done by different sides of the brain may contribute to a greater understanding of the language-learning process. Furthermore, if, as Krashen (1977) suggests, "individuals have a tendency to appeal to one hemisphere and its mode of thought more than the other" (p. 121), then an investigation of the cognitive processing done by different kinds of individuals may add to this understanding.

In this study, the dichotomous pairs of information-processing theories listed by Bogen, specifically those of
Guilford's convergent and divergent operations, will serve as a basis for investigation of the task variable, while the distinction between intelligence and creativity characterized by Getzels and Jackson will provide the basis for distinguishing individuals who may utilize different kinds of cognitive processes.

The Guilford Structure-of-intellect (SI) model, which has been used in related studies in education and in foreign-language education (Feldhusen and others 1971; Landry 1974; Birckbichler 1975), and, more importantly, has been empirically validated through extensive experimentation, provides a useful framework for study. The model deals with cognitive operations in the context of content and products, an aspect that is particularly relevant for classroom application because teachers deal with the content of subject matter and expect intellectual products from students as a result of teaching. Guilford's model (Figure 1, p. 13) contains 150 different combinations of content, product and operation, a reflection of the many and varied potential intellectual abilities that may be needed in using language or in learning a second language. The difference between convergent and divergent mental operations is part of a three-dimensional model of intelligence that contains five kinds of information or content, six product levels and five mental operations. Guilford (1979) says that "basically, information differs
OPERATION:
Evaluation
Convergent production
Divergent production
Memory
Cognition

PRODUCT:
Units
Classes
Relations
Systems
Transformations
Implications

CONTENT:
Visual-figural
Auditory-figural
Symbolic
Semantic
Behavioral

Figure 1. Guilford's structure-of-intellect model (after Guilford, 1968, 1975).
as to kind in two ways. One way is in terms of the kind of stuff that it is: its kind of content. ...As a group, the content categories constitute a set of different codes or languages" (p. 33-34): visual-figural, auditory-figural, symbolic, semantic, and behavioral. Any of these information codes or languages can be used in cognitive processing, and, "although they are distinctly different, there is much communication between them" (p. 34). The other way that information differs is that "items of information within the same content category come in different forms, called products. This term is apt, because our brains construct all the items that we know or experience" (p. 34): units, classes, relations, implications, systems, and transformations. Guilford identifies five kinds of operations that can be applied to items of information: cognition, memory, divergent production, convergent production and evaluation. The cognitive factors identified by Guilford that will be of particular concern in this study are semantic content, relations products, and divergent and convergent operations. These cognitive factors are described below.

Because this study will deal with language, specifically the acquisition of a foreign language, Guilford's semantic content area will be utilized. Guilford defines this area as follows:
Semantic: Information in the form of meaning to which words commonly become attached, hence most notable in verbal thinking and verbal communication, but not identical with words. Meaningful pictures also convey semantic information (1970, p. 159).

The specific semantic tasks in this study will consist of vocabulary-acquisition tasks, because subjects in studies by Guntermann (1977), Ervin (1977), and numerous other studies cited by Ervin (p. 34) indicated that their greatest problem in communication or in failing to communicate was lack of adequate vocabulary. In addition, although there is substantial current research on children's acquisition of their first language, little is known about how foreign-language vocabulary is acquired. This study will deal with classroom learning and vocabulary acquisition in an educationally valid type of learning experience in a foreign-language classroom. The focus of this study is the acquisition process by different individuals rather than on the content of that acquisition. Attempts have been made, therefore, to minimize confounding variables that might occur as a result of the vocabulary content of the tasks. According to Paivio and Begg (1981), concrete words are easier to learn than abstract words. Ellis and Shepherd (1974) found, for example, that recognition of abstract and concrete vocabulary items differs in right-brain versus left-brain presentations, and Sacks and
Eysenck (1977) found an interaction between convergence-divergence and abstractness-concreteness: "Convergers made many more errors on abstract than on concrete sentences, whereas divergers made an equal number on both sentence types" (p. 219). Since either a mixed vocabulary list or an abstract list might give ambiguous results, a set of concrete nouns was selected to comprise the SI semantic content in this study.

A common task for students at early levels of foreign-language study is to relate a target-language vocabulary word to a previously-learned concept that is already understood in a native-language context. Therefore, although all the SI products are utilized by the foreign language learner, a common product used with vocabulary content is the SI relations product, which will be utilized in this study. Guilford defines the relations product as follows:

Relations: Conceptions of connections between items of information based upon variables or points of contact that apply to them (Guilford, 1970, p. 159).

While the content category of the SI model will be meaningful concrete vocabulary and the product category will be a relation between the native language and target language vocabulary, one of the variables investigated in this study will be in the SI operation categories. The convergent and divergent categories will be utilized as
dichotomous kinds of cognitive processing tasks that represent examples of spread of processing within the semantic level. Guilford (1970) defines divergent production as the "generation of information from given information, where the emphasis is upon variety and quantity of output from the same source" (p. 159), and convergent production as the "generation of information from given information, where the needed information is fully determined by the given information" (p. 159).

There is evidence that these convergent and divergent operations fall into dichotomous categories, although Craik and Jacoby (1979) point out that dichotomous terms often describe opposite ends of the same continuum and imply less extreme points between. Nevertheless, Guilford (1979) found that "the two kinds of abilities correlate zero or near zero in the population. A study of individuals' interests in the two kinds of thinking activities ...shows a correlation of about -.30. Individuals who like the one kind of thinking have some tendency to dislike the other" (p. 35). In addition to their usefulness as different types of cognitive operations, Butcher (1968) has noted that divergent thinking has often been closely associated with creativity and that convergent thinking has been associated with intelligence. Nevertheless, both Butcher and Guilford along with many others point out that the terms divergent and creative are not synonymous nor
are convergent and intelligent since both intelligence and creativity may, at times, include other factors. Guilford (1979), in fact, states that, "From the SI point of view, intelligence is defined as a systematic collection of abilities or functions for processing different kinds of information in various ways" (p. 33), and he includes both divergent and convergent processing as two of the 16 categories in his SI model of intelligence.

In Guilford's definitions, the divergent and the convergent operations involve productive-thinking activities. He specifies the memory operation as the encoding function and the divergent and convergent operations as the recall functions. Houston (1981), however, notes that, "the distinctions among encoding, storage, and retrieval seem to be widely accepted. But we have not yet progressed to the point where differences among these three components can be conclusively demonstrated on an experimental level" (p. 333). Jacoby and Craik (1979), in fact, point out that the encoding and retrieval processes are very similar in many ways. Second-language acquisition, moreover, presents some unique cognitive processing problems that involve encoding, rehearsal, storage, and productive operations. Regardless of the exact terminology, the question in foreign-language acquisition is whether a difference in convergent or divergent operation results in a difference in learning foreign-language/target-language relations.
One of the purposes of this study is to gain a better understanding of the effects of different cognitive processes (represented by convergent and divergent variables) among different kinds of students (represented by intelligence and creativity variables) on the acquisition of second-language vocabulary in a classroom learning design. Materials and tasks that represent typical classroom learning experiences in foreign-language acquisition have been selected for use in this study. The operational definitions in the following section reflect these considerations.

**Operational definitions**

Craik and Tulving did not provide precise definitions of meaningful semantic processing, nor have linguists been able to describe precisely what the concept 'semantic' includes (Akmajian, Demers, and Harnish 1979, Chapter 12, for example). Birckbichler (1975), in a similar investigation of divergent and convergent processing, provided a definition that, because it was specifically adapted to the unique nature of second-language situations, and because it is congruent with this research, will be used in this study:

Semantic processing tasks: ...tasks requiring semantic processing refer to any processing of language that is more than the processing of morphological and/or syntactic information and requires analysis of the meaning(s) of words (p. 11).
As Birckbichler further points out, students in elementary language courses lack the target-language sophistication necessary for actual production of the language as envisioned by Guilford. Nevertheless, although the second-language vocabulary and syntax of these students is limited, the tasks in this study have been structured to correspond to the linguistic capabilities of the students and to fit the definitions provided by Guilford for divergent production and convergent production. Based on these considerations, divergent and convergent production are defined as follows.

**Divergent production:** Generation of information from given information, where the emphasis is upon variety and quantity of output from the same source; a search for logical alternatives (Guilford 1970, p. 159).

**Convergent production:** Generation of information from given information, where the needed information is fully determined by the given information; a search for logical imperatives (Guilford 1970, p. 159).

Guilford goes on to explain that in divergent processing a number of different alternatives are logically possible and may occur, whereas in convergent processing the given information is so restrictive that only one response is acceptable.

Because the tests developed by Torrance (1962b) were originally based on Guilford's concept of creativity and Guilford's SI model and because their reliability and
validity have been established (See Appendix P, p. 97), these tests were used to measure the level of creativity of the subjects in this study. The tests developed by Torrance, originally known as the Minnesota Tests of Creative Thinking, are now called the Torrance Tests of Creative Thinking (TTCT), and they include verbal forms and figural forms. Because the study will deal with language in general and specifically with vocabulary acquisition, a verbal form of the TTCT is the appropriate measure of creativity.

The definitions of creativity as used in this study are:

**Subject creativity:** Creativity as determined by scores on Verbal Form A of the TTCT.

**High creativity:** Creativity as determined by scores falling above the median TTCT score of subjects in this study.

**Low creativity:** Creativity as determined by scores falling below the median TTCT score of subjects in this study.

Other relevant definitions are as follows:

**Subject intelligence:** Intelligence as determined by IQ scores on the Otis Lennon School Ability Test Form S. (For data on validity and reliability, see Appendix B, p. 97).

**High intelligence:** Intelligence as determined by scores falling above the median IQ score of subjects in this study.
Low intelligence: Intelligence as determined by scores falling below the median IQ score of subjects in this study.

Value of the study

This study will investigate the effects on vocabulary-acquisition measures of Guilford's divergent and convergent cognitive processing of meaningful semantic tasks and will evaluate the effects of this processing as determined by levels of student intelligence and creativity. Some educators such as Hunter (1976) and Birkmaier (1971) believe that creative students are shortchanged in the schools by an overemphasis on convergent-type tasks. In one analysis of classroom observational data, for example, the reproductive process was observed 66.4% of the time, the convergent process 24.9%, the divergent process 3.9% and evaluative process 4.8% of the time (Bjerstedt 1976). Studies (Torrance 1962b, Haddon and Lytton, 1968) have also shown that students tend to develop the type of thinking ability that is most often used in the school they attend. If it can be shown, therefore, that creative students profit from divergent-processing tasks, it may be necessary to reevaluate the amount of classroom time devoted to various types of cognitive processing.

This study will provide a better understanding of convergent and divergent processing by different types of
students, and, if the results of divergent processing differ from those of convergent processing, may provide rationale for an increased use of divergent-processing activities in the classroom. If more is known about the effects of different kinds of cognitive processing, this may also have implications for the kinds of student activities planned for a classroom lesson and for the development of differentiated tasks in learning materials. Finally, this study may suggest that more students may learn a second language better than seems to be the case at present if a variety of cognitive-processing tasks are provided that correspond to their individual cognitive strengths.

Purpose of the study

Based on the Getzels and Jackson distinction between intelligence and creativity, on Bogen's identification of dichotomous sets of information-processing tasks and specifically on Guilford's SI model, this study will attempt to answer the following research questions:

1. Do tasks requiring convergent and divergent processing affect the learning of second-language vocabulary?

2. Does student creativity affect performance in learning second-language vocabulary following learning tasks requiring convergent or divergent processing?
3 Does student intelligence affect performance in learning second-language vocabulary following learning tasks requiring convergent or divergent processing?

4 Does interaction between student creativity and student intelligence affect performance on second-language learning tasks requiring convergent or divergent processing?
CHAPTER II

REVIEW OF LITERATURE

Introduction

This study of foreign-language learning draws upon theoretical bases in psychology in the area of creativity and the area of cognitive processing. The literature in both areas is voluminous. This review of literature will, therefore, include discussions of selected studies and research in these categories:

1  Creativity
2  Creativity and intelligence
3  Convergence and divergence
4  Hemisphericity
5  Cognitive processing
6  Related foreign language studies

Creativity

Roweton (1976) reflects a general consensus in stating that "no fully matured, comprehensive theoretical statement has been developed which is directed specifically toward creativity" (p. 228). Creativity probably has
as many definitions, however, as there are writers on the topic. Bloomberg (1973) states:

The most impressive feature characterizing the area of creativity is its diversity. ...In fact, controversy exists over the meaning of creativity. One observer judges the locus of creativity to be attributes within the person; another considers tangible products as the only viable means by which creative activity can be evaluated" (p. vii).

Strasheim (1971), for example, defines creativity as a response to a need: "Creativity is subjective, the end product of one individual's ambition and/or curiosity and his need to express that curiosity and/or ambition" (p. 341). She distinguishes between creativity and innovation and says that the truly creative person is "one in a thousand—if not a million" (p. 343). Birkmaier (1971) believes, however, that everyone possesses creative abilities to some degree. She includes "adventurous thinking or imaginativeness, an insatiable curiosity, getting away from the main track, being open to experience, permitting one thing to lead to another, discovering, innovating, and inventing" (p. 345) as components of the creative process.

Another view of creativity is that of Mott (1973) who defines creativity as "magic in the mind" (p. 5), which she explains as "the broadest interpretation of creativity: the power to develop to the fullest all abilities, those that are known and those that are hidden; in other words, to be all that one can be" (p. 6). Mott includes
the ability to wonder, to be surprised and puzzled, to see what others have seen and to respond differently as components of creativity.

Roweton (1976) classifies definitions of creativity into behavioristic, definitional, dispositional, humanistic, psychoanalytic, and operational interpretations of creative behavior. The interpretations within the scope of this paper fall into the dispositional classification that "examines creativity as a facet of personality or intellectual development....The dispositional approach employs procedures, techniques, and controls similar to those used in experimental psychology" (p. 233). The interpretations of creativity of Guilford, Thurstone, Getzels and Jackson, Wallach and Kogan, and Barron fall into Roweton's dispositional category. Other widely-known activities that are commonly associated with the creative process are the brainstorming procedures of Osborn, and the connection-making activities or synectics of Gordon. The definitions of creativity corresponding to these procedures are listed under Roweton's operational approach in which he includes "teachable strategies, embodied in books, courses, and programs, for deliberately increasing creative behavior" (p. 236).

Bloomberg (1973) has identified seven approaches to creativity: psychoanalytic, humanistic, environmental, associative, factorial, cognitive-developmental, and
holistic. Each approach has its own range of definitions. In one study within the environmental approach, creativity was judged subjectively by teachers (Domino 1973), and in a psychoanalytic study, creative architects were nominated by professors of architecture, ranked by their degree of creativity by the researcher according to predetermined criteria, and invited to participate in the study by their rank until 40 had been selected (MacKinnon 1973). In the associative area, one definition of the creative-thinking process was "the forming of associative elements into new combinations which either meet specified requirements or are in some way useful" (Mednick 1973, p. 161). The study proposed in this paper would be included in the factorial approach. Bloomberg (1973) states that, "In contra-distinction to the associative approach which hypothesizes one basic intellectual component as causally related to creativity, the factorial approach views creativity as a function of many separate intellective 'factors' [that] can be ascertained by mathematical devices" (p. 12).

Hampden-Turner (1981) identifies nine categories of theories of the mind, the fourth of which is the creativity category. He classifies six theories of the mind as relating to the mind's capacity for creativity:

At the level of the creative mind the capacity to combine, recombine and reorganize received information and mental structures is explored, along with those syntheses which are more than the sum of
their parts. The creative mind transcends mechanism (p. 11).

Three concepts of the mind identified by Hampden-Turner as creative are: 1) The Two Cultures Controversy of Getzels, Jackson and Hudson, which relates convergent thinking to a science stereotype and divergent thinking to an arts stereotype, 2) The Paradox of Creativity of Barron and Ogilvy, which symbolizes the contradictions of the creative mind, and 3) The Structure of the Intellect Model of Guilford, which identifies the cubic factors of operations, products and contents.

**Creativity and intelligence**

Substantial research has been conducted to determine whether or not the terms "intelligence" and "creativity" describe a single factor of the mind or different factors. Spearman believed that general intelligence was the only common element in cognitive performance, but Thurstone, who introduced the statistical concepts of factor matrix, correlated factors, and simple structure, believed that there were at least seven "primary mental abilities" (Butcher 1968). Guilford, who initiated the modern study of creativity through his well-known 1950 speech on the topic, developed the SI model in which 150 factors are identified, each representing a different mental process. Each of the five operations identified may be defined in terms of its five kinds of content and each of these may
be further defined in terms of six kinds of products. (See Figure 1, p. 13.) Bloomberg (1973) states that "Guilford has contributed two important hypotheses concerning creativity: that (a) it is unrelated to intelligence and (b) it is a multidimensional variable" (p. 14).

Getzels and Jackson (1962) found similarities and differences between high-intelligence and high-creativity students. The high-creativity group equalled the high-intelligence group in achievement although their average IQ was 23 points lower. Since this study was conducted at a school for the gifted, however, the average IQ of the lower group was 127. Another interesting finding was that teachers appeared to approve of the high-IQ group much more than the high-creativity group. The study also identified a number of personality factors that showed significant differences between groups.

Getzels and Jackson's study was immediately criticized because it dealt with exceptional students, and, more importantly, because it seemed poorly designed and inadequately reported. Hans and Butcher found much higher correlations between intelligence and creativity among children in normal IQ ranges although teacher preference for intelligence rather than creativity was confirmed (Butcher 1968). Wallach and Kogan (1973), however, using a carefully designed, individualized, informal-interview technique with students of a normal range of intelligence,
supported the position that among school-age children creativity and general intelligence are different types of cognitive excellence.

