

Analyzing the Bilingual Brain: Language Learning at Home and in the Classroom

Claire Purdy



Introduction

My senior project is centered around better understanding the bilingual brain, and evaluating speaking, listening and reading abilities in young children exposed to two languages. This project also aims to comprehend which teaching and testing methods are the most effective in measuring language proficiency.

Project Components

1) Experimentation

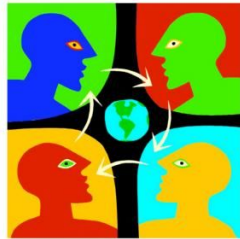
- Working with *En Nuestra Lengua*
 - program for elementary school children who speak Spanish and want to continue their Spanish learning
- Observing vocabulary examinations for four-year old students

2) Analysis

- Understanding how the brain learns language
- Research of different testing types
- Interpretation of results

About *En Nuestra Lengua*

- Established in 2010 by Dr. Teresa Satterfield and Dr. José Benkí
- “aimed at developing academic skills in Spanish for bilingual children” (ENL).
- The program works toward the “development of literacy skills of students” and “building pride in the Hispanic community and rich Latino culture” (ENL)



**EN NUESTRA
LENGUA**
proyecto de
alfabetismo
y cultura



Why did I choose this project?

After volunteering with *En Nuestra Lengua* for the past five and a half years, I have always greatly admired their commitment to furthering the Spanish education of bilingual children and encouraging them to feel pride in their Hispanic ethnicity.

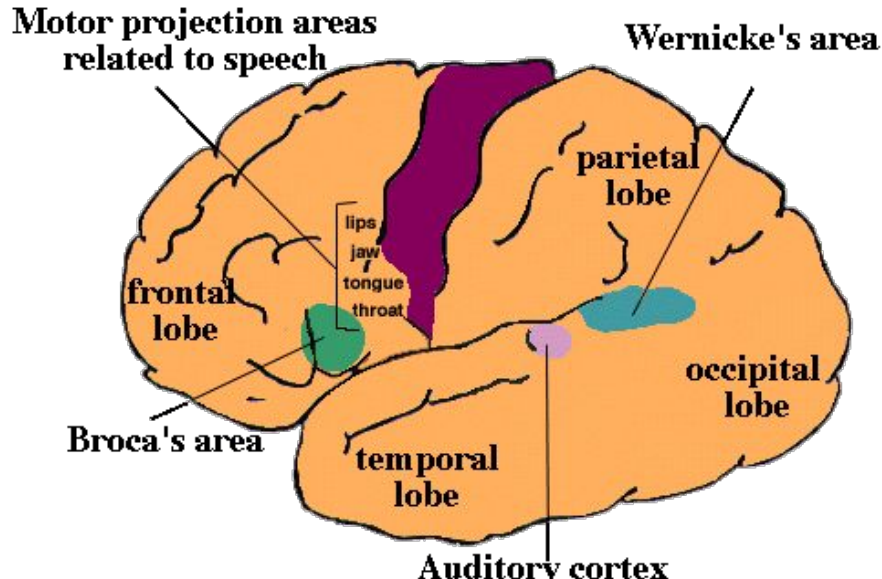
Furthermore, I am fascinated by the children's ability to communicate so fluently in Spanish, and how the knowledge and examples they have received from their parents have influenced them so greatly.

Understanding the Bilingual Brain

- Why is it harder for adults to learn a second language than for young children?
 - 1) Reduced plasticity of the brain
 - 2) Adults adopt a problem-solving approach (Cooper)

Understanding the Bilingual Brain (cont.)

- Broca's area of the brain: "native and second languages are spatially separated" (Talukder)
- Wernicke's area of the brain: languages are not separated
 - it is "responsible for comprehension of language" (Talukder)



Learning a Second Language

- “A combination of listening and vocalization seems to be the most biologically advantageous method of acquiring a second language for both adults and children” (Talukder)
- Language should be approached as a “tool of communication, not as a complex set of rules to master” (Nielson).

+23-34

In a Florida study, kids who knew two languages **SCORED AN AVERAGE OF 23 TO 34 POINTS HIGHER** on both math and language arts standardized tests than kids who only spoke one language.



PERCENT OF PRESCHOOL-AGE BILINGUAL CHILDREN ARE ABLE TO EASILY DISTINGUISH THE MEANINGS OF WORDS.

(Most children aren't able to do this until elementary school.)

BABIES RAISED IN BILINGUAL HOMES DEMONSTRATED SUPERIOR COGNITIVE ABILITY—SPECIFICALLY THE ABILITY TO SEEK NEW STIMULI MORE QUICKLY—AS EARLY AS SEVEN MONTHS OLD. (And according to the National Academy of Sciences, that's an early indicator of a high IQ.)



