THE THEORY OF INFORMATION AS A TESTING TECHNIQUE TO DETERMINE SPANISH READING PROFICIENCY

THESIS

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by

Sandra G. Kukuvka and Jean M. T. Hurst

State University College at Brockport

Brockport, New York

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SUBMITTED BY:

Sandra L. Kubecka — Candidate — 8/26/94 — Date

Jean M. L. Hurst — Candidate — 8/26/94 — Date

APPROVED BY:

Robert B. Fiske — Thesis Advisor — 8/26/94 — Date

Victor J. Rojas — Second Faculty Reader — 8/26/94 — Date

Patricia E. Baker — Director of Graduate Studies — 8/26/94 — Date

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ABSTRACT

The purpose of this study was to expand on previously-limited investigations into the use of information theory as a Spanish language assessment technique, within an English-speaking setting, by providing a larger data base and employing a wider variety of reading passages. A further purpose was to attempt the development of a Spanish reading proficiency test that could be used in the classroom to provide a broad picture of a student's ability to comprehend reading material at or near his/her level of language learning. At no time was this study an attempt to analyze specific strengths or weaknesses in a student's reading ability or to debate the usefulness of any existing Spanish language reading proficiency tests.

At the time of this study, Sandra Kukuvka was a first grade teacher at Dr. Martin Luther King Jr. School # 9 in Rochester, New York ,working in a Spanish dominant bilingual setting. Jean Hurst was teaching English-speaking students in a second grade Primary Approach to Language (Spanish exposure) program at Abelard Reynolds School # 42 in the same district. Both of these educators felt that a limited number of Spanish language assessment tools existed and were, together, informally

investigating alternative techniques. As a result of this preliminary search, they discovered previous theses written by Eliza Bennette-Kinkead and Ivette Robles that suggested the diagnostic theory of information (a mathematical based theory of language transmission) as a potential important language assessment tool. Further investigation into the research done by Bennette-Kinkead and Robles revealed that minimal work had been published on this application of the theory. This latter discovery prompted the authors of the current study to further expand upon the previous investigations in the hopes of transforming the theory into a more developed, practical testing tool.

With regard to a student's comprehension ability, both authors felt that consistency in genre and readability within the passages chosen for the tool would eliminate variables that might otherwise interfere with such comprehension, i.e., literary and poetry style, rhyme and rhythm, technical jargon, etc. With the intent to control variables for the sake of reliability, these researchers chose 6 short (1 and 2 paragraphs), non-fiction passages from published first-grade reading and science textbooks around which to develop their assessment tool. With the variables of genre limited, interference could be somewhat controlled and emphasis could, therefore,

be placed on the percentage of bits deleted in attempting to target a passage to a specific reading level. The authors also agreed that creating 2 passages targeted for the beginning Spanish reader, 2 for the intermediate, and 2 for the advanced would serve to verify the level at which an individual is reading consistently. The final battery of tests, then, consisted of 2 passages with approximately 10% of the information missing from both, 2 passages with approximately 18% of the information missing, and 2 passages with approximately 29% of the information missing. The objective of the test was for the subjects to record missing letters in a given passage within a period of 45 minutes.

Once the battery of tests had been completed, the authors asked students from 4 Spanish classes at the State University of New York, College at Brockport, to complete the passages. The first class was identified by course number as an Intermediate I class and was composed of 9 students. The second class was identified as an Advanced Conversation and Composition class and was composed of 10 students. The third group, a beginning Spanish class, contained 14 students. The final class was identified as an Advanced Grammar course and contained 15 students. The authors felt that targeting students known to be working at the beginning,

intermediate, or advanced levels, would provide evidence as to the validity of their tool. With this in mind, the authors hoped to obtain test results from beginning students that showed a steep downward trend as they progressed from one set of tests to another. They hoped that results from the intermediate students would show minimal change when progressing from the first set of tests to the second and an obvious downward trend from the second set to the third. Finally, they hoped that students working at an advanced level in Spanish reading would show minimal change when progressing through the three sets.

CHAPTER I

Statement of the Problem

Purpose

The purpose of this study was to expand on previously limited investigations into the use of information theory as a Spanish language assessment technique, within an English-speaking setting, by providing a larger data base and employing a wider variety of reading passages. A further purpose was to attempt the development of a Spanish reading proficiency test that could be used in the classroom to provide a broad picture of a student's ability to comprehend reading material at or near his/her level of language learning. At no time was this study an attempt to analyze specific strengths and weaknesses in a student's reading ability or to debate the usefulness of any existing Spanish language reading proficiency tests.

Need for Study

Historically, theories surrounding the process of language acquisition have determined the nature of language assessment tools. Educational institutions reflect this regularly. Organizations which espouse the Gestaltist, top down, view of language learning, tend to adopt ongoing

techniques such as portfolios or hands-on projects, while those who view language learning as a "bottom up" process traditionally choose skill based examinations to assess their students' progress. Such disparity among the theories and their resultant assessment tools has engendered much discussion and research around how the nature of language itself determines the process of its acquisition. Jeremy Campbell (1982) in Grammatical Man suggested that a mathematical theory developed by Claude Shannon, surrounding the transmittal of messages from one place to another (specifically through the telephone and telegraph systems), could be applied to written language. Assuming that the adaptation of this math-based theory to language is sound, an assessment tool developed from it would offer a relatively objective measure of language proficiency. A need exists, then, for the development of such a language assessment tool, which can be used as an alternative to those currently in circulation. This study offers a preliminary tool and investigates its use in validating 3 levels (beginning, intermediate, and advanced) of Spanish reading proficiency.

Questions

This study will attempt to answer the following questions:

Is the theory of information a valid measure of Spanish reading proficiency?

Is the theory of information a valid measure of Spanish reading comprehension?

CHAPTER II

Rationale

Definition of Terms/Review of Literature

In order to appreciate the development of the theory of information as a language testing tool, the authors of this study felt that relevant terms and concepts needed to be clearly defined at the outset. The following are concepts that appear frequently in the content of this study. All are examined as to their direct relationship to the theory and its application in this study.

The Theory of Information

With respect to language, The Theory of Information is a formal theory of syntax in which "a single relation of word-sequence gives to the set of these sequences the structure of a mathematical object, and produces a base set of sentences which carry all the information that is carried in the language." (Harris: 1990) In other words, a message (in the case of this study, a written message) contains more data than is necessary to adequately

convey the meaning intended by the sender and as such, is highly predictable.

The theory demonstrates, mathematically, that most of the information contained in any given sentence is so interrelated that the presence of one bit of information will necessitate the presence of another. For example, the presence of the word "it" in English necessitates the presence of a noun nearby. A corresponding example in Spanish would be that the presence of the word "las" necessitates the presence of a feminine plural noun nearby. Such redundancy and predictability implies that part of the information in a sentence could be deleted without significantly hindering the reading process. In effect, the reader would be able to reconstruct the message by using his/her language skills to recognize cues in the sentence. This application of the theory of information was adopted in these researchers' final language assessment tool.

Information

The term information has commonly been defined as news, facts, or ideas that can be acquired and passed on as knowledge. During the age of electronic communications, however, the term has come to represent the

agent that "informs the material world, much as the messages of the genes instruct the machinery of the cell to build an organism, or the signals from a radio transmitter guide the intricate path of a vehicle on its journey through space." (Campbell: 1982) For the purpose of this study, these researchers define information as the agent that instructs the written word to build meaning.

Entropy

While information is defined as the agent which generates new structures, entropy is seen as its opposite; the agent of chaos, which tends to destroy meaning. Its importance in this study derives from a view of the universe, adopted by many scientists, which contends that random and nonrandom forces coexist in a complementary relationship. (Campbell: 1982) In terms of language, this would further explain the predictability inherent in such a flexible message system.

Language/Language Acquisition and Learning

Although generally considered as *any* means of communicating, these researchers define language, within the context of this study, as the written symbols for human speech or vocal sounds; letters, numerals, rules, etc.

used for the transmission of information.

Knowledge of language is acquired unconsciously. (Harris, 1990) The theory of information makes it clear that symbols cannot be strung together at random; there must be an agent that instructs words to build meaning. If there is no such agent, the messages generated will not be intelligible, nor will they be protected against error. (Campbell: 1982) With this in mind, the acquisition of a language can be seen as a process of identification and interrelation of the elements of language. In other words, the language learner begins to recognize nonrandom patterns. Actual language learning, then, would be the conscious knowledge and application of those patterns.

