

Recent Mexican Policy Initiatives in Support of Vulnerable Populations: La Prueba Maya, a Test
for Bilingual Teachers of Indigenous Language-Speaking Students

Liz Hollingworth

The University of Iowa

Pedro Sánchez-Escobedo

Universidad Autónoma de Yucatán

Graciela Cortés Camarillo

Universidad de Oriente

Anthony D. Fina

The University of Iowa

Author Note

Liz Hollingworth, Department of Educational Policy and Leadership Studies and Iowa Testing Programs, University of Iowa College of Education, Iowa City, Iowa, USA; Pedro Sánchez-Escobedo, Facultad de Educación, Universidad Autónoma de Yucatán, Mérida, Yucatán, México; Graciela Cortés Camarillo, Universidad de Oriente, Valladolid, Yucatán, México; Anthony D. Fina, Psychological and Quantitative Studies, University of Iowa College of Education, Iowa City, Iowa, USA.

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Correspondence concerning this article should be addressed to Liz Hollingworth, 340C Lindquist Center, Iowa City, Iowa 52242. Email: liz-hollingworth@uiowa.edu.

Abstract

La Prueba Maya is a new, computer-based diagnostic assessment that was developed to measure the Maya proficiency of Mexican teachers. 2,507 preschool and primary school teachers in Mexico answered a battery of tests to assess Mayan fluency in reading, listening, speaking, and writing. Results were used to determine proficiency in Maya as a second language for teachers wishing to work with indigenous, Maya-speaking children in Yucatán, Campeche, and Quintana Roo. We ground this work in the theories and research from the fields of anthropology, education, linguistics, second language acquisition, the unique features of indigenous languages, and best practices in language assessment. The results of the tests indicate the listening part of the test was the easiest for test takers, and the written test was the hardest. There are challenges and limitations of testing teachers of indigenous children who, in most cases, are new to basic and general testing procedures and digital media. In addition, teachers' scores were higher in listening and speaking. If Mexico wants to protect Heritage languages, then its teachers must be given opportunities to attend to their own competencies in reading and writing to pass the indigenous languages to the next generation.

La Prueba Maya: Testing Bilingual Teachers of Indigenous Language-Speaking Students

La Prueba Maya is a new, computer-based assessment developed to measure the ability of Mexican teachers to read, write, speak, and listen in Maya. This research study is an examination of the complex interaction between linguists with expertise in indigenous languages, Mexican professors with knowledge in language and intelligence testing, American test development experts, and a federal Mexican policy directive to honor and protect the indigenous languages by providing qualified teachers who are fluent in the indigenous Mayan language to the Yucatán. This work is designed to contribute to the literature on the policy and politics of indigenous language testing, and it describes the results of our study and the role of culture and language in the assessment of bilingual teachers of indigenous students and some challenges when developing tests to measure indigenous language skills.

Background

The Mexican Yucatán Peninsula is home to North America's largest indigenous population, the Maya. Mayan history in the Yucatán Peninsula (see Figure 1) can be traced to around 2600 B.C., and Mayan culture rose to prominence around 250 A.D. in present-day southern Mexico, Guatemala, western Honduras, El Salvador, and northern Belize. Today there are about 750,000 people who speak Maya in Mexico (Villar, 2005), and tourists from around the world flock to the region to visit archaeological evidence of the lives of the Maya. According to the Mexican census, the states that comprise the Yucatán peninsula have the highest percentage of indigenous language speakers in Mexico (Villar, 2005; see Table 1). Based on statistical data from the 2005 *Count of Population and Housing* (Censo de Población y Vivienda) in Mexico, 92.9% of the people who speak an indigenous language also speak

Spanish. Only 5.5% of the population is monolingual. This is not surprising, given that the language of instruction in school is Spanish across the country.

The Spaniards came to Mexico in 1521, but it was not until 1814, when the Mexican constitution was created, that the political decision was made to use Spanish the official national language for government and administration. However, most indigenous people learned Spanish as a result of their work outside of their communities, and not from school (Cifuentes, 1992). Historically, education for Indian children in rural areas has been grounded on the “assumption that indigenous languages and cultures were ‘primitive’ and inferior” (Drake, 1978).

