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ABSTRACT
The experiments discussed in this report are designed to explore the relationship between language and thought and implications for foreign language learning. Three basic issues are considered: whether or not thought and language are sufficiently distinct to require separate attention and planning as distinct factors in language teaching; the role of thought in foreign language performance; and means of introducing thought into language teaching, with an experimental check on its effect on learning and motivation. Five experiments are described along with their results, and the conclusions are reviewed. Thought and language are considered distinct; thought is central in language in maintaining unity, continuity, and relevance; and language is a symbolic system used to refer to thought. Findings on memory and recall are also presented. Examples from the experiments and a bibliography are provided. (Author/VM)

FINAL REPORT

Contract No. OEC-0-70-1626

The Relationship of Thought and Memory in Linguistic Performance: 'Thought' Exercises in Foreign Language Teaching

A series of experiments to test five hypotheses of the role of thought and immediate and recall memory in linguistic performance and translation and the effect of 'thought' exercises on learning and motivation in foreign language teaching.

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Theodore V. Higgs, Research Associate
Joseph Edgerton, Psychometrist

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1. THE PROBLEM

One of the major difficulties in foreign language teaching and learning is to develop effective use of the language once rules and/or patterns have been mastered in the basic course. The research on Massive Vocabulary Expansion (MVE, Project No. 5-1095, Grant No. OE-6-14-021) dealt with the problem of lexical competence on the recognition level in reading, where large increases in vocabulary are necessary.

Effective use, however, includes performance in speaking, listening and writing as well. And it is becoming increasingly clear that full mastery is not achieved by the manipulation of the structure of the language alone, whether on a pattern model or a generative transformational one.

The experience and findings of the MVE research suggested that the internal relation of language to thought may be as important as manipulation of the language itself. The neglect of this additional dimension might explain in part the indecisive results obtained in experiments on language teaching and the loss of student motivation in intermediate and advanced language courses, where the mortality of enrollments is very severe.

The problems that the current series of experiments explored were (1) whether or not thought and language were sufficiently distinct to require separate attention and planning as distinct factors in language teaching, (2) the role of thought in foreign language performance, and (3) means of introducing thought into language teaching, with an experimental check on its effect on learning and motivation.

After reviewing key points of view on the relation of language and thought, and in the absence of a satisfactory theory to explain the problems outlined, a series of hypotheses were formulated to the effect that (A) thought and language were distinct, (B) that memory operated differently for language and thought, a difference that provided a promising research strategy for the experimental study of the relations of thought and language in performance, and (C) that in performance the central role was played by thought. If these hypotheses were to be sustained by the experiments, a major implication for foreign language teaching would be the need to develop various types of "thought" exercises to be added to teaching materials, on the hypothesis (D) that such exercises will contribute significantly to effective use of the language. The experimental testing of the effect of such exercises on learning and motivation was thus included in the series of experiments.

Pilot experiments had been conducted on several of the crucial questions, and public discussion of the hypotheses had been held with encouraging results and reactions. It was then urgent that a series of controlled experiments be conducted to either confirm or deny the hypotheses, or to modify them.

2. SELECTED KEY POSITIONS ON THE ROLES OF LANGUAGE AND THOUGHT

Among the key positions on the relation of language and thought, the views of Saussure and Bloomfield contrast sharply and had to be considered. Whorf's hypotheses (1941) were of obvious interest, and Chomsky and his notion of generative transformational grammar in the context of typical language use was relevent. After noting the limits of these systems, a "thought" view was outlined as a basis for the questions raised preceding the experiments.

SAUSSURE

Three relevant aspects of Saussure's view on language and thought as gleaned from the Course in General Linguistics (1915, translation 1959) are the process of language in use, the signifier-signified distinction, and his notion of language versus thought.

With regard to the process of language in use, Saussure says:

> "Suppose that two people, A and B, are conversing with each other:
>
> "Suppose that the opening of the circuit is in A's brain, where mental facts (concepts) are associated with representations of the linguistic sounds (sound-images) that are used for their expression. A given concept unlocks a corresponding sound-image in the brain; this purely psychological phenomenon is followed in turn by a physiological process: the brain transmits an impulse producing sounds. Then the sound waves travel from the mouth of A to the ear of B: a purely physical process. Next, the circuit continues in B, but the order is reversed." (p.11-12)

With regard to the signifier-signified distinction in language, he says:

> "It is a system of signs in which the only essential thing is the union of meanings and sound-images, and in which both parts of the sign are psychological." (p. 15)

For Saussure the concept is the signified, and the sound-image the signifier.

With regard to thought and language he says:

> "Psychologically our thought--apart from its expression in words--is only a shapeless and indistinct mass. Philosophers and linguists have always agreed in recognizing that without the help of signs we would be unable to make a clear-cut, consistent distinction between two ideas. Without language, thought is a vague, uncharted nebula. There are no pre-existing ideas, and nothing is distinct before the appearance of language." (p.111-112)

This view can be challenged today on the basis of the research of cognitive psychologists such as Bruner (1967) and on the basis of inferences shown below.

BLOOMFIELD

It is not easy to summarize pertinent aspects of Bloomfield's view of language and thought in Language (1933) because of the nature of the problem and because of possible internal inconsistencies in the book itself. With regard to the process of language use he says:

> "2.2 Suppose that Jack and Jill are walking down a lane. Jill is hungry. She sees an apple in a tree. She makes a noise with her larnyx, tongue, and lips. Jack vaults the fence, climbs the tree, takes the apple, brings it to Jill, and places it in her hand. Jill eats the apple.
>
> "This succession of events could be studied in many ways, but we who are studying language, will naturally distinguish between the act of speech and the other occurrences, which we shall call practical events. Viewed in this way, the incident consists of three parts, in order of time:
>
> "A. Practical events preceding the act of speech.
> "B. Speech.
> "C. Practical events following the act of speech.
>
> "We shall examine first the practical events, A and C. The events in A concern mainly the speaker, Jill. She is hungry; that is, some of her muscles were contracting, and some fluids were being secreted especially in her stomach. Perhaps she was also thirsty; her tongue and throat were dry. The light waves reflected from the red apple struck her eyes. (p.22-23)

" ..Accordingly, we say that speech-utterance, trivial and unimportant in itself, is important because it has a meaning: the meaning consists of the important things with which the speech-utterance (B) is connected namely with the practical events (A and C)." (p. 27)

Bloomfield distinguishes between mentalists and mechanists in the study of language. The mentalist defines the meaning of a linguistic form as the characteristic mental event which occurs in every speaker and hearer in connection with the utterance. The speaker who utters the word apple has had a mental image of an apple. For the mentalist, language is the expression of ideas, feelings, or volitions.

"The mechanist does not accept this solution. He believes that mental images, feelings, and the like are merely popular terms for various bodily movements....")p. 142)

Bloomfield considered himself a mechanist, and dealt with language as forms. His effort was to study language as physical phenomena. Thought is far removed from this view.

WHORF

Whorf (1941), highlighting the influence of SAE (Standard Average European) and Hopi on the thought of its speakers, implies a distinction between his "Linguistic Meaning, residing in the name or the linguistic description commonly applied to the situation" and "the habitual thought worlds of SAE and Hopi speakers."

"By 'habitual thought' and 'thought world' I mean more than simply language, i.e. than the linguistic patterns themselves. I include all the analogical and suggestive value of the patterns (e.g., our 'imaginary space' and its distant implications), and all the give-and-take between language and the culture as a whole, wherein is a vast amount that is not linguistic but yet shows the shaping influence of language. In brief, this 'thought world' is the microcosm that each man carries about within himself, by which he measures and understands what he can of the macrocosm." (In Carroll 1956, p. 147)

Obviously his term "habitual thought" implies a non-habitual thought also. His "linguistic meaning" refers to the content side of language. His habitual thought world plus the

implied non-habitual thought world are included in the "thought" view of language use.

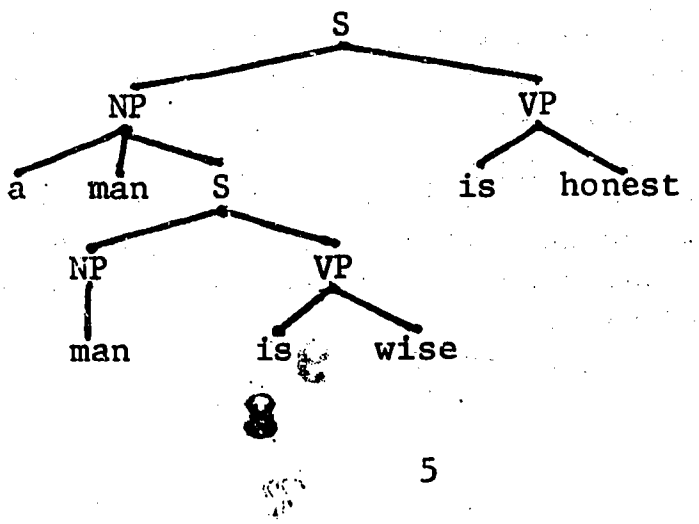
But Whorf was trying to show the influence of language on certain habits of thought - an interesting problem in its own right - and not on the relation between thought - habitual and creative - and language in actual performance.

CHOMSKY

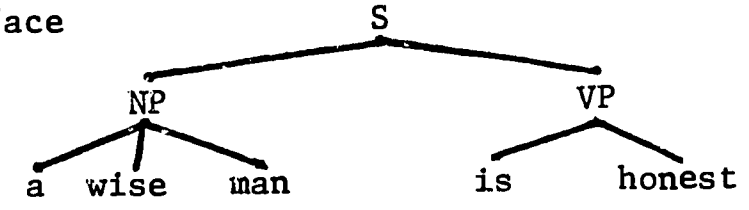
In the post Bloomfieldian scene when form and the empirical study of language dominated the stage, Chomsky argued convincingly that language could not be explained adequately via taxonomy of forms alone. He re-introduced rationalism.