Communication

In the same way that genes are a system for sending chemical messages to the protein factories of the cell, instructing them to make a living organism, so is communications a system which sends messages of speech to a receiver, instructing it to create meaning. (Campbell: 1982) Such messages of speech can be sent in a variety of ways; including body language, orally, or via the written word. The focus in this study, is on the transmission of a message via the written word.

Claude Shannon's theory of information relies on this definition of communication; without a system, the nonrandom elements of redundancy and predictability would be scarce in language, if not completely nonexistent. The use of the system image implies some type of order and structure. It is this connection between the system of communications and the mathematical view of language (the theory of information) that has led these researchers to believe that the latter can be of use in determining an individual's proficiency in the former.

Message

A meaning that is transmitted through a system of rules that reduces uncertainty. (Campbell: 1982) For example, a written message would be a meaning that has conformed to rules of spelling, structure, and sense that are shared between the writer and the reader, making it understandable to both. Because these rules make the message partly predictable, proficiency in a written language necessitates an ability to identify and use those rules.

Predictability

Generically, predictability can be defined as the ability to foretell what will follow. Educators often use this concept as a strategy to teach

comprehension; a primary teacher, while reading a story, may encourage students to use their life experiences and common sense to guess (or predict) what will happen next.

According to the theory of information, the ability to foretell what will follow (or predictability) is possible because in all forms of communication, more messages are sent than are strictly necessary to convey the information intended by the sender. (Campbell: 1982) These additional messages act to decrease the surprise effect of the information being sent, thereby making it more predictable (or more easily foretold).

Redundancy

Closely related to predictability is the concept of redundancy. With respect to language, redundancy is a consistent use of more bits of information than are actually needed to send a message. In effect, it is the quality of redundancy (the rules of spelling, structure, and sense mentioned above) that makes written language predictable in the first place.

After conducting numerous experiments with English text in which he eliminated varying amounts of information, Claude Shannon concluded that English is about 50 % redundant when we consider samples of eight letters at a time. He claimed that if the length of the sample is increased, the

redundancy is much greater and that in the case of whole pages or chapters, where the reader is able to get an idea of the theme and literary style of a text, up to 75 % could feasibly be redundant. Again, it is partially the intent of this study to determine if the concept of redundancy (as defined by the theory of information) can be used to determine language proficiency (specifically Spanish).

Readability

Readability is a term used in education to describe the sum total of the elements contained in a piece of printed material with respect to how successful a group of readers might be in decoding and comprehending it. (Bennette-Kinkead: 1990) Claude Shannon, in applying his theory of information, felt that in the same way in which that theory could be used to determine redundancy in a text, so could it be used to determine readability. It is not the intent of these researchers to determine whether or not this may be the case, however; their interest in this concept lies in its application to the validity of the tool they developed. With this in mind, they used publishers' descriptions of readability to select passages operating at comparable levels of difficulty in their original form. This was done so as to eliminate readability as a variable affecting the outcome of subjects' scores

as they progressed through the sets of passages.

Proficiency

Whether demonstrated through comparison (as in trends or bell curves) or against a standard, proficiency is the degree of correctness and ease identified through training or performance. (Bennette-Kinkead: 1990) For the purpose of this study, proficiency is the degree of competence in correctly identifying missing bits of information from written passages.

Proficiency Test

While proficiency is the degree of correctness, a proficiency test is the method or the tool used to measure that degree. Within this study, when employing the term *proficiency test*, these researchers are referring to assessment tools designed to measure an individual's competence in a second language, independent of any particular curriculum or course of study. One of the purposes of this study is, in fact, to design a test where the percentage of missing bits identified, correctly serves as a measure of an individual's proficiency in Spanish reading.

Bit

A bit, or binary digit, is a measure of amount of information. In the historical sense, the term arises from the electrical (and more recently, computer) representation of information: the choice between an electrical impulse, or "1", and no electrical impulse, or "0". In other words, it is a choice between two equally probable messages; it either is or is not something. (Campbell: 1980) In language, and for the purpose of this study, a bit is the smallest piece of information conveyed by a letter, space, or punctuation. In other words, a missing bit in the tool developed by these researchers is a missing piece of information that requires identification. All of the bits deleted by these researchers were chosen based on their relationship to the redundancy of the text.

Comprehension

Webster's New World Dictionary, 1988, defines comprehension as "the capacity for understanding facts, ideas, etc."

While comprehension itself is not visibly tangible and measurable in a concrete sense, "a reader's comprehension can be measured by his or her behavior exhibited after he or she has read a passage."

(Bennette-Kinkead: 1980). In an educational setting, comprehension of a particular passage is most frequently measured by a question-and-answer format. In this particular investigation as well, each passage was followed by 2 multiple-choice questions pertaining to the content of each passage. Said questions were an attempt by these researchers to measure a degree of comprehension on the part of the reader.

Validity

The validity of a test is the extent to which a test actually measures what it claims to measure. (Robles: 1992)

The tests prepared by these researchers attempted to validate the reading proficiency levels of Spanish language learners who had been previously identified as working consistently at either a beginner, intermediate or advanced level.

Reliability

The term reliable is "applied to a person or thing that can be counted upon to do what is expected or required." (Webster New World Dictionary, 1988)

While the tools of this study actually attempted to validate pre-determined learning levels, reliability was attempted by administering a second test of approximately the same degree of difficulty at each designated level.

Summary

In 1948, Claude Shannon of the Bell Telephone Laboratories, published two papers consisting of a set of theorems dealing with the problem of sending messages from one place to another quickly, economically, and efficiently. (Campbell: 1982) In effect, Shannon succeeded in defining information mathematically, enabling him to generalize it and establish laws that hold good for all types of information. When applied to language, information becomes the agent that instructs the written word to build meaning. Shannon's theory became known as the theory of information. In the application of his theory to language, Shannon discovered that language is redundant; it conforms to rules of spelling, structure, and sense, and in so doing reduces uncertainty. (Campbell: 1982) It stands to reason, then, that redundancy increases predictability.

In this study, the researchers have attempted to translate this theory into

an actual tool to measure proficiency. They believe that an individual's ability to use his/her knowledge of redundancy in the Spanish written language can be measured and can be considered an indication of his/her level of proficiency.

CHAPTER III

Design of the Study

Purpose

The purpose of this study was to investigate the use of information theory as a testing technique to diagnose Spanish reading proficiency of students learning the Spanish language. Based on the above investigation, a further purpose of this study was to develop a Spanish reading assessment tool, which could be used in the classroom, to provide a broader picture of a student's ability to comprehend reading material at or near his/her level of language learning.

Methodology

This study was based on two prior masters' theses written by Eliza Bennette-Kinkead and Ivette Robles, respectively, (published by the State University of New York, College at Brockport) on the use of the theory of information as a testing technique.

In determining the types of passages to be used, the authors of this study felt the need to eliminate as many possible variables of comprehension

interference as could be eliminated. Consequently, they chose 1 genre of non-fiction, and chose 6 passages within that genre from published reading and science textbooks which were designated for the first grade level.

Using these primary passages, the degree of difficulty was determined as follows:

All bits of information were counted -- every letter, punctuation mark, space, etc. -- and a percentage of those bits were deleted and increased accordingly as levels of difficulty increased. Two passages at each level were created, with the intent being that the second test would verify the level at which a student was reading consistently.

Level 1 consisted of 2 passages with approximately 10% of the information missing from each passage. Level 2 was comprised of 2 passages with approximately 18% of the information deleted, and 2 passages at Level 3 had approximately 29% of the information omitted.

With regard to determining the rationale for the deletion of bits of information, both authors of this investigation decided to place the heaviest emphasis on the factor of redundancy, with secondary emphasis being given to predictability.

The subjects of this study were Spanish language students of various proficiency levels from the State University of New York, College at Brockport; there were 4 groups of students. Each student gave written consent to participate in this study, and all tests were administered anonymously.

Although each group was designated by the college to be at a specific ability level, these researchers felt that there would very likely be some students who would not actually be performing at their designated placement level. Therefore, with this in mind, these researchers also asked the students to self-determine their own level of Spanish reading proficiency.