Mayan Literacy

Archeological evidence, historical record, and the accounts of the Mesoamerican people point to early writing in Mexico in the Olmec period in Oaxaca at 600 BC (King, 1994, p. 24). In fact, the ancient Maya writing system is considered “one of the most significant achievements of pre-Columbian peoples,” (Sharer and Traxler, 2006, p. 125). Mayan pre-Hispanic notational systems used a logosyllabic system in which pictorial representations depicted entire words or symbolic pairings (illustrated in Figure 2). In her anthropological analysis of literacy in Mexican indigenous cultures, King (1994) writes that pre-Hispanic Maya writing was both pictographic and ideographic and “not intended to be reduced to speech in the same sense as phonetic writing,” (p. 35). Furthermore, written materials were meant for the shamans and enlightened ones, and not for the common people.

Despite this tradition, Maya was translated phonetically into its current written form in the 16th Century, when Spanish friars imposed their alphabetic system (Brody, 2004). The friars transcribed significant Maya documents into a phonetic alphabet. Furthermore, the Maya took an active role in this production, adapting pre-Hispanic codical knowledge as well as information

from European sources translated into Maya but presented in the Latin alphabet (Bricker and Miram, 2002) via the books of the *Chilam Balam*, almanacs written in Maya, Spanish, and Latin in the Latin alphabet to depict beliefs on astrology, medicine, prophecy, the calendar system, and the origin and history of the Mayan peoples, as well as information from European almanacs (Ancona, 1978). The alphabetic script then became an important tool for communication between the Maya and the Spanish authorities in Mérida, the Yucatecan capital. Rather than learning Spanish, the Mayans taught the colonizers Maya. They transcribed their own religious texts into a phonetic alphabet that could be read by the colonizers, preserving a “virtual treasure trove of information reflecting the intellectual concerns of the colonial Maya scribe,” (Bricker and Miram, 2002, p. 3). Bilingual individuals then could act as “language and culture brokers for their communities,” (England, 1998).

In this way, Maya language and culture has been maintained in the southeastern peninsula of Mexico and has served as a means to preserve both regional and ethnic identity. Today approximately 1.2 million people living in the Mexican Yucatán peninsula speak Maya. The current written form of the Maya language is produced by writing words according to the 23 different sounds that can be identified in the spoken Mayan language.

Policy Initiatives in Support of Vulnerable Populations

Testing indigenous teachers’ Mayan language proficiency was a decision made by the federal agency that oversees Indigenous Education in Mexico (Dirección General de Educación Indígena) and the Secretaría de Educación of the three states that make up the Yucatán Peninsula (Yucatán, Campeche and Quintana Roo). The resulting test of Maya literacy, or *La Prueba Maya*, is a computer-based assessment of Maya reading, writing, listening, and speaking skills that was administered in the spring of 2009 to preschool and primary school teachers in the

Mexican states of Yucatán, Campeche, and Quintana Roo. Because this policy has the support of the federal Ministry of Education, it has not been subjected to the same kinds of limitations of other testing efforts instigated by indigenous groups: for example, lack of technical expertise (McGroarty, Beck, & Butler, 1995). In fact, substantial resources were devoted to this project.

Why Maya?

According to the 2000 national census, Maya is the most common indigenous language spoken in Campeche, Yucatán, and Quintana Roo, with 80.9% of Campeche residents and 99.6% of Yucatán residents five years and older who report speaking an indigenous language (Villar, 2005). However census data on writing and reading indigenous languages are not collected. Hornberger and Skilton-Sylvester (2000) describe a continuum model of biliteracy and the complex interrelationships between and among communities that use multiple languages for a variety of educational purposes. Their work on indigenous teacher education programs in the Amazon revealed a power structure between the languages which resulted in the prevalence of an oral first language, but a lack of minority-authored texts in a written form of the indigenous language. A similar phenomenon exists in the Yucatán, where the oral form of Maya is prevalent, but most texts are written in Spanish.