Such an outcome was especially striking in light of the fact that our procedures for assessing creativity of necessity called upon the child's verbal ability in some degree—and verbal ability is known to contribute substantially to performance on IQ tests (Wallach and Kogan 1973, p. 252).

They went on to describe personality factors of children in the categories of High Creativity-High Intelligence, Low Creativity-High Intelligence, High Creativity-Low Intelligence and Low Creativity-Low Intelligence, in which they described the High Creativity-Low Intelligence students as tending to exhibit disruptive behavior in the classroom and as being least able to concentrate and maintain attention in class.

Several other studies have findings relevant to the relationship between creativity and intelligence. Aliotti (1979) supports the independent dimensions for the domains of creativity and intelligence in a study of reading readiness in young children. Cicirelli (1965) cited a study by Yamamoto (1961) in which it was found that IQ beyond 120 had no effect on the academic achievement of high-creative groups. Cicirelli (1965) statistically controlled for the effects of IQ and found that there were significant correlations between a composite creativity score and reading, arithmetic, and language achievement. Boersma
and O'Bryan (1968), like Wallach and Kogan, found that students tested under non-classroom conditions scored higher on both nonverbal and verbal creativity tests and showed a markedly reduced relationship between creativity and intelligence. Feldhusen and others (1971), however, investigated four different testing conditions (standard, facilitated, take-home and game-like), and concluded that, contrary to the results of Wallach and Kogan, creativity scores correlate significantly with IQ, although "when both the test-like stress and the time limits involved in administering the TTCT are relaxed...the intercorrelations among creativity scores increase and the correlations of creativity scores with IQ decrease" (p. 39). They also found that verbal flexibility was a powerful predictor of achievement even when the effects of IQ were controlled and that nonverbal elaboration also correlated consistently with achievement.

One commonly-held view of the relationship between intelligence and creativity is that of a "threshold." At lower IQ ranges, creativity and intelligence may be interdependent with IQ being more predictive of achievement (Butcher 1968). As IQ scores rise above approximately 120, however, creativity is largely independent of intelligence (Prentky 1980), and creativity may become more important in determining achievement (Butcher 1968). Because foreign language study is usually part of the academic
college-preparatory curriculum in the high school, foreign language students are generally the better students in a school and would fit into the latter category. The foreign language students who participated in this study, for example, had a mean IQ of 119, which is 11 points higher than the 108 mean for all students at their grade level in the same school.

**Convergence and divergence**

If intelligence and creativity are widely-used terms to describe the mind, convergent thinking and divergent thinking are the terms often used to describe cognitive processes employed by intelligent and by creative individuals. Butcher (1968), for example, states that "often, particularly in America, convergent thinking only is described as intelligence, and divergent thinking is called 'creativity'" (p. 17). Getzels and Jackson (1962), Torrance (1962b), Kaufman (1979), and many others have indicted traditional tests of intelligence because they favor convergent thinking and fail to recognize the various divergent thinking skills that they define as measuring creativity. Their studies were able to show that convergence and divergence are different mental operations.

In Guilford's SI model, for example, convergence and divergence are two different operations factors. Guilford (1973) additionally states that:
Most of the more obvious contributors to creative thinking are abilities in the divergent-production category. The factors of fluency, flexibility, originality and elaboration are in that category. It can be said that the divergent-production abilities are the most direct contributions to creativity (p. 242).

More recently, however, Prentky (1980) cites a study by Haddon and Lytton (1968) as the basis for hypothesizing that convergence and divergence may overlap at low ability levels and become increasingly independent at higher ability levels.

Personality factors may partly explain the difference between convergent and divergent thinkers. Hudson (1966, cited in Butcher 1968, Willings 1980, and Hampden-Turner 1981) concluded that personality differences were the most significant factor in convergent and divergent thinking. In a study of students in England, Hudson found that divergent thinkers tend to take courses in the arts and convergent thinkers tend to take science courses. There have also been numerous studies of creativity and personality. One of the most extensive is that of Barron (1968) who studied variables such as ego-strength and power to rally from setback, ego-strength and management of aggression, rebelliousness and morality, believing for oneself, independence of judgment, liking of complexity and disposition toward originality, all in order to investigate the relationship of creativity to personal freedom.
Guilford (1973) identified highly creative adults and found that they share these traits: flexibility, fluency, elaboration, tolerance of ambiguity, originality, breadth of interest, sensitivity, curiosity, independence, reflection, action, concentration and persistence, commitment, expression of total personality, and a sense of humor. Houtz and others (1980) identified tolerance of ambiguity, internal locus of control, and positive self-esteem as personality characteristics that correlated highly with measures of fluency and concluded that there is a great deal of consistency between cognitive and affective characteristics associated with fluent thinking.

According to Hampden-Turner (1981), the personality characteristics of convergent thinkers and divergent thinkers follow from their dominant styles of thinking, and they are different not only in personality but also in societal conceptualization. Citing the continuing differences between concern for developing technology and concern for ecology and humanism, Hampden-Turner notes that "in the last two decades the divergent-convergent distinction has become a crude and quarrelsome political stereotype used to symbolize contrasting forms of moral virtue" (p.107). He cites further examples to show that convergers and divergers not only think differently, but they think of themselves differently and think of others differently.
Another factor that may partly explain the difference between convergent and divergent thinking is the type of schooling received by students. In a study of IQ and creativity in four elementary schools, Torrance (1962b) found that in some schools students are taught in such a way that they learn creatively and that creative thinking abilities therefore become important in learning. In other schools, however, they are taught authoritatively and emphasis is placed on memory and conformity. Thus, the kind of thinking the children used was, to a large degree, dependent upon the school they attended. Haddon and Lytton (1968) also found evidence that informal schools "develop qualities of personality that facilitate divergent thinking" (p. 171), and that formal schools with their highly structured curricula and rigid schedules were more conducive to development of convergent thinking.

In a study in which the subjects were identical twins, fraternal twins and single siblings, Pezzullo, Thorsen and Madaus (1972) studied the heritability of various factors and found that while short-term memory has a moderate index of heritability and the general intellectual factor has a somewhat high heritability, there was no evidence of heredity variation in divergent thinking. This finding would suggest, then, that divergent thinking develops independently of intelligence and that divergent thinking can be learned or facilitated.
More generally Torrance (1972) asks, "Can We Teach Children to Think Creatively?" and cites 142 studies that seem to indicate that we can. In these studies teacher-classroom variables, packaged-materials programs, and modifications of Osborn-Parnes training programs were investigated. The approaches having the greatest success in teaching children to think creatively are those that emphasize the Osborn-Parnes training program, other disciplined approaches, the creative arts, and media-oriented programs. All these studies utilized the Torrance Tests of Creative Thinking to measure subject creativity.

While high intelligence and divergent thinking can be shown to be distinctly different abilities, the relationship between creativity and convergent thinking is not as clear. The divergent categories are not the only ones to contribute to creativity, depending, of course, on one's definition of creativity. Guilford (1975) recognized that creativity was wider in scope than divergent thinking when he noted that, "although it seems to be generally recognized that divergent production contributes most to creative thinking, the value of convergent productions should not be overlooked, by any means" (p. 112). He cites redefinition, or the ability to produce unique transformations, as a creative ability that belongs in the convergent-production category. Many of the other abilities in the transformation layer also contribute to creativity.
In fact, Guilford (1973) states that "it cannot be said, without fear of contradiction, that any intellectual factor makes no contribution to creative thinking at some time or place" (Guilford, 1973, p. 242).

A criticism of Mednick's Remote Associates Test (RAT), which purports to be a measure of creativity, is that it seems to measure convergent thinking (Bloomberg, 1973), but studies have found that in some cases the RAT does predict creativity (Laughlin, 1973). The RAT asks subjects to find a single word to associate with three different stimulus words. (Rat, blue and cottage, for example, have an associative link with cheese.) Mednick (1973) explains that "the highly creative individual will have greater access to less probable associates and therefore produce a greater number of associates" (p. 172). The production of a greater number of associates for each of the three examples provided gives subjects a greater chance of finding a single association that all three have in common and will result in a higher creativity score.

Although the production of a large number of associates is a divergent production skill, finding a common associate is considered to be a convergent production skill, which provides an example of the problem in defining the relationship between convergent thinking and creativity. The problem probably lies in the multiplicity of definitions of creativity as well as the many abilities that
seem to be involved in the creative process. Until there is consensus on the parameters of creativity, it is unlikely that the relationship of creativity to convergent and divergent thinking will be clarified.

Hemisphericity

According to Gowan (1979), there is a growing interdisciplinary awareness that right-hemisphere imagery is the source of creativity. Getzels and Jackson, Torrance and others criticize schools for overreliance on convergent thinking and neglect of divergent-thinking skills, while Hunter (1976) recognizes this problem as "Right-Brained Kids in Left-Brained Schools" (p. 45). Nebes (1977) says that "if there is any truth in the assertion that our culture stresses left-hemispheric skills, this is especially true of the school systems. ...We may be shortchanging ourselves when we educate only left-sided talents in basic schooling" (p. 105). In the language of brain specialization, Nebes confirms the distinction between convergent and divergent thinking. Using a concept similar to Guilford's recognition of the role of other intellectual factors besides divergence in creative thinking, Nebes recognizes the complementary nature of the skills of the left and right brains. The right brain deals with the visual-spatial and imagery aspects of language, while the left brain deals with the temporal
and grammatical aspects of language. Nevertheless, although each side of the brain has its areas of specialization, there is a substantial crossover of information; a helping relationship occurs between the halves of the brain. Gazzaniga (1977) has found "a redundancy which suggests that all language and all spatial functions are not strictly and exclusively lateralized to the respective left and right hemispheres" (p. 94).

Imagery has been identified as a right-brain skill. A study by Paivio and others (1968, cited in Adams, 1976), compared imagery and meaningfulness in learning paired associates. Imagery, like natural language, is a way of organizing verbal items in a paired-associate list. Imagery involves the right brain and natural language the left brain. In this study, the high imagery-high meaningfulness group of words was best recalled, the high imagery-low meaningfulness next in number of words recalled, the low imagery-high meaningfulness third, and the low imagery-low meaningfulness was lowest in number of words recalled. Thus imagery seemed to enhance meaningfulness in the subjects' ability to recall words.

Hart (1978) views the brain as a pattern-detecting apparatus and defines the process of learning as "the extraction of meaningful patterns from confusion" (p. 42). Searleman (1977) cites data from aphasic patients that indicates that the right hemisphere possesses a far greater
capability to comprehend or extract meaning from speech and language, but the left hemisphere is more capable of speech production abilities. As examples of other specialized skills, Nebes (1977) reports that the right brain synthesizes, and Krashen (1977) reports that the left brain analyzes.

Imagery, integrated units, synthesis and pattern variables are right-brain specializations that have helped explain native language abilities. As more is learned about the hemispheric interrelationships of the brain, it may also help to explain foreign-language learning abilities. Another important area of study to help understand the brain's language capabilities is cognitive processing.

Cognitive Processing

Since Craik and Lockhart (1972) proposed a levels-of-processing framework for memory research, numerous empirical studies have used this framework within the fields of psychology and education. Craik and Lockhart identified a general principle that might explain cognitive-perceptual operations by suggesting that the deeper something is encoded, the better it is retained. They define depth as the degree of semantic involvement in the processing. Most subsequent experiments have confirmed that semantic processing results in greater retention than non-semantic processing such as phonemic processing (Eysenck 1979).
Other important factors within this framework shown by subsequent experimentation are spread or elaboration of processing (Craik and Tulving 1975), distinctiveness or uniqueness of processing (Moscovitch and Craik 1976), and extensiveness of processing (Kolers 1979). The general consensus reached as a result of such studies is that the quality of processing affects retention.

Jenkins (1974) explains quality of processing by using the term "contextualism." He makes the point that "what memory is depends on context" (p. 786). The quality of an experience results from the context or the "interaction of the experiencer and the world, that is, the interaction of the organism and the physical relations that provide support for the experience" (p. 786).

There has been criticism, however, of the levels of processing or spread of processing framework (Nelson 1977; Baddeley 1978; Eysenck 1978; and Postman, Thompkins and Gray 1978, for example). One area of criticism has focused on the difficulty of defining such terms as "level," "spread," and "elaboration," and on the difficulty of describing the relationship between various terms. A related question of whether deep coding is necessary for retention is asked. Another area of criticism is failure to identify levels within the broad domain of semantic coding. Baddeley (1978), for example, concedes that "subjects adopting a strategy of elaborating a visual image are
processing information in a different way from those attempting to generate associative links, but it is unclear how one would describe these differences in terms of a levels-of-processing approach" (p. 142). The theoretical base of the levels-of-processing concept represents still another area of criticism. The levels-of-processing framework is based on a unitary theory of memory: those who advocate a dual storage memory system argue that many of the experimental findings within the levels-of-processing framework could be accounted for by a domains-of-processing framework.

In spite of this criticism, nevertheless, the levels-of-processing and subsequent spread-of-processing frameworks have had great heuristic value. Psychologists are beginning to identify and classify levels and spread. Perfetti (1979), for example, identifies seven levels dealing with sentence processing, admitting that his list is penurious: prelinguistic, phonological, syntactic, propositional, referential, thematic and functional. He describes the encoding tasks for each and makes explicit the assumption that each processing level "assumes the analysis at the next lowest level, but not vice versa" (p. 173) and that some levels become automatic more easily than others. Perfetti also suggests "transparent" and "opaque" processing levels and explains that "form is transparent, meaning opaque" (p. 170). All the nonsemantic
levels are transparent; that is, they are not normally noticed without specific orientation. Not all semantic levels, however, are opaque or noticeable. Perfetti also describes experiments that show that levels are not a result of processing time and that "memory is a function of encoding context rather than task orientation" (p. 179).

One type of context that has been investigated is that of mediators. Various studies suggest that subject-generated associations or mediators will enhance learning. Bobrow and Bower (1969) found that learning was much better when the subject was asked to make up a sentence mediator to help remember lists of paired associate words than when researchers gave them a sentence. In another study by McFarland, Frey and Rhodes (1980), subjects either decided if an experimenter-generated word fit a specific context or they generated a word to fit the context. In the design of the study, differences could not be explained by deep versus shallow processing or by elaborative thinking. Subject-generated associations proved to be most potent in remembering the words. As Craik and Tulving (1975) suggested, "subjects remember not what was 'out there' but what they did during encoding" (p. 292).

Subjects may generate an association to learn better, but other explanations of what subjects do to learn include findings from a series of experiments in reading. Kolers (1979) has found that the nervous system encodes
remarkable amounts of detail regarding events:

"We may remember not only what we read, but where on the page we read it, the color of the book's binding, whether it was in one language or another, and perhaps the weather at the time of reading and the lighting level of the room—along, perhaps, with the name, sex, and appearance of the experimenter. Moreover, we may even recognize the typography" (p. 381).

Kolers explains that the graphemic content of experimental materials is usually transparent and this transparency allows the reader to look past the graphemic level without noticing or having to analyze it. The semantic content of experimental materials is, on the other hand, usually novel or opaque, which forces the reader to analyze the material in order to understand it, and the semantic content is then better remembered. When the process is reversed by making the semantic content ordinary and the graphemic content more novel or opaque, graphemic analysis produces better recognition. Kolers concludes that, "what is remembered better is what was analyzed more; the analytical operations themselves, their extent and complexity, account for performance" (p. 384). He believes that levels-of-processing favors semantic analysis because of the specific stimuli and specific task used and that semantic analysis is not a necessary factor for memory.

While there is considerable current research being conducted to learn more about cognitive processing, it
seems clear that cognitive processing variables play an important part in learning. The role that such cognitive processing plays in learning foreign languages has only begun to be investigated.

**Related foreign languages studies**

Research in creativity done in the foreign language field has focused on divergent-thinking. Studies have either used the Guilford SI model or have measured creativity with the TTCT.

Kealey (1976) reported that the more creative student teachers tended to obtain higher ratings from their students than less creative student teachers, although training the student teachers with a modified version of the Parnes Creative Problem Solving Course did not improve their creative abilities.

In a study designed to find factors related to communicative competence, Bartz (1974) found that two measures of fluency, two measures of flexibility and six measures of originality were significantly correlated with productive skills in communication in German.

Birckbichler (1975) found no effects on student achievement in vocabulary, grammar, and paragraph completion that could be attributed to convergent or divergent operations at either the morphological-syntactic or semantic levels of processing.
Based on previous studies that indicated that bilingual children had greater flexibility in language and that flexibility is an important factor in divergent thinking, Landry (1974) compared second-language learners and monolinguals at the elementary school level on six measures of divergent thinking. At the second-grade level, no significant differences were observed, but at the fourth-grade level, FLES students scored higher on all six measures. According to Landry (1974), "the second language learner has the advantage of being able to relate widely different looking data and, in fact, of being in a state highly favorable to the appearance of divergent thinking" (p. 15).

In a second-language study of adults, Krashen (1977) discusses findings that hemisphericity may play a role in language learning. Krashen cites a study in which it was found that "successful foreign-language students who were taught by an analytic, heavily deductive method of learning Spanish (explicit rules preceding practice) were predominantly [left-brain dominant], while a group of students who were successful at a more direct conversational, inductive approach did not have a preferred direction" (p. 122).