> "I believe that the most appropriate general framework for the study of problems of language and mind is the system of ideas developed as part of the rationalist psychology of the seventeenth and eighteenth centuries, elaborated in important respects by the romantics and then largely forgotten as attention shifted to other matters. According to this traditional conception, a system of propositions expressing the meaning of a sentence is produced in the mind as the sentence is realized as a physical signal, the two being related by certain formal operations that, in current terminology, we may call grammatical transformations. Continuing with current terminology, we can thus distinguish the surface structure of the sentence, the organization into categories and phrases that is directly associated with the physical signal, from the underlying deep structure, also a system of categories and phrases, but with a more abstract character. Thus, the surface structure of the sentence "A wise man is honest" might analyze it into the subject A wise man" and the predicate "is honest." The deep structure, however, will be rather different ..." (P.25)

Deep



Surface



(P. 25-26)

"How are the deep and surface structures related? Clearly, in the simple example given we can form the surface structure from the deep structure by performing such operations as the following:

"a. assign the marker wh- to the most deeply embedded NP, "man"
"b. replace the NP so marked by "who"
"c. delete "who is"
"d. invert "man" and "wise" (P. 26)

As we consider the example above, it appears that the explanation is more complicated than the phenomenon explained. Further, children learn to use the adjective-noun construction before they use the full sentence construction. Also, the speaker does not seem to go through the mental steps of deriving the adjective construction every time he uses it, etc.

Chomsky, of course, does not say that speakers generate sentences in this way. He is talking about competence, not performance. He is explaining within a formalized system how he can explain these constructions as deriving from underlying deep structures (how they can be 'generated.') To quote him:

"We have now discussed a certain model of competence. It would be tempting, but quite absurd, to regard it as a model of performance as well. Thus we might propose that to produce a sentence, the speaker goes through the successive steps of constructing a base-derivation, line by line from the initial symbols, then inserting lexical items and applying grammatical transformations to form a surface structure, and finally applying the phonological rules in their given order, in accordance with the cyclic principle discussed earlier. There is not the slightest justification for any such assumption. In fact, in implying that the speaker selects the general properties of sentence structure before selecting lexical items (before deciding what to talk about), such a proposal seems not only without justification but entirely counter to whatever vague intuitions one may have about the processes that underlie production." (in Lenneberg 1967, p. 436-437)

3. THE THOUGHT HYPOTHESES

Under competence, then, Chomsky is attemp ing to account for (to explain) all the different constructio of a languag and of language in general. He hopefully can this with an extended formalized treatment of each set of r les without regard to time and speed, length and memory, a non-linguistic thought. In typical language use (performance) which is central to psycholinguistics and language teach ng and learning, all five are involved.

In order to deal with linguistic performan e we need the following hypotheses that go beyond Chomsky s view of competence. (1) Thought and language are disti ct and they are both involved in performance. (2) In perfo nance, though is central and a language is a symbolic system at refers to it in a variety of ways. (3) Immediate memory nctions well with language utterances and texts up to a limi d length of utterance and of time; long term memory functio with ideas, identifications, relations, feelings, etc. that are here called thought.

This third hypothesis supports (1) and (2) by inference, since if it can be shown that memory processes anguage and thought differently it follows that they must b distinct and autonomous, and further that if subjects cannot recall utterances beyond the capacity of immediate memory it will follow that whatever is remembered beyond the capacity of i mediate recall must be something other than language utterance , which we have called thought.

(4) If immediate memory works with though then translation will show greater interference across la uages than delayed recall. (5) If relating thought and l guage simultaneously at normal speed and under normal thou t density consitutes performance, then exercises that inv ve such performance should increase learning and motiva on in foreign language teaching.

With regard to the first hypothesis, that t ought and language are distinct and are both involved in p rformance, there are a number of arguments that seem to sup ort it.

(i) Thought is multidimensional; it may en ompass simultaneously space, movement, color, sound, to ch, smell, subjectivity (I, you, he, etc.). Language is li ear; one thing must follow the other. When one thinks of a particular house, the thought can include size, color, mate ial, style,

age, ownership, etc. simultaneously. In talking about it, one has to refer to each of these features separately and report them in separate words that must follow one upon another.

(ii) Thought does not seem to originate fully encoded in the words, phrases, and sentences of a particular language. The following quotation from Vygotsky (1962) clarifies this point and supports (i) as well.

> "Thought, unlike speech, does not consist of separate units. When I wish to communicate the thought that today I saw a barefoot boy in a blue shirt running down the street, I do not see every item separately: the boy, the shirt, its blue color, his running, the absence of shoes. I conceive of all this in one thought, but I put it into separate words. A speaker often takes several minutes to disclose one thought. In his mind the whole thought is present at once, but in speech it has to be developed successively." (p. 150)

(iii) Thought does not seem to occur typically in single sentences. It is only when we refer to thought via a particular language that we must divide it up into sentences. And to refer to typical thought complexes we need series of sentences rather than isolated sentences.

(iv) There are observable differences in the time it takes to think through a state of affairs, to solve a puzzle, to understand a mechanical problem, etc. and the time it takes to explain the solution in a connected oral or written report. Although presumably one could use inner speech at a rapid rate, the observable differences in time between thinking and verbal report seem more dramatic than this explanation could convincingly account for, and intuitively one does not have the notion that inner speech is the only thought involved. The notion one has is one of insight. Lado conducted a pilot experiment in which Ss were shown a traffic pattern from a road sign and were asked to nod when they understood it. They were then asked to explain what they had understood. The verbal report took longer than the study time.

(v) There are observable differences between errors of thought, i.e. things or operations that Ss understand incorrectly, and errors of verbal report: those that they understand correctly but report incorrectly. Their correct understanding can be demonstrated by actions, e.g. they can be asked to operate a machine, give the solution to a problem, etc. Yet the verbal report if followed literally might lead to an incorrect operation or solution. Examples of these differences are abundant with present day office and domestic machines and gadgets.

(vi) There are several types of thought that develop prior to language and are therefore possible without language. Bruner, et al., (1967) demonstrated the development of enactive and iconic thought before language, and independent of it. Enactive thought permits a child to do something in a different way without being told or shown. Iconic thought permits a child to solve design problems without access to language. The two types of thought are used by adults as well, but the demonstration of their independence of language is clearer in developmental terms.

There are actually many other types of thought that are not bound to verbalization; for example, quantitative thought, musical thought, thinking involving perceptions of the sense of smell, thinking concerning shape or texture such as a blind person does, etc.

(vii) Thinking of the deaf. Hans Furth (1966) has demonstrated that deaf Ss can think in ways that are similar to those of hearing subjects.

> "It has been shown that the intelligence of linguistically deprived deaf persons in development and maturity seems not basically different from that of the hearing...." (p. 168)

> "At this point in our inquiry, we are actually no longer asking whether it is possible to think logically without enjoying linguistic competence. We know that it is possible with a degree of certitude that we would not dare assert if empirical observation of deaf persons had not provided a natural experiment crucis." (p.169)

(viii) The developmental argument. It is generally accepted that the normal child goes through a prelinguistic phase in the development of thought and a pre-intellectual phase in the development of speech. At about the age of two the development of thought and speech meet and form the onset of language behavior. From this age through six the child uses language both egocentrically and for communication. At about age six the egocentric use of language becomes fully socialized according to Piaget and it becomes inner speech and a tool for thinking according to Vygotsky (cf. Vygotsky, 1962 pp. 41-44).

In support of hypothesis (1) one can say that thinking without language should be expected to continue after this age since it would be atypical in biological terms to have this capacity develop to a point and then disappear. The expectation is that thinking without language continues to

develop and that language - both form and meaning - becomes an autonomous symbolic system that we use in various ways to refer to thought. To be sure, language provides experience for thought, but thought and language would seem to have autonomous trajectories in developmental terms. Piaget states that the symbolic function is the basis of thought and that language is only a particular form of this function (1968 pp. 90-92).

4. EXPERIMENTS

Five experiments were conducted in this series. The first two tested hypothesis (3) directly, and hypotheses (1) and (2) by inference. Hypothesis (3) stated that utterances and texts are held under immediate memory up to a limited length of time, whereas under long term memory what is recalled is thought rather than verbatim text. This gives us an experimental wedge by which we can test some relations between thought and language through the experimental comparison of immediate recall and delayed recall of texts versus ideas.

By comparing immediate recall and long term recall for both text and thought we were able to test by inference hypothesis (1), that language and thought are distinct, and also hypothesis (2), that thought is central in linguistic performance. All the arguments adduced in support of hypothesis (1) remained speculative, except perhaps Furth's study of deaf subjects, and since the question had not been answered adequately by Saussure, Bloomfield, Whorf or Chomsky it seemed necessary to put it to an experimental test through Experiment One.

Once we can accept the distinction between thought and language and their involvement in linguistic performance, the further hypothesis, that of the two, thought is the more central and language is a symbolic system that we use to refer in various ways to thought, becomes crucial. By "more central" is meant that thought provides the continuity and congruence of any connected series of sentences in the normal use of the language beyond the triviality of greetings, memorized texts, platitudes about the weather, etc. Again this requires experimental evidence since thought as such is not directly observable, and is not always accessible or obvious even through introspection.