Street (1997) outlines the challenges in creating a national language policy that takes account of multiple local languages. In particular, he notes that there is a tension between the dominant national literacy practices and the local languages and literacies (p. 374). Without a doubt, there are challenges and limitations of testing teachers of indigenous children, and Mexico's policy to revitalize indigenous languages hinges on its teachers attending to their own competencies in reading and writing to pass the languages to the next generation.

Lewis and Trudell (2010) characterize language policies as either *endoglossic*, supporting the development of local languages, or *exoglossic*, focusing on the diffusion of a national language. The Mexican policy to devote resources to the creation of a test of Maya is an *endoglossic* policy in this respect. The language diversity policy can be understood as an ecological system where each language variety represents a significant resource to be protected (p.268).

Theoretical Framework

We ground this work in the theories and research from the fields of linguistics, second language acquisition, the unique features of indigenous languages, and best practices in language assessment. For the purposes of developing this language test, the construct of Maya proficiency was developed with the knowledge that best practice requires “assessing a test taker’s knowledge of language versus the person’s ability to use language; viewing language proficiency as essentially something internal to the test taker versus something generated in a dynamic interaction among participants; developing language tests to tap hypothesized cognitive abilities versus tests, which are based on specific tasks of interest and are meant to illustrate what a test taker can do,” (Chalhoub-Deville & Deville, 2006, p. 523). For this reason, the test tasks were carefully designed to reflect the participant’s ability to use the Mayan language in a variety of contexts. Criticism of this approach to language testing is that it has the potential to lead to “reductionist approaches to instruction, where only certain aspects of language behavior are selected for evaluation, neglecting others,” (McGroarty, et al., 1995). Understanding this, we developed four subtests for *La Prueba Maya: Lectura* (Reading), *Escrita* (Writing), *Oral* (Speaking), and *Audición* (Listening).

A second issue we address in this work is the process for making educational assessment decisions in the service of language policy. In an attempt to honor and protect the indigenous languages and give them status comparable to the dominant language, in this case Spanish, there is “evidence that language policy and language education can serve as vehicles for promoting the vitality, versatility, and stability of these languages,” (Hornberger, 1998). For this reason, linguists with expertise in Maya and Spanish were key participants in the development process. The next section describes the methodologies that were used to develop *La Prueba Maya*.

Methodology

A computer-based, interactive test of Mayan reading, writing, listening, and speaking was created in the fall of 2008. In the spring of 2009, *La Prueba Maya* was piloted with a sample of adult classroom teachers who plan to work with indigenous Mayan children in the Yucatán peninsula (the states of Campeche, Quintana Roo, and Yucatán), who speak Maya, and who are learning Spanish in school. To appropriately hire competent bilingual teachers, it is essential to have a measure of the degree of competence in various language domains. Teachers fluent in Maya are necessary to ensure the success of bilingual programs designed to preserve and enrich the Mayan language, a valuable heritage to future generations of Mayan descendants. For the test pilot, 2,507 preschool and primary teachers in Mexico working in the indigenous school system in Yucatán, Campeche, and Quintana Roo took the test in seven computer labs that were set up in higher education institutions across the peninsula. Table 2 breaks down the participants by gender and region.

The test itself took three hours to administer and included forced choice items for reading, writing and listening subtests, and recorded oral responses for speaking. A cloze format

was used to assess Maya in context. Test data were analyzed by the multidisciplinary team and an index of inter-rater reliability was calculated.

Test Development Procedure

According to McGroarty et al, (1995), “the development of any test in an indigenous language can be considered an innovation in the educational technology of testing,” (p. 329). With this in mind, an interdisciplinary group was created to develop appropriate items to measure Mayan language competence. The criteria to integrate this team were twofold: first, professional expertise in each of the following academic fields: Linguistics, Psychology, Education, Teaching Languages, Teaching Mayan Language, Measurement, Evaluation, and Computer Sciences; second, diverse representation from the three states of the peninsula. Additionally, a group of 20 native Mayan speakers who were also Mayan linguistics college students participated as team members; they were from diverse towns all over the peninsula. The Mayans were involved in the development, scoring, and interpretation of the test scores. Since the test was planned to be taken by teachers from the three states of the peninsula, it was important to have diversity in dialects represented.