The first group to be tested was college-designated as an Intermediate I group, and consisted of 9 students. Within this group, 1 student described herself as a beginner. A major cause for the limited data at this level was the weather; many students did not appear in class that morning due to impassable road conditions.

The second group of 10 students was designated as an Advanced Conversation and Composition class, and among those subjects, 5 were self-described as intermediate learners.

The third group of subjects were college-designated as Spanish language Beginners, and of that group of 14 students, 1 person classified herself as intermediate.

Finally, the fourth group was enrolled in an Advanced Grammar course, and of those 15 advanced students, 3 described themselves as intermediate learners, and 1 subject failed to indicate any self-description at all.

The subjects of this study underwent a battery of 6 tests: 2 tests at Level I (designated 1-A and 1-B), 2 tests at Level II (designated 2-A and 2-B), and 2 tests at Level III (designated 3-A and 3-B).

Test 1-A contained a total of 280 bits of information, with 28 deletions made, for a total percentage of 10% deletions. Level 1-B contained 303 total bits of information, had 32 deletions, for 11% of total bits deleted.

Test 2-A had 321 total bits of information, 53 deletions, or 17% of the bits deleted. Test 2-B had 399 total bits of information, less 70 deletions, for a total of 18% deletions.

Finally, test 3-A had a total of 496 bits, 142 deletions, for 29% of total bits omitted. Test 3-B contained a total of 434 bits, had 131 omissions, for a total of 30% deletions.

Procedure

The first order of business was, essentially, to create the test materials themselves. These researchers believed that maintaining a genre style and readability level would lessen variables which might otherwise interfere with reading proficiency. Accordingly, 6 non-fiction passages were chosen from published reading and science textbooks designated as first-grade material. By increasing the percentage of bits of information deleted, thus was the degree of difficulty increased.

In addition to the testing materials, these researchers felt it necessary to obtain certain personal information from their prospective subjects solely for the purpose of population identification. Therefore, a Personal Data Questionnaire was prepared, which asked for each subject's gender and self-perceived level of Spanish reading proficiency.

With these materials completed, these researchers then proceeded to administer the tests to 4 different groups of college students studying Spanish. In administering the tests, the students were given an oral explanation/description of this pending research, and were asked to

participate. Clarification was made on the chalkboard as to exactly how to proceed in filling in the missing bits of information on the tests themselves.

In an effort to keep the tests and subjects completely anonymous, a separate consent form was given to each student, signed by him or her, and returned to the researcher. At that point, pre-numbered test packages were then handed out to the students. The first page of the packet was the Personal Data Questionnaire wherein the gender and self-perception was asked of each student. Again, it was the intent of these researchers to use this particular data solely for population referents. The remainder of the packet contained the battery of 6 tests in ascending order in degree of difficulty. After each passage were 2 written, multiple-choice, comprehension questions. The students were given 45 minutes to complete the 6 tests, which appeared to be ample time. Once completed, the test packets were returned to the researcher.

Summary

The theory of information claims, among other things, that due to the factors of redundancy and predictability, much information of a given text can be omitted and still allow a reader to read the text proficiently and maintain comprehension. Based on this theory, these researchers expanded upon prior theses written by Eliza Bennette-Kinkead and Ivette Robles and developed a battery of 6 different assessment tools for Spanish language learners.

Whereas Bennette-Kinkead and Robles repeated the same passages in descending order of difficulty, these researchers developed 6 different passages, 2 passages each at approximately the same level of difficulty, and administered them in ascending order. It was the belief of these investigators that the second test at each level would serve to better validate these assessment tools. Additionally, by administering the tests in ascending order, it was intended that the beginner students be able to find some degree of success and not reach an immediate frustration level of proficiency.

All 50 subjects of this investigation were students of the State University of New York, College at Brockport, during the Spring semester 1994. All 4 classes chosen were pre-designated at levels ranging from

beginner to advanced Spanish language learners. These researchers asked each participant in this investigation, via the Personal Data Questionnaire, to evaluate his or her own proficiency level in order to shed any light on potential inconsistencies in the data outcome. All students were given a time frame of 45 minutes within which to complete the testing packet.

CHAPTER IV

Analysis of Data

Purpose

The purpose of this study was to investigate the use of information theory as a testing technique to diagnose Spanish reading proficiency of students learning the Spanish language. Based on the above investigation, a further purpose of this study was to develop a Spanish reading assessment tool, which could be used in the classroom, to provide a broad picture of a student's ability to comprehend reading material at or near his/her level of language learning.

Establishment of Proficiency Criteria

The criterion reference for this tool was chosen after careful empirical review of the data. Students were to correctly supply 80% of the missing bits of information for both tests at each level to be deemed "proficient." While 80 % is somewhat arbitrary, it is not a "wild guess"; the researchers discovered that most college-classified advanced students were the only students to score 80 % or better on measures 3a and 3b, while only the college classified beginners were **not** able to score at least 80 % at the

intermediate level. Additionally, the researchers accepted Campbell's argument that in order to successfully determine the identity of a missing bit, an individual must employ his/her knowledge of redundancy in language, and therefore employ comprehension abilities. (Campbell: 1982) These researchers allotted a 20 % leeway at each testing level to adequately provide for factors such as poor spelling ability on the part of the test taker, or poor choice on the part of the test developers of some of the bits deleted (extremely low redundancy, for example).

Beginner

Subject	Description		1a Percent Score	1b Percent Score		2a Percent Score	2b Percent Score		3a Percent Score	3b Percent Score		Researchers' Classification	College Classification
20	Beginner		93	91		53	81		65	71		B	B
21	Beginner		96	88		85	84		49	69		B	B
22	Beginner		79	63		36	63		43	37		B	B
24	Beginner		75	81		66	67		50	16		B	B
25	Beginner		89	88		81	83		26	48		I	B
26	Beginner		79	88		66	64		32	54		B	B
27	Beginner		93	97		79	80		54	63		B	B
28	Beginner		79	88		72	79		54	41		B	B
29	Beginner		86	84		68	79		53	18		B	B
30	Beginner		82	88		49	63		37	35		B	B
31	Beginner		89	75		58	61		51	31		B	B
32	Beginner		89	88		66	70		52	59		B	B
33	Beginner		79	81		51	54		37	22		B	B
34	Beginner		71	72		49	64		36	49		B	B
Mean			84.18	83.48		62.80	70.92		45.57	43.68			
Standard Deviation			7.64	8.70		14.13	9.73		10.75	18.25			

The above group of students was classified by the college as beginning Spanish language learners. With a criterion level of 80% proficiency in both passages at this level, this assessment tool would seem to confirm the beginning level placement for the majority of these students. The mean scores at each level also show a distinct downward trend in proficiency as the percentage of deleted information increased.

An interesting discrepancy to note is Subject No. 21. While this subject was placed in a beginner group, she described herself on the Personal Data Questionnaire as being an intermediate student. According to this tool, she did, in fact, test out at the intermediate level.

With respect to Subject No. 25 and her performance at the intermediate level (according to this tool), these researchers attribute this borderline proficiency to actual growth in learning as these tests were administered late in the Spring semester. (The tests were administered in early April; the college semester ended in May.)

Intermediate

Subject	Description		1a Percent Score	1b Percent Score		2a Percent Score	2b Percent Score		3a Percent Score	3b Percent Score		Researchers' Classification	College Classification
1	Intermediate		79	84		43	66		63	57		B	I
2	Intermediate		89	97		98	84		78	72		I	I
3	Intermediate		93	91		89	86		68	64		I	I
4	Intermediate		89	72		77	54		26	31		B	I
5	Intermediate		86	63		62	69		35	34		B	I
6	Intermediate		89	84		89	81		48	67		I	I
7	Intermediate		100	97		96	93		70	83		I	I
8	Intermediate		93	91		68	83		67	63		B	I
9	Intermediate		96	97		77	80		63	61		B	I
Mean			90	86		78	77		58	59			
Standard Deviation			6.19	12		17.7	12		18	17			

At the time of this study, subjects 1 through 9 were the only participants undergoing Spanish instruction at the intermediate level. The above table is arranged by subject number, and displays the score obtained by each on all 6 passages, in terms of the percentage of missing bits correctly identified. The mean score for each test is given at the bottom of the table. Taken together, these mean scores show a downward trend as the intermediate group moves

from one set of tests to another (in effect, moving from one level of difficulty to the next).