There are many suggestions available for helping teachers teach creatively (Miel 1961, Goodale 1970, Torrance 1962a, Mott 1973, and Stein 1975, for example).
Stanislawczyk and Yavener (1976) and Birckbichler (1977) have compiled suggestions and activities for creativeness in the language classroom. Hahn (1980) has applied Gordon's synectics model of creativity to the foreign language classroom. Synectic or connection-making activities produce metaphors by using strategies such as direct analogy, personal analogy, and compressed conflict and these strategies can enhance student creativity.

The current state of knowledge about creativity in foreign language education, however, is equivalent to the state of knowledge about creativity in general that was indicated by Guilford in 1950: almost nonexistent.

An area of research that foreign language educators need to address is whether such variables as creativity, right-brain skills, and divergent processing are helpful in second-language learning. Roweton (1976) notes that creativity in general has an unlimited potential as an area of researchable human behavior.

The present state of the art is a mixture of some models, limited applications, operational and nonoperational definitions, random speculation, and some hypothesis testing. Progress to date is promising, but manifestly incomplete. Nonetheless, creativity is coming of age (p. 244).

The present study will investigate one facet of creativity: the effects of divergent versus convergent processing in learning foreign-language vocabulary.
CHAPTER III

DESIGN AND PROCEDURES

Experimental Design of the Study

This study investigated the effects of intelligence, creativity, and convergent-and-divergent-processing tasks on measures of Spanish-vocabulary learning.

A 2 x 2 x 2 factorial design was used with two levels of three independent variables. (See Figure 2). The independent variable of type of processing consisted of two experimental treatments: practice tasks requiring convergent processing and practice tasks requiring divergent

<table>
<thead>
<tr>
<th>Type of processing:</th>
<th>Divergent</th>
<th>Convergent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of intelligence:</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Level of creativity:</td>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>
processing. The two levels of the independent variable of intelligence consisted of two groups of subjects designated high intelligence or low intelligence as determined by IQ scores on the Otis Lennon School Ability Test, and the two levels of the independent variable of creativity consisted of two groups of students designated high creative or low creative as determined by scores on Verbal Test A of the Torrance Tests of Creative Thinking. (For operational definitions, see Chapter I, p. 21. For information on the reliability and validity of these measures, see Appendix B, p. 97.)

The dependent variable in this study consisted of scores on a cued recall measure of Spanish vocabulary. This test measured recall of all Spanish vocabulary words introduced during the treatment tasks. An English word was followed by a space for writing the equivalent in Spanish.

Subjects

The sample consisted of students enrolled in second-year Spanish classes at Normandy High School in Parma, Ohio, a large suburban school located in a largely middle-class community where there is a substantial ethnic-European population. Because first-year language classes are offered at the junior high school, the number of first-year students at the high school was limited; thus
the decision was made to use second-year students as subjects in this study. Declining population in the suburbs and consequent lower school-wide enrollment, however, limited the population available for the sample to approximately 160 students. Several additional factors further limited the sample. Only sophomores were included in the study, first, because juniors and seniors enrolled in Spanish II often have previous or concurrent experience in another language, and, second, the maturity of the older students might have been a confounding factor. Students for whom either the intelligence scores or the creativity scores were unavailable were excluded from participation, and, finally, several students were absent from school on the day of the experiment. The total number of subjects was, therefore, 102 students.

While students were informed of the general nature of the experiment, they were not aware of the exact nature of the investigation. Before they participated, the students were told only that the study involved an investigation of the effectiveness of two different kinds of practice activities and that they would be asked to fill out questionnaires concerning their reactions to the activities following completion of the tasks. Although studies (Hyde and Jenkins 1969, Craik and Tulving 1975, Nelson and Vining 1978) have shown that incidental or instrumental orienting tasks do not affect learning patterns, students
did not ask and were not informed of the recall measure, thus creating an incidental learning situation. Subjects were also informed that their responses would be anonymous and that their participation would have no effect on their class progress or grades.

**Instrumentation**

Two task instruments were developed: a set of written practice exercises requiring divergent processing and a set of written practice exercises requiring convergent processing. The content of the exercises was based on a list of concrete Spanish vocabulary words, a set of 40 animal names. This set was selected because there were an adequate number of words available that were not already familiar to the students and that were not cognates, and, additionally, because learning this vocabulary would be an educationally valid experience for the participating students. (See Appendix C, p. 99, for the experimental exercises.) The convergent tasks were single-answer tasks in which the information generated by the student to produce the answer was fully determined by the information given in the task. The divergent tasks were multiple-answer tasks in which the information given to the students allowed them to generate a variety of answers. The sets of convergent and divergent tasks were, however, similar in interest, difficulty and time required for
for processing as determined by pretesting at other secondary schools. They differed principally in the type of processing required for the completion of the tasks. The limited nature of students' linguistic knowledge in a second-language classroom was considered in the development of tasks that conform to the capabilities of participating students. Tasks were also structured to resemble those that might be used in classroom language-learning materials since the focus of this study is classroom learning of a foreign language rather than memory as studied in a psychology laboratory.

Additionally, both the convergent and the divergent exercises asked for answers based on the subjects' knowledge of the world rather than solely on self-contained aspects. Questions that required knowledge of the world, for example, asked for the name of an animal that might be used on an invitation for a conference on endangered species or in a clothing ad, while questions that do not require knowledge of the world asked only for information that would be known if the meaning of the vocabulary word itself were known. Students were asked, for example, to name an animal that was big or that was ugly. Cognitive theorists such as Reynolds and Flagg (1977) believe that knowledge of the world is an important factor contributing to understanding and memory and that "this cognitive contribution can have powerful effects....When this
contextual information is absent from the linguistic input, people spontaneously supply it from their knowledge of the world" (p. 266). They conclude that comprehension is a prerequisite for memory and that meaning is not carried by the materials but is generated by the subject. Knowledge of the world, therefore, was not minimized, but rather an attempt was made to balance such content in the two sets of tasks.

A variety of tasks were developed. The types of convergent tasks included fill-in-the-blank with multiple-choice answers, completion, list-making, question-answer with multiple-choice answers and a classification exercise. The divergent exercises followed these formats as closely as possible. For example, in the convergent fill-in-the-blank type of question, three answers were suggested, one of which was correct, while in the similar divergent questions, the subject selected his or her own answer or answers. The list-making in the convergent set of exercises required classification according to concrete right or wrong labels (Animal, Bird, or Insect), whereas the list-making in the divergent counterpart required judgmental classification into open-ended descriptive categories (Fantastic, Important, or Ridiculous).

The set of either convergent or divergent tasks was accompanied by the following materials: 1) an introductory statement and directions, 2) a list of the vocabulary
words in Spanish and English, and 3) a dictionary of Spanish-language words used in the exercises other than the target vocabulary. A second set of materials included a recall measure and a questionnaire asking for student reactions to the tasks.

For the purposes of this study, a recall measure to serve as the dependent-variable instrument was also developed. All 40 vocabulary items were included in the recall measure. The order of appearance on the measure was determined by using a table of random numbers based on an alphabetical listing of the vocabulary words in English.

A recall measure rather than a recognition measure was selected for two reasons. Recall involves a retrieval process of generating an item from memory and then recognizing it as a correct item. In a recognition measure the item has already been generated by the experimenter and the subject needs only to recognize it. A recall measure was selected, first, because learning to communicate in a foreign language involves generation of vocabulary items as well as recognition of the item. Second, while recognition and recall probably involve different underlying processes, the items themselves affect the processes. Based on several cited studies, Houston (1981) indicates that "uncommon words are more easily recognized than common words... [and] common words appear to be better recalled than uncommon words" (p. 379). Since the Spanish
vocabulary words would be categorized as uncommon for the students, recognition of the vocabulary might be easier than recall. In pretesting and pilot testing of both recall and recognition measures, this effect was indicated by the large numbers of students who correctly recognized all items in the recognition measure after being unable to recall many of those items. A recognition measure, therefore, would not have measured one of the important skills involved in foreign-language learning and probably would have resulted in a ceiling effect that would not have provided reliable data.

Pilot-testing procedures

Pre-testing of the task instruments was conducted in March, 1982, in the following schools: Garfield Heights High School, Garfield Heights, Ohio; Edgewood High School, Ashtabula, Ohio; McKinley High School, Canton, Ohio; Valley View High School, Germantown, Ohio; Northwest High School, Cincinnati, Ohio; Green High School, Greensburg, Ohio; Hillel Academy, Dayton, Ohio; and Chamberlain High School, Twinsburg, Ohio. Pre-testing included the following: 1) assessment of the difficulty level of the number of vocabulary items, 2) timing of the exercises, 3) student reaction to and suggestions for the activities and the format of the vocabulary list, and 4) teacher reaction and suggestions to all aspects of the materials.
A pilot test was conducted May 7, 1982, at Upper Arlington High School, Upper Arlington, Ohio. It included: 1) evaluation of procedures for administration of tasks and tests, 2) timing of the procedures, 3) reactions and suggestions of students and teachers, and 4) practice in scoring the recall measure and evaluation of scoring procedures. (See Appendix D, p. 134, for pilot-test materials.) As previously indicated, results of the pilot testing confirmed the ceiling effect of the recognition measure, and it was not, therefore, included as part of the experimental procedures. The general procedures, however, were satisfactory, and only very minor changes were made in the practice instruments.

Experimental groups

Since it was hypothesized that subject intelligence and creativity might interact with the processing variable, four experimental groups were formed. Prior to the experiment, data on the IQ of participating Normandy students was gathered from student files. Student IQ was measured by the Otis Lennon School Ability Test Form S administered through the Normandy Guidance Department in September, 1981. Data on student creativity was gathered by administering the Verbal Tests Form A of the Torrance Tests of Creative Thinking on April 28, 1982. The Normandy Guidance Department also assisted in the administration of
these tests. Scoring of the creativity tests was done by experienced scorers at the Scholastic Testing Service, Bensenville, Illinois. Torrance (1974) reports that the reliability of scoring by experienced scorers is above .90. (See Appendix B, p. 97, for data on reliability and validity of IQ and creativity measures.)

When all creativity and IQ scores had been determined, participating students were assigned to one of four categories:

I  **High creativity-high IQ.** Students assigned to this category had a creativity score above the median creativity score of participating students and had an IQ score above the median IQ of participating students.

II  **High creativity-low IQ.** Students assigned to this category had a creativity score above the median creativity score of participating students and had an IQ score below the median IQ of participating students.

III  **Low creativity-high IQ.** Students assigned to this category had a creativity score below the median creativity score of participating students and had an IQ score above the median IQ of participating students.

IV  **Low creativity-low IQ.** Students assigned to this category had a creativity score below the median creativity score of participating students and had an IQ score below the median IQ of participating students.
The median rather than the mean was used to assign students to categories because it was thought that using the median would better equalize the number of students in each group. The median IQ of students eligible to participate was 115.8 and the median creativity score was 101, and these scores were used to assign students to categories. (For information on correlation between IQ and creativity scores, see Appendix E, p. 168.) Because not all eligible students were present for the experimental treatment, the actual median IQ and creativity scores of participating students may differ slightly from that used to categorize students. (For data on the participating students, see Appendix F, p. 148.)

A stratified random sampling procedure was used to assign students to treatment groups; i.e., students in each category were assigned independently of student assignments in other categories. Using a table of random numbers, students in each category were assigned either to Treatment Group A or to Treatment Group B. The treatments, Convergent Processing Tasks and Divergent Processing Tasks, were assigned randomly to the treatment groups. Students were informed in advance only that they had been assigned to one of the two groups (a "yellow" group or a "blue" group), but they were not informed of the basis for that assignment nor the nature of the task that had been assigned to that group.
Experimental procedures

This study was conducted at Normandy High School on May 19, 1982. All subjects participated in the treatment conditions at the same time in the same room. Normandy has a large study hall/little theater room that seats approximately 150 students. This room is frequently used for classroom-type activities and was, therefore, familiar to most of the participating students. In order to facilitate the distribution and collection of materials, all students in the blue group sat on one side of the room and all students in the yellow group on the other.

The experiment was conducted between 8:45 and 10:15 AM when both early-schedule and late-schedule students are normally in the building. The researcher, one other foreign language teacher, and three counselors were present to assist with the administration of the tasks, tests, and evaluations.

The following schedule was observed:

8:45 - 9:00 Students seated. Directions given. Questions answered. Task booklets distributed.
9:00 - 9:35 Task completion.
9:40 - 9:50 Recall Test completion.
9:55 - 10:10 Evaluation form completed.
10:10 - 10:15 Evaluations collected. Questions answered. Students dismissed to return to normal schedules.

Scoring and Statistical treatment

The dependent variable measures student learning based on the treatment procedures. The recall measure was scored with the intent to measure the learning of the vocabulary items but not necessarily the spelling of those items. Certain spelling variations, therefore, were permitted. Substitution of feminine for masculine endings or vice versa was allowed, for example, as were certain spelling errors such as substitution of the letter h for the letter j and substitution of single letters for double letters or vice versa. In addition one spelling error for words of more than four letters was allowed before the vocabulary item was scored as incorrect. (See Appendix G, p. 153 for complete scoring information.) Two Spanish teachers scored the recall measure independently. The interrater reliability of these two scorers was .99. A third teacher resolved the score for papers on which the first two did not agree.

Data from the dependent variable was then analyzed by three-way analysis of variance (ANOVA) in which levels of creativity and intelligence and types of processing served
as the independent variables. The alpha level was set at the .05 level of significance. Computations were made by the Instruction and Research Computer Center at The Ohio State University through the services of the Statistics Laboratory of the College of Mathematics and Physical Sciences.

The following null hypotheses were tested in this study:

\( H_01 \) There will be no significant differences attributable to variations in convergent or divergent processing on a recall measure of Spanish vocabulary.

\( H_02 \) There will be no significant differences attributable to variation in level of creativity on a recall measure of Spanish vocabulary.

\( H_03 \) There will be no significant differences attributable to variation in level of intelligence on a recall measure of Spanish vocabulary.

\( H_04 \) There will be no significant interactions among the variables on a recall measure of Spanish vocabulary.
CHAPTER IV

RESULTS AND DISCUSSION

Introduction

The purpose of this study was to investigate the effects of intelligence, creativity, and convergent and divergent processing tasks on measures of Spanish vocabulary learning. A 2 x 2 x 2 factorial design was used with two levels of each of the three independent variables. The two levels of the independent variable of intelligence consisted of two groups of subjects designated high intelligence and low intelligence, the two levels of the independent variable of creativity consisted of two groups of subjects designated high creative and low creative, and the two levels of the independent variable of type of processing consisted of two experimental treatments: practice tasks requiring convergent processing of concrete Spanish vocabulary items and practice tasks requiring divergent processing of the vocabulary items. (For operational definitions, see Chapter I, pp. 19-21.) The dependent variable was a 40-item recall measure of the
vocabulary items. The reliability of this criterion measure computed by the Kuder-Richardson formula 20 was .86. (For discussion of the dependent variable, see Chapter III, pp. 55-56.)

The scores were analyzed by the General Linear Models procedure of the Statistical Analysis System, SAS Institute, Inc., Cary, North Carolina. All statistical computations were done by the Instruction and Research Computer Center at The Ohio State University. A three-way ANOVA of the data (see Table 1) showed a significant difference among the variables at the .03 level of significance. (Results beyond the .05 level of significance will be indicated with an asterisk* in the tables.) Further results of the statistical analyses and discussion of these results will first be given for each of the research hypotheses followed by discussion of some additional results. (The following notations will be used in the statistical analysis tables: High Intelligence HI, Low Intelligence LI, High Creative HC, and Low Creative LC.)

Table 1
Summary of Three-Way Analysis of Variance

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>SS</th>
<th>F</th>
<th>PR &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>7</td>
<td>461.683</td>
<td>2.23</td>
<td>.0379*</td>
</tr>
<tr>
<td>Error (101-7)</td>
<td>94</td>
<td>2775.464</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion of Hypotheses

Hypothesis I: There will be no significant differences attributable to variations in convergent or divergent processing on a recall measure of Spanish vocabulary.

Based on data that show a difference in mean scores between the convergent processing treatment group and the divergent processing group at the .005 level of significance, this null hypothesis must be rejected. (For a summary of ANOVA data, see Table 2.) The mean score of the divergent processing treatment group was significantly greater than the mean score of the convergent processing group. (Duncan’s multiple range test for variable scores

Table 2
Summary of Analyses of Variance for Independent Variables

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>F(1,94)</th>
<th>PR &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligence</td>
<td>1</td>
<td>171.796</td>
<td>5.82</td>
<td>.018 *</td>
</tr>
<tr>
<td>Creativity</td>
<td>1</td>
<td>0.143</td>
<td>0.00</td>
<td>.945</td>
</tr>
<tr>
<td>Treatment</td>
<td>1</td>
<td>243.027</td>
<td>8.23</td>
<td>.005 *</td>
</tr>
<tr>
<td>Int/Creat</td>
<td>1</td>
<td>5.071</td>
<td>0.17</td>
<td>.680</td>
</tr>
<tr>
<td>Int/Treat</td>
<td>1</td>
<td>0.571</td>
<td>0.02</td>
<td>.890</td>
</tr>
<tr>
<td>Creat/Treat</td>
<td>1</td>
<td>16.785</td>
<td>0.57</td>
<td>.453</td>
</tr>
<tr>
<td>Int/Creat/Treat</td>
<td>1</td>
<td>2.940</td>
<td>0.10</td>
<td>.753</td>
</tr>
</tbody>
</table>
scores was the post-hoc test used to confirm differences of means.) As Table 3 indicates, the mean score of the convergent-processing group was 7.89 while that of the divergent-processing group was 11.12. These results suggest that learning foreign language vocabulary is more effective when practice exercises that require divergent processing are used. Although explanations that would account for such an effect have already been proposed in previous chapters, several of the more important ones will be reviewed here.