Experiment One measured both amount of text and amount of thought content remembered immediately and after 48 hours. It was predicted according to hypothesis (3) that as segments of the text increased in length the Ss would remember less of the text. Similarly, after a delay of 48 hours the amount of text

that the Ss would recall would decrease even further. Simultaneously, it was predicted that the amount of thought content remembered would not show the same decrement under the same conditions.

This experiment used a dictation technique by which different groups of subjects heard the same text with an increasing number of words per segment and were asked to reproduce it immediately and 48 hours later. The inference was that if Ss could not remember the words of the text, yet if they remembered the thought content as predicted, they must remember in something other than text, i.e. they must remember in thought itself. And if they remember in thought terms, their thinking must have been in those terms as they were exposed to the text, since no other source was available.

Experiment Two was a variation of Experiment One and was also designed to investigate hypothesis (3) directly and hypotheses (1) and (2) by inference. The principal difference was that in Experiment Two the Ss generated their own text after studying a picture stimulus. This was designed to eliminate the possibility that the failure to recall verbatim text might have been due to the fact that the style of the text was not the student's own.

The prediction again was that Ss would not be able to recall the actual text even though it was their own, while they would recall the thought content. Testing the delayed recall of text and thought content followed the same procedures described in Experiment One.

Experiment Three tested hypothesis (4), that translation will show greater interference across languages than will delayed recall if it is true that immediate memory handles short texts and utterances, and long term memory does not, but retains thought instead. The experimental design was a simple one: one group of Ss were given a text to be translated immediately into English. Another group were given the same text to study for a brief period and an hour later were asked to recall the text and its content in English. The English rendition of both groups was scored for non-English elements which could be assumed to have resulted from interference of the source language. It was predicted that the immediate translation group would show greater evidence of interference. In two pilot experiments, one from English to Spanish and the other from French to English, the evidence seemed to support the hypothesis.

Experiment Four compared production in the foreign language using pictures as stimulus with production from thought content originally obtained from a text in the source language. The recall from the source language was divided into recall after one hour, recall after one day, and recall after two days. The purpose was to discover when, if ever, the recall group would show no greater interference from the source language than the picture group. If such an equalization were reached, it would be possible to use the recall technique from the source language for the thought content of language teaching, thus expanding greatly the types and complexities of the thought exercises that could be used effectively in foreign language teaching.

The fifth and last experiment attempted to test hypothesis (5), that if relating thought and language simultaniously at normal speed and under normal thought density constitutes performance, then exercises that involve such performance should increase learning and motivation in foreign language teaching. Two groups were taught specific linguistic problems by a pattern practice/cognitive approach. One of the groups was given in addition thought exercises on the same specific linguistic problems. The latter group constituted the control group and was taught entirely by the pattern practice/cognitive techniques without moving on to thought exercises.

To sum up, the series of experiments was designed to test two basic hypotheses concerning the distinction of thought and language and the central function of thought in linguistic performance as a basis from which three corollaries of practical application to language teaching could be derived and tested, namely (1) the use of delayed recall across languages as a rich source of thought for production practice without the undesirable negative transfer of translation, (2) the recall time delay necessary to decrease negative transfer to no more than that occurring with pictures as stimuli, and (3) the predicted favorable effect of thought exercises on amount of learning and on motivation. The results, as shown below favored the theoretical hypotheses and confirmed or exceeded expectations in the third and fourth experiments, and proved inconclusive in the fifth, which would require a longitudinal study for more significant results.

EXPERIMENT ONE: Amount of text and amount of thought content remembered both immediately and after 48 hours.

OBJECTIVE: To test the hypothesis that (1) Thought and language are distinct, and both are involved in performance, (2) Thought is central and language is a symbolic system that

refers in various ways to it, (3) Immediate memory operates with short texts and utterances, and long term memory does not retain texts but retains thought content.

SUBJECTS: Eighty Ss were selected from a college population of undergraduate and graduate students. Sex and age were not factors in this selection. Eight experimental groups were formed, and Ss were matched by using Horton's Adaptation of Part V of the Modern Language Aptitude Test to ensure minimum variability in memory span among the groups.

MATERIALS: Tapes were made of a two hundred word text with dictation units of 5, 10, 20, 40, 100, and 200 words. Two other tapes were recorded, one using the grammatical phrases of text as the dictation unit, the other using sentences. Use of a single master tape recording eliminated differences in intonation and speed. The experiment was administered in a language laboratory. Ss heard the text through earphones in order to reduce interference from other groups and extraneous noise.

PROCEDURES: The Ss were divided into eight groups of 10 Ss each, corresponding to the different dictation units. Each S, seated in a separate booth, listened to the following instructions on tape:

> Instructions for Group _____: The passage in English which you will hear contains exactly 200 words. It will be dictated to you in groups of _____ words each. You are asked to write the passage from dictation as well as you can, writing only during the pauses between groups. There is enough time allowed for writing after each group of words. Your score will be determined by the number of words you reproduce exactly. You will not be scored either right or wrong on punctuation or spelling. Please do not use abbreviations. The passage will not be repeated.

When the dictation phase of the experiment was finished, there was an instruction on the tape to 'Please stop writing now'. The dictation papers were then collected, and a second set of papers was distributed. The instructions for the second phase, recorded on the tape were:

> You are now asked to write the same text as well as you can in your own words. The score on this second part will be determined by the amount of content that you remember. That is, by the number of thoughts that you write down even though these thoughts may be in a sequence different from that of the original text. You will have ten minutes to write. Please begin now.

Approximately 48 hours later, the Ss again reported, and were given the following instructions verbally for the third phase of the experiment:

> You are asked to write as well as you can the passage which you heard on (Monday). You will be given two scores: one score for the actual number of words of the original text that you reproduce, and the second for the amount of content, i.e. the number of thoughts that you remember, even if they are expressed in your own words or in a sequence different from that of the text. You have ten minutes to complete this task. Please begin writing now.

At the end of ten minutes, the papers were collected, and the Ss were asked not to talk about the experiment with any of their friends.

RESULTS: Three sets of data were obtained from the Experiment: (a) Phase I-A, transcriptions, (b) Phase I-B, paraphrases, and (c) Phase II, delayed recall transcription-paraphrases. The I-A transcriptions were scored for accuracy of textual recall. Scoring by two experimenters (Es) for the text gave credit for any sequence of two words identical to the original text. The score was expressed in terms of the percentage of all possibilities correct. Scoring was done by each E independently to avoid possible E bias, and was then crosschecked by the other E for possible errors.

Phase I-B papers were scored for accuracy of thought recall. A list of possible thoughts compiled as minimal content units was compiled through agreement of the Es. A total of 17 content units was agreed upon. The papers were then scored in terms of the percentage of these thoughts which were correctly recalled. Each thought was counted only once. Each paper was scored by two Es working together in an attempt to eliminate variance due to independent scoring.

Phase II papers were scored for both text and thought, according to the criteria already described. The mean percentage of thought and text for each phase are presented in Table 1.

To perform the necessary statistical tests on these data, the Arcsin Transformation ($\phi=2 \arcsin\sqrt{X}$) was used to convert the percentage scores to a normal distribution. Using the transformed data, three statistical tests were performed.

(1) To test the prediction that the percentage of text recalled in group 7 (phrases) in Phase I-A would exceed the percentage of text recalled in group 8 (sentences), a t-test for uncorrelated data was computed between groups 7 and 8. A t-value of 10.62 was obtained, which was significant at the .0005 level.

(2) To test the prediction that in Phase I-A groups 1 (five words) and 2 (10 words) would recall a higher percentage of text than groups 3 through 6 (respectively 20, 40, 100, and 200 words), a t-test for uncorrelated data was computed between the combined data of groups 1 and 2 and combined data of groups 3 through 6 in Phase I-A (text). The t-value obtained was 14.05, which was also significant at the .0005 level.

(3) To test the prediction that in Phase II a higher percentage of thought than text would be recalled, a t-test for correlated data was computed between the text data and the thought data of Phase II, utilizing the data from all the groups. The obtained t-value was 21.08, which was significant at the .0005 level.

Table 1: Mean Percentages of Thought and Text Recalled by Each Group

	Group	I-A	I-B	II thought	II text
1	(5-word)	97.50	46.61	36.58	5.90
2	(10-word)	92.05	38.35	37.17	6.70
3	(20-word)	56.05	43.07	42.48	7.00
4	(40-word)	24.55	41.89	40.71	6.55
5	(100-word)	10.45	21.24	23.60	4.40
6	(200-word)	12.85	28.91	24.19	5.05
7	(Phrases)	99.15	38.94	39.53	5.20
8	(Sentences)	61.25	39.53	41.30	8.25

Rank-order correlation coefficients were calculated for all groups between the following scores: (a) Horton's Adaptation of Part V of the Modern Language Aptitude Test (HAMLAT) and Phase I-A, (b) HAMLAT and Phase I-B, (c) HAMLAT and Phase II-Thought, (d) HAMLAT and Phase II-Text, (e) Phase I-A and Phase I-B, (f) Phase I-A and Phase II-Thought, (g) Phase I-A and Phase II-text, (h) Phase I-B and Phase II-thought, (i) Phase I-B and Phase II-text, and (j) Phase II-Thought and Phase II-text. These correlation coefficients are shown in Table 2.