As a group, these students correctly identified an average of 90 % of the missing bits on passage 1a and 86 % on passage 1b. As both these scores exceed the benchmark of 80 % correct identification, it can be concluded that, as a group, these students are proficient in Spanish reading at *at least* the beginner level.

An examination of the average scores of these students on passages 2a and 2b (passages which the researchers intended to reflect an intermediate level of difficulty) indicate that, as a group, they are working below level. The average score on passages 2a and 2b were 78 % and 77 % correct identification respectively. Both of these scores fall below the benchmark of 80 %, indicating that the type of deletions made at this level may need to be modified in order to increase the reliability of the tool, or that some of the students may, indeed, be placed incorrectly.

It is apparent to these researchers that the discrepancies evident in the results obtained by subjects 1, 4, 5, 8 and 9 are responsible, in part, for the overall "poor" (below benchmark) mean performance on passages 2a and 2b. Subject 1 shows a curious discrepancy in that her score on passage 2a is

lower than those obtained in the more difficult 3a and 3b passages. Based on this data and the criteria for evaluation set above, the researchers have classified this subject as a beginner.

Although not lower than their 3a and 3b scores, subjects 8 and 9 also scored "low" (below the benchmark) on passage 2a (68 % and 77 % respectively). Noteworthy also, is the fact that both subjects scored above the benchmark on passage 2b; identifying their score on 2a as the only factor that has kept the researchers from classifying them as intermediate students as opposed to beginners. This evidence suggests that passage 2a may be the weaker of the two in determining intermediate ability for these students.

Subjects 4 and 5 both scored lower on passage 1a (a passage aimed at a beginning Spanish level in terms of percent and type of bits deleted) than they did on one of the two more "difficult" passages in the second set. These researchers feel that results from a larger population of preidentified intermediate students is needed before attempting to adequately explain this type of discrepancy. They tentatively suggest that these scores might be coincidental; possibly caused by personal circumstances on the part of the subject such as distraction, anxiety, etc., or indicators of a need to modify

that particular passage. Based on this information, they conclude that these two students are working at a beginning Spanish level.

These researchers caution that while this tool indicates that only 4 of the nine students identified as intermediate students (by virtue of the course in which they were enrolled) appear to be working at that level, a much larger population is required to obtain an accurate picture. Results from the population of 9 appear to indicate that passages 2a and 2b may need some modification in terms of type of information deleted (i.e. vowels, nouns, etc.), or that the students may have been placed in an inappropriate setting.

Advanced

Subject	Description		1a Percent Score	1b Percent Score		2a Percent Score	2b Percent Score		3a Percent Score	3b Percent Score		Researchers' Classification	College Classification
10	Advanced		96	100		100	94		91	95		A	A
11	Advanced		100	97		98	84		92	88		A	A
12	Advanced		100	97		98	84		92	88		A	A
13	Advanced		96	100		89	90		85	86		A	A
14	Advanced		100	100		100	97		89	82		A	A
15	Advanced		100	100		96	90		90	85		A	A
16	Advanced		100	100		94	90		87	93		A	A
17	Advanced		100	97		91	86		94	79		I	A
18	Advanced		96	97		98	99		99	97		A	A
19	Advanced		100	97		91	83		85	80		A	A
36	Advanced		96	100		98	99		83	93		A	A
37	Advanced		100	100		98	99		96	90		A	A
38	Advanced		96	100		96	90		99	100		A	A
39	Advanced		100	97		100	100		100	99		A	A
40	Advanced		100	100		87	94		97	98		A	A
41	Advanced		100	100		96	100		99	98		A	A
42	Advanced		100	100		100	100		80	79		I	A
43	Advanced		100	97		96	90		63	60		I	A
44	Advanced		100	100		100	94		82	82		A	A
45	Advanced		96	97		92	81		60	62		I	A
46	Advanced		100	97		98	90		94	87		A	A
47	Advanced		100	100		94	100		99	95		A	A
48	Advanced		100	100		94	99		95	97		A	A
49	Advanced		100	97		91	96		99	97		A	A
51	Advanced		96	94		94	94		93	85		A	A
Mean			99	99		96	93		90	88			
Standard Deviation			1.64	1.8		3.8	5.9		10	10			

Two groups of subjects who participated in this study were studying Spanish at an advanced level. Subjects 10 through 19 were enrolled in a Spanish conversation and composition class, while subjects 36 through 49

and subject 51 were taking an advanced grammar course. The above table is arranged by subject number, and displays the score (in terms of the percentage of missing bits correctly identified) obtained by each on all 6 passages. The mean score for each test is given at the bottom of the table. Taken together, these mean scores show a gradual downward trend as the advanced group moves from one set of passages to another (in effect, moving from one level of difficulty to the next).

As a group, these students correctly identified an average of 99 % of the missing bits on passages 1a and 1b. As both these scores exceed the benchmark of 80 % correct identification, it can be concluded that, as a group, these students are proficient in Spanish reading at *at least* the "beginner" level.

An examination of the mean scores of these students on passages 2a and 2b (96 % and 93 % respectively) indicates that, as a group, these students are also proficient at the intermediate level.

The mean scores on passages 3a and 3b (90 % and 88 % respectively) also surpass the benchmark, leading the researchers to conclude that, as a group, these subjects preidentified by class designation as advanced students, are, in fact, proficient at that level.

With the exception of numbers 42, 43, and 45, an examination of the scores by individual subject reveals a "gentle" (an average of 3 points per set of passages) decrease when moving from one set to the next. The decrease is explained by the fact that each set of passages contains a higher percentage and more difficult type of deletions . The bits targeted were of lesser redundancy than those in previous passages. These subjects performed as predicted; their scores were still "high" (above the benchmark) on passages 3a and 3b. Based on this information, the researchers classified those 22 individuals as advanced students.

Subjects 43 and 45 scored at least ten points above the benchmark on the first two sets of passages, indicating that they are working at *at least* an intermediate level. Both of these subjects fell below the benchmark by almost 20 points in passages 3a and 3b, demonstrating that they are not proficient at an advanced level. The researchers suggest that, although enrolled in an advanced grammar course, these students may be intermediate level students who are consciously working above level for personal reasons (degree requirements, or a desire for the information supplied in that particular course, for example). It is worth noting that both of these subjects indicated on the Personal Data Questionnaire that they felt

they were at an intermediate level of Spanish proficiency.

The other discrepancy between designation by course enrollment and designation by this tool occurs in the scores obtained by subject 42. This student scored 100 % on both passage 2a and 2b, indicating quite strongly that she is proficient at *at least* the intermediate level. On passages 3a and 3b, she scored 80 % and 79 % respectively, which falls just short of these researchers' criteria of 80 % or better in **both** passages at a given level for that subject to be classified proficient. Subject 42, then, has been classified as an intermediate student, as per their criteria. They felt that the closeness of the scores to the benchmark did warrant mention and that this student might, in fact, be working at an advanced level and may have "rushed" through the last 2 passages. In other words, they caution that such a close score may indicate variables other than simply the level of reading ability.

The results from this population of 25 "advanced" subjects appears to confirm the usefulness of this tool; 22 of the 25 subjects scored above the benchmark on both passage 3a and 3b. In terms of identification of an advanced student, then, these researchers conclude that this tool can be successfully employed. They also suggest that further

research into the percentage and type of bits deleted in passages 3a and 3b (specifically with respect to the law of diminishing returns) be made. They feel that testing Claude Shannon's claim that an individual can understand a passage even if 75 % of the information is missing, (Campbell: 1982) will further validate their findings.