Funding from the Mexican Federal Government was used to create a team of educators, linguists, international test development experts, statisticians, software developers, native speakers, and language teachers, as well as experts in the teaching and learning of second languages, particularly English. The team worked in the design and development of a Maya test that measured competency in four language domains: writing, reading, speaking and listening at five levels of performance: basic, elementary, intermediate, proficiency and expert. The course of action took four stages: designing, administration, grading and meta-evaluation.

Two teams worked in the first stage, test design. The first included nine people who were experts in linguistics and were fluent in Maya. A second group included experts in intercultural education, the teaching of both Spanish and Maya. Of these, five are fluent Maya speakers and three are native Mayans. They were in charge of establishing proficiency levels and determining the structure and format of the test. The second team was integrated by three higher education Mayan teachers, two linguists, one computer science expert, and 20 native Maya speakers who were college students. To be part of this team, they had to pass an exam in Mayan writing and participate in a testing workshop. This group was in charge of formulating items, revising, editing, and building the test according to the specifications table and the format required. In this process, to abide to the culture and tradition of the Mayans, items were constructed by native speakers and item developers discussed and revised the test in Maya.

Also of interest were linguistic issues that had to be addressed in the test development process. For example, the linguists and test development experts debated the appropriateness of writing the test item stems in Spanish or Maya for the vocabulary section of the test (particularly in the Writing test). Bachman (2001) suggests a conceptual framework between language use in specific situations and language test performance. The authenticity of the language tasks presented in the test affect the construct validity of the inferences that can be made about test takers' ability. In the end, the decision was made to write the item stems in Spanish and the vocabulary words in Maya to ensure that only the Maya vocabulary words under consideration were being measured. Once the team finished the test, software was created to administer it.

Regarding item type, the team opted for a forced choice format for the reading, writing, and listening subtests, and a tape recorded oral format for speaking. A cloze format (Bailey, 1998) was used to assess test takers ability to use Maya in context. There is ample research

evidence to support the appropriateness of the use of computerized testing to assess language ability, in particular second language learners (see, for example Alderson & Bachman, 2006). More importantly, there is a tradition of research in language testing to support the use of a computerized cloze format (Bachman, 1990).

The second stage, administering the test, was divided into two procedures. First, the test was administered to three groups of college students, all of whom were required to have high proficiency in Maya. Modifications to the test items were done according to feedback that came from this administration. The second stage was the administration to the target group: teachers who work in indigenous education in the Yucatán Peninsula. The test was administered in seven schools across the three states, in computer rooms equipped with PC's for each respondent with the program encrypted and ready for use. The reading, writing, and speaking tests were administrated by computer; only the two final levels of writing competency were via pencil and paper.

The third stage was scoring. Most of the test was scored electronically; however, the speaking competency and the two higher levels of writing competency were assessed by judges using a rubric. A team consisting of college students who were native Maya speakers and two Maya language teachers were trained by two linguists who developed the rubric and the grading system. In looking for judges' consistency, each grading session started with a training section to enhance inter-rater reliability. There were three possible grades for each answer: 1, wrong, 3, correct; and 2, questionable. If any judge graded with 2, the answer had to be scored again, by another judge; if the grade was 2 again, a third score was planned. The speaking competency portion of the test was recorded using digital software; the writing competency subtest was on paper. At the end, the final score was the result of both grading systems: by judge and by

software. Each individual had a final score that included the four communicative competences and one score for each competency.