Table 2

Correlations for Experiment 1

	Group 1	2	3	4	5	6	7	8
P x IA	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
P x IB	.673*	n.s.	n.s.	n.s.	n.s.	n.s.	.691*	n.s.
P x II tho	.839**	.817*	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
P x II te	.827**	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
IA x IB	.785*	n.s.	n.s.	.771*	n.s.	n.s.	n.s.	.736*
IA x II tho	.761*	n.s.	n.s.	.762*	n.s.	n.s.	n.s.	n.s.
IA x II te	.706*	n.s.	n.s.	.887**	n.s.	n.s.	n.s.	n.s.
IB x II tho	.958**	.867**	n.s.	.879**	n.s.	.862**	.894**	.809**
IB x II te	.879**	n.s.	n.s.	.871**	n.s.	n.s.	n.s.	.673*
II tho x II te	.939**	n.s.	.879**	.962**	n.s.	n.s.	n.s.	n.s.

P(.05) = *
P(.01) = **

For Group 1, correlations between HAMLAT and Phase II-Thought, HAMLAT and Phase II-Text, Phase I-B and Phase II-Thought, Phase I-B and Phase II-Text, Phase II-Thought and Phase II-Text were significant at the .01 level, while correlations between HAMLAT and Phase I-B, Phase I-A and Phase I-B, Phase I-A and Phase II-Thought, Phase I-A and Phase II-Text were significant at the .05 level. In Group 2 a correlation between Phase I-B and Phase II-Thought was significant at the .01 level, and a correlation between HAMLAT and Phase II-Thought was significant at the .05 level. There was one correlation in Group 3 (Phase II-Thought and Phase II-Text) which was significant at the .01 level. In group 4 correlations were significant at the .01 level between Phase I-A and Phase II-Text, Phase I-B and Phase II-Thought, Phase I-B and Phase II-Text, and Phase II-Thought and Phase II-Text; other correlations were significant at the .05 level between Phase I-A and Phase I-B, and Phase I-A and Phase II-Thought. For Group 5 there were no significant correlations. Group 6 had one correlation significant at the .01 level (Phase I-B and Phase II-Thought). In Group 7 one correlation was significant at the .01 level between Phase I-B and Phase II-Thought, and another correlation was significant at the .05 level between HAMLAT and Phase I-B. Group 8 had one correlation which was significant at the .01 level between Phase I-B and Phase II-Thought; there were two correlations significant at the .05 level between (Phase I-A and Phase I-B and between Pyase I-B and Phase II-Text). It might have been predicted that there would be significant correlations between the percentage of text recalled and percentage of thought recalled for both Phase I and Phase II, between the HAMLAT score and percentage of text recalled, and between the HAMLAT scores and percentage of thought recalled in both phases. The correlations shown in Table 2 tend to lend some support to this prediction, and to the hypothesized relationship between long term memory (as measured by percentage of thought recalled) and short term memory (as measured by the percentage of text recalled).

EXPERIMENT TWO:

SUBJECTS: Fifteen Ss were selected from a college population of undergraduate and graduate students. Sex and age were not factors in this selection. All Ss participated in both phases of the experiment.

MATERIALS: Three pictures were chosen to serve as stimuli for the Ss. One of these was a photograph, a second was a single cartoon, and a third was a cartoon strip. The criterion for the selection of the pictures was that they

should be sufficiently unstructured so that the Ss could create an interesting story, using the picture stimulus as a reference point. The pictures were assigned to the Ss at random, the only restriction being that each picture was used five times. The Ss were asked to write their stories.

PROCEDURE: The experiment was conducted in a small classroom, with Ss participating individually or in small groups of two or three. After giving the S a picture, the E presented the following instructions:

> You will have three minutes to study this picture. After three minutes, you will be asked to write a story suggested to you by the picture. You should do more than simply describe the picture. Do not begin writing until you are told to do so. You may turn your picture over now and begin thinking.

After a pause of three minutes, the E continued:

> You may begin writing now. Remember to write a story, not just a description of what you have seen. You will have fifteen minutes to complete this task.

Approximately 48 hours later, the Ss returned and were read the following instructions:

> You are asked to write as well as you can the story which you developed on (Monday). You will be given two scores: one score for the actual number of words of the original text that you reproduce, and the second for the amount of content, i.e. the number of thoughts that you remember, even if they are expressed in different words or in a sequence different from that of the original story. You have 22 minutes to complete this task. Please begin writing now.

At the end of 22 minutes the papers were collected and the Ss were asked not to talk about the experiment with any of their friends.

RESULTS: Two sets of data were obtained from the Phase II papers, (1) textual scores based on the number of words in any sequence of two words identical to the original text, and (2) content scores, comparable to the content scores in Experiment One, based on the number of thoughts recalled from the original text. Thus, each Phase I paper had to be analyzed by the Es to determine the number of thoughts which it included. This number ranged from 18 to 60. Again, scores were expressed in terms of the percentage of original thought and text correctly recalled. As in Experiment One, scoring was done by the Es

independently for the textual scores and in concert for the content scores.

The mean percentage of text recalled was 25.93. The mean percentage of thougnt recalled was 71.93. after transforming these data, again using the Arcsin Transformation, the difference between the two means was tested, using a t-test for correlated data. The obtained t-value was 11.11 which was significant at the .0005 level.

DISCUSSION: The significance of Experiment One was that texts could not be recalled immediately beyond a small number of words while thought could be recalled without significant decrement 48 hours later, thus supporting by inference hypothesis (1) as a plausible explanation of the observed results.

Experiment Two was an attempt to test the possibility that the decrease of text recall might be due to the fact that the style and vocabulary of the text was not that of the individual S. Would they remember more text if it was their own? In Experiment Two this hunch was confirmed. The 25.93 percent of text recalled is more than three times as much as Ss recalled of the text in Experiment One. At the same time, Ss also remembered a good deal more of their own thoughts. But the most striking finding is the difference between the amount of text and of thought recalled. The difference was approximately 45 percent which is significant statistically. Hypothesis (3) was sustained, and so were hypotheses (1) and (2) by inference.

[illegible] Translation versus Recall

Experiment Three was designed to test the hypothesis that "if immediate memory works with texts and utterances, and recall memory works with thought, then translation will show greater interference across languages than will delayed recall", because in translation one is likely to take a phrase at a time, and while it is still in mind, attempt to put it into the target language, with the result that the surface structure will exert maximum influence on the target phrase produced. In delayed recall across languages, the source text has been forgotten and the S will proceed from the thought he remembers to the target language in a more normal use of the language.

SUBJECTS. Thirty Ss were selected from a college population of undergraduate and graduate students of Spanish. Sex and age were not considered in this selection. Two experimental groups were formed, and were matched by using form MB of the MLA-Cooperative Foreign Language Test. Only the reading comprehension part of the test was administered.

MATERIALS. A Spanish text of 157 words was selected by the Es. It was typewritten single space, and each S received a Xerox copy. Lined legal-pad paper was provided.

PROCEDURES. The Ss were divided into two groups of 15 Ss each. The first group, called the T-Group was read the following instructions:

> You will be given a text in Spanish of approximately 150 words. Please translate the text into English as quickly as you can. Write your translation on the yellow paper provided. Work as quickly as possible. A polished translation is not necessary. You will have 13 minutes to complete this task.

At the end of 13 minutes, papers were collected, and Ss were reminded to return at the same time on the following day. The recall group, called the Z-Group, was read the following instructions:

> You will be given a Spanish text of approximately 150 words. You are asked to study it carefully, so that you will be able to answer general comprehension questions about it. The questions will be in Spanish, in multiple-choice form. You will have seven minutes to study the text. At the end of that time, you will be given six minutes to answer the questions with the text still in front of you.

The results of the reading comprehension test taken by the Z-Group were not considered in the outcome of the experiment. The test was included because it was felt that by announcing a reading comprehension test, the Ss of the Z-Group would be encouraged to read more thoroughly the content of the Spanish text. At the end of 13 minutes, the test papers were collected, and the Z-Group Ss were reminded to return at the same time on the following day.

At the second meeting the procedure was the same for both groups. Approximately 24 hours after the original session, Ss again reported and were read the following instructions:

> On the paper provided please write an English version of the Spanish text that you saw yesterday. Try to parallel as well as you can the style and the content of the original text. You will have ten minutes to complete this task. Remember that you will be writing in English.

At the end of 10 minutes the papers were collected.

RESULTS. Three sets of data were obtained in this experiment: 1) the translations from the T-Group from Spanish into English, 2) the recall versions from the T-Group, and 3) the recall versions from the Z-Group. Scoring of the translations and of the recalled paraphrases was determined as follows: The Es agreed on criteria which allowed three categories of errors to be established. These categories were based exclusively on the expression of the papers, with no notice taken of the accuracy or inaccuracy of the translations or the paraphrases themselves. The first category of errors (Type 1) was made up of those which were clearly conditioned by the Spanish syntax or vocabulary, and which resulted in the production of demonstrably non-grammatical English utterances, in spite of the fact that all of the Ss were college educated native speakers of English. An example of one of the translations and its corresponding recall version can be found in the Appendix. The second category of errors (Type 2) was constituted by those which because of the influence from the Spanish resulted in long, "run-on" sentences, although they showed acceptable syntactic patterns otherwise. These errors usually surfaced when terminal punctuation in the Spanish text was taken over unchanged into the English versions, since the typical Spanish sentence is significantly longer than the typical English sentence. The third and most intangible category was that of errors which somehow seemed "awkward" in construction, but without displaying any obvious direct contamination from specific Spanish constructions (Type 3). We agreed that although they showed no direct relation to Spanish syntax, it may be reasonable to assume that they were in part caused by the pressure of translating, since none of this type or error appeared on any of the papers in the Z-Group.

The transcriptions of the T-Group (immediate and delayed) and the Z-Group (all delayed) were scored for errors by two Es working in concert. The three types of errors were added for each S to yield a total error score.