Reliability

RELIABILITY OF LEVEL THREE MEASURES
CORRELATION BETWEEN 3A AND 3B

Table A

LINEAR Y = A + B*X

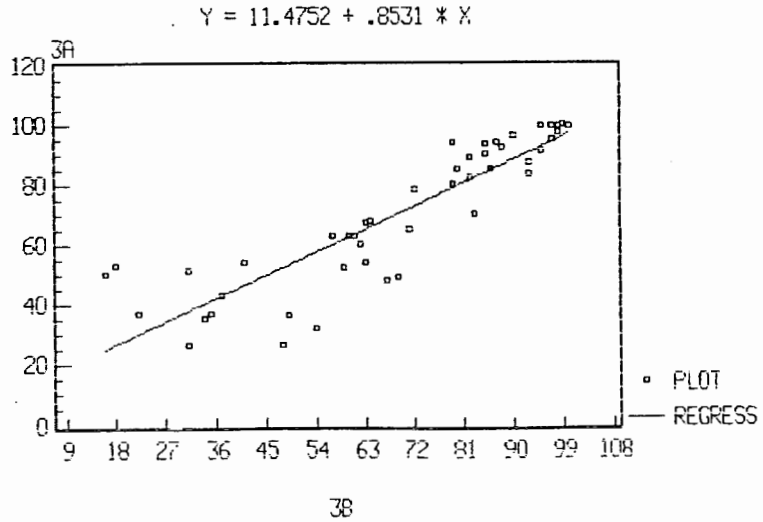
Y = 11.4752 + .8531 * X

PARAMETER	COEFFICIENT	STD ERROR	T-VALUE	PROB
CONSTANT (A)	11.47517	4.873456	2.354627	.0229
3B (B)	.853051	.066186	12.88876	<.0001

UNADJUSTED R^2	= .783142	REGRESSION ANOVA	F = 166.1207
ADJUSTED R^2	= .778427	2-TAILED PROB	P = <.0001
CORRELATION COEF	= .884953	DEGREES OF FREEDOM	= 1 AND 46
STD ERR OF ESTIMATE	= 11.04323	DURBIN-WATSON STAT	= 1.782376
VARIANCE OF ESTIMATE	= 121.9529	DEPENDENT VAR. MEAN	= 70.83334
MEAN ABSOLUTE ERROR	= 7.971743	COEFF. OF VARIATION	= .155904

WITH X = 3B AND Y = 3A

Graph A



In the development of most measurement tools, it is a common practice to determine the tool's reliability via a test-retest procedure. This, however, was not done in the current research. Instead, the approach used herein was 2 forms of the measuring instrument pitted against **each other**. The crucial measuring tool in the current study was the set of 2 parallel measures called "3a" and "3b", which were designed to differentiate the advanced students from the intermediate, as well as confirm the lowest level of performance on the part of the beginners. Table A shows the statistical workup for this third level (advanced) measure. Here, the correlation coefficient between the 2 forms was .88. Since .80 is a commonly accepted benchmark for establishing interform reliability, and since this was exceeded, it can be concluded that the tests are highly reliable. This statistical relationship demonstrated in Table A is further supported by Graph A, which indicates, subject by subject, the same strong interrelationship between the two test forms 3a and 3b.

Validity

The case for the validity of the instrument rests upon its ability to predict the level of global language performance. The classification made

by the college is based upon the student's progress through it's established program, while the classification made by these researchers is based solely on the results of their tool. Despite this difference, the new reading proficiency measure did agree with the college instructors' classifications in 77 % of the cases. With respect to those subjects classified by these researchers as operating at a lower level than that designated by the college, the argument can be made that 1) these are students who are at risk of failure in that particular class, 2) were affected by emotional factors, or 3) have been incorrectly placed by the college. In cases where the researchers' placement was higher than that given by college course, it could be said that since this data was collected at the end of the semester, some of the changes might be attributed to the learning that took place during the semester. Noteworthy, however, is the fact that no college classified "advanced" student was classified by the new tool as a "beginner", or vice versa. Because the test was given anonymously, the researchers do not have access to the college instructors' performance data concerning any individual subject. Such information might explain some of the classification discrepancies and is, therefore, offered as an element to be considered in the event that further data is collected based on this tool.

3a and 3b Score Distributions

BREAKDOWN OF '3A'

ESCAT GROUP	N	MIN.	LOW QUART.	MEDIAN	UP QUART.	MAX.
	17	26	36.5	51	58.5	67
	10	26	49	65.5	78	94
	21	82	88	93	99	100
TOTAL	48					

BREAKDOWN OF '3B'

ESCAT GROUP	N	MIN.	LOW QUART.	MEDIAN	UP QUART.	MAX.
	17	16	31	41	60	71
	10	48	62	68	79	83
	21	80	85.5	93	97	100
TOTAL	48					

The above histogram shows the breakdown in the score distributions by proficiency level (beginner, intermediate, and advanced) in the measures known as "3a" and "3b". Again, both measures clearly distinguish between the three performance levels, thus (further) supporting the reliability and validity of the instrument. It should be noted, however, that the discriminatory ability of 3b is superior to that of 3a.

CHAPTER V

Conclusions/Recommendations

Conclusions

The purpose of this study was to further investigate the use of information theory as a Spanish language assessment technique, within an English-speaking setting, by broadening the data base and employing a wider variety of reading passages. A further purpose was to attempt the development of a Spanish reading proficiency test that could be used in the classroom to provide a broad picture of a student's ability to comprehend reading material at or near his/her level of language learning.

The subjects of this investigation were college level Spanish language learners, pre-classified as either beginner, intermediate or advanced students.

With respect to the population, these researchers feel that a significant limitation of this investigation was the actual size of the data base. Due to the relatively small sample population, these researchers would highly recommend a larger data base should this investigation be replicated at a future date.

The criterion reference for this tool was chosen after careful empirical review of the data. Students were to correctly supply 80% of the missing bits of information for both tests at each level to be deemed "proficient." While 80 % is somewhat arbitrary, it is not a "wild guess"; the researchers discovered that most college-classified advanced students were the only students to score 80 % or better on measures 3a and 3b, while only the college classified beginners were **not** able to score at least 80 % at the intermediate level. Additionally, the researchers accepted Campbell's argument that in order to successfully determine the identity of a missing bit, an individual must employ his/her knowledge of redundancy in language, and therefore employ comprehension abilities. (Campbell: 1982) These researchers allotted a 20 % leeway at each testing level to adequately provide for factors such as poor spelling ability on the part of the test taker, or poor choice on the part of the test developers of some of the bits deleted (extremely low redundancy, for example).

The bias of these researchers was that definite trends in Spanish language reading proficiency would correspond directly with the percentage of deletions made in each passage. It was also the hope that the second passages at each level would support these findings. The mean scores of

each test level did indicate a consistently downward trend in proficiency, and the overall correlation among the testing tools themselves (at each level) confirmed that. The researchers did find then, that there was a strong relationship between the deletions and the level of reading proficiency.

The investigators express some concern over the multiple-choice comprehension questions that appear at the bottom of each passage. A few subjects indicated that they were able to supplement their knowledge of the missing bits of information with the content of the actual questions and answer choices themselves. These researchers would recommend either: a) placing the questions on a separate page following each test, b) placing the questions on a separate sheet after the entire battery of tests, or c) total omission of the questions altogether.

In actuality, the comprehension data of this tool was not given a great deal of credence by these investigators. Initially, the questions were meant to determine a degree of comprehension, but as the overall responses to the questions were correct, despite low percentage scores on the tests themselves, these researchers ultimately determined this portion of the tool as a limitation of this study. The discrepancy between the scores and the comprehension questions could be attributed to the ease of and familiarity

with the subject matter -- being that all passages were taken from published first-grade readers. Thus, these investigators would reiterate the above recommendations, as well as suggest that careful consideration be given to the actual wording of the questions, and possibly to reconsider the format of questions asked.

In addition to the discrepancy between the test scores and comprehension portion, there were several discrepancies among the data at the intermediate level. The fact that these disparities were bi-directional is of particular interest as the intermediate level of proficiency is very often the most difficult level for educators to determine. These researchers feel that this bi-directionality of scores may be the result of the subject's degree of familiarity with the passage content. We would recommend, therefore, that for an English-speaking class learning Spanish, more culturally hispanic passages would be appropriate to lessen the interference of the subject's prior knowledge.

As it stands, these researchers feel that this tool is useful in determining the level of Spanish reading proficiency of a student. The minimal discrepancies in data at the beginner and advanced levels would seem to support this belief (no beginners are classified as advanced by this

tool or vice versa). With this observation in mind, then, these researchers feel that with a larger data base, such would also be the case at the intermediate level.

Recommendations for Further Study

These researchers suggest that this tool be used in conjunction with Spanish proficiency tests given by colleges in New York State that determine the eligibility of a candidate to teach Spanish in the public school system. They feel that such use of the tool will serve to establish concurrent validity. If, in a population of at least 100, it can be demonstrated that all persons who obtained 80% proficiency on levels 3a and 3b of this tool did pass the college-given proficiency exam, then a strong case will have been made for the administration of this tool as a prerequisite to the college exam.