20%



TWO LANGUAGES vs. ONE LANGUAGE

People who know more than one language are able to pay attention for 20% longer on average than their one-language-speaking friends. (Now that certainly would come in handy during a long class period, wouldn't it?)

0.05 The number of cubic millimeters of gray matter



Teaching a Second Language

- Cultural understanding is essential to successfully teach a language

National Center on Intensive Intervention:

- “I think we have to view teaching and learning as cultural acts. Teachers that provide culturally responsive intervention have a deep understanding of their own culture...They understand that interventions have to reflect children’s linguistic and cultural backgrounds”

The Vocabulary Tests

- 2 different tests:
 - **Comprehensive test:** student is given a word orally and they must choose the image that corresponds from a selection of images
 - **Productive test:** the student is shown an image, and they must state the word that corresponds to the image
- The words on the tests were taken from books as part of a project called "Proyecto World"

About Proyecto WORLD

- Takes place at *En Nuestra Lengua*
- Students take home different books throughout the year and must complete certain activities with their parents

- It was created under the idea that “the family is the most effective and economic system for promoting and sustaining a child’s development [which] has been supported in a variety of contexts” (Satterfield).

About Proyecto WORLD (cont.)

- It was created with the following questions in mind:
 - 1)“Can intervention be modified and integrated into the Saturday Spanish immersion for Spanish-speaking [pre-school] children?” (Satterfield)
 - 2)“ Can intervention produce positive effects [e.g. higher-levels of “participation”] in Spanish-speaking parents?” (Satterfield)

About Proyecto WORLD (cont.)

The program also aims to:

- “Support immigrant parents in becoming partners in their child’s education in the US” (Satterfield)

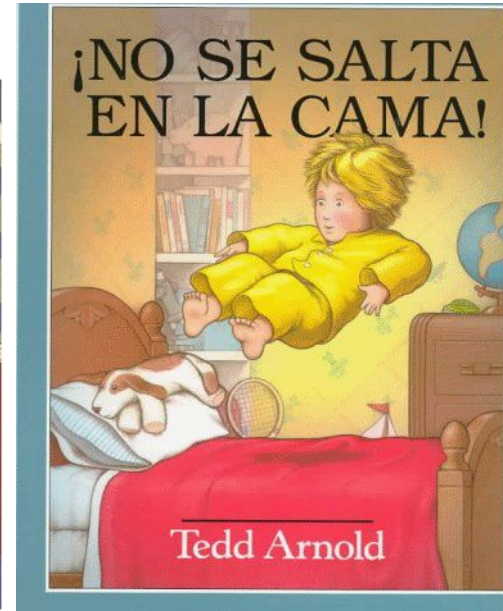
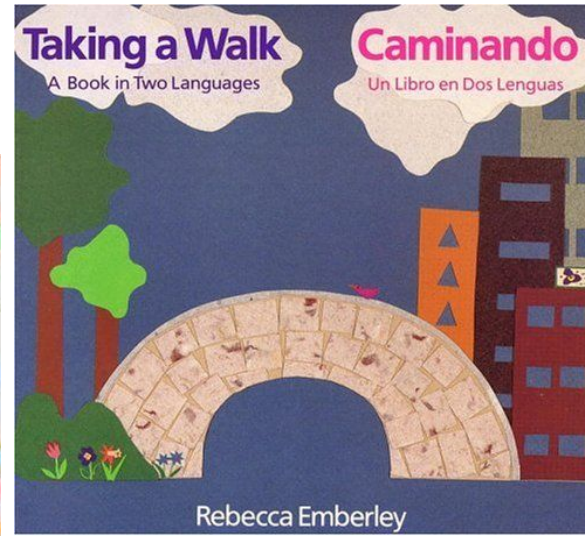
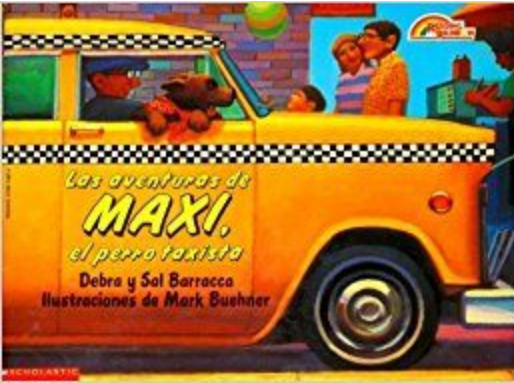
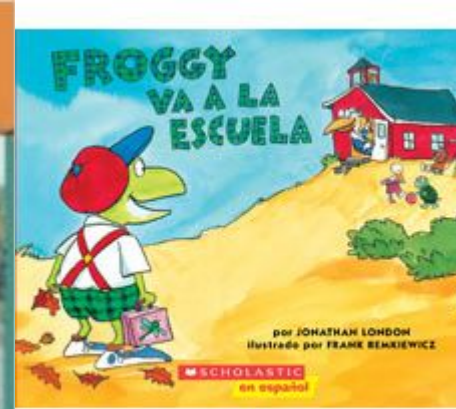
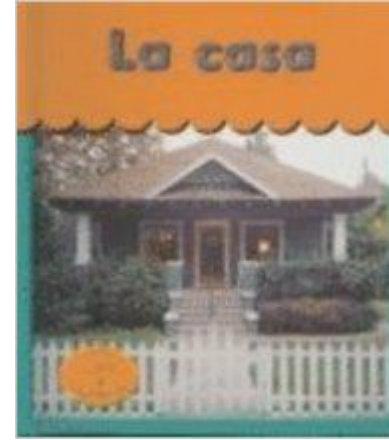