If, as Perfetti (1979) has suggested, memory is a function of encoding context, then asking students to use a context of practice exercises that demand divergent thinking improves their memory for the encoded items. Reynolds and Flagg (1977) suggest that meaning is not carried by the materials but is generated by the subject. They conclude that "comprehension or understanding...is a

<table>
<thead>
<tr>
<th>Table 3</th>
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<tbody>
<tr>
<td>Data for Treatment Group Variable</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Convergent</td>
</tr>
<tr>
<td>Divergent</td>
</tr>
</tbody>
</table>
prerequisite to memory" (p. 266). Students in the divergent group who generated their own answers may have been generating meaning which they were then better able to remember than students in the convergent group who relied on meanings generated by the researcher and who may not have fully understood some meanings. Jenkins (1974) suggests that "the quality of the event is the resultant of the interaction of the experiencer and the world" (p.786). Such interaction during a divergent-processing task may be more extensive and of a more active nature thereby giving greater quality to the pertinent learning event. Kolers (1979) has concluded that "what is remembered better is what was analyzed more" (p. 384). Divergent tasks may require more extensive and complex analysis of the content, thus enabling subjects to better remember what was analyzed. Finally, Craik and Tulving (1975) conclude that what determines retention is "the qualitative nature of the task, the kind of operations carried out" (p. 290). They further suggest that "subjects remember not what was 'out there' but what they did during encoding" (p. 292). While the tasks were similar in subject matter, interest level, and processing time, subjects in the convergent processing group spent the time trying to figure out a predetermined answer while subjects in the divergent group spent the time generating answers. The task of generating one's own answers may be more productive than that of
searching for answers predetermined by someone or something else.

A possible confounding factor, however, may have been the greater number of vocabulary words written by subjects in the divergent group. Birckbichler (1975) suggested that the amount of writing involved during practice exercises may account for differences in learning. In constructing the exercises in the present study, care had been taken to equalize the amount of writing each group would do: the convergent group was asked, for example, to write answers rather than circling or underlining them. Under experimental conditions, however, the subjects in the divergent treatment group wrote many more vocabulary words in completing the exercises than those in the convergent group. This result was not expected because in pre-testing conditions and during the pilot test, this effect had not occurred, nor did it occur when the exercises were subsequently assigned as homework. During the pilot test, for example, the mean number of words written by subjects in the divergent processing group was 98, but under experimental conditions the mean was 153. One possible explanation of this phenomenon is that the students were aware that they were participating in a study and may have cooperated by producing many more answers than previous students had generated by utilizing the total amount of time available to continue to work on the exercises.
The time of 35 minutes given for processing was determined by taking the average amount of time needed by students to complete the exercises in pretesting. Under experimental conditions, therefore, approximately half of the students would be expected to complete the exercises. Apparently those who finished continued to work on the exercises, but those in the convergent group checked their answers by re-reading items, while those in the divergent group added to their answers by writing additional vocabulary words.

While various explanations or a combination of explanations may account for the difference observed between the treatment groups, it is clear that in the present study students using the written practice exercises designed to elicit divergent processing recalled significantly more vocabulary than did students using the exercises designed to elicit convergent processing.

Hypothesis II: There will be no significant differences attributable to variation in level of creativity on a recall measure of Spanish vocabulary. As the data in Table 4 (p. 70) indicates, there was no significant difference in scores attributable to variation in level of creativity. The mean score of the two groups was almost equal; the mean of the high creative group was 9.63 and that of the low creative group was 9.26. This hypothesis, therefore, must be retained. Several explanations are offered for this finding.
Table 4

Data for Creativity Variable

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>X</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC</td>
<td>49</td>
<td>9.63</td>
<td>5.8</td>
</tr>
<tr>
<td>LC</td>
<td>53</td>
<td>9.26</td>
<td>5.5</td>
</tr>
</tbody>
</table>

First, although numerous researchers report differences between highly creative individuals and those who do not have a high degree of creativity, the research has focused mainly on areas such as correlation of creativity with intelligence and achievement, on personality aspects of the creative individual, on teaching people to be more creative and on the products produced by people with various levels of creativity. The effect of student creativity as a factor in classroom learning results has not been investigated. It may be that creativity affects such aspects as style of learning but does not affect the result of learning. Another explanation may be that, since the subjects in this study were in a school situation doing written vocabulary exercises of the type that might be given for homework, the student perception of the tasks may have been based on normal expectations of vocabulary learning tasks so that use of intellectual skills would be
maximized whereas creative skills would be minimized. Intellectual skills are measured in IQ tests which usually ask for single or convergent answers, while creative skills are those that allow the student to think of alternative answers and extensions of answers. Although the divergent processing tasks asked the students to generate answers, it is also possible that the vocabulary from which the answers could be selected was necessarily limited by the constraints of the foreign language content and was not sufficiently diverse to allow the students to utilize creative skills.

Finally, the recall measure itself may have had the effect of causing intellectual skills rather than creative skills to be used. Not only were convergent answers necessary to complete the recall measure, but, in fact, creative answers were scored as incorrect answers. For example, the vocabulary word given for puppy was cachorro; thus the answer perrito (small dog) was scored as incorrect. Students' creative answers fell into several interesting categories. They used previously acquired vocabulary plus known suffixes to attempt to answer as in the example given for puppy. Some students described the animal using known vocabulary combinations such as writing pez malo (bad fish) for shark (ballena). One student exemplified the phenomenon of lexical creativity described by Clark and Clark (1977) by inventing a new word that
would certainly be understood by native Spanish speakers. The word for robin in Spanish is petirrojo, while the word for bird is pájaro and the word for red is rojo. The word created by the student was pajarrojo. Two students (who were probably unaware that mascar means to chew) created the false cognate mascado for raccoon (mapache). One creative but possibly frustrated student used syntactical knowledge to answer by writing such expressions as hog de ground (groundhog), coon de rac (raccoon), and fly de man-tequilla (butterfly). Several students apparently remembered words used in the task exercises to elicit animal names and used the relationship to answer on the recall measure. For example, a question in Convergent Exercise A asks which animal has many "arms." One student wrote ocho brazos (eight arms) after octopus and also answered with other parts of the body after other cues such as cuello (neck) for swan. Knowledge of native-language connotations prompted several students to write names of classmates after cues such as fox and monkey. These students were all using their knowledge of language creatively, but such creativity was not recognized in the design of the study and these answers were, therefore, scored as incorrect. More than two-thirds of the students who wrote such creative answers were from the high creative group.

Although there was no significant difference attributable to levels of creativity as a main effect, one
interaction that emerged will be discussed in the section containing discussion of additional results (p. 74).

Hypothesis III: There will be no significant differences attributable to variation in level of intelligence on a recall measure of Spanish vocabulary. This hypothesis is rejected since a difference in mean scores based on level of intelligence was observed at the .018 level of significance. The mean score of the high-intelligence group was 10.67 and the mean score of the low-intelligence group was 8.00. (For data on the intelligence variable, see Table 5.) Intelligence as a measure of mental ability has been extensively documented since Binet's original studies of intelligence (Butcher, 1968), and psychologists and educators have long accepted IQ as a significant factor in learning (i.e., Ausubel, 1968; Guilford, 1968; Oller, 1979). Failure to find a significant difference due to levels of intelligence would have been surprising.

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<tr>
<th></th>
<th>n</th>
<th>X</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI</td>
<td>55</td>
<td>10.67</td>
<td>6.1</td>
</tr>
<tr>
<td>LI</td>
<td>47</td>
<td>8.00</td>
<td>4.8</td>
</tr>
</tbody>
</table>
Hypothesis IV: There will be no significant interactions among the variables on a recall measure of Spanish vocabulary. Because there were no interactions among the main variables of intelligence, creativity and treatment that reached the level of significance, this hypothesis must also be retained. (For data on interactions, see Table 2, p. 65.) It would seem that the effect of the main treatment group variable was so strong that it neutralized or negated any interactions. It was expected that the high creative-low intelligence group would show more learning from divergent processing while the high intelligence-low creative group would be relatively more successful at the more traditional convergent processing. In fact, however, both these groups and also the low creative-low intelligence group succeeded to a significant extent in this study in learning foreign language vocabulary using divergent processing rather than convergent processing. (For additional data on interactions, See Table 6, p. 75.)

Additional discussion

While there were no significant interactions among the main independent variables, examination of the experimental data does show an interaction of creativity and treatment (See Figure 3, p. 76) that does not reach the required level of significance because of the strong
Table 6  Interaction of Variables

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>X</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Creativity x Treatment</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>HC/Convergent</td>
<td>25</td>
<td>8.44</td>
<td>4.3</td>
</tr>
<tr>
<td>LC/Convergent</td>
<td>28</td>
<td>7.39</td>
<td>3.1</td>
</tr>
<tr>
<td>HC/Divergent</td>
<td>24</td>
<td>10.88</td>
<td>7.0</td>
</tr>
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<td>LC/Divergent</td>
<td>25</td>
<td>11.36</td>
<td>6.8</td>
</tr>
<tr>
<td><strong>Intelligence x Treatment</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>9.07</td>
<td>3.6</td>
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<td>9.64</td>
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<td><strong>Intelligence x Creativity x Treatment</strong></td>
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<td>9.57</td>
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<tr>
<td>LI/LC</td>
<td>12</td>
<td>10.33</td>
<td>5.1</td>
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</table>
Figure 3: Interaction of Treatment and Creativity

Figure 4: Interaction of Low-Intelligence sub-groups
effect of the divergent treatment variable. Nevertheless, this interaction provides a clue to another possible reason for the failure to find a significant difference due to the creativity variable. By looking at each of the four main groups (high intelligence, low intelligence, high creative, low creative) independently of each other, it appears that this interaction involves the low-intelligence group and it further indicates that this interaction is due largely to the performance of one specific subgroup, the low intelligence-low creativity group using divergent processing. (See Figure 4, p. 76.) In a rank ordering by the mean of each sub-group (See Table 7), it

<table>
<thead>
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<th>Rank</th>
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<th>n</th>
<th>X</th>
<th>S.D.</th>
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<tr>
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<td>7.00</td>
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<tr>
<td>8</td>
<td>LI/LC/C</td>
<td>14</td>
<td>6.21</td>
<td>2.6</td>
</tr>
</tbody>
</table>
appears that the sub-group of low intelligence-low creativity benefitted most from using divergent processing. This sub-group ranks third highest of the eight groups with a mean of 10.33, while the mean of the high intelligence-high creative sub-group using convergent processing was only 9.57. It may be that asking the less creative students to perform divergent tasks may allow these students to be more creative and to benefit from the creativity asked of them, while for the usually creative students there is no such added advantage. The creative students may habitually encode items in a divergent process that allows them to learn in a meaningful way, but the less creative students may not have learned to utilize or may not be accustomed to creative encoding. It is also possible that low creative students may not possess the right-brain characteristics or preferences that enhance creative encoding. When given tasks that provide them the opportunity to use or that demand the use of divergent processing, however, they may be provided with a process that allows them to perform equally as well as the normally more creative perform. While the divergent processing was beneficial to all four groups, the single sub-group of low intelligence-low creativity apparently benefitted most from the divergent exercises.

The evaluations of the exercises completed by the students also provide a look at the differences resulting
from convergent treatment and divergent treatment. (For information on the evaluations, see Appendix H, p. 175.) The exercise that the convergent group liked best was Exercise A, while the exercise preferred by the divergent group was Exercise E. In both the convergent set and the divergent set of tasks, Exercise A is based on factual information about the characteristics of the animals, and Exercise E is an exercise in which fantasy in used and in which students are asked to use their imagination. It is interesting to note that the kind of processing used elicited opinions that are often considered characteristic of people classified as convergent or divergent thinkers.

**Summary of Results**

Of the three independent variables, treatment, intelligence and creativity, only two were significant in the present study. The treatment variable consisting of two types of cognitive processing, convergent and divergent processing of foreign language vocabulary practice exercises, was significant at the .005 level with a convergent mean score of 7.87 and a divergent mean score of 11.12. The intelligence variable was significant, as expected, at the .018 level of significance. The high intelligence mean score was 10.67 and the low intelligence mean score was 8.00. The variable of level of creativity was not statistically significant nor was interaction among the
variables significant. Nevertheless, there was an interaction of creativity and treatment that apparently is explained by an unexpected mean of 10.33 for the sub-group of low creative-low intelligence students using divergent processing, a mean almost as high as that of the main high intelligence group mean of 10.67.
CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

This study was undertaken to learn more about how creativity contributes to the foreign-language learning process. Its purpose was to investigate the effects of student intelligence, student creativity, and different types of processing tasks upon a recall measure of foreign-language vocabulary. Two sets of processing tasks were developed, a set of convergent tasks and a set of divergent tasks. The convergent tasks represented the more traditional practice exercises used in learning foreign language vocabulary, while the divergent tasks represented more creative and less commonly used practice exercises. Getzels and Jackson's (1962) distinction between intelligence and creativity, Bogen's (1977) identification of dichotomous sets of information-processing tasks, Craik and Tulving's (1975) spread-of-processing explanation of cognitive processing, and Guilford's (1968) SI model provided useful theoretical bases for the study. Guilford's model provided the conceptual framework of convergent and
divergent operations, the semantic content area, and the relations product (i.e., the relation between the English and Spanish vocabulary items).

A 2 x 2 x 2 factorial design was used with two levels of each of three independent variables. The independent variables were intelligence, creativity and cognitive processing, and the dependent variable was a recall measure of Spanish vocabulary. The two levels of the independent variable of intelligence consisted of two groups of subjects designated the high-intelligence group and the low-intelligence group; the two levels of the independent variable of creativity consisted of two groups of subjects designated the high-creative group and the low-creative group; and the two levels of the independent variable of cognitive processing consisted of two experimental treatments: practice tasks requiring convergent processing and practice tasks requiring divergent processing. The content was a set of 40 concrete Spanish vocabulary words which were animal names unfamiliar to the subjects. The dependent variable was a recall measure of all 40 vocabulary items with English cues given.

The subjects were 102 sophomore students enrolled in second-year Spanish classes at a large suburban high school. All subjects participated in the experimental procedures at the same time and in the same room under incidental learning conditions; that is, no specific
instructions were given to learn the vocabulary while completing the practice exercises.

All data were analyzed by the Instruction and Research Computer Center at The Ohio State University by using the general linear models procedure of a three-way analysis of variance with a .05 level of significance.

Conclusions

The conclusions and implications of the results of this study will address the research questions presented in Chapter I.

1. Do tasks requiring convergent and divergent processing affect the learning of second-language vocabulary? Based on Bogen's (1977) list of dichotomous terms for intelligence, on Craik and Tulving's (1975) spread of processing explanation of cognitive processing, and on Guilford's (1968) SI model of intelligence, the researcher hypothesized that convergent processing and divergent processing would show differential effects in the processing of foreign-language vocabulary. When students were given practice exercises similar to those that might be found in language classrooms in order to learn a set of concrete Spanish vocabulary items, the results indicated that the exercises designed to elicit convergent processing and the exercises designed to elicit divergent processing differentially affected the learning of the vocabulary items
with divergent processing yielding a higher mean score at the .005 level of significance. The learning differences following divergent processing occurred for all groups and sub-groups participating in this study.

While the difference might partially be explained by the greater number of vocabulary items written by the students using divergent processing under experimental conditions, it would nevertheless seem to indicate that exercises which elicit divergent processing of items which are then recorded in writing are more effective in learning foreign-language vocabulary than the more traditional and more commonly used exercises that elicit convergent processing with written responses. While various reasons may be suggested for the apparent superiority of divergent-processing tasks in learning foreign language vocabulary in this study, it would seem that a clear advantage occurs in learning through the use of divergent processing practice exercises. The cognitive contribution to the divergent processing tasks apparently exceeds that of the convergent processing tasks resulting in greater recall of the material processed. The conclusion, therefore, is that tasks requiring convergent and divergent processing differentially affect the learning of second-language vocabulary within the limitations of this study.

2. Does student creativity affect performance in learning second-language vocabulary following learning
tasks requiring convergent or divergent processing? Based on Getzels and Jackson's (1962) differentiation between the constructs of intelligence and creativity, it was hypothesized that more creative students would perform better in learning foreign-language vocabulary than less creative students. The results, however, indicate that there was no differential effect in learning second-language vocabulary as a result of different levels of creativity. One possible reason for failure to find a difference is the possibility that the criterion measure elicited the intellectual skills typical of classroom learning rather than creative skills that students might possess but were not able to utilize. It is also possible that the typical school setting of the experiment, the limited number of Spanish vocabulary items available, or the scoring procedures of the recall measure in which creative answers were scored as incorrect may have overridden the effects of student creativity.

Examination of the data for the low creative group (See Figures 3 and 4, p. 76, and Table 7, p. 77) provides another possible explanation for failure to find a difference based on creativity. Among students in this group, those students who were also classified as low intelligence and who utilized divergent-processing performed at a higher level than five other sub-groups including students classified as high intelligence-high
creative who utilized convergent processing. The surprisingly high achievement of this sub-group helps to explain an overall mean score for the low creative group that was almost equal to the mean score of the high creative group. Because of the superior performance of the low intelligence-low creative sub-group, one might conclude that materials requiring a creative type of processing help the normally low creative student to become more creative or to utilize latent creativity. Although student creativity does not differentially affect performance on second-language learning tasks requiring convergent or divergent processing, the learning tasks requiring divergent processing may affect student creativity.