Table 3
Mean Number of Errors by Group and Type

	Type of Error		
Group	1	2	3
T-Group Phase I	6.00	3.31	1.31
T-Group Phase II	1.00	1.38	0.31
Z-Group	0.53	1.13	0.00

To test the prediction that translation would show greater interference across languages when working with immediate recall than when working with delayed recall, Friedman rank tests were computed for all types of errors between immediate and delayed responses of the T-Group. With a chi-square value of 12.25, which was significant at the .01 level, immediate translation had more Type 1 errors than delayed recall. A chi-square value of 12.25, significant at the .01 level, was obtained for the total number of errors. Immediate translation again had more Type 2 errors than delayed recall. Finally, immediate translation also had significantly more Type 3 errors than delayed recall, on the basis of a chi-square of 4.00, significant at the .05 level. Support for the hypothesis that immediate translation would show more interference across languages when working with immediate memory than when working with delayed recall is offered by these results.

In further testing the data to see whether any negative effects of immediate translation would persist 24 hours after the original experience, t-tests for uncorrelated groups were computed for all the types of errors between the T-Group (delayed response) and the Z-Group. There was one comparison which was significant at the .02 level, with a t-value of 2.58: the T-Group had more Type 3 errors than the Z-Group. None of the other comparisons between the T-Group and the Z-Group were significant. This finding would seem to indicate that for these two groups of college students coming from a fairly homogeneous population and matched on the basis of their command of a Spanish reading test, the awkwardness type of error which we ascribed to immediate translation effect persisted significantly 24 hours later, when from our findings in Experiments One and Two the memory of the original text must have been quite weak.

EXPERIMENT FOUR: Delayed recall across languages versus production with pictures.

It was found in Experiment Three that when the thought stimulus was a specific language text, delayed recall across languages produced significantly less negative interference than did direct translation. It is generally assumed that there is less negative interference from the native language when the thought stimulus is a picture as opposed to a specific text. Experiment Four was designed to investigate whether the interference in delayed recall across languages using a linguistic text as the thought stimulus could be reduced to the same proportion as in the use of pictures

as the thought stimulus. It was assumed in the latter instance that the interference detected in the picture-stimulus mode was assignable to the linguistic habits of the speaker, rather than to the thought stimulus itself. The practical application of a positive finding here would be to justify the use of the native language as a source of interesting and worthwhile thought for language practice in learning on the same level as the use of pictures thus providing an additional source for thought exercises.

SUBJECTS. Fifty-two Ss were selected from a college population of undergraduate students of Spanish. None of the Ss were Spanish majors, and all were studying the same second year course. All Ss were native speakers of English. Sex and age were not factors in the selection. Four experimental groups were formed, and were matched by using Horton's Adaptation of Part V of the Modern Language Aptitude Test to ensure minimum variability in memory span among the groups. The four groups consisted of one control group and three experimental groups labeled 1, 2, and 3. These groups were made up of 20, 11, 9, and 12 Ss respectively.

MATERIALS. For the control group the materials consisted of a hand-drawn picture chosen by the Es. The picture was selected because it was sufficiently unstructured so as to allow for individual expression, but was sufficiently specific to suggest some kind of narrative to everyone. The three experimental groups received a text in English. Lined yellow paper was provided.

PROCEDURES. The control group was given a Xerox copy of the original drawing and was read the following instructions:

> Study the drawing which you have been given carefully for three minutes. During that time try to think of any simple narrative which the picture suggests to you. (Three minute pause.) Now, on the paper which has been provided please write in SPANISH a story or narrative which has been suggested to you by the picture. Do not merely describe the content of the picture. You may continue to refer to the picture as you develop your narrative passage. You will have ten minutes to complete this task.

At the end of the alloted time the pictures and the papers were collected. One of the Es read through all the narratives several times and wrote a paragraph in English based on the narratives written by the control group. Every effort was

made to keep the style, level of expression, and vocabulary as nearly the same in the English version as it had been in the Spanish versions produced by the Ss.

Experimental groups 1, 2 and 3 were read the following instructions at the first meeting:

> Please read the paragraph which you have been given several times, concentrating your attention on the INFORMATION or CONTENT of the narrative. In your next appointment you will not be asked to do anything specifically related to the form or expression of the paragraph such as the order of the sentences or the wording of the passage. You will have five minutes to study the paragraph.

At the end of five minutes the paragraphs were collected and the Ss were reminded of their next appointment. Group 1 returned one hour later. Groups 2 and 3 returned one day later and two days later, respectively. At the second meeting Groups 1, 2 and 3 were read the following instructions:

> On the paper provided please write as well as you can remember the story that you read during your last appointment. PLEASE WRITE IN SPANISH. You have 13 minutes to complete this task.

RESULTS. The transcriptions of the stories were scored for three types of errors: 1) Type-A errors, which were defined as obvious negative transfer errors in which the error in Spanish was clearly assignable to an English construction, lexical item, or rule; 2) Type B-B errors, which could have been categorized as being due to negative transfer from English or from independent, i.e. "cognitive" causes; and 3) Type-C errors, "cognitive" errors, in which the Ss used incorrect morphological, lexical, or syntactic constructions not supposed to have been conditioned by corresponding structures in English. A total of 18 different Type-A errors was found in the transcriptions and are listed in the Appendix. These errors were reliably detected and classified by two Es scoring papers independently.

Table 4

Errors of Clear Negative Transfer*

1.	"Whiz" deletion	1. un hombre [que está] tocando guitarra
2.	Postposed direct object pronoun	2. amó la ... [la amo]
3.	Relative pronoun deletion	3. tan triste [que] no sabía
4.	Noun/adjective agreement: invariant masculine singular	4. poco noticias [pocas ...]
5.	Insertion of 'a' with infinitive	5. quiere a salir [quiere salir]
6.	Ill-formed negatives, especially with nominals	6. tenía no amigos [no tenía ...] tenía no parientes [no tenía]
7.	Random literal translations	7. no sabía qué estaba iendo a hacer son sus solamente amigos
8.	Improper nominalization	8. que es importante [lo que es]
9.	Article omission with unmodified abstract nouns	9. Amor es Dios [el amor] que [la] música fue [la] vida
10.	'Gustar' inversions	10. no me gusta Dios [no le gusto]
11.	Undifferentiated indirect and direct object pronouns	11. esperando que su amigo le viera [que su amigo la viera]
12.	Cognate inventions	12. technical [técnico] solitudo [soledad]
13.	Omission of "personal 'a'"	13. vio su hermana [vio a su hermana]
14.	Subject repetition	14. An error at discourse level. English demands an overt subject with each verb form; Spanish does not
15.	Modification word order	15. una guapa chica [una chica guapa]
16.	Spelling transfer	16. telephono [teléfono]
17.	Object pronoun for subject	17. la es [Ø es]
18.	Article insertions with 'ser'	18. es un profesor [es profesor]

*Words in square brackets represent correct Spanish forms.

Table 4 represents a characterization of these errors with examples of each taken from the transcriptions. Type-B errors were those in which Spanish demands a choice not demanded in English. For example, Spanish has two choices for the English word 'for', either 'por' or 'para'; two choices for English 'be', either 'ser' or 'estar'; two choices for English 'think'. either 'pensar' or 'creer', two choices for English 'know', either 'conocer' or 'saber'; etc. In order to have been called wrong choices as examples of errors of clear negative transfer, it would have been necessary to establish the "primacy" of one member of the Spanish pair of alternatives with respect to the other possibility. That is, it would have been necessary to prove that native speakers of English always associate English 'be' with Spanish 'ser', and thus any occurrence of 'ser' in an 'estar' environment would have been clear negative transfer. Such "primacy determination" would have been necessary for all of the pairs. No unambiguous evidence suggests that this is readily possible. Thus, in another sense these Type B pair errors can all be considered as either Type A errors or Type C errors. If they are to be considered as all Type A (negative transfer) errors it can be argued that the student must do something in Spanish which is not demanded in English; that because nothing is demanded of him in English he makes no effort to make a choice in Spanish; and that because his strategy in building a sentence in Spanish is a function of his decision to use his English rules, all of his errors involved in not making the proper choice between two alternatives is the result of clear negative transfer. On the other hand, all such Type-B pair errors could be adjudged as really Type-C (cognitive) errors, in that something which has no analogue in English causes simple learning problems, not assignable to negative transfer. Under this latter viewpoint, learning to use 'ser' or 'estar' as analogous to learning irregular past tense forms in Spanish. Neither can be portrayed as being influenced by English structure or vocabulary. It is assumed that if either of these possibilities for interpretation of Type-B errors is correct it is the former one, which would treat them as negative transfer. For that reason in addition to doing a statistical analysis based on all three types of errors, a second analysis of the same data was done which treated Type A and Type B errors as clear negative transfer as compared and contrasted with Type C which was unchanged.

To test the hypothesis that interference in delayed recall across languages can be reduced to the same proportion as in the use of pictures as a thought stimulus, t-tests were computed to determine the differences in number and type of error between groups. Table 5 shows the mean number of errors by group and type.

Table 5
Mean Number of Errors

Group	Type of Error A	B	C	Total
Picture Group	8.75	2.60	10.90	22.25
Group 1	6.82	1.55	6.91	15.27
Group 2	4.78	1.22	6.56	12.56
Group 3	6.17	1.58	6.42	14.17

As shown in Table 6, with a t-value of 3.60 (significant at the .01 level) the number of total errors was significantly greater for the Picture Group than for Group 2 (one day delay).