The researchers feel that reliability has been adequately established, and therefore, suggest that only one passage be given at each level when the tool is next administered. They recommend all three "b" passages due to their stronger showing in the breakdown of tests (see Appendix).

Summary

This study attempted to answer two questions: Is the theory of information a valid measure of Spanish reading proficiency? and, Is the theory of information a valid measure of Spanish reading comprehension? It was concluded that the theory of information can be used to develop an effective Spanish reading proficiency assessment tool. The test data indicated that the subjects were successful (in terms of the benchmark set by the researchers) up to and including the passages at their level. Because the deletions made in each passage were based on degrees of redundancy in the text, it is logical to conclude that the subjects were required to use their knowledge of syntactic and semantic cues to determine the missing information. As the subject moved from one set of passages to another and was required to rely more and more on his/her knowledge of language, he/she showed a decrease in the percentage of missing bits correctly identified. Advanced students showed less of a decline in scores as they moved through the sets, while beginners showed the most severe downward trend.

With respect to its use as a measure of reading comprehension, these researchers conclude that this tool does appear to be an indicator. They agree with Campbell's argument that in order to identify the deletions, a student is forced to use his/her understanding of the passage content. They do caution that the multiple choice questions may have affected some scores. With only a change in comprehension question format or presentation, they offer their tool as an effective measure of Spanish reading proficiency.

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LIST OF APPENDICES

- Test Passages in Original Form Without Deletions
- Instructions to Subjects
- Consent form
- Final Battery of Tests
- Data from Study
- Reliability of Level One Measures: Correlation between 1a and 1b
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Original Form of Passage 1a:

Alexander Graham Bell

El inventor del teléfono nació en Escocia en 1847. Vino a los Estados Unidos cuando tenía 24 años de edad. Fue maestro de niños sordomudos. También fue profesor en la Universidad de Boston. Creó una gran compañia telefónica. El hizo posible la comunicación a larga distancia.

[From pg. 163 of Tradición y Fantasia.]

Original Form of Passage 1b:

Noche Y Día

En la mañana el Sol parece salir del este. Parece que se mueve a través del cielo durante el día. Al mediodía está alto en el cielo. Al anochecer parece que se pone en el oeste.

Nos llega más luz del Sol durante el día. Por eso recibimos más calor durante el día. En la noche no recibimos luz del Sol.

[From pg. 146 of Ciencias.]

Original Form of Passage 2a:

Margarita Robleda Moguel

Margarita Robleda Moguel nació en Mexico y vivió en San Antonio, Texas, cuando era muy pequeña. A ella le gusta escribir y cantar canciones para niños. También es la autora de muchos cuentos. Margarita Robleda Moguel dice que toma las ideas para sus cuentos de sus recuerdos de Texas y de sus viajes por todo Mexico.

[From pg. 98, Cataplum.]

Original Form of Passage 2b:

Las Supersticiones

Las supersticiones o creencias populares también forman parte de las tradiciones. En Puerto Rico, como en otros países, existen muchas supersticiones.

Algunas de ellas son:

* Ver una mosca grande en la casa anuncia una visita.
* Pasar por debajo de una escalera da mala suerte.
* Romper un espejo anuncia una desgracia.
* Ver volar un pajarito dentro de la casa anuncia que se recibirá una visita.

[From pg. 86, Por El Mundo Del Cuento y La Aventura.]

Original Form of Passage 3a:

Una Tradición

Lo que tu familia y tu comunidad hacen es tradición. Una tradición es una costumbre que pasa de padre a hijos a través del tiempo. La gente de un país o comunidad siente que sus tradiciones son algo muy suyo. Piensan que son algo que no debe cambiar.

La gente tiene también otras cosas como cuentos, leyendas, chistes, dichos, canciones y creencias, que forman parte de su tradición.

A todo este tipo de costumbres y tradiciones que forman parte de la cultura de un pueblo se le llama folklore.

[From pg. 79, Por El Mundo Del Cuento y La Aventura.]

Original Form of Passage 3b:

Japón

En el Japón, el Año Nuevo se celebra el día primero de enero y continua durante quince días. La gente pone sus casas bien bonitas para recibir a la familia. Preparan como postre un gran bizcocho de arroz y les dan regalos a los niños y a las niñas.

Frente a la casa ponen dos ramos. Uno es de pino y el otro es de bambú. Según la creencia de los japoneses, estos ramos darán felicidad y larga vida a la familia que vive en la casa.

[From pg. 74, Por El Mundo Del Cuento y La Aventura.]

DESCRIPTION OF THE ORAL PRESENTATION TO BE GIVEN BEFORE THE STATEMENT OF CONSENT:

This study involves research into the validity of a new type of modified cloze procedure that we think can be used to determine a student's level of Spanish reading comprehension. We need people who are currently at the beginning, intermediate, or advanced levels to help us test whether or not our procedure accurately predicts the level a student is at. If you agree to participate in this project you will be asked to read as many as 6 short passages, to fill in the missing letters in those passages, and to answer two brief questions about each passage. The process will last approximately 1/2 hour and a pizza dinner and refreshments will be provided. Your name will never appear on any of the passages and the results will only be used to determine whether or not our tool works, **not** where your strengths or weaknesses may be. Those who are interested in the results of our research or who have any other questions related to the research may contact Dr. Robert Ribble in the Department of Education and Human Development or Dr. Victor Rojas in the Department of Foreign Languages here at Brockport. We can answer any questions you have now.

STATEMENT OF CONSENT

You are being asked to make a decision whether or not to participate in the project. If you wish to participate and you agree with the statement below, please sign in the space provided. Remember, you may change your mind at any point and withdraw from the study. All information collected in this study will be kept strictly confidential. If any publication results from this research, you will not be identified by name.

I _____, having understood the information provided regarding this project, agree to participate as a subject in this project

_____ _____

Signature of Subject Date

Personal Data Questionnaire

It would be helpful to us to get a general "big picture", so to speak, of the population that has agreed to help us in the development of our assessment tool. We ask that you complete this questionnaire but do not put your name on it. All of this data will be kept confidential. Circle or fill in the blank for each question.

1. Gender
   a. female
   b. male

2. How would you characterize your level of Spanish reading ability?
   a. beginner
   b. intermediate
   c. advanced or native speaker

Alexander Graham Bell

El i_ve_tor de_ tel_fono nació e_ Escocia en 1847. Vino a lo_ Est_dos Unido_ cu_ndo tenía 24 añ__ de e_ad. Fue m_estr_ de ni_os sordomudo_. Ta_bién fue pro_esor en l_ Un_versidad de Boston. Creó una g_an co_pañi_ tel_fónica. El hizo po_ible la comuni_ación a lar_a dis_ancia.

1. Alexander Graham Bell fue un inventor y

(a) un atleta
(b) un educador
(c) un músico

2 Según el autor, Alexander Graham Bell hizo posible

(a) la comunicación entre los sordomudos
(b) la creación de la Universidad de Boston
(c) la comunicación a larga distancia

Noche Y Día

En l_ m_ñan_ el S_l par_ce salir de_ este. P_rece q_e se m_eve a tr_vés de_ ciel_ du_ante _l día. A_ m_diodía e_tá alt_ en el ciel_. Al an_checer parece que se p_ne en el oest_.

Nos llega más luz d_l Sol durante el d_a. Por e_o recib_mos mas calor du_ante el día. En l_ n_che no re_ibimo_ lu_ del Sol.

1. ¿De qué hablan estos párrafos?

   (a) el movimiento de los planetas durante la noche y el día
   (b) la ruta que parece tener el Sol en el cielo
   (c) la diferencia entre el Sol y la Luna

2. Según este párrafo, recibimos más calor

   (a) al anochecer
   (b) durante la noche
   (c) durante el día

Margarita Robleda Moguel

Marg_rita Robl_da Moguel na_ió __ Mexico y vi_ió en San A_tonio, Texas, cu__do e_a mu_ pe___ña. A e__a le gus_a e_c_i_ir y c_nt__ can___nes pa_a ni_os. _am_ien es la a_tor_ de mu____ cu_ntos, Margarita Robleda Moguel dic_ que toma ___ id_as p_ra s__ cu__tos de sus recuer___ de Texas y de sus viaj__ por to_o Mexico.