3. Does student intelligence affect performance in learning second-language vocabulary following learning tasks requiring convergent or divergent processing? As documented in numerous studies since Binet's original studies of intelligence, levels of student intelligence affect performance. As expected, therefore, the high intelligence group outperformed the low intelligence group at the .018 level of significance on the second-language learning tasks in this study.

4. Does interaction between student creativity and student intelligence affect performance on second-language learning tasks requiring convergent or divergent processing? Because a previous study in foreign language
learning (Birckbichler 1975) had failed to find a difference in student performance attributable to convergent and divergent processing, this researcher hypothesized that more intelligent students might normally utilize convergent processing whereas more creative students might utilize divergent processing more effectively, and that grouping subjects into high and low intelligence and high and low creativity groups might produce an interaction by showing better performance on the convergent processing tasks by the high intelligence-low creative group and better performance on the divergent processing tasks by the high creative-low intelligence group. While, in fact, these two groups showed almost equal performance (See Table 6, p. 75), the high intelligence-low creative divergent group attained a mean score higher than either of these groups; and there was no significant interaction among the three independent variables of intelligence, creativity and treatment. Failure to find interaction may be attributed to the strong effect of the divergent treatment variable among all groups and sub-groups. While the two groups of interest in this hypothesis performed almost equally well, results in this study indicated that when second-language learning tasks requiring convergent or divergent processing are utilized, interaction between student creativity and student intelligence does not differentially affect performance resulting from those tasks.
The interaction among sub-groups of the low intelligence group has already been noted in the discussion of Hypothesis 2. Some researchers (i.e. Cicirelli 1965, Prentky 1980) have found a greater correlation between intelligence and creativity below an IQ of 120 and less correlation above that level. (See Appendix E, p. 168 for data on correlations of IQ and Creativity of students in this study.) Since the mean IQ of students participating in this study was 119, the interaction noted in the low intelligence-low creative group may support this position. Further research may indicate that there is interaction among the intelligence, creativity and convergent and divergent treatment variables when the average and less intelligent students are involved and the highly intelligent student is excluded.

Limitations

While it is conventional to limit the results of this study to the population from which the sample of subjects was taken and to the specific materials developed for this study, it is also arguable that the students of the subject sample are typical of second-year Spanish students particularly and high school foreign-language students in general and that the materials developed are representative of the kinds of materials that can be used in typical language classes. Certainly, however, the results cannot
be generalized beyond the early levels of language learning at the high school level nor beyond the study of a specific set of concrete foreign-language vocabulary items. An additional factor is the extent to which the materials that were developed or the procedures that were followed actually measured typical student abilities in learning second-language vocabulary.

Recommendations

Because the effects of the divergent processing were significant and because classroom teachers of foreign languages are interested in more effective methods and materials for teaching foreign languages, recommendations for classroom application of the results of this research are offered subject to the limitations previously noted. Previous research by Ervin (1977) and Guntermann (1977) indicated that students are concerned about their failure to learn sufficient foreign-language vocabulary. If vocabulary exercises that utilize divergent processing help students perform better in recalling vocabulary items, then it is recommended that such exercises be more widely used to supplement or to partially replace the currently common exercises utilizing convergent processing. These divergent-processing exercises should ask students to generate answers from a given range of information rather than ask them to recognize answers previously determined by another
source. An emphasis should be placed on variety and quantity of answers rather than on a single correct answer. Students should consider alternatives rather than imperatives. Creativity and diversity in using vocabulary should be recognized, encouraged, and rewarded. Examples of five such sets of exercises are provided in the materials developed for this study (See Appendix B, p. 97). Many more practice-exercise formats are possible and still more are possible by using communicative practice formats. It is recommended that teachers utilize practice exercise formats that elicit divergent processing when teaching vocabulary items and it is further recommended that authors, editors, and publishers of second-language materials include such exercises in their textbooks and supplementary materials.

Suggestions for Further Research

The first suggestions for further research are, of course, replications of the present study using a) other sets of concrete vocabulary items, b) sets of abstract vocabulary items, c) vocabulary of other foreign languages, d) advanced levels of foreign-language study, and e) communicative exercises emphasizing vocabulary learning. If replicated, however, it is suggested that the exercises be even more carefully designed to eliminate the possible confounding factor of the additional number of
written items occurring in the divergent-processing exercises in this study. Additionally, the writing variable itself might be studied.

A further replication of this study in order to investigate foreign language vocabulary learning by average and/or less able students is urged. The highly intelligent and highly creative already possess skills that help them in learning; it is important that foreign language educators find ways to help the average and less able students learn and enjoy learning foreign languages. Since the mean scores of the low intelligence-low creative groups in this study indicate a possible interaction of the creativity and processing variables, further study might clarify this effect and contribute information that could help students of average and low ability levels better learn a language. A replication that includes the investigation of the separate components of creativity, identified by Guilford (1973) as fluency, flexibility, originality and elaboration, might yield significant data about the role of creativity in foreign-language learning, especially among these average and less intelligent students.

Finally, a replication of this study that adds or involves figural creativity as well as verbal creativity could further contribute to the growing body of literature on the role of visuals in foreign-language learning. Is
verbal creativity largely a function of the left brain, does divergent verbal processing enhance right-brain functions, especially among the less intelligent and less creative, and to what extent do right-brain capabilities contribute to learning a foreign language are questions that might be addressed. What combination of verbal or figural creativity, for example, produced the response pajarojo for robin (petirrojo) by combining the Spanish words for bird and red?

Although this experimental study investigated student creativity as a variable in cognitive processing, creativity is a relatively unexplored construct in foreign-language education. Further investigation of creativity in the classroom, possibly of a naturalistic design, could provide valuable information about the differences in learning preferences, learning styles and learning behaviors of the highly creative and the less creative.

Guilford's SI model provided useful theoretical support for this study. Further investigation of foreign-language learning using other components of the model might provide useful data. Because it represents a cognitive process that is important in foreign-language learning, it is recommended that Guilford's operations category of evaluation be investigated. Evaluation "is concerned with self-checking of information, possibly leading to self-correction" (Guilford 1979). In the product category,
systems and transformations seem especially relevant to foreign-language learning. Three or more interrelated or organized units of information form a system. In a foreign language context, verb endings, word families, and vocabulary prefixes and suffixes would be classified in Guilford's product category as systems. For example, would divergent processing help students better learn such suffixes as -ería in cafetería, librería, guitarrería, (usually a place to buy something), or -dor in trabajador, despertador, marcador (usually an agent to perform the action of the verb)? Modifications, revisions, redefinitions, rearrangements, and substitutions are examples of transformations. In foreign language study, self-correction, paraphrase, or recognition of a known word used in a different way would be examples of transformations.

Since the theoretical bases for this study came largely from psychology, it is recommended that foreign-language educators work with colleagues in the cognitive psychology and psycholinguistics fields to investigate the psychological contribution to second-language learning. There is substantial research currently being conducted that investigates cognition in first-language learning, and it seems logical that a better understanding of how people learn a second language would contribute to our understanding of how language in general is handled cognitively by the human brain.
What are the variables that cause some people to learn a language better than others and to be able to use it more creatively? Can knowledge of these variables be used to help foreign-language students better learn a second language and to be creative using the second-language? The questions seem to be endless and the research possibilities almost unlimited. The many research suggestions provided in this chapter are indicative of the research that remains before we understand how languages, and specifically second languages, are learned and used. An important and yet neglected factor in both the foreign-language classroom and in foreign-language research is one that is vital to the use of language personally and communicatively. That factor is creativity.
APPENDICES

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APPENDIX A

Bogen's list of dichotomous terms for intelligence

Bogen (1977, p.135) listed the following dichotomous terms of intelligence and the people who use them, but did not imply that the terms in one column are all more-or-less different labels for a single construct.

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<thead>
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<th>Term</th>
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<td>Akhlinanda</td>
<td>buddi</td>
<td>manas</td>
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<td>Assagioli</td>
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<td>intuition</td>
</tr>
<tr>
<td>Austin</td>
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<td>divergent</td>
</tr>
<tr>
<td>Bateson &amp; Jackson</td>
<td>digital</td>
<td>analogic</td>
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<td>Blackburn</td>
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<td>imaginative</td>
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<td>metaphoric</td>
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<td>Cohen</td>
<td>analytic</td>
<td>relational</td>
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<td>impulsive</td>
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<td>Hobbes (per Murphy)</td>
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<td>free</td>
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<tr>
<td>Humphrey &amp; Zangwill</td>
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<td>imaginative</td>
</tr>
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<td>A. Jensen</td>
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<td>associative</td>
</tr>
<tr>
<td>Kagan &amp; Moss</td>
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<td>relational</td>
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<td>mythic</td>
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<td>gestalt</td>
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<td>integration</td>
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<td>McFie, Piercy</td>
<td>relations</td>
<td>correlates</td>
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<td>ampliative</td>
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<td>compositionist</td>
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<td>eidetic</td>
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<td>Schenov (per Luría)</td>
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<td>simultaneous</td>
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<td>subjective</td>
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<tr>
<td>C. C. Smith</td>
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<td>gross</td>
</tr>
<tr>
<td>Wells</td>
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</table>
APPENDIX B

Reliability and validity of IQ and creativity measures

I. Otis Lennon Test of School Ability Form S

The Otis Lennon Test of School Ability is an IQ test published by the Psychological Corporation, a division of Harcourt, Brace, Jovanovich, Inc. Since Form S, the form used to test subjects in this study, is a new form of the Otis Lennon test, complete data on the test is not yet available. The following information, therefore, was reported by Mary Schratz of the Psychological Corporation in a personal communication.

Form S has a reliability of .95 for 10th graders computed by the Kuder-Richardson formula 20. The correlation of Form S with the Research Form, Form R, is .88.

Correlations with the Stanford Achievement Test result in the following data for 10th graders:

Otis Lennon correlation with Stanford Form E Task 1:
- Reading vocabulary: .76
- Reading comprehension: .76
- Mathematics: .77
- Spelling: .63
- English: .71
- Social science: .70
- Science: .68

Otis Lennon correlation with Stanford Form E Task 2:
- Reading vocabulary: .80
- Reading comprehension: .80
- Mathematics: .82
- Spelling: .70
- English: .79
- Social science: .78
- Science: .76
II. Torrance Tests of Creative Thinking

The following information is taken from Buros, *The Seventh Mental Measurements Yearbook* (1972).

Test-retest reliabilities range from .50 to .93 over one to two week periods, and from .35 to .73 over three year periods. The majority of the reliability coefficients exceed .70. Baird states that "the diversity of studies and samples suggests that the scales have adequate reliability" (p. 837). Alternate forms reliability ranges from .85 to .90 for the verbal tests.

The fluency, flexibility, and originality sub-scores tend to be highly correlated ranging from .74 to .80 for the verbal test. Thorndike believes that "it would be better to think of each test as yielding a single total score" (p. 839).

Reporting on the more than 50 studies of validity provided in the test manual, Baird concludes that "the studies do suggest that the test does measure behaviors consistent with the literature on creative behavior" (p. 837).
APPENDIX C

Experimental instruments

1 Convergent Materials
   A Treatment Tasks ................................ 100
   B Recall Measure ................................ 114
   C Evaluation Materials ............................ 116

2 Divergent Materials
   A Treatment Tasks ................................ 119
   B Recall Measure ................................ 129
   C Evaluation Materials ............................ 131
GROUP C

PACKET A

EXERCISES

PLEASE DO NOT OPEN THIS PACKET UNTIL TOLD TO DO SO
These exercises are designed to learn more about different types of foreign language vocabulary practice exercises. We are asking your help in doing the exercises thoughtfully and in giving us your opinions about the various exercises.

Thank you very much for your participation and cooperation.

First, before beginning the exercises, briefly look over the vocabulary list on the next page. You will need this vocabulary in order to complete the exercises. In addition to the vocabulary list, there is a dictionary at the end of the exercises that you may use if you need to know one of the other words in the exercises.

You will be given approximately 30 minutes to do these exercises. If you finish early, please wait quietly for time to be called.

You may turn the page and begin to work.
VOCABULARY - ANIMALS

(Although the term "animals" is used, in these exercises it includes birds, fish, fowl and insects.)

<table>
<thead>
<tr>
<th>SPANISH</th>
<th>ENGLISH</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1 águila</td>
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</tr>
<tr>
<td>5 becerro</td>
<td>calf</td>
<td>25 mono</td>
<td>monkey</td>
</tr>
<tr>
<td>6 buho</td>
<td>owl</td>
<td>26 mosca</td>
<td>fly</td>
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<td>firefly</td>
<td>40 zorro</td>
<td>fox</td>
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</table>

(You may tear this page out of the packet if you wish.)
EXERCISE A.

Preguntas. Select the correct answer to each question and write the answer in the blank provided.

Example: ¿Qué animal no tiene piernas?
        cigüeña  mapache  gusano
        ________________

1. ¿Qué animal es más grande?
   oso  marmota  oveja
   ________________

2. ¿Qué pájaro es más pequeño?
   águila  colibrí  petirrojo
   ________________

3. ¿Qué animal puede nadar?
   saltamontes  mariposa  foca
   ________________

4. ¿Qué pájaro puede volar mejor?
   pavorreal  cisne  paloma
   ________________

5. ¿Qué animal es más joven?
   buho  cachorro  caimán
   ________________

6. ¿Qué animal tiene un cuello largo?
   rana  cisne  cochino
   ________________

7. ¿Qué animal tiene una cola larga?
   águila  mosca  zorro
   ________________

8. ¿Qué animal tiene muchos "brazos?"
   potrillo  pavorreal  pulpo
   ________________

9. ¿Qué animal tiene cuatro piernas?
   marmota  araña  ballena
   ________________

10. ¿Qué animal vive en los árboles?
    conejo  ardilla  guajolote
    ________________

11. ¿Qué animal corre muy rápido?
    venado  araña  foca
    ________________

12. ¿Qué animal vive en la granja?
    tiburón  mono  becerro
    ________________

13. ¿Qué animal puede vivir en casa?
    lobo  cascabel  minino
    ________________
14. ¿Qué animal es más pequeño?
   luciérnaga murciélago pulpo

15. ¿Qué animal es más viejo?
   becerro potrillo oveja

TURN THE PAGE AND CONTINUE WITH THE NEXT EXERCISE
EXERCISE B.

Descripciones. Complete the following sentences with the correct word from the list provided. Use each word in the list only once.

1. zorro, mariposa, ardilla, saltamontes, zorrillo, cigüeña
   a. La __________________ es amarilla.
   b. El __________________ es verde.
   c. El __________________ es negro.
   d. La __________________ es blanca.
   e. El __________________ es "rojo."
   f. La __________________ es gris.

2. cascabel, potrillo, mono, pavorreal, petirrojo, gusano
   a. El __________________ es cómico.
   b. El __________________ es hermoso.
   c. El __________________ es rápido.
   d. El __________________ es despacioso.
   e. El __________________ es peligroso.
   f. El __________________ es inocuo.

3. rana, ardilla, paloma, mosca, ballena, hormiga
   a. La __________________ es fea.
   b. La __________________ es hermosa.
   c. La __________________ es grande.
   d. La __________________ es inocua.
   e. La __________________ es simpática
   f. La __________________ es antipática.
4. oso, gusano, cochino, venado, minino, saltamontes
   a. El ________________ es alto.
   b. El ________________ es bajo.
   c. El ________________ es gordo.
   d. El ________________ es delgado.
   e. El ________________ es pesado.
   f. El ________________ es ligero.

TURN THE PAGE AND CONTINUE WITH THE NEXT EXERCISE
EXERCISE C.

Artista. You are an artist for a greeting card company. Which animal would be best for the following projects? Choose the most appropriate answer to each question and write the answer in the space provided.

Example: ¿Una tarjeta para un cumpleaños en la primavera?
  cascabel lobo petirrojo

1. ¿Una invitación a una fiesta para un nuevo bebé?
  zorro foca cigüeña

2. ¿Una tarjeta de Navidad?
  gusano venado mono

3. ¿Una tarjeta para "Halloween?"
  cisne hormiga murciélago

4. ¿Una tarjeta para la Pascua Florida?
  conejo tiburón caimán

5. ¿Una tarjeta para el Día de Gracias?
  guajolote oso mosca

6. ¿Una invitación para una conferencia del gobierno de los Estados Unidos?
  cachorro águila oveja

7. ¿Una invitación para una conferencia internacional de la paz?
  araña cascabel paloma

8. ¿Una invitación para una conferencia sobre animales en peligro de extinción?
  becerro ballena colibrí

9. ¿Una tarjeta cómica para el dos de febrero?
  pulpo mapache marmota

10. ¿Una tarjeta para la graduación?
  buho rana cochino

TURN THE PAGE AND CONTINUE WITH THE NEXT EXERCISE
Clasificaciones. Classify the following as animal (ANIMAL), bird (PAJARO), or insect (INSECTO). Write each word under the correct heading.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>águila</td>
<td>guajolote</td>
<td>mosca</td>
</tr>
<tr>
<td>araña</td>
<td>hormiga</td>
<td>paloma</td>
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<td>pavorreal</td>
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<td>buho</td>
<td>luciérnaga</td>
<td>petirrojo</td>
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<tr>
<td>cachorro</td>
<td>mapache</td>
<td>potrillo</td>
</tr>
<tr>
<td>cigüeña</td>
<td>mariposa</td>
<td>saltamontes</td>
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<td>colibrí</td>
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<td>zorro</td>
</tr>
<tr>
<td>conejo</td>
<td>mono</td>
<td>zorrillo</td>
</tr>
</tbody>
</table>

ANIMAL   PAJARO   INSECTO

TURN THE PAGE AND CONTINUE WITH THE NEXT EXERCISE
La tierra. Read the descriptions of the following animals. Some are real animals found here on earth and some are imaginary. Decide if it is possible to find these animals here on earth or not. Write the word for each animal under the heading POSIBLE or IMPOSIBLE.