Table 6
Summary of t-tests & Comparisons between Groups

Comparison	Type of Error A	B	C	Total
Picture Group vs. Group 1	n.s.	n.s.	2.13*	2.60*
Picture Group vs. Group 2	2.65*	2.34*	2.32*	3.60**
Picture Group vs. Group 3	n.s.	n.s.	2.70*	3.34**
Group 1 vs. Group 2	n.s.	n.s.	n.s.	n.s.
Group 1 vs. Group 3	n.s.	n.s.	n.s.	n.s.
Group 2 vs. Group 3	n.s.	n.s.	n.s.	n.s.

* $p < .05$
** $p < .01$

A t-value of 3.34 (significant at the .01 level) was obtained in the comparison of total errors between the Picture Group and Group 3 (two day delay). The Picture Group also had more total errors than Group 1, with a t-value of 2.60 which was significant at the .05 level. With a t-value of 2.65, significant at the .05 level, the Picture Group had more Type A (transfer) errors than Group 2. A t-value of 2.34, significant

at the .05 level, was obtained for the comparison of Type B errors between the Picture Group and Group 2, the Picture Group again having more errors than Group 2. Obtaining t-values of 2.13, 2.32, and 2.70, all significant at the .05 level, for the comparisons of the Picture Group with Groups 1, 2, and 3, respectively, showed that the Picture Group had more Type C (cognitive) errors than any of the other groups. None of the other comparisons was significantly different. When Type A and Type B errors were combined for the different groups, no significant differences in their numbers between the Picture Group and either Group A, B, or C were obtained. Comparisons of the proportions of the three types of errors were obtained between the different groups. Table 7 shows the proportions of different types of error for each group.

Table 7
Proportions of Error by Group

	Type of Error		
Group	A	B	C
Picture Group	.393	.117	.490
Group A	.446	.101	.452
Group B	.381	.097	.522
Group C	.435	.111	.453

There were no significant differences obtained between the groups when comparing proportions of the same type of error.

EXPERIMENT FIVE: The Effect of Thought Exercises Superimposed on Pattern Practice -- Cognitive Exercises Versus Pattern Practice -- Cognitive Exercises Alone on Learning Specific Linguistic Problems and on Motivation

This experiment was designed to test the hypothesis "if relating thought and language simultaneously at normal speed and under normal thought density constitutes performance, then exercises that involve such performance at the appropriate level should increase learning and motivation in foreign language teaching".

SUBJECTS. The members of three sections of second year Spanish were chosen as Ss for this experiment. The largest class consisted of 16 students and was used as the control group. The other two classes consisted of 10 and 11 students, and were used as the experimental groups. The three classes

were matched according to the results of a translation exercise in which they were asked to translate a passage from English into Spanish. This passage was built around English constructions which require the use of the subjunctive mode in Spanish; constructions which are traditionally those of greatest difficulty for native speakers of English learning Spanish. Specifically, the passage focused on the Spanish subjunctive in nominal clauses. Results of the translation exercises served not only to match the three classes of Ss, but also to establish this construction as the linguistic problem to be taught in the experimental sessions.

MATERIALS. Materials for the control group included a Xeroxed copy of the experimental English text of 60 words which provided the material to be recalled at the end of the experimental session, pattern practice drills, dittoed written pattern practices, a short-answer objective test, and a dittoed follow-up test. For the experimental groups, the materials consisted of visually presented oral pattern practices, visually elicited cognitive exercises, Xeroxed short texts in English for classroom practice, hand-drawn slides for use on an overhead projector, the same 60-word experimental text, the same short-answer objective test, and the same follow-up test. Both groups also received an evaluation form.

PROCEDURES. Both the control and the experimental groups were given one class of which the duration was 50 minutes. In each case the class was broken up into four sections: First a four-minute period to read and study the 60-word experimental text, then two 16-minute instructional modules, and finally a 12 minute evaluation period devoted to the short-answer objective test and the recall of the experimental text which they had seen at the beginning of the experimental session. Two days after the experimental session each group took the follow-up examination. Table 8 summarizes the division of time and the activities undertaken in the control group and in the experimental groups:

Table 8
Summary of Activities

Control Group

Total Teaching & Learning Time	Study Experimental Text	Brief Explanation & Contrast of Structure to be taught	Oral Pattern Practice	Short Answer Objective Test & Recall of Experimental Text
48 minutes	4 minutes	2 minutes	12 minutes	12 minutes
		Oral Pattern Practice	Written Pattern Practice	
		10 minutes	4 minutes	
		Written Pattern Practice		
		4 minutes		

Experimental Group

	Study	Study Practice Text 1 minute	Study Practice Text 1 minute	Short Answer Objective Test & Recall of Experimental text in Spanish
	Experimental	Brief Explanation & Contrast of Structure to be taught	Cognitive Exercises Elicited by Visual Stimuli	
	Text			
48 minutes	4 minutes	2 minutes	9 1/2 minutes	12 minutes
		Pattern Practices Visual Stimuli	Oral Recitation of Text 2	
		7 1/2 minutes	1 1/2 minutes	
		Oral Recitation of Text	Written Text 2	
		1 1/2 minutes	4 minutes	
		Write text 4 minutes		

In the control group, the experimental text was distributed at the beginning of the class. Ss were asked to read it carefully and to concentrate more on the content than on the expression. At the end of four minutes, the class itself was begun. A brief explanation of the subjunctive in Spanish dependent noun clauses was given. This explanation lasted for two minutes, and was intended largely to establish a cognitive base. For the next ten minutes Ss were given traditional pattern practices of the substitution type. The final four minutes were given over to doing written pattern practices of the same type. The second instructional module consisted of 12 minutes of oral pattern practice followed by four minutes of written pattern practice. At the conclusion of this second module Ss were given a short-answer objective test on the linguistic structure taught during the experimental session, and were asked to write from memory in Spanish the 60-word text which they had studied in English at the start of the session. Following the evaluation session Ss were asked to fill out the motivation opinion scale.

For the experimental group, the first four minutes were as described above for the control group. The first instructional module was divided as follows: a one minute period during which Ss read and studied a brief English text with the instructions to study for content; a two minute presentation of the structure to be taught, essentially the same as that given to the control group; seven and a half minutes of visually elicited pattern practice; an oral recitation of the brief English text -- in Spanish -- with prompting and correction; and finally a four minute period for writing in Spanish the content of the brief English text. The second instructional module was identical in duration to the first except that the explanation was eliminated, thereby making the effective practice time 9 1/2 minutes rather than 7 1/2. The essential difference in the second instructional module was that no pattern practices as such were used. Ss were given visual stimuli to which they responded with original Spanish sentences, essentially un-cued and un-controlled by E. In these un-cued utterances Ss gave responses of their own making, using the constructions which had been practiced earlier. The evaluation procedure was the same for the experimental groups as it had been for the control group.

RESULTS. Three sets of data were obtained from the experimental and control groups. One set of data consisted of errors from the short answer objective test, which was designed to test the material covered in the teaching session. Table 9 shows the mean number of errors for each group on this test.

Table 9
Mean Number of Errors on
Initial and Follow Up Objective Tests

Group	Initial Test Errors X	Follow Up Test X
Experimental (Cognitive)	2.62	2.70
Control (Pattern Practice)	3.69	3.22

It was specified by the E that the only errors to be scored in this test were those of incorrect usage based on the teaching session. Another test was administered two days after the first test to test the prediction that teaching a specific linguistic problem in a foreign language by an approach that combines pattern practice with thought exercises will produce fewer errors than when using a pattern practice approach exclusively. Statistical comparisons of the number of objective errors were made between the experimental (thought) and the control (pattern practice) groups.

Comparisons were also made for the number of errors between the test immediately following the teaching session and the follow up test. As shown in Table 10, only one comparison was statistically significant.

Table 10
Comparisons Between Groups on
Initial and Follow Up Objective Tests

Comparison	T Value
Experimental Group vs Control Group (Initial Test)	< 1 (n.s.)
Experimental Group vs. Control Group (Follow Up)	< 1 (n.s.)
Experimental Group (Initial) vs. Experimental Group (Follow Up)	2.12*
Control Group (Initial) vs. Control Group (Follow Up)	< 1 (n.s.)

*p< .05

A t-value of 2.12, significant at the .05 level, was obtained for the number of errors between the experimental group's immediate test and the follow up test. The follow up test contained more errors. No comparisons between the experimental and control groups on the objective tests were significantly different.

A second set of data was gathered from memory samples collected at the end of the testing session from material which was to be recalled after study at the beginning of the teaching session. Table 11 shows the mean number of errors by Group and Type.

Table 11
Mean Number of Memory Errors

Group	Type			
	T	C	V	S
Experimental	0.73	1.77	2.18	0.91
Control	2.69	2.06	1.88	1.31

It was predicted that there would be more interference in the pattern practice method than in the thought method. Comparisons were made for various types of errors between the experimental and control groups as shown in Table 12.

Table 12
Summary of T Test Comparisons
Between Groups on Memory Samples

	Type of Error			
	T	C	V	S
Experimental Group vs. Control Group	2.76**	1(n.s.)	1(n.s.)	1(n.s.)

** p .01

The control group made significantly more errors of obvious negative transfer (Type-T errors) than the experimental group. A t-value of 2.76, significant at the .01 level, was obtained for this comparison. None of the comparisons of other types of error were significantly different. The other types of error were vocabulary (V), cognitive (C), and subjunctive(S) errors. S-errors were defined as (1) the occurrence of non-finite verb forms in the dependent sentence, or (2) the lack of the necessary syntactic markers for dependent sentence constructions.

Finally, a set of data was obtained concerning the motivation of the Ss in both groups. Bi-polar scales were constructed for four adjectives, and Ss were instructed to rank along a scale of one to five their impression of the teaching session. The adjectives compared were "interesting/boring", "slow/fast", "positive/negative", and "learned nothing/learned everything". Table 13 shows the mean rankings for these adjective pairs.