1. Margarita Robleda Moguel es

   (a) una niña
   (b) una autora
   (c) un personaje en un cuento

2. Las ideas de Margarita Robleda Moguel vienen de

   (a) sus experiencias
   (b) sus canciones
   (c) su familia

Las Supersticiones

L__ supers___iones o c___ncia_ p_pul_res t_mbi_n forma_ pa_te de las tra_icion__. En Puerto R__o, c_mo en o_ros pa__es, ex_sten much__ supersti___nes.

A_gun__ de e_las so_:

* V_r una mosc_ gran__ en __ casa anunc__ un_ visita.
* Pasa_ por de_ajo __ una e_caler_ da m_la su_rte.
* Ro_per un espej_ anu_cia _na de_gracia.
* Ver vol__ un pajar_to de_tro __ _a casa anuncia q_e se rec_birán buen__ not__ias.

1. Según este artículo, ver volar una mosca grande en la casa:

   (a) significa que se recibirán una visita
   (b) anuncia una desgracia
   (c) anuncia que llegarán buenas noticias

2. ¿Cuál de estas supersticiones es mencionada en el artículo?

   (a) caminar debajo de una escalera da mucha suerte
   (b) romper un espejo da buena salud
   (c) caminar debajo de una escalera da mala suerte

Una Tradición

Lo qu_ tu fa_il_a y __ comu__da_ hac__ es tradi____. U_a ___di_ión es ___ __stu_bre que __sa de pa_re_ a __jos a t__vés de_ t_em_o. __ ge_te de u_ _aís o co__n_da_ si_nte q__ su_ tra__ci__es ___ a_go m_y _uyo. Pi_ns__ que _on al_o que no __be c__bi_r.

La g__te t_en_ tam____ ot_as co___ co_o cu_nt__, le___das, ch____s, d_ch__, ___c_i_nes y cr___cias, que f_rm__ _ar_e __ su _____ción.

A to_o __te t_po __ cos___bres y tra__cione_ q_e _or_an p__te de __ cul__ra de __ pu_blo se le __ama fo_k_ore.

1. ¿A qué (o quién) pertenecen las tradiciones?

   (a) a los cuentos
   (b) a la gente
   (c) a las canciones

2. Según el artículo, las tradiciones...

   (a) son muy importantes en una comunidad
   (b) deben cambiar por necesidad
   (c) duran poco tiempo

Japón

E_ e_ J_p_n, el A_o __evo s_ ce_eb__ el __a pr__ero de __ero y cont____ du_ante q___ce dia_, __ g_n_e po__ s_s c_s__ b_e_ bon___s pa_a re_ib__ a __ f_mi_ia. Pre___an c_mo po_tre __ gr_n ___co_ho de a__oz y le_ d_n r_ga___ a l_s ni___ y a l_s ___as.

F__nte _ l_ __sa po_en d_s r_m_s. Un_ es __ p_no y _l ____ e_ de ba_bú. _eg_n la cr__nc_a de los ja_on____, e_t__ ra_os dar__ fe_ici___ y la_ga v_da a __ fa_i_ia q_e v_ve __ l_ ca__.

1. ¿Que tipo de comida preparan los japoneses para celebrar el ano nuevo?

   (a) un pastel de arroz
   (b) arroz con pollo
   (c) arroz con habichuelas

2. Para los japoneses, ¿qué significan los ramos de pino y de bambú?

   (a) buena salud
   (b) decoraciones de bienvenido
   (c) felicidad y larga vida

data from study

Subject	Description	1a Raw Score	1a Percent Score	1b Raw Score	1b Percent Score	2a Raw Score	2a Percent Score	2b Raw Score	2b Percent Score	3a Raw Score	3a Percent Score	3b Raw Score	3b Percent Score	1a Multiple Choice	1b Multiple Choice	2a Multiple Choice	2b Multiple Choice	3a Multiple Choice	3b Multiple Choice
1	Intermediate	22	79	27	84	23	43	46	66	89	63	75	57	2	0	1	2	2	2
2	Intermediate	25	89	31	97	52	98	59	84	111	78	94	72	2	2				2
3	Intermediate	26	93	29	91	47	89	60	86	97	68	84	64	2	2	2	2	2	2
4	Intermediate	25	89	23	72	41	77	38	54	37	26	40	31	2	1	2	2	2	2
5	Intermediate	24	86	20	63	33	62	48	69	49	35	45	34	2		2	1		0
6	Intermediate	25	89	27	84	47	89	57	81	68	48	88	67	2	2	2	2	2	2
7	Intermediate	28	100	31	97	51	96	65	93	100	70	109	83	2	2	2	2	2	2
8	Intermediate	26	93	29	91	36	68	58	83	95	67	82	63	2	1	2	2	2	1
9	Intermediate	27	96	31	97	41	77	56	80	90	63	80	61	2	2	2	2	1	
10	Advanced	27	96	32	100	53	100	66	94	129	91	125	95	2	2	2	2	2	2
11	Advanced	28	100	31	97	52	98	59	84	130	92	115	88	2	2	2	2	2	2
12	Advanced	28	100	31	97	52	98	59	84	130	92	115	88	2	2	2	2	2	2
13	Advanced	27	96	32	100	47	89	63	90	121	85	113	86	2	2	2	2	2	2
14	Advanced	28	100	32	100	53	100	68	97	127	89	108	82	2	2	2	2	2	2
15	Advanced	28	100	32	100	51	96	63	90	128	90	112	85	2	2	2	2	2	2
16	Advanced	28	100	32	100	50	94	63	90	123	87	122	93	2	2	2	2	2	2
17	Advanced	28	100	31	97	48	91	60	86	133	94	103	79	2	2	2	2	2	2
18	Advanced	27	96	31	97	52	98	69	99	140	99	127	97	2	2	2	2	2	2
19	Advanced	28	100	31	97	48	91	58	83	120	85	105	80	2	2	2	2	2	2
20	Beginner	26	93	29	91	28	53	57	81	93	65	93	71	2	2	1	2	2	1
21	Beginner	27	96	28	88	45	85	59	84	69	49	90	69	2	2	2	2	2	2
22	Beginner	22	79	20	63	19	36	44	63	61	43	48	37	2	2	2	1	2	0
24	Beginner	21	75	26	81	35	66	47	67	71	50	21	16	2	1	2	2	1	
25	Beginner	25	89	28	88	43	81	58	83	37	26	63	48	2	2	1	1		
26	Beginner	22	79	28	88	35	66	45	64	45	32	71	54	1	0	0	1	1	2
27	Beginner	26	93	31	97	42	79	56	80	76	54	82	63	2	2	2	2	2	2
28	Beginner	22	79	28	88	38	72	55	79	76	54	54	41	2	2	2	2	2	2
29	Beginner	24	86	27	84	36	68	55	79	75	53	23	18	2	1	1	1	1	1
30	Beginner	23	82	28	88	26	49	44	63	53	37	46	35	2	2	1			
31	Beginner	25	89	24	75	31	58	43	61	73	51	40	31	2	1	1	1	1	2
32	Beginner	25	89	28	88	35	66	49	70	74	52	77	59	2	2	2	2	2	2
33	Beginner	22	79	26	81	27	51	38	54	52	37	29	22	2	2	0	2	0	1
34	Beginner	20	71	23	72	26	49	45	64	51	36	64	49	2	2	2	1		1
36	Advanced	27	96	32	100	52	98	69	99	118	83	122	93	2	2	2	2	2	2
37	Advanced	28	100	32	100	52	98	69	99	136	96	118	90	2	1	2	2	2	2
38	Advanced	27	96	32	100	51	96	63	90	140	99	131	100	2	2	2	2	2	2
39	Advanced	28	100	31	97	53	100	70	100	142	100	130	99	2	2	2	2	2	2
40	Advanced	28	100	32	100	46	87	66	94	138	97	128	98	2	2	2	2	2	2
41	Advanced	28	100	32	100	51	96	70	100	141	99	128	98	2	2	2	2	2	2
42	Advanced	28	100	32	100	53	100	70	100	114	80	104	79	2	2	2	2	2	2
43	Advanced	28	100	31	97	51	96	63	90	89	63	79	60	2	1	2	2	2	2
44	Advanced	28	100	32	100	53	100	66	94	116	82	108	82	2	2	2	2	2	2
45	Advanced	27	96	31	97	49	92	57	81	85	60	81	62	2	2	2	2	2	2
46	Advanced	28	100	31	97	52	98	63	90	133	94	114	87	2	2	2	2	2	2
47	Advanced	28	100	32	100	50	94	70	100	140	99	125	95	2	2	2	2	2	2
48	Advanced	28	100	32	100	50	94	69	99	135	95	127	97	2	2	2	2	2	2
49	Advanced	28	100	31	97	48	91	67	96	141	99	127	97	2	2	2	2	2	2
51	Advanced	27	96	30	94	50	94	66	94	132	93	111	85	2	2	2	2	2	2