<table>
<thead>
<tr>
<th>Example</th>
<th>POSIBLE</th>
<th>IMPOSIBLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. El <strong>buho</strong> puede ver en la noche.</td>
<td><strong>buho</strong></td>
<td></td>
</tr>
<tr>
<td>b. La <strong>mariposa</strong> come todas las legumbres en el jardín y mucha gente tiene hambre.</td>
<td></td>
<td><strong>mariposa</strong></td>
</tr>
<tr>
<td>1. La <strong>ardilla</strong> vuela más alto que un avión.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Las <strong>ballenas</strong> son los animales más grandes del océano.</td>
<td></td>
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</tr>
<tr>
<td>3. Los <strong>cisnes</strong> son verdes, azules y anaranjadas.</td>
<td></td>
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</tr>
<tr>
<td>4. La <strong>oveja</strong> ataca al lobo.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. La <strong>foca</strong> puede ser un actor muy cómico.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. El <strong>tiburón</strong> ataca a la gente que nada en la playa.</td>
<td></td>
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</tr>
<tr>
<td>7. &quot;El <strong>zorrillo</strong>&quot; es el nombre de un perfume muy dulce.</td>
<td></td>
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</tr>
<tr>
<td>8. Es posible ver la <strong>luciérnaga</strong> por la noche porque tiene una luz.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Los <strong>cachorros</strong> y los <strong>mininos</strong> son animales muy populares en casa.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. El <strong>caimán</strong> juega con un equipo de fútbol americano.</td>
<td></td>
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</tr>
<tr>
<td>11. El <strong>oso</strong> blanco vive donde hace mucho frío y mucha nieve.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12. El **murciélago** es una comida muy buena y todos los estudiantes comen mucho.

13. El **guajolote** es feroz, violento y peligroso.

14. El **cochino** es el modelo para un banco.

15. La **marmota** es un animal muy hermosa y las mujeres quieren llevar su piel.

WAIT QUIETLY UNTIL TIME IS CALLED
Dictionary C

alto - tall, high
amarilla - yellow
americano - American
anaranjadas - orange
antes de - before
antipático - unlikeable, disagreeable
árboles - trees
atacar - to attack
avión - airplane
azules - blue
bajo - short, low
banco - bank
bebé - baby
blanco, blanca - white
brazos - arms
buena - good
casa - house, home
cola - tail
comer - to eat
cómico - comical, funny
comida - food
conferencia - meeting
correr - to run
cuello - neck
cumpleaños - birthday
delgado - thin
despacioso - slow
Día de Gracias - Thanksgiving
donde - where
dulce - sweet
equipo - team
Estados Unidos - United States
estudiantes - students
extinción - extinction
fea - ugly
febrero - February
feroz - ferocious, wild
fiesta - party
Florida: Pascua Florida - Easter
frío - cold
fútbol americano - football
gente - people
gobierno - government
gordo - fat
grande - big, large
granja - farm
Gracias: Día de Gracias - Thanksgiving
gris - gray
hace mucho frío - it's very cold
hambre - hungry
hermoso, hermosa – beautiful
innocua, inocuo – innocuous, harmless
jardín – garden
joven – young
juega (jugar – to play)
largo, larga – long
lavar – to wash
legumbres – vegetables
ligero – light in weight
luz – light
llevar – to wear
más – more, most
mejor – better, best
modelo – model
mucho – much, a lot
mujeres – women
muy – very
nadare – to swim
Navidad – Christmas
negro – black
nieve – snow
noche – night, por la noche – at night
nombre – name
nuevo – new
océano – ocean
pájaro – bird
para – for
Pascua Florida – Easter
paz – peace
peligro – danger
peligroso – dangerous
pequeño – small
pesado – heavy
piel – fur, skin
piernas – legs
playa – beach
por la noche – at night
porque – because
primavera – spring
puede – can, is able
que – that, than
¿Qué? – What?
rápido – fast
rojo – red
ser – to be
simpático – nice, agreeable
sobre – about, on
tarjeta – card
tiene – has: tener – to have
todos – all / todos los – every
Unidos: Estados Unidos – U. S.
ver – to see
verdes - green
viejo - old
vivir - to live
violento - violent
volar (vuela) - to fly
GROUP C

PACKET B

RECALL

PLEASE DO NOT OPEN THIS PACKET UNTIL TOLD TO DO SO
Write the Spanish vocabulary words for as many of the following as possible.

calf ____________________ frog ____________________
swan ____________________ skunk ____________________
pony ____________________ groundhog ____________________
bear ____________________ shark ____________________
peacock ____________________ seal ____________________
deer ____________________ eagle ____________________
fox ____________________ alligator ____________________
fly ____________________ ant ____________________
rabbit ____________________ pig ____________________
bat ____________________ monkey ____________________
robin ____________________ firefly ____________________
hummingbird ____________________ octopus ____________________
rattlesnake ____________________ squirrel ____________________
dove ____________________ worm ____________________
kitten ____________________ wolf ____________________
grasshopper ____________________ owl ____________________
whale ____________________ spider ____________________
turkey ____________________ butterfly ____________________
stork ____________________ puppy ____________________
sheep ____________________ raccoon ____________________

STOP! WAIT FOR FURTHER INSTRUCTIONS.
GROUP C

PACKET C

EVALUATION

PLEASE DO NOT OPEN THIS PACKET UNTIL TOLD TO DO SO
EVALUATION C

Please fill out the following information:

A. What specific comments can you make about each exercise? For example: Were some questions too difficult? Was the exercise boring? Would you like to see this type of exercise in a book or workbook? What were your feelings while you were doing it?

Exercise A
Example: ¿Qué animal no tiene piernas? ______________
cigüeña  mapache  gusano

Exercise B
Example: mariposa, saltamontes, zorrillo, cigüeña
a. El _____ es verde.  c. La _____ es amarilla.
b. La _____ es blanca.  d. El _____ es negro.

Exercise C
Example: ¿Una tarjeta para un cumpleaños en ________
la primavera?
cascabel  lobo  petirrojo

Exercise D
Example: Classify: becerro  mariposa  pavorreal
ANIMAL  PAJARO  INSECTO

Exercise E
Example: Possible or impossible? POSIBLE  IMPOSIBLE
El buho puede ver en la noche.
B. How much do you think these exercises helped you to learn the vocabulary? Circle the numbers that indicate your opinions.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Helped a lot</th>
<th>Helped some</th>
<th>Not sure</th>
<th>Didn't help much</th>
<th>Didn't help at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>B.</td>
<td>1</td>
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<td>4</td>
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<tr>
<td>C.</td>
<td>1</td>
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<td>4</td>
<td>5</td>
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<tr>
<td>D.</td>
<td>1</td>
<td>2</td>
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<td>4</td>
<td>5</td>
</tr>
<tr>
<td>E.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

C. In general, how you feel about these exercises? Circle the letters that indicate your opinion.

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Not sure</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
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<tbody>
<tr>
<td>The exercises are:</td>
<td></td>
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<tr>
<td>Enjoyable</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Different</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Interesting</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
<td>SD</td>
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D. Considering the time it took and what you learned from doing the exercises, which exercise would you like best in a book or workbook? Which one would you like least?

I would like Exercise ____ best. Reason?

I would like Exercise ____ least. Reason?

E. Taking everything into consideration, give each exercise a letter grade: A, B, C, D, or E.

Exercise A ________
Exercise B ________
Exercise C ________
Exercise D ________
Exercise E ________
Spanish II

Name ______________________________
Class ____________________________
Date ______________________________

These exercises are designed to learn more about different types of foreign language vocabulary practice exercises. We are asking your help in doing the exercises thoughtfully and in giving us your opinions about the various exercises.

Thank you very much for your participation and cooperation.

First, before beginning the exercises, briefly look over the vocabulary list on the next page. You will need this vocabulary in order to complete the exercises. In addition to the vocabulary list, there is a dictionary at the end of the exercises that you may use if you need to know one of the other words in the exercises.

You will be given approximately 30 minutes to do these exercises. If you finish early, please wait quietly for time to be called.

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<td>firefly</td>
<td>40 zorro</td>
<td>fox</td>
</tr>
</tbody>
</table>

(You may tear this page out of the packet if you wish.)
EXERCISE A.

Preguntas. Answer the following questions by selecting answers from the vocabulary list and writing them in the spaces provided. You may write more than one answer.

Example: ¿Qué animales no tienen frío? oso, perezoso

1. ¿Qué animales son más grandes?
   ______________________________________

2. ¿Qué animales pueden nadar?
   ______________________________________

3. ¿Qué animales son jóvenes?
   ______________________________________

4. ¿Qué animales son más importantes?
   ______________________________________

5. ¿Qué animales corren muy rápido?
   ______________________________________

6. ¿Qué animales son muy felices?
   ______________________________________

7. ¿Qué animales son peligrosos?
   ______________________________________

8. ¿Qué animales pueden vivir en la granja?
   ______________________________________

9. ¿Qué animales pueden entrar en la casa?
   ______________________________________

10. ¿Qué animales son muy pequeños?
    _____________________________________

TURN THE PAGE AND CONTINUE WITH THE NEXT EXERCISE
EXERCISE B

Descripciones. Complete the following sentences with names of animals from the vocabulary list.

Example: _mosca, paloma, gusano_ son innocuos.

1. __________________________ son cómicos.

2. __________________________ son feos.

3. __________________________ son hermosos.

4. __________________________ son simpáticos.

5. __________________________ son antipáticos.

6. __________________________ son populares.

7. __________________________ son originales.

8. __________________________ son inteligentes.

TURN THE PAGE AND CONTINUE WITH THE NEXT EXERCISE
EXERCISE C

Artista. You are a famous artist and your paintings of animals are superb. Which animals would you choose to paint for the following situations? Write your answers in the spaces provided.

Example: ¿Una pintura para una tienda de ropa?

_ colibrí, ballena, saltamontes, cigüeña_

1. ¿Una pintura para un sello?

2. ¿Una pintura para un anuncio de la ropa?

3. ¿Una pintura para una caja de cereal?

4. ¿Una pintura para el museo de arte moderno?

5. ¿Una pintura para una revista de las ciencias?

6. ¿Una pintura para personas con enfermedades mentales?

7. ¿Una pintura para la Casa Blanca?

8. ¿Una pintura para un colegio?

TURN THE PAGE AND CONTINUE WITH THE NEXT EXERCISE
EXERCISE D

Clasificaciones. What animals might be classified as FANTASTICOS (Fantastic), IMPORTANTES (Important), or RIDICULOS (Ridiculous)? Write the names of the animals under one of the classifications.

<table>
<thead>
<tr>
<th>FANTASTICOS</th>
<th>IMPORTANTES</th>
<th>RIDICULOS</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

TURN THE PAGE AND CONTINUE WITH THE NEXT EXERCISE
EXERCISE E

La película. You are helping to make a new Walt Disney movie. Which animals might you choose for the following roles?

Example: Animales que vuelan más alto que un avión.  
           águila, murciélago, ardilla, buho

1. Animales enormes de otro planeta.

2. Animales azules, anaranjados, amarillos, y rojos.

3. Animales héroes que ayudan a todo el mundo.

4. Animales que son detectives.

5. Animales que juegan al fútbol americano.

6. Animales que estudian en la escuela y son muy populares entre los estudiantes.

7. Animales del trópico que viven donde hace mucho frío y nieva mucho.

8. Animales terribles que van a comer a todos los estudiantes.

9. Animales que celebran la Navidad.

10. Animales que traen paz al mundo.

11. Animales que viven después de una guerra atómica.

12. Animales que van a robar un banco.

WAIT QUIETLY UNTIL TIME IS CALLED
DICTIONARY

amarillos - yellow
americano - American; futbol americano - football
aranjados - orange
antipáticos - unlikeable, disagreeable
anuncio - ad, advertisement
arte - art
atómica - atomic
ayudar - to help
azules - blue
banco - bank
blanca - white
caja - box
casa - house, home; Casa Blanca - White House
celebrar - to celebrate
cereal - cereal
ciencias - science
colegio - school, high school
comer - to eat
cómicos - comical, funny
con - with
correr - to run
después - after
detectives - detectives
donde - where
enfermedades - illness
enormes - enormous, huge
entrar - to enter
entre - among
escuela - school
estudiantes - students
estudiar - to study
felices - happy
feos - ugly
frío - cold: hace mucho frío - it's very cold
fútbol americano - football
grandes - big
granja - farm
guerra - war
hace mucho frío - it's very cold
hermosos - beautiful
héroes - heros
importantes - important
innocuos - innocuous, harmless
inteligentes - intelligent
jóvenes - young
juegan (jugar) - to play
más - more, most
mentales - mental
moderno - modern
mucho - much, a lot
mundo - world
museo - museum
muy - very
nadar - to swim
Navidad - Christmas
nieva - it snows
para - for
paz - peace
peligrosos - dangerous
pequeños - small
personas - people, persons
pintura - painting
planeta - planet
pueden - can, are able
que - that
¿Qué? - What?
originales - original
otro - another
rápido - fast
revista - magazine
robar - to rob
rojos - red
ropa - clothes
sello - stamp
simpáticos - nice, agreeable
terribles - terrible
tienda - store
tienen frío - are cold
todo - all,
todo el mundo - everyone
todos los - all, every
traer - to bring
trópico - tropics
van (ir) - go
vivir - to live
vuelan (volar) - to fly
GROUP D

PACKET B

RECALL

PLEASE DO NOT OPEN THIS PACKET UNTIL TOLD TO DO SO
RECALL

Write the Spanish vocabulary words for as many of the following as possible.

calf ____________________ frog ____________________
swan ____________________ skunk ____________________
pony ____________________ groundhog ____________________
bear ____________________ shark ____________________
peacock ____________________ seal ____________________
deer ____________________ eagle ____________________
fox ____________________ alligator ____________________
fly ____________________ ant ____________________
rabbit ____________________ pig ____________________
bat ____________________ monkey ____________________
robin ____________________ firefly ____________________
hummingbird ____________________ octopus ____________________
rattlesnake ____________________ squirrel ____________________
dove ____________________ worm ____________________
kitten ____________________ wolf ____________________
grasshopper ____________________ owl ____________________
whale ____________________ spider ____________________
turkey ____________________ butterfly ____________________
stork ____________________ puppy ____________________
sheep ____________________ raccoon ____________________

STOP! WAIT FOR FURTHER INSTRUCTIONS.
GROUP D

PACKET C

EVALUATION

PLEASE DO NOT OPEN THIS PACKET UNTIL TOLD TO DO SO
EVALUATION D

Please fill out the following information:

A. What specific comments can you make about each exercise? For example: Were some questions too difficult? Was the exercise boring? Would you like to see this type of exercise in a book or workbook? What were your feelings while you were doing it?

Exercise A
Example: ¿Qué animales no tienen frío? ________________

Exercise B
Example: ________________ son cómicos.

Exercise C
Example: You are an artist. What animals would you choose for...
¿Una pintura para una tienda de ropa?

Exercise D
Example: Classify animals as...
FANTASTICOS IMPORTANTES RIDICULOS

Exercise E
Example: Animals for a Walt Disney movie?
Animales que vuelan más alto que un avión.
B. How much do you think these exercises helped you to learn the vocabulary? Circle the numbers that indicate your opinions.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Helped a lot</th>
<th>Helped some</th>
<th>Not sure</th>
<th>Didn't help much</th>
<th>Didn't help at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>B.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>C.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>D.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>E.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

C. In general, how you feel about these exercises? Circle the letters that indicate your opinion.

<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Not sure</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The exercises are:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enjoyable</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>Different</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
<tr>
<td>Interesting</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
</tr>
</tbody>
</table>

D. Considering the time it took and what you learned from doing the exercises, which exercise would you like best in a book or workbook? Which one would you like least?

I would like Exercise ____ best. Reason?
I would like Exercise ____ least. Reason?

E. Taking everything into consideration, give each exercise a letter grade: A, B, C, D, or E.

Exercise A ________
Exercise B ________
Exercise C ________
Exercise D ________
Exercise E ________
APPENDIX D

Pilot-test instruments

1 Convergent Materials
   A Treatment Tasks ......................... 135
   B Recall Measure ......................... 146
   C Evaluation Materials ................... 150

2 Divergent Materials
   A Treatment Tasks ......................... 152
   B Recall Measure ......................... 162
   C Evaluation Materials ................... 166
PILOT TEST C

PACKET A

PLEASE DO NOT OPEN THIS PACKET UNTIL TOLD TO DO SO

135
These exercises are designed to learn more about different types of foreign language vocabulary practice exercises. We are asking your help in doing the exercises, in reporting the time that it takes you to complete each exercise and in giving us your opinions about the various exercises.

Thank you very much for your participation and cooperation.