Table 13
Mean Rankings for Adjective Pairs

Group	Interesting Boring	Slow Fast	Positive Negative	Learned Everything Learned Nothing
Experimental	3.08	3.13	2.48	3.04
Control	2.56	4.00	2.44	3.00

Comparisons were made between the groups the Control group rated the teaching session as being slower than did the experimental group, as shown in Table 14.

Table 14
Comparisons of Rankings for Adjective Pairs

	T-Values			
	Interesting Boring	Slow Fast	Positive Negative	Learned Everything Learned Nothing
Comparison				
Experimental Group vs. Control Group	1.41 (n.s.)	2.41*	< 1 (n.s.)	< 1 (n.s.)

*$p < .05$

A t-value of 2.41, significant at the .05 level, was obtained for this comparison. None of the other comparisons were significantly different.

5. SUMMARY

In summary, this was a series of five experiments to test whether or not (1) thought and language were sufficiently distinct in linguistic performance to justify or require differential attention in language teaching and learning, and (2) thought was more central than language in the normal use of language. In addition the experiments tested: (3) whether

delayed recall across languages produced less interference across languages than translation as a source of interesting thought content for second language learning and teaching, (4) how much delay was necessary in delayed recall across languages to reduce interference to the supposed low level of pictures as a stimulus for thought content, and (5) whether or not thought exercises using pictures and delayed recall across languages combined with cognitive-pattern practice exercises had any positive effects on motivation and amount of learning in a second language.

Experiment One tested 80 Ss divided into eight groups of 10 on immediate and delayed recall of a 200 word text in their native language. Each group heard the text in one of the eight dictation units of lengths of five words, ten words, 20 words, 40 words, 100 words, 200 words, phrases, and sentences. They tried to write the exact text after hearing each dictation unit, and again in their own words immediately after the whole text. The first writing was scored for words recalled and the second on the amount of content recalled. Forty eight hours later they again wrote the text from memory trying to recall both text and content. The results showed highly significant greater immediate recall of text in the phrase group than in the sentence group, and in the five and ten word groups than in the 20 to 200 word groups, confirming the prediction that as the length of the utterances extended beyond the limits of immediate memory the percentage of text recalled would decrease significantly. While the results of the 48-hour delayed recall also confirmed the prediction that a greater percentage of thought than text would be recalled, the difference again being highly significant. The decrease in words recalled after 48 hours was dramatic since all groups recalled less than nine percent, whereas the thought recalled did not deteriorate significantly. The average for all groups together of thought recalled was 37.32% immediately and 35.69% after 48 hours.

This experiment supports the hypothesis (3) that immediate memory operates well with texts up to its limits and that long term memory fails with texts, but in turn operates well with thought. The decisive variables in remembering text were length of dictation unit in number of words and time delay in the recall task. The possibility that dictation units based on the phrase and the sentence would increase recall over arbitrarily cut units of five, ten, etc. words did not materialize, and phrases produced the highest immediate text recall, 99.15%, but they were also the shortest dictation unites, averaging 3.8 words. The sentence, which averaged 17 words in length came in between the 10 and 20 word dictation groups.

The results of Experiment One also support hypotheses (1) and (2) since if thought and language were not distinct there should not have been a significant difference between the two in immediate or in delayed recall, and the experiment proved that there indeed was such a difference. Furthermore, since the amount of text remembered deteriorated severely to 24.55% when the dictation unit reached 40 words it is argued that thought must have been present while the text was being heard, at least after every phrase or so, in order for it to be recalled later. This thought was not stored in deep structure terms or the reproduction would have shown higher parallelism with the original text. Thought, then, is central to language use, beyond the length of text that can be remembered under immediate memory.

Experiment Two tested whether the inability of Ss to remember texts might be due to the fact that the text in Experiment One was not their own. Fifteen Ss were given pictures from which they created their own stories. Forty-eight hours later they were asked to write the story as they had developed it before, trying to use the same words and thoughts. The results showed that indeed they remembered more text -- 25.93% -- but they also remembered more thought -- 71.93% -- and the difference between the two is highly significant statistically, thus again confirming hypotheses (1), (2) and (3).

Experiment Three tested the effect of language interference in immediate translation versus delayed recall across the same languages. The errors made by fifteen college students who translated immediately a Spanish text of 157 words into their native English were compared with material written from memory 24 hours later. The errors were of three types, namely those that could convincingly be ascribed to specific negative interference from Spanish, those that could be ascribed to interference of Ss more general nature such as "run-on" sentences acceptable in Spanish but objectionable in English, and still a more general category of errors which is generally called "awkwardness". The immediate translation papers showed significantly more errors of all three categories, thus supporting the hypothesis. In addition, the delayed recall papers of these Ss were compared with similar renditions by fifteen other students who did not do the immediate translation but did only the delayed recall across languages. The translation group displayed significantly more errors of the awkward type, showing that the translation effect persisted in this aspect at least 24 hours after the experience.

Experiment Four investigated the length of time delay necessary in recall across languages to reduce the negative interference of the source text to no more than the negative

interference observable when a picture stimulus is used as a source of thought. Four groups of subjects were asked to produce a story in Spanish and their papers were scored for errors of three types: those that could specifically be ascribed to negative transfer, those that could be categorized as due to negative transfer or to some other cause, and those that were cognitive errors not ascribable to native language transfer. The control group consisting of 20 subjects was given a picture from which they produced their stories in Spanish. The three experimental groups with a total of 32 Ss were given the story in English and were asked to retell it in Spanish one hour later, one day later, and two days later respectively. The results showed significantly fewer transfer errors and fewer total errors for the one-day-delay group than for the control picture group. This finding partially supports the use of native languages texts with delay of one hour or more as a source of interesting and worthwhile content for thought exercises in language teaching and learning.

The finding that using native language texts as thought stimuli does not induce more negative transfer than using non-verbal picture stimuli is also interesting in view of the generally accepted belief that visual methods are superior because they avoid interference from the native language.

Experiment Five, the last of the series, investigated the prediction that if relating thought and language at normal speed constitutes language performance, then thought exercises used at the appropriate level in combination with more basic pattern practice and explanation should increase motivation and amount of learning. The experiment taught three groups of students a subjunctive problem in Spanish for one 50-minute class period. The control group with 20 students went through a two-minute explanation, and 32 minutes of pattern practice. The experimental group with 21 students went through a similar two minutes of explanation followed by 12 minutes of pattern practice, and then went on to 9 1/2 minutes of thought exercises instead of continuing with pattern practice. Results were measured with an objective test, a recall-across-languages test, and an attitude questionnaire with bi-polar scales on interest and subjectively estimated length of time spent in the class. No significant differences were found in the objective test results between the control and experimental approaches. There was a significant drop from the immediate scores to the 48-hour delayed score for the experimental group, but this did not constitute a significant difference with the parallel control group results.

In the delayed recall text into Spanish from a native language text the experimental group made significantly fewer errors. This finding supported the prediction of greater learning by the thought group.

No significant difference was found in the motivation questionnaire with regard to interest of the lesson, but a significant difference was obtained in the subjective estimate of the length of time of the lesson in favor of the experimental group which estimated the time to have passed more quickly than the estimates of the students in the control group. Actual time, of course, was the same for both.

The findings of Experiment Five should be considered quite tentative since the duration of the experimental teaching time was only one class period, and the Hawthorne effect of having an experiment with a new teacher must have been sufficient to mask much of the possible difference in effect of the experimental and the control groups. A longitudinal experiment of six or more weeks duration seems more appropriate to obtain more conclusive data in this matter.

6. CONCLUSIONS

The conclusions drawn from this study are:

(1) that thought and language are distinct and are both involved in linguistic performance;

(2) that thought is central in language use in maintaining unity, continuity, and relevance, and that language is a symbolic system that we use to refer to it;

(3) that we remember full texts under immediate memory up to 10 to 20 words and then largely forget the text and remember the thought to which it referred without significant deterioration for at least 48 hours;

(4) that in delayed recall across languages -- delayed translation -- there is significantly less interference across languages than in immediate translation, explainable in that in delayed recall the S cannot remember the original text and thus goes from thought to language as in normal production, whereas in immediate translation, the S remembers the source text and becomes subject to full interference;

(5) that delayed recall across languages causes no more interference than picture stimuli when the delay is approximately one hour, and may actually cause less interference than pictures when the delay is one day. A pedagogical corollary is that the native language can be used as a source of interesting and/or worthwhile content for thought exercises in the target language without the negative interference of translation. This conclusion has great educational value for the more advanced stages of foreign language teaching;

(6) that a single 50-minute class session is insufficient to reveal any significant differences in amount of learning and motivation resulting from the use of thought exercises. The only statistically significant difference appeared in the subjective estimates of elapsed time during the session, but even this can hardly be considered established. The Hawthorne effect caused by the presence of a new teacher to teach the class was obviously a strong equalizing factor for both the control and the experimental groups.

7. RECOMMENDATION

The corollary of conclusion 6 is a recommendation that the experiment be repeated under a longitudinal design lasting probably no less than six weeks.

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8. APPENDICES

I. Text Used for Experiment One, Separated into Grammatical Phrases.

Because of the libr y's many functions / today's librarian / is not one person / but many persons. / The library / is not a single agency / but many agencies. / The needs that the librarian serves / are not simply described / but are wide ranging / and diverse. / Obviously, / the continually growing range of services / that librarians now assume / demands a great variety / of qualities and skills. / However, / there is little agreement / on the qualities needed / even within the profession / of librarianship itself. / There are those who feel / that the bookman of old / is still the best librarian. / Some believe / that administrative skills, / almost divorced / from the specifics of books and reading,/ are the major essentials. / Others stress / the outgoing personality / and the knowledge of group dynamics / that facilitate / the active educative function. / The truth is / that librarianship / now embraces / such a wide range of services / that each of these qualifications / can find a suitable place / in some library. / There are libraries / in which specialists / in adult education / have full time responsibility / for the promotion of activities / that are educational in purpose / but may have little relation to books. / Specialists of all kinds / are needed.