It was determined that the test results would be interpreted using a criterion-referenced reporting framework. That is, language proficiency is referenced against the operational performance of a set of authentic language tasks (Brown & Hudson, 2002). Test takers were assigned levels of proficiency (from one to five) based on their performance in each of the four content areas. From the data, interpretations were made about test takers' L2 acquisition. There are three theoretical approaches to second language acquisition—Generative, Interactionist, Emergenist. Table 3 is a reproduction which outlines these theoretical approaches (Norris & Ortega, 2003, p. 726). The language tasks that were selected for *La Prueba Maya* were interpreted from a generative theoretical framework. That is, test takers were expected to demonstrate grammatical competency. Table 4 depicts the item difficulties from the pilot test, and the items do indeed become more difficult for test takers at each of the five levels. A summary of the results from the pilot appears in the next section.

Results

Participants demonstrated varying degrees of proficiency in reading, writing, speaking, and listening in Maya. Table 5 breaks down the performance on each subtest by state. The goal in creating the test was that the items would get progressively harder in each subtest. In addition to language proficiency exercises, demographic data were collected from each subject, including years of teaching experience, whether or not he or she owns a computer, and if the subject has other family members who speak Maya. The test takers reported learning Mayan in a variety of settings: speaking it in the home since birth, learning it from chatting with friends, or studying it in a formal workshop setting (see Table 6). From analyzing the demographic data provided by

the test takers, it is clear that most of the teachers have learned the Maya by oral tradition within the family context and outside the formal educational system. Not surprisingly, subjects who had spoken Maya since birth scored higher overall on the Maya language test than those who had learned Maya at school.

The test development team had hypothesized a priori that most test takers would not be able to fluently read and write Maya, because it is traditionally passed down orally from generation to generation. What is more, Maya is a Heritage Language which has traditionally not been taught formally in schools. In fact, on the whole, participants scored higher in listening and speaking than in writing and reading. Specifically, the listening test was the easiest for test takers, and the written test was the hardest (see Figures 3 and 4). In addition, our data suggest the test did an excellent job sorting teachers who were able to speak Maya from those who were not.

Without a doubt, there were challenges that arose from the decision to create a computer-based test, comparable to the kinds of concerns of other language tests, like the Test of English as a Foreign Language (TOEFL): “do test takers world-wide need to have a computer familiarity to be successful on the test (in addition to their English language abilities)?” (Kunnan, 1999, p. 241). Weir (2005) cautions differences in performance might be due to an individual’s computer competence (p. 54). However, because computer usage and digital media have become more prevalent among the test taking population (bilingual classroom teachers in Mexico), the test development team was confident computer based testing would not interfere with validity issues with the chosen testing format. But based on the demographic data we collected from test takers, many subjects were unacquainted with computers. Only 4% of test takers reported owning a laptop and 7% said they owned a desktop computer. Despite this, the decision has been made to continue to use the computer to facilitate the recording of data. To mediate this challenge, test

takers were trained in how to use the computer at each facility, and practice items were provided to acquaint subjects with the digital procedures. In addition, assistants were at each test site to provide technical help to anyone who needed it.

Summary and Recommendations

In general, the pilot of *La Prueba Maya* was considered to be a success, and the computer-based test will be used in the future to diagnose levels of language proficiency in adults interested in teaching indigenous Mayan children in the Yucatán peninsula of Mexico. The success of the program has led to the expansion of the test development process in 2010 to Nahuatl, the most prevalent indigenous language in the Mexico City area. In part, the government's dedication to the placement of certified bilingual teachers in Mexican classrooms is a major step forward in both the education of children who are learning Spanish as a second language in school and in the preservation of the Heritage Languages of Mexico.

Mexico must develop a comprehensive Maya education program to teach reading, writing, listening, and speaking. To do this, it is imperative that any bilingual language education program include a separate track to teach only Maya writing and reading to native speakers. We agree with the Mexican government that language proficiency must be taken into account when placing teachers into the classroom.

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Table 1

Indigenous population of Mexico's Yucatan Peninsula.