RELIABILITY OF LEVEL ONE MEASURES
CORRELATION BETWEEN 1A AND 1B

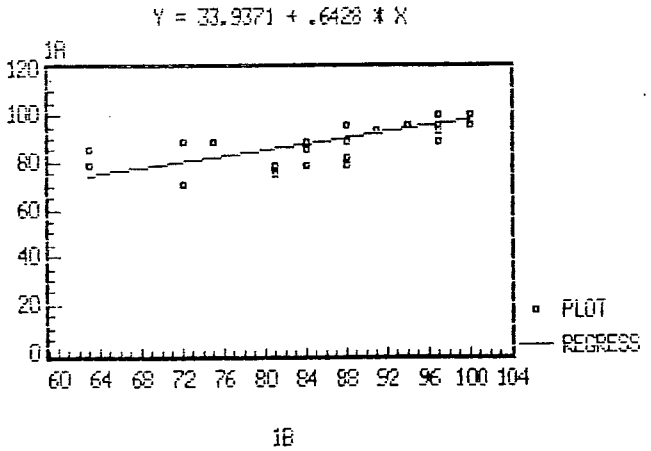
LINEAR Y = A + B*X

Y = 33.9371 + .6428 * X

PARAMETER	COEFFICIENT	STD ERROR	T-VALUE	PROB
CONSTANT (A)	33.93708	7.092867	4.784677	<.0001
1B (B)	.642797	.076737	8.376662	<.0001

UNADJUSTED R^2	= .604023	REGRESSION ANOVA	F = 70.16653
ADJUSTED R^2	= .595415	2-TAILED PROB	P = <.0001
CORRELATION COEF	= .777189	DEGREES OF FREEDOM	= 1 AND 46
STD ERR OF ESTIMATE	= 5.178256	DURBIN-WATSON STAT	= 1.302969
VARIANCE OF ESTIMATE	= 26.81433	DEPENDENT VAR. MEAN	= 93.02084
MEAN ABSOLUTE ERROR	= 3.87145	COEFF. OF VARIATION	= .055668

WITH X = 1B AND Y = 1A



RELIABILITY OF LEVEL TWO MEASURES
CORRELATION BETWEEN 2A AND 2B

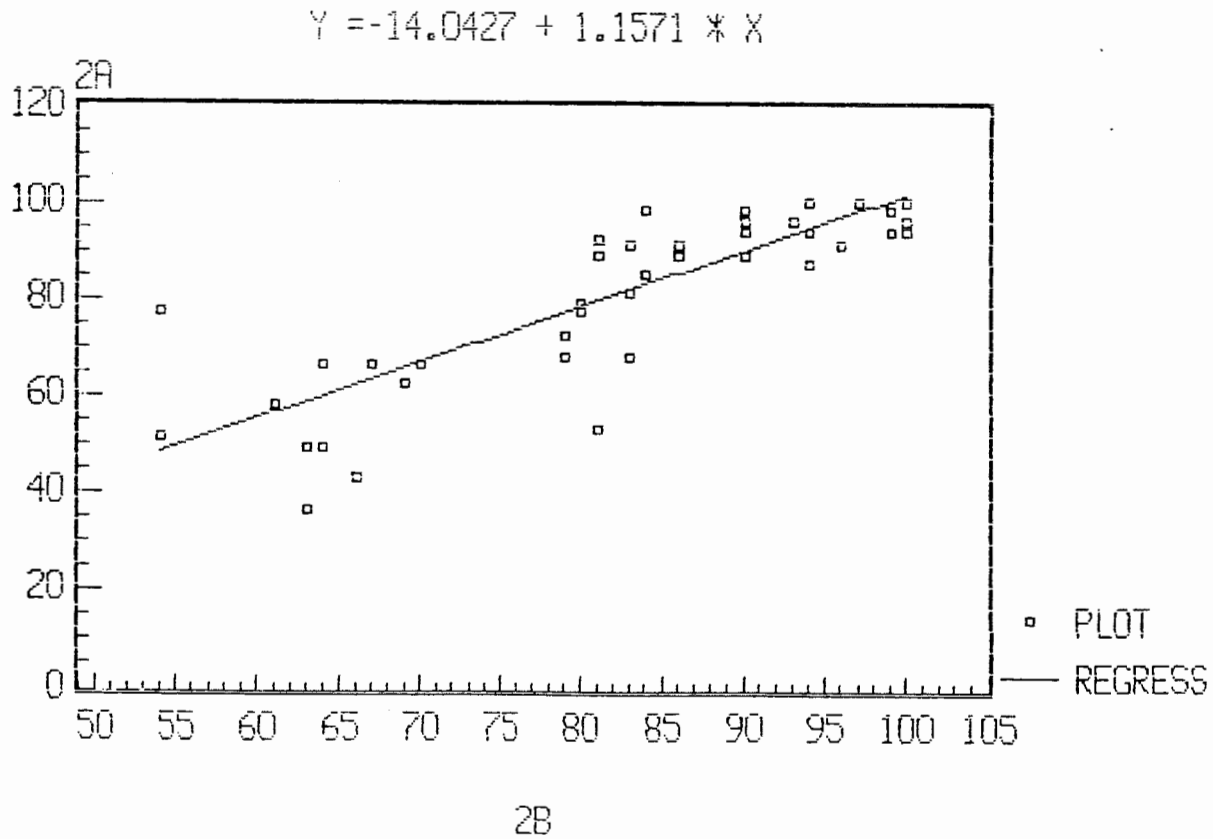
LINEAR Y = A + B*X

Y = -14.0427 + 1.1571 * X

PARAMETER	COEFFICIENT	STD ERROR	T-VALUE	PROB
CONSTANT (A)	-14.04269	9.354949	-1.501097	.1402
2B (B)	1.15708	.110624	10.45954	<.0001

UNADJUSTED R^2	= .703993	REGRESSION ANOVA	F = 109.4017
ADJUSTED R^2	= .697558	2-TAILED PROB	P = <.0001
CORRELATION COEF	= .839043	DEGREES OF FREEDOM	= 1 AND 46
STD ERR OF ESTIMATE	= 9.949936	DURBIN-WATSON STAT	= 1.660226
VARIANCE OF ESTIMATE	= 99.00123	DEPENDENT VAR. MEAN	= 82.64584
MEAN ABSOLUTE ERROR	= 7.166254	COEFF. OF VARIATION	= .120392

WITH X = 2B AND Y = 2A



COMPARISON OF PROFICIENCY GROUPS
AS CLASSIFIED BY THE PRESENT RESEARCH CRITERIA OF 80%

BREAKDOWN OF '1A'

SCAT OUP	N	MIN.	LOW QUART.	MEDIAN	UP QUART.	MAX.
	17	71	79	86	91	96
	10	89	89	96	100	100
	21	96	96	100	100	100
TAL	48					

BREAKDOWN OF '1B'

SCAT OUP	N	MIN.	LOW QUART.	MEDIAN	UP QUART.	MAX.
	17	63	73.5	84	89.5	97
	10	84	88	97	97	100
	21	94	97	100	100	100
TAL	48					

BREAKDOWN OF '2A'

SCAT OUP	N	MIN.	LOW QUART.	MEDIAN	UP QUART.	MAX.
	17	36	50	66	70	79
	10	81	89	91.5	96	100
	21	87	94	96	98	100
TAL	48					

BREAKDOWN OF '2B'

SCAT OUP	N	MIN.	LOW QUART.	MEDIAN	UP QUART.	MAX.
	17	54	63	67	79.5	83
	10	81	83	85	90	100
	21	83	90	94	99	100
TAL	48					