II. Minimal Thought Units Contained in Text for Experiment One.

(1) The library has many functions; (2) Librarians need many abilities and much preparation; (3) The library system is growing; (4) There is disagreement on the preparation needed; (5) [opinion] traditional librarian best; (6) [opinion:] administrator best, (7) [opinion:] outgoing personality type best; (8) [opinion:] knowledge of group dynamics principal requirement; (9) Administration is unrelated to books; (10) All attributes usable in modern libraries; (11) Libraries have adult education programs; (12) These may be unrelated to books; (13) They are administered by specialists; (14) Some of these specialists work full time; (15) Some libraries have special collections; (16) Some libraries preserve rarities; (17) Specialists of all kinds are needed.

III. Text for Experiment Three

Soy maestra y trabajo con niñas de unos doce años. Le agradecería me oriente sobre la solución de un problema moral práctico que se nos presentó el mes pasado, con motivo de una visita que hice con mis alumnas al Museo del Prado.

Después de ver las obras de Murillo, las niñas quisieron ver algo de Goya: cuatro de ellas querían ver las Majas. Después de la visita compraron algunas postales, algunas en blanco y negro, algunas en colores, reproducciones de cuadros del Museo; cuatro adquirieron postales de la Maja desnuda. Ya de vuelta al grupo escolar, se comentó la visita y no tuve inconveniente en relatar lo que acabo de escribir. Con este motivo, hubo muchos comentarios entre las maestras. Se llamó a las niñas a Dirección y se les exigió que entregasen las tarjetas. Yo me pregunto: Se procedió bien? Se puede considerar antipedagógico el que las niñas vieran esa obra de arte de Goya?

IV. Reading Comprehension Test for Experiment Three

INSTRUCCIONES: En el espacio a la izquierda escriba la letra de la repuesta que mejor complete cada frase.

____ 1. La persona que escribió este pasaje se dedica a
a. la ensenanza
b. la economía
c. la teología
d. el arte

____2. Este pasaje prcbablemente es
a. un ensayo
b. una carta
c. un cuento
d. una poesía

____3. La persona que escribe está
a. pidiendo limosnas
b. poniendo avisos
c. aconsejando a las niñas
d. pidiendo consejos

____ 4. El pasaje detalla
a. una clase de pintura
b. una excursión
c. unas vistas
d. una peregrinación

____5. Lo que querían ver fueron
a. murallas
b. reproducciones
c. pinturas
d. pintores

____6. Murillo y Goya son
a. arquitectos
b. dramaturgos
c. pintores
d. escultores

____ 7. La Maja desnuda es
a. un cuadro de Goya
b. una postal
c. un cuadro de Murillo
d. una reproducción

____ 8. En el museo, las niñas
a. se mojaron
b. vieron nudos
c. adquirieron cuadros
d. compraron postales

____ 9. Después de regresar del paseo, las postales fueron
a. vendidas
b. botadas
c. confiscadas
d. destruídas

____ 10. El director del colegio
a. felicitó a las ninas
b. reganó a las ninas
c. regañó a la maestra
d. visitó a la maestra

V. Sample Translation From Experiment Three

I am a teacher and I work with children of about 12 years old. ~~It would~~ My experience ~~would please~~ on a solution to a practical moral problem ~~would please you~~ that happened last month with the ~~motive~~ motive of a visit that I made with my students to Prado Museum would please (delight) you.

After seeing the works of Murillo, the children wanted to see some of Goya: four of them wanted to see <u>las Majas</u>. After the visit they bought some post-cards, some in black and white and some in color, reproductions of pictures of the Museum; four acquired postcards of the <u>Maja desnuda</u> (Nude Lady). Now on return, to the group of students commented on the visit and I did not find it ~~convenient~~ inconvenient to relate that had just taken place in writing. ~~One called the~~ The students were called to the Director's ~~of~~ and made.

VI. Recall Version 48 Hours Later

I am a teacher of children of about 12 years. It would please you to know what happened to me when I made a visit to the Prado Museum with my students. After seeing the works of _____ the students wanted to see some of the works of Goya. After the tour, the students bought post cards, museum reproductions of the paintings, some in black and white and others in color. It was not convenient for me to check the postcards some of the students had reproductions of the Nude Lady. On returning we talked about the trip and the students related their visit to the Museum in writing. Several students were called ....

VII. Delayed Recall Story from Experiment Four

It's nearly midnight on the 31st of December, and John is sitting alone in his small room, remembering how life used to be many years ago. John is now an old man. Once he had many friends, but now his only friend is his old guitar. He especially misses his wife who has been dead for so many years. He remembers how he and his wife had always been able to find a little extra money each year to have a little party alone together in their house on New Year's Eve. It never mattered to them that they were poor. John knows that in the morning he will have to return to the lonliness and the routine of his present life, but that doesn't bother him. For tonight he is not alone. Tonight he is waiting happily, just as he always did, waiting for the New Year to begin.

VIII. Paragraph Used to Normalize Groups in Experiment Five

Robert is eight years old. He doesn't like to go to school. He usually gets there at 8:00 in the morning, and he has to stay until 3:15 in the afternoon. During all that time he has to do what his teacher tells him. It's always the same. She tells him to sit down, and then she tells him not to talk. Sometimes she asks him to write on the blackboard, or to show his work to the other students. Robert doesn't like his teacher. Tomorrow he's going to tell her to ask someone else her questions.

IX. Experimental Text from Experiment Five.

Study this text for four minutes. Pay especial attention to the CONTENT of the paragraph. Do not worry about the specific phrasing or the order of the sentences.

Mary wants me to invite her to David's party. I'm going to ask her to go with me. I'll tell Mary to leave her house early. My mother insists that I arrive at home at 11:00. David wants me to take my guitar to the party. I'll ask John to sing "la cucaracha". David always tells me to come on time.

X. Sample Written Pattern Practice from Experiment Five.

Written Pattern Practice: Write an answer to the following questions according to the examples given.

E-1	Él va a venir mañana?	Sí, dígale que ve a mañana.
E-2	Ellos van a cantar?	Sí, dígales que canten.

1. Rogelio va a usar el carro?

2. Eugenia va a traer las revistas?

3. Raúl y Carlos van a ir a la plaza central?

4. Hortensia va a limpiar la casa?

5. Vilma va a montar a caballo?

6. Aníbal va a quedarse en casa?

7. Lilia e Ivette van a vender las antigüedades?

8. Antonio va a estudiar física?

9. Eugenia y Rigoberto van a venir temprano?

10. Joaquín va a mandar los documentos ahora?

XI. Objective Test from Experiment Five.

Transform the following sets of sentences according to each example sentence.

1. Sentences beginning with "Quiero que ...."
   Example: Hablan siempre inglés. Quiero que hablen siempre inglés.

   a. Nadie dice esas cosas aquí.

   b. Todo el mundo sabe la noticia.

   c. Encuentras muchas dificultades.

   d. Tocas la guitarra.

   e. Venden la casa.

   f. Van al teatro esta noche.

   g. Insisten en eso.

   h. La muchacha sacude el polvo.

2. Sentences beginning with "Insisten en que ...."
   Example: Se lo dices tú. Insisten en que se lo digas tú.

   a. Les mando el dinero.

   b. Pepe baja corriendo.

   c. Nos casamos mañana a las diez.

   d. Le pido la plata a mi papá.

   e. Tú vas a visitarme.

   f. Nos reunimos aquí por la tarde.

   g. Los niños suben en seguida.

   h. Le digo a Juan que venga.

XII. Follow-Up Test from Experiment Five.

Write a Spanish version of the following sentences. Remember to check on whether or not someone is trying to influence the behavior of somebody else.

1. I'll tell John that he leaves at three.

2. I'll tell John to leave at three

3. I insist that John speaks Spanish.

4. I insist that John speak Spanish.

5. He'll ask John to sing "La cucaracha".

6. I want to go with Maria.

7. I want Maria to go with me.

8. The teacher insists that John is reading.

9. The teacher insists on John('s) reading.

10. Ask Mary to tell John to prepare the meal.

XIII. Attitude and Motivation Questionnaire from Experiment Five.

Indicate your first impressions of this class period by placing a check mark (√) at one of the points between one and five on the accompanying scale. If you thought the class period was very INTERESTING you would check the column headed by the number one. If you thought the time passed very SLOW you would also check the column headed by one.

INTERESTING	_____	_____	_____	_____	_____	BORING
SLOW	_____	_____	_____	_____	_____	FAST
POSITIVE	_____	_____	_____	_____	_____	NEGATIVE
LEARNED NOTHING	_____	_____	_____	_____	_____	LEARNED EVERYTHING

XIV. T-Values (Wilcoxon's Text) for a Nonparametric Analysis of Experiment Four.

	Type of Error			
Comparison	A	B	C	Total
Picture Gr. vs. Gr. 1	172	167	131	151
Picture Gr. vs. Gr. 2	77**	85*	86*	91*
Picture Gr. vs. Gr. 3	149	194	134*	144*
Group 1 vs. Gr. 2	123	114	105	111
Group 1 vs. Gr. 3	147	132	125	108
Group 2 vs. Gr. 3	98	103	115	93

*P < .05

**P < .01

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