First, before beginning the exercises, briefly look over the vocabulary list on the next page. You will need this vocabulary in order to complete the exercises. In addition to the vocabulary list, there is a dictionary at the end of the exercises that you may use if you need to know one of the other words in the exercises.
VOCABULARY - ANIMALS

(Although the term "animals" is used, in these exercises it includes birds, fish, fowl and insects.)

<table>
<thead>
<tr>
<th>SPANISH</th>
<th>ENGLISH</th>
<th>SPANISH</th>
<th>ENGLISH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 águila</td>
<td>eagle</td>
<td>21 mapache</td>
<td>raccoon</td>
</tr>
<tr>
<td>2 araña</td>
<td>spider</td>
<td>22 mariposa</td>
<td>butterfly</td>
</tr>
<tr>
<td>3 ardilla</td>
<td>squirrel</td>
<td>23 marmota</td>
<td>groundhog</td>
</tr>
<tr>
<td>4 ballena</td>
<td>whale</td>
<td>24 minino</td>
<td>kitten</td>
</tr>
<tr>
<td>5 becerro</td>
<td>calf</td>
<td>25 mono</td>
<td>monkey</td>
</tr>
<tr>
<td>6 buho</td>
<td>owl</td>
<td>26 mosca</td>
<td>fly</td>
</tr>
<tr>
<td>7 cachorro</td>
<td>puppy</td>
<td>27 murciélago</td>
<td>bat</td>
</tr>
<tr>
<td>8 caímán</td>
<td>alligator</td>
<td>28 oso</td>
<td>bear</td>
</tr>
<tr>
<td>9 cascabel</td>
<td>rattlesnake</td>
<td>29 oveja</td>
<td>sheep</td>
</tr>
<tr>
<td>10 cigüeña</td>
<td>stork</td>
<td>30 paloma</td>
<td>dove</td>
</tr>
<tr>
<td>11 cisne</td>
<td>swan</td>
<td>31 pavorreal</td>
<td>peacock</td>
</tr>
<tr>
<td>12 cochino</td>
<td>pig</td>
<td>32 petirrojo</td>
<td>robin</td>
</tr>
<tr>
<td>13 colibrí</td>
<td>hummingbird</td>
<td>33 potrillo</td>
<td>pony</td>
</tr>
<tr>
<td>14 conejo</td>
<td>rabbit</td>
<td>34 pulpo</td>
<td>octopus</td>
</tr>
<tr>
<td>15 foca</td>
<td>seal</td>
<td>35 rana</td>
<td>frog</td>
</tr>
<tr>
<td>16 guajolote</td>
<td>turkey</td>
<td>36 saltamontes</td>
<td>grasshopper</td>
</tr>
<tr>
<td>17 gusano</td>
<td>worm</td>
<td>37 tiburón</td>
<td>shark</td>
</tr>
<tr>
<td>18 hormiga</td>
<td>ant</td>
<td>38 venado</td>
<td>deer</td>
</tr>
<tr>
<td>19 lobo</td>
<td>wolf</td>
<td>39 zorrillo</td>
<td>skunk</td>
</tr>
<tr>
<td>20 luciérnaga</td>
<td>firefly</td>
<td>40 zorro</td>
<td>fox</td>
</tr>
</tbody>
</table>
EXERCISE A.

Select the correct answer to each question and write the answer in the blank provided.

Example: ¿Qué animal no tiene piernas?  
cigüeña  mapache  gusano

1. ¿Qué animal es más grande?  
oso  marmota  oveja

2. ¿Qué pájaro es más pequeño?  
águila  colibrí  petirrojo

3. ¿Qué animal puede nadar?  
saltamontes  mariposa  foca

4. ¿Qué pájaro puede volar mejor?  
pavorreal  cisne  paloma

5. ¿Qué animal es más joven?  
buho  cachorro  caimán

6. ¿Qué animal tiene un cuello largo?  
rana  cisne  cochino

7. ¿Qué animal tiene una cola larga?  
águila  mosca  zorro

8. ¿Qué animal tiene muchos "brazos"?  
potrillo  pavorreal  pulpo

9. ¿Qué animal tiene cuatro piernas?  
marmota  araña  ballena

10. ¿Qué animal vive en los árboles?  
conejo  ardilla  guajolote

11. ¿Qué animal corre muy rápido?  
venado  araña  foca

12. ¿Qué animal vive en la granja?  
tiburón  mono  becerro

13. ¿Qué animal puede vivir en casa?  
lobo  cascabel  minino

14. ¿Qué animal es más pequeño?  
luciérnaga  murciélago  pulpo

15. ¿Qué animal es más viejo?  
becerro  potrillo  oveja
EXERCISE B.

Complete the following sentences with the correct word from the list provided. Use each word in the list only once.

1. zorro, mariposa, ardilla, saltamontes, zorrillo, cigüeña
   a. La ________________ es amarilla.
   b. El ________________ es verde.
   c. El ________________ es negro.
   d. La ________________ es blanca.
   e. El ________________ es "rojo."
   f. La ________________ es gris.

2. cascabel, potrillo, mono, pavorreal, petirrojo, gusano
   a. El ________________ es cómico.
   b. El ________________ es hermoso.
   c. El ________________ es rápido.
   d. El ________________ es despacioso.
   e. El ________________ es peligroso.
   f. El ________________ es inocuo.

3. rana, ardilla, paloma, mosca, ballena, hormiga
   a. La ________________ es fea.
   b. La ________________ es hermosa.
   c. La ________________ es grande.
   d. La ________________ es inocua.
   e. La ________________ es simpática
   f. La ________________ es antipática.

4. oso, gusano, cochino, venado, mínino, saltamontes
   a. El ________________ es alto.
   b. El ________________ es bajo.
   c. El ________________ es gordo.
   d. El ________________ es delgado.
   e. El ________________ es pesado.
   f. El ________________ es ligero.
EXERCISE C.

Artista. You are an artist for a greeting card company. Which animal would be best for the following projects? Choose the most appropriate answer to each question and write the answer in the space provided.

Example: ¿Una tarjeta para un cumpleaños en la primavera? cascabel lobo petirrojo

1. ¿Una invitación a una fiesta para un nuevo bebé?
zorro foca cigüeña

2. ¿Una tarjeta de Navidad?
gusano venado mono

3. ¿Una tarjeta para "Halloween?"
cisne hormiga murciélago

4. ¿Una tarjeta para la Pascua Florida?
conejo tiburón caimán

5. ¿Una tarjeta para el Día de Gracias?
guajolote oso mosca

6. ¿Una invitación para una conferencia del gobierno de los Estados Unidos?
cachorro águila oveja

7. ¿Una invitación para una conferencia internacional de la paz?
araña cascabel paloma

8. ¿Una invitación para una conferencia sobre animales en peligro de extinción?
becerro ballena colibrí

9. ¿Una tarjeta cómica para el dos de febrero?
pulpo mapache marmota

10. ¿Una tarjeta para la graduación?
buho rana cochino
EXERCISE D

Classify the following as animal (ANIMAL), bird (PAJARO), or insect (INSECTO). Write each word under the correct heading.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Bird</th>
<th>Insect</th>
</tr>
</thead>
<tbody>
<tr>
<td>águila</td>
<td>guajolote</td>
<td>mosca</td>
</tr>
<tr>
<td>araña</td>
<td>hormiga</td>
<td>paloma</td>
</tr>
<tr>
<td>becerro</td>
<td>lobo</td>
<td>pavorreal</td>
</tr>
<tr>
<td>buho</td>
<td>luciérnaga</td>
<td>petirrojo</td>
</tr>
<tr>
<td>cachorro</td>
<td>mapache</td>
<td>potrillo</td>
</tr>
<tr>
<td>cigüeña</td>
<td>mariposa</td>
<td>saltamontes</td>
</tr>
<tr>
<td>colibrí</td>
<td>minino</td>
<td>zorro</td>
</tr>
<tr>
<td>conejo</td>
<td>mono</td>
<td>zorrillo</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ANIMAL</th>
<th>PAJARO</th>
<th>INSECTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>_______</td>
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</tbody>
</table>
EXERCISE E

Read the descriptions of the following animals. Some are real animals found here on earth and some are imaginary. Decide if it is possible to find these animals here on earth or not. Write the word for each animal under the heading VERDADEROS (real) or IMAGINARIOS (imaginary).

<table>
<thead>
<tr>
<th>Examples</th>
<th>VERDADEROS</th>
<th>IMAGINARIOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. El búho puede ver en la noche.</td>
<td>búho</td>
<td></td>
</tr>
<tr>
<td>b. La mariposa come todas las legumbres en el jardín y mucha gente tiene hambre.</td>
<td>mariposa</td>
<td></td>
</tr>
</tbody>
</table>

1. La ardilla vuela más alto que un avión.                               |             |             |
2. Las ballenas son los animales más grandes del océano.                |             |             |
3. Los cisnes son verdes, azules y anaranjadas.                          |             |             |
4. La oveja ataca al lobo.                                               |             |             |
5. La foca puede ser un actor muy cómico.                                |             |             |
6. El tiburón ataca a la gente que nada en la playa.                    |             |             |
7. "El zorrillo" es el nombre de un perfume muy dulce.                  |             |             |
8. Es posible ver la luciérnaga por la noche porque tiene una luz.     |             |             |
9. Los cachorros y los mininos son animales muy populares en casa.      |             |             |
10. El caimán juega con un equipo de fútbol americano.                   |             |             |
11. El oso blanco vive donde hace mucho frío y mucha nieve.              |             |             |
12. El murciélago es una comida muy buena y todos los estudiantes comen mucho.

13. El guajolote es feroz, violento y peligroso


15. La marmota es un animal muy hermosa y las mujeres quieren llevar su piel.
Dictionary

alto - tall, high
amarilla - yellow
americano - American
anaranjadas - orange
antes de - before
antipático - unlikeable, disagreeable
árboles - trees
atacar - to attack
avión - airplane
azules - blue
bajo - short, low
banco - bank
bebé - baby
blanco, blanca - white
brazos - arms
buena - good
casa - house, home
cola - tail
comer - to eat
cómico - comical, funny
comida - food
conferencia - meeting
correr - to run
cuello - neck
cumpleaños - birthday
delgado - thin
despacioso - slow
Día de Gracias - Thanksgiving
donde - where
dulce - sweet
equipo - team
Estados Unidos - United States
estudiantes - students
extinción - extinction
fea - ugly
febrero - February
feroz - ferocious, wild
fiesta - party
Florida: Pascua Florida - Easter
frío - cold
fútbol americano - football
gente - people
gobierno - government
gordo - fat
grande - big, large
granja - farm
Gracias: Día de Gracias - Thanksgiving
gris - gray
hace mucho frío - it's very cold
hambre - hungry
innocua, innocuo - innocuous, harmless
jardín - garden
joven - young
juega (jugar - to play)
largo, larga - long
lavar - to wash
legumbres - vegetables
largo - light in weight
luz - light
más - more, most
mejor - better, best
modelo - model
mucho - much, a lot
muy - very
nadar - to swim
Navidad - Christmas
negro - black
nieve - snow
noche - night, por la noche - at night
nombre - name
nuevo - new
oceánico - ocean
pájaro - bird
para - for
Pascua Florida - Easter
paz - peace
peligro - danger
peligroso - dangerous
pequeño - small
pesado - heavy
piel - fur, skin
piernas - legs
playa - beach
por la noche - at night
porque - because
prima - spring
puede - can, is able
que - that, than
¿Qué? - What?
rápido - fast
rojo - red
ser - to be
simpático - nice, agreeable
sobre - about, on
tarjeta - card
tiene - has: tener - to have
todos - all / todos los - every
Unidos: Estados Unidos - U. S.
ver - to see
verdes - green
viejo - old
vivir - to live
violento - violent
volar (vuela) - to fly
PILOT TEST C

PACKET B

PLEASE DO NOT OPEN THIS PACKET UNTIL TOLD TO DO SO
RECALL

Write the Spanish vocabulary words for as many of the following as possible.

calf                      frog
swan                      skunk
pony                      groundhog
bear                      shark
peacock                   seal
deer                      eagle
fox                       alligator
fly                       ant
rabbit                    pig
bat                       monkey
robin                     firefly
hummingbird               octopus
rattlesnake               squirrel
dove                      worm
kitten                    wolf
grasshopper               owl
whale                     spider
turkey                    butterfly
stork                     puppy
sheep                     raccoon
Circle the Spanish vocabulary word that correctly translates each animal listed.

<table>
<thead>
<tr>
<th>Animal</th>
<th>a.</th>
<th>b.</th>
<th>c.</th>
<th>d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>shark</td>
<td>foca</td>
<td>pavorreal</td>
<td>tiburón</td>
<td>guajolote</td>
</tr>
<tr>
<td>skunk</td>
<td>murciélago</td>
<td>zorrillo</td>
<td>ballena</td>
<td>buho</td>
</tr>
<tr>
<td>kitten</td>
<td>mínino</td>
<td>gusano</td>
<td>conejo</td>
<td>luciérnaga</td>
</tr>
<tr>
<td>spider</td>
<td>hormiga</td>
<td>becerro</td>
<td>araña</td>
<td>mariposa</td>
</tr>
<tr>
<td>rabbit</td>
<td>cisne</td>
<td>cícueña</td>
<td>tiburón</td>
<td>conejo</td>
</tr>
<tr>
<td>swan</td>
<td>cisne</td>
<td>zorro</td>
<td>cochino</td>
<td>caimán</td>
</tr>
<tr>
<td>peacock</td>
<td>cascabel</td>
<td>oveja</td>
<td>rana</td>
<td>pavorreal</td>
</tr>
<tr>
<td>deer</td>
<td>mosca</td>
<td>cigüeña</td>
<td>venado</td>
<td>cochino</td>
</tr>
<tr>
<td>owl</td>
<td>buho</td>
<td>petirrojo</td>
<td>ardilla</td>
<td>zorro</td>
</tr>
<tr>
<td>grasshopper</td>
<td>rana</td>
<td>saltamontes</td>
<td>mariposa</td>
<td>lobo</td>
</tr>
</tbody>
</table>
11. stork
   a. pavorreal
   b. cigüeña
   c. águila
   d. oveja

12. alligator
   a. cachorro
   b. mono
   c. gusano
   d. caiman

13. calf
   a. becerro
   b. zorrillo
   c. cachorro
   d. mono

14. eagle
   a. foca
   b. venado
   c. águila
   d. becerro

15. bat
   a. cascabel
   b. murciélago
   c. ballena
   d. caimán

16. whale
   a. zorrillo
   b. ballena
   c. murciélago
   d. cascabel

17. wolf
   a. lobo
   b. araña
   c. ardilla
   d. guajolote

18. pig
   a. oso
   b. buho
   c. saltamontes
   d. cochino

19. squirrel
   a. minino
   b. pavorreal
   c. mariposa
   d. ardilla

20. fly
   a. foca
   b. mosca
   c. venado
   d. luciérnaga
Please fill out the following information:

A. What specific comments can you make about each exercise? For example: Were some questions too difficult? Was the exercise boring? Would you like to see this type of exercise in a book or workbook? What were your feelings while you were doing it?

Exercise A

Exercise B

Exercise C

Exercise D

Exercise E
B. How much do you think these exercises helped you to learn the vocabulary? Circle the numbers that indicate your opinions.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Helped a lot</th>
<th>Helped some</th>
<th>Not sure</th>
<th>Didn't help much</th>
<th>Didn't help at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>B.</td>
<td>1</td>
<td>2</td>
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<td>4</td>
<td>5</td>
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<tr>
<td>C.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>D.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
<td>E.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

C. In general, how you feel about these exercises? Circle the letters that indicate your opinion.

<table>
<thead>
<tr>
<th>The exercises are:</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Not sure</th>
<th>Disagree</th>
<th>Strongly disagree</th>
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</thead>
<tbody>
<tr>
<td>Enjoyable</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Different</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
<td>SD</td>
</tr>
<tr>
<td>Interesting</td>
<td>SA</td>
<td>A</td>
<td>N</td>
<td>D</td>
<td>SD</td>
</tr>
</tbody>
</table>

D. Considering the time it took and what you learned from doing the exercises, which exercise would you like best in a book or workbook? Which one would you like least?

I would like Exercise ____ best.
Reason?

I would like Exercise ____ least.
Reason?
PILOT TEST D

PACKET A

PLEASE DO NOT OPEN THIS PACKET UNTIL TOLD TO DO SO
These exercises are designed to learn more about different types of foreign language vocabulary practice exercises. We are asking your help in doing the exercises, in reporting the time that it takes you to complete each exercise and in giving us your opinions about the various exercises.

Thank you very much for your participation and cooperation.

First, before beginning the exercises, briefly look over the vocabulary list on the next page. You will need this vocabulary in order to complete the exercises. In addition to the vocabulary list, there is a dictionary at the end of the exercises that you may use if you need to know one of the other words in the exercises.
**VOCABULARY - ANIMALS**

(Although the term "animals" is used, in these exercises it includes birds, fish, fowl and insects.)