State in Mexico	Indigenous population (N)	Percent of total state population ≥ 5 years old who speak an indigenous language	Type of indigenous language	Breakdown of indigenous populations
Campeche	93,765	15.50%	Maya	80.90%
			Chol	9.40%
			Kanjobal	2.00%
			Tzeltal	1.80%
			Other	5.40%
Chiapas	809,592	24.60%	Tzotzil	36.00%
			Tzeltal	34.40%
			Chol	17.40%
			Zoque	5.10%
			Tojolabal	4.70%
			Chuj	0.20%
			Kanjobales	0.70%
			Mame	0.70%
Other	0.80%			
Yucatán	549,532	37.30%	Maya	99.60%
			Other	0.40%
Quintana Roo	173,592	23%	Maya	94.20%
			Kanjobal	0.70%
			Nahuatl	0.70%
			Tzotzil	0.70%
			Other	3.30%
Tabasco	62,027	3.70%	Chontal de Tabasco	61.80%
			Chol	16.20%
			Tzeltal	3.10%
			Tzotzil	1.50%
			Other	8.30%

Note. From Mexico Census 2000 (Villar, 2005).

Table 2

Participants

State	Gender		Total
	Male	Female	
Yucatán	645	780	1425
Campeche	201	320	521
Quintana Roo	270	291	561
Total	1116	1391	2507

Note. The mean age of participants was 42 years old; however a great variance was present.

Table 3

What counts as L2 acquisition for three types of SLA theories.

Stage	Generative SLA	Interactionist SLA	Emergentist SLA
Epistemology and construct interpretations	Language as symbolic representation which is autonomous from cognition Learning mediated by UG and L1 Grammatical competence Property theory: initial state and end state in L2 acquisition	Language as symbolic representation which is constrained by cognition Learning mediated by social, affective, and cognitive variables Communicative competence Transition theory: developmental course of L2 acquisition (For information-processing theories) automatization of declarative knowledge	Language as complex rule-like behavior, epiphenomenal result of functional needs Learning as interaction of the organism with the environment Neural networks Transition theory: Specification of input frequency and regularity plus learning mechanisms
Target Behaviors	Tacit intuiting of what is ungrammatical in the L2	Appropriate and fluent performance when using the L2 communicatively (and in controlled tasks)	Accurate and fluent performance in laboratory tasks Output that matches attested learning curves and eventually matches characteristics of fed input
Elicitation tasks/situations	Grammaticality judgment tasks of various kinds	Spoken and written discourse production Tests of implicit and explicit knowledge: verbalization of understanding of rules; controlled performance on comprehension and production tasks; grammaticality judgment tasks	Implicit memory tasks and forced-choice reaction-times tasks with human learners in laboratory Computer simulations of neural networks

Note. From (2003, p. 728)

Table 4

Item Difficulties for the Mayan Proficiency Test

Item	Subtest			
	Listening	Writing	Reading	Speaking
1	.76	.80	.79	.81
2	.87	.89	.80	.74
3	.96	.96	.89	.68
4	.87	.86	.88	.77
5	.93	.66	.82	.77
6	.62	.74	.81	.69
7	.89	.40	.81	.62
8	.87	.63	.80	.71
9	.77	.57	.78	.68
10	.84	.65	.70	.57
11	.80	.43	.70	.59
12	.80	.47	.68	.62
13	.76	.42	.56	.63
14	.74	.37	.52	.62
15	.73	.32	.53	.50
16	.61	.37	.46	.51
17	.66	.29	.40	.58
18	.52	.30	.29	.58
19	.46	.05	.18	.43
20	.58	.01	.15	.33
21			.24	
22			.06	
23			.11	

Note: N=2507

Table 5
Descriptive Statistics

	State	Mean	SD	N
Listening Total	Campeche	14.79	6.117	521
	Quintanaroo	17.26	4.403	561
	Yucatán	14.25	5.257	1425
	Total	15.04	5.410	2507
Writing Total	Campeche	9.91	5.536	521
	Quintanaroo	11.28	5.656	561
	Yucatán	9.88	4.654	1425
	Total	10.20	5.114	2507
Reading Total	Campeche	12.90	7.175	521
	Quintanaroo	14.06	7.159	561
	Yucatán	12.57	4.868	1425
	Total	12.97	5.997	2507
Speaking Total	Campeche	10.36	7.254	521
	Quintanaroo	12.46	7.404	561
	Yucatán	13.22	7.033	1425
	Total	12.46	7.247	2507