<table>
<thead>
<tr>
<th>SPANISH</th>
<th>ENGLISH</th>
<th>SPANISH</th>
<th>ENGLISH</th>
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<td>1 águila</td>
<td>eagle</td>
<td>21 mapache</td>
<td>raccoon</td>
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<tr>
<td>2 araña</td>
<td>spider</td>
<td>22 mariposa</td>
<td>butterfly</td>
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<tr>
<td>3 ardilla</td>
<td>squirrel</td>
<td>23 marmota</td>
<td>groundhog</td>
</tr>
<tr>
<td>4 ballena</td>
<td>whale</td>
<td>24 minino</td>
<td>kitten</td>
</tr>
<tr>
<td>5 becerro</td>
<td>calf</td>
<td>25 mono</td>
<td>monkey</td>
</tr>
<tr>
<td>6 buho</td>
<td>owl</td>
<td>26 mosca</td>
<td>fly</td>
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<tr>
<td>7 cachorro</td>
<td>puppy</td>
<td>27 murciélago</td>
<td>bat</td>
</tr>
<tr>
<td>8 caimán</td>
<td>alligator</td>
<td>28 oso</td>
<td>bear</td>
</tr>
<tr>
<td>9 cascabel</td>
<td>rattlesnake</td>
<td>29 oveja</td>
<td>sheep</td>
</tr>
<tr>
<td>10 cigüeña</td>
<td>stork</td>
<td>30 paloma</td>
<td>dove</td>
</tr>
<tr>
<td>11 cisne</td>
<td>swan</td>
<td>31 pavorreal</td>
<td>peacock</td>
</tr>
<tr>
<td>12 cochino</td>
<td>pig</td>
<td>32 petirrojo</td>
<td>robin</td>
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<tr>
<td>13 colibrí</td>
<td>hummingbird</td>
<td>33 potrillo</td>
<td>pony</td>
</tr>
<tr>
<td>14 conejo</td>
<td>rabbit</td>
<td>34 pulpo</td>
<td>octopus</td>
</tr>
<tr>
<td>15 foca</td>
<td>seal</td>
<td>35 rana</td>
<td>frog</td>
</tr>
<tr>
<td>16 guajolote</td>
<td>turkey</td>
<td>36 saltamontes</td>
<td>grasshopper</td>
</tr>
<tr>
<td>17 gusano</td>
<td>worm</td>
<td>37 tiburón</td>
<td>shark</td>
</tr>
<tr>
<td>18 hormiga</td>
<td>ant</td>
<td>38 venado</td>
<td>deer</td>
</tr>
<tr>
<td>19 lobo</td>
<td>wolf</td>
<td>39 zorrillo</td>
<td>skunk</td>
</tr>
<tr>
<td>20 luciérnaga</td>
<td>firefly</td>
<td>40 zorro</td>
<td>fox</td>
</tr>
</tbody>
</table>
EXERCISE A.

Answer the following questions by selecting answers from the vocabulary list and writing them in the spaces provided. You may write more than one answer.

Example: ¿Qué animales no tienen frío? oso, pez, reloj, miel, conejo

1. ¿Qué animales son más grandes?

2. ¿Qué animales pueden nadar?

3. ¿Qué animales son jóvenes?

4. ¿Qué animales son más importantes?

5. ¿Qué animales corren muy rápido?

6. ¿Qué animales son muy felices?

7. ¿Qué animales son peligrosos?

8. ¿Qué animales pueden vivir en la granja?

9. ¿Qué animales pueden entrar en la casa?

10. ¿Qué animales son muy pequeños?
EXERCISE B

Complete the following sentences with names of animals from the vocabulary list.

Example: _mosca, paloma, gusano_ son inocuos.

1. ________________________________ son cómicos.

2. ________________________________ son feos.

3. ________________________________ son hermosos.

4. ________________________________ son simpáticos.

5. ________________________________ son antipáticos.

6. ________________________________ son populares.

7. ________________________________ son originales.

8. ________________________________ son inteligentes.
EXERCISE C

You are a famous artist and your paintings of animals are superb. Which animals would you choose to paint for the following situations? Write your answers in the spaces provided.

Example: ¿Una pintura para una tienda de ropa?  
**colibrí, ballena, saltamontes, cajigüeña**

1. ¿Una pintura para un sello?

2. ¿Una pintura para un anuncio de la ropa?

3. ¿Una pintura para una caja de cereal?

4. ¿Una pintura para el museo de arte moderno?

5. ¿Una pintura para una revista de las ciencias?

6. ¿Una pintura para personas con enfermedades mentales?

7. ¿Una pintura para la Casa Blanca?

8. ¿Una pintura para un colegio?
EXERCISE D

What animals might be classified as FANTASTICOS (Fantastic), IMPORTANTES (Important), or RIDICULOS (Ridiculous)? Write the names of the animals under one of the classifications.

<table>
<thead>
<tr>
<th>FANTASTICOS</th>
<th>IMPORTANTES</th>
<th>RIDICULOS</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
EXERCISE E

You are helping to make a new Walt Disney movie. Which animals might you choose for the following roles?

Example: Animales que vuelan más alto que un avión.

águila, murciélagos, ardilla, luchador

1. Animales enormes de otro planeta.

2. Animales azules, anaranjados, amarillos, y rojos.

3. Animales héroes que ayudan a todo el mundo.

4. Animales que son detectives.

5. Animales que juegan al fútbol americano.

6. Animales que estudian en la escuela y son muy populares entre los estudiantes.

7. Animales del trópico que viven donde hace mucho frío y nieva mucho.

8. Animales terribles que van a comer a todos los estudiantes.

9. Animales que celebran la Navidad.

10. Animales que traen paz al mundo.

11. Animales que viven después de una guerra atómica.

12. Animales que van a robar un banco.
DICTIONARY

amarillos - yellow
americano - American; futbol americano - football
aranjados - orange
antipaticos - unlikeable, disagreeable
anuncio - ad, advertisement
arte - art
atomatica - atomic
ayudar - to help
azules - blue
banco - bank
blanca - white
caja - box
casa - house, home; Casa Blanca - White House
celebrar - to celebrate
cereal - cereal
ciencias - science
colegio - school, high school
comer - to eat
comicos - comical, funny
con - with
correr - to run
despuess - after
detectives - detectives
donde - where
enfermedades - illness
enormes - enormous, huge
entrar - to enter
entre - among
escuela - school
estudiantes - students
estudiar - to study
felices - happy
feos - ugly
frio - cold; hace mucho frio - it's very cold
futbol americano - football
grandes - big
granja - farm
guerra - war
hace mucho frio - it's very cold
hermosos - beautiful
heroes - heros
importantes - important
innocuos - innocuous, harmless
inteligentes - intelligent
jovenes - young
juegan (jugar) - to play
mas - more, most
mentales - mental
moderno - modern
mucho - much, a lot
mundo - world
museo - museum
muy - very
nadar - to swim
Navidad - Christmas
nieva - it snows
para - for
paz - peace
peligrosos - dangerous
pequeños - small
personas - people, persons
pintura - painting
planeta - planet
pueden - can, are able
que - that
¿Qué? - What?
originales - original
otro - another
rápido - fast
revista - magazine
robar - to rob
rojos - red
ropa - clothes
sello - stamp
simpáticos - nice, agreeable
terribles - terrible
tienda - store
tienen frío - are cold
todo - all:
todo el mundo - everyone
todos los - all, every
traer - to bring
trópico - tropics
van (ir) - go
vivir - to live
vuelan (volar) - to fly
PILOT TEST D

PACKET B

PLEASE DO NOT OPEN THIS PACKET UNTIL TOLD TO DO SO
RECALL

Write the Spanish vocabulary words for as many of the following as possible.

calf ______________________ frog ______________________
swan ______________________ skunk ______________________
pony ______________________ groundhog ______________________
bear ______________________ shark ______________________
peacock ____________________ seal ______________________
deer ______________________ eagle ______________________
fox ______________________ alligator ______________________
fly ______________________ ant ______________________
rabbit ______________________ pig ______________________
bat ______________________ monkey ______________________
robin ______________________ firefly ______________________
hummingbird ______________________ octopus ______________________
rattlesnake ______________________ squirrel ______________________
dove ______________________ worm ______________________
kitten ______________________ wolf ______________________
grasshopper ______________________ owl ______________________
whale ______________________ spider ______________________
turkey ______________________ butterfly ______________________
stork ______________________ puppy ______________________
sheep ______________________ raccoon ______________________
Circle the Spanish vocabulary word that correctly translates each animal listed.

1. shark
   a. foca
   b. pavorreal
   c. tiburón
   d. guajolote

6. swan
   a. cisne
   b. zorro
   c. cochino
   d. caimán

2. skunk
   a. murciélago
   b. zorrillo
   c. ballena
   d. buho

7. peacock
   a. cascabel
   b. oveja
   c. rana
   d. pavorreal

3. kitten
   a. minino
   b. gusano
   c. conejo
   d. luciérnaga

8. deer
   a. mosca
   b. cigüeña
   c. venado
   d. cochino

4. spider
   a. hormiga
   b. becerro
   c. araña
   d. mariposa

9. owl
   a. buho
   b. petirrojo
   c. ardilla
   d. zorro

5. rabbit
   a. cisne
   b. cigüeña
   c. tiburón
   d. conejo

10. grasshopper
    a. rana
    b. saltamontes
    c. mariposa
    d. lobo
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>11. stork</td>
<td>16. whale</td>
<td>a. zorrillo</td>
<td>b. ballena</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>c. murciélago</td>
</tr>
<tr>
<td>a. pavorreal</td>
<td></td>
<td></td>
<td>d. cascabel</td>
</tr>
<tr>
<td>b. cigüeña</td>
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<td></td>
<td></td>
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<tr>
<td>c. águila</td>
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<tr>
<td>d. oveja</td>
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<td>12. alligator</td>
<td>17. wolf</td>
<td>a. lobo</td>
<td>b. araña</td>
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<td></td>
<td></td>
<td>c. ardilla</td>
<td>d. guajolote</td>
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<tr>
<td>a. cachorro</td>
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<tr>
<td>b. mono</td>
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<td></td>
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<tr>
<td>c. gusano</td>
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<tr>
<td>d. caimán</td>
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<td>13. calf</td>
<td>18. pig</td>
<td>a. oso</td>
<td>b. buho</td>
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<td>c. saltamontes</td>
<td>d. cochino</td>
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<tr>
<td>a. becerro</td>
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<tr>
<td>b. zorrillo</td>
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<td>c. cachorro</td>
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<td>d. mono</td>
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<tr>
<td>14. eagle</td>
<td>19. squirrel</td>
<td>a. minino</td>
<td>b. pavorreal</td>
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<td></td>
<td></td>
<td>c. mariposa</td>
<td>d. ardilla</td>
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<td>a. foca</td>
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<td>b. venado</td>
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<td>c. águila</td>
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<td>d. becerro</td>
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<td>15. bat</td>
<td>20. fly</td>
<td>a. foca</td>
<td>b. mosca</td>
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<td></td>
<td></td>
<td>c. venado</td>
<td>d. luciérnaga</td>
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<tr>
<td>a. cascabel</td>
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<tr>
<td>b. murciélago</td>
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<td>c. ballena</td>
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<tr>
<td>d. caimán</td>
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</table>
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A. What specific comments can you make about each exercise? For example: Were some questions too difficult? Was the exercise boring? Would you like to see this type of exercise in a book or workbook? What were your feelings while you were doing it?

Exercise A

Exercise B

Exercise C

Exercise D

Exercise E
B. How much do you think these exercises helped you to learn the vocabulary? Circle the numbers that indicate your opinions.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Helped a lot</th>
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</tr>
<tr>
<td>B.</td>
<td>1</td>
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<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>C.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
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<tr>
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C. In general, how you feel about these exercises? Circle the letters that indicate your opinion.

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D. Considering the time it took and what you learned from doing the exercises, which exercise would you like best in a book or workbook? Which one would you like least?

I would like Exercise ____ best.
Reason?

I would like Exercise ____ least.
Reason?
APPENDIX E

Correlations of IQ and creativity (CR) scores

Correlations by standard scores:

- IQ $X = 100$, SD = 15
- CR $X = 100$, SD = 20

$n = 102$, $r = .07$

Low/High groups divided at median:

- Low IQ subjects $n = 47$, $r = .05$
- High IQ subjects $n = 55$, $r = -.07$
- Low CR subjects $n = 53$, $r = .19$
- High CR subjects $n = 49$, $r = -.01$

Correlation by subject means:

- IQ $X = 119$, SD = 13.5
- CR $X = 103$, SD = 18

$n = 102$, $r = .08$

Low/High groups divided at mean:

- Low IQ subjects $n = 53$, $r = .20$
- High IQ subjects $n = 49$, $r = .06$
- Low CR subjects $n = 57$, $r = .23$
- High CR subjects $n = 45$, $r = .13$
APPENDIX F

Subject data

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<td>IQ</td>
<td>IQ%</td>
<td>CR</td>
<td>CR%</td>
<td>Groups</td>
<td>Score</td>
</tr>
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<td>-----</td>
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<tr>
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<td>84</td>
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<td>LI/LC/D</td>
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<td>95</td>
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<td>126</td>
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<td>HI/HC/C</td>
<td>9</td>
</tr>
<tr>
<td>96</td>
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<td>76</td>
<td>93</td>
<td>29</td>
<td>HI/LC/D</td>
<td>5</td>
</tr>
<tr>
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<td>99</td>
<td>5</td>
<td>68</td>
<td>1</td>
<td>LI/LC/D</td>
<td>6</td>
</tr>
<tr>
<td>98</td>
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<td>83</td>
<td>121</td>
<td>78</td>
<td>HI/HC/C</td>
<td>5</td>
</tr>
<tr>
<td>99</td>
<td>137</td>
<td>89</td>
<td>113</td>
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<td>14</td>
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<tr>
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<td>97</td>
<td>39</td>
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<td>11</td>
</tr>
<tr>
<td>102</td>
<td>125</td>
<td>68</td>
<td>100</td>
<td>48</td>
<td>HI/LC/D</td>
<td>10</td>
</tr>
</tbody>
</table>

IQ: Otis Lennon School Ability Test Form S

\[ \bar{X} = 100 \quad \text{SD} = 15 \]

CR: Torrance Tests of Creative Thinking Verbal Form A

\[ \bar{X} = 100 \quad \text{SD} = 20 \]

% Percentiles reported by scoring services

HI High Intelligence group above median of 115.8

LI Low Intelligence group below median of 115.8

HC High Creative group above median of 101

LC Low Creative group below median of 101

C Convergent practice treatment group

D Divergent practice treatment group
**APPENDIX G**

**Scoring guidelines**

The following errors should be discounted:

<table>
<thead>
<tr>
<th>Error</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plural endings</td>
<td>osos, moscas</td>
</tr>
<tr>
<td>Substitution of masculine and feminine endings</td>
<td>coneja, balleno</td>
</tr>
<tr>
<td>Punctuation</td>
<td>arana, aguila, caiman</td>
</tr>
<tr>
<td>Substitution of single letters for double letters</td>
<td>zorillo, ardila</td>
</tr>
<tr>
<td>Substitution of double letters for single letters</td>
<td>minnino, gussano</td>
</tr>
<tr>
<td>Substitution of another vowel for &quot;uh&quot; sound</td>
<td>cascabell</td>
</tr>
<tr>
<td>Substitution of j for h.</td>
<td>bujo</td>
</tr>
<tr>
<td>Substitution of ñ for ñ.</td>
<td>paharo, coneho</td>
</tr>
<tr>
<td>Substitution of sc or zc for s.</td>
<td>bescerro, luzciernaga</td>
</tr>
<tr>
<td>Substitution of tch for ch.</td>
<td>mapatche</td>
</tr>
<tr>
<td>Substitution of e for i.</td>
<td>ceguena, mareposa</td>
</tr>
<tr>
<td>Substitution of b for v.</td>
<td>benado, obeja</td>
</tr>
<tr>
<td>Substitution of v for b other than as first letter.</td>
<td>cascavel</td>
</tr>
<tr>
<td>Omission of h.</td>
<td>ormiga, buo</td>
</tr>
</tbody>
</table>

In addition, for words of more than four letters, any one other error may be discounted.

The following errors should be counted:

A switch of two letters will be counted as one error.

Omission of a letter other than h will be counted as an error.

Addition of a letter or letters will be counted as an error noting the above exceptions.

Examples of words that may be counted correct:

| Examples | mormotta, ormeega, getтирroja, collibre |


APPENDIX H

Summary of student evaluations of practice exercises

Exercise liked best (Percent of those responding)

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convergent n = 53</td>
<td>34</td>
<td>9</td>
<td>26</td>
<td>26</td>
<td>4</td>
</tr>
<tr>
<td>Divergent n = 47</td>
<td>19</td>
<td>17</td>
<td>15</td>
<td>19</td>
<td>30</td>
</tr>
</tbody>
</table>

Exercise liked least (Percent of those responding)

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convergent n = 53</td>
<td>11</td>
<td>21</td>
<td>6</td>
<td>17</td>
<td>45</td>
</tr>
<tr>
<td>Divergent n = 45</td>
<td>20</td>
<td>13</td>
<td>20</td>
<td>29</td>
<td>18</td>
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</tbody>
</table>

Summary of grades assigned to exercises

<table>
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<tr>
<th></th>
<th>A = 5</th>
<th>B = 4</th>
<th>C = 3</th>
<th>D = 2</th>
<th>E = 1</th>
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</thead>
<tbody>
<tr>
<td>Convergent</td>
<td>3.6</td>
<td>3.3</td>
<td>3.5</td>
<td>3.3</td>
<td>2.4</td>
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<tr>
<td>Divergent</td>
<td>3.0</td>
<td>2.8</td>
<td>2.8</td>
<td>2.8</td>
<td>3.2</td>
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Aliotti, Nicholas C. Educational Stimulation, Creativity, Intelligence and School Readiness in Young Children. 1976. [EDRS: ED 175 542].


Bjerstedt, Ake. Explorations in Creativity. 1976 [EDRS: ED 1411 397].


. Can We Teach Children To Think Creatively? 1972. [EDRS: ED 061 544].