Table 6

Performance of Test Takers based on where they learned Mayan

Participant responses to: <i>How did you learn Mayan?</i>		Listening Total	Writing Total	Reading Total	Speaking Total
Taking Mayan Language Classes	Mean	11.23	7.88	7.56	5.97
	N	99	99	99	99
	SD	5.622	4.231	6.165	6.137
Talking with Family	Mean	14.46	10.02	11.87	10.88
	N	289	289	289	289
	SD	5.696	5.052	6.021	7.192
Talking with Other People	Mean	13.34	8.72	10.68	9.81
	N	342	342	342	342
	SD	5.962	4.581	6.309	7.222
Speaking it Since Birth	Mean	15.67	10.65	13.89	13.58
	N	1777	1777	1777	1777
	SD	5.065	5.179	5.607	6.946
Total	Mean	15.04	10.20	12.97	12.46
	N	2507	2507	2507	2507
	SD	5.410	5.114	5.997	7.247



Figure 1. Map of the Mexican states involved in the creation of *La Prueba Maya*: Yucatán, Campeche, and Quintana Roo. Source: Lonely Planet Publications, 2009. Available online at: <http://www.lonelyplanet.com/maps/north-america/mexico/yucat%El%n-peninsula/>

1 a	10 i	19 p
2 a	11 ca	20 pp
3 a	12 k	21 cu
4 b	13 l	22 ku
5 b	14 l	23 ch
6 c	15 m	24 x
7 t	16 n	25 u
8 e	17 o	26 u
9 h	18 o	27 z
Signos monosilábicos.		
má, no.	tí	ah, signo de aspiracion.
há, agua.		

Figure 2. Alphabetic translation code from Mayan to Spanish, (Ancona, 1978).

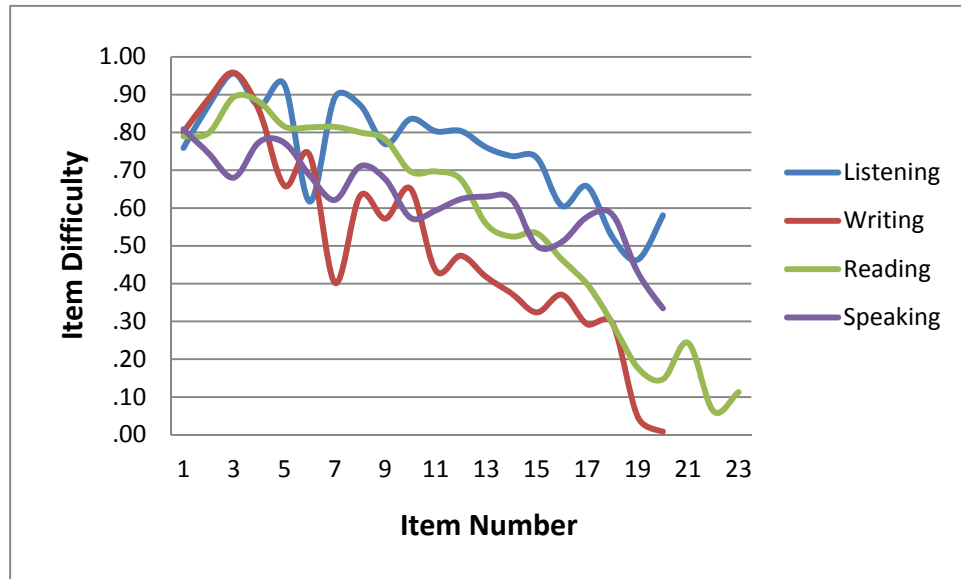


Figure 3. The Writing test was the most difficult and the Listening test was the easiest.



Figure 4. Comparison of the means from each subtest broken down by state.