Proyecto WORLD: Parental Involvement

- Parents received a training session to ensure that they understood the program
- They were informed of the three main goals of the program:
 - 1) “to help parents to read to their children at home using two types of books
 - 2) to help children and parents to talk about books and have fun with books
 - c) to help children understand information and new words that appear in books “ (Satterfield)

Books

- *Las aventuras de Maxi, el perro taxista*
- *Caminando*
- *¡No se salta en la cama!*
- *La casa*
- *Froggy va a la escuela*



Has the program been effective?

- Both Pre-K and K student showed improvement in vocabulary from the fall to the spring evaluations
- *En Nuestra Lengua* has found that the involvement of parents in their children's language has increased with Proyecto World

Test 1: Comprehensive Vocabulary Test

- Words that they have learned from several books throughout the year as part of "Proyecto World."
- the student simply has to select the image that corresponds to the word that the tester says.

Tester Initials: _____
 Testing Date: _____
 Data Entry: _____
 Data Entry Check: _____

5/10/17

PPVT-Modified Directions and Scoring Protocol (A)

Samples:

Show the Training Plate. Say, **Quiero que mires algunas imágenes conmigo. Mira todas las imágenes en esta página.** (Point to each of the 4 pictures on the Training Plate). **Voy a decir una palabra. Luego, quiero que pongas tu dedo en la imagen que yo dije. Vamos a probar una palabra. Pon tu dedo en el bebe.**

Correct Responses	Incorrect Responses
<p>¡Muy bien! Ahora pon tu dedo en manzana. If correct, turn to Plate 1 and read directions below. If incorrect, have the child point to bear and cat. Repeat samples until the child is able to give two consecutive correct responses.</p>	<p>If the child responds incorrectly say, Buen intento, pero la respuesta correcta es ésta. (point to the correct response). Ahora inténtalo de nuevo. Pon tu dedo en el bebe. If the child makes a correct response say, ¡Bien! Intentamos otra. Pon tu dedo en manzana. If the child makes an incorrect response, correct them using the same procedure above. Continue Training Plate using bear and cat before continuing to Test Items. Repeat samples until the child is able to give two consecutive correct responses.</p>

Introduce Test:

Show Plate 1 and say, **¡Bien! Ahora voy a enseñarte otras imágenes. Cada vez que yo diga una palabra tú buscas la mejor imagen de ella. Mas adelante puede que no estés seguro(a) de que sabes el significado de la palabra, pero quiero que mires todas las imágenes cuidadosamente y que escojas la que tú creas que es la correcta. Señala _____** (starting item word).

After a few test items you don't need to say "point to" just read the word. Administer all 24 items in the order listed below. Each plate will be shown 4 times. Record the picture number that corresponds to the child's response and slash the "E" if an error is made.

Show Plate 1		Start over with Plate 1		Start over with Plate 1	
1. Techo	(4) <u> </u> E	6. Tornado	(3) <u> </u> E	11. Líquido	(2) <u> </u> E
2. Verano	(4) <u> </u> E	7. Edificio	(1) <u> </u> E	12.	SKIP
3. Conserje	(2) <u> </u> E	8. Nieve	(4) <u> </u> E	13. Flotar	(1) <u> </u> E
4. Mojarse	(1) <u> </u> E	9. Congelado	(2) <u> </u> E	14. Sótano	(4) <u> </u> E
5.	SKIP	10. Invierno	(1) <u> </u> E	15. Derretirse	(3) <u> </u> E

*Discontinue testing if student responds incorrectly to the first six items.

Start over with Plate 1	
16. Cajera	(1) <u> </u> E
17. Puente	(2) <u> </u> E

Score: 15 - 9 (errors) = 6 correct



1



2



3



4



1



2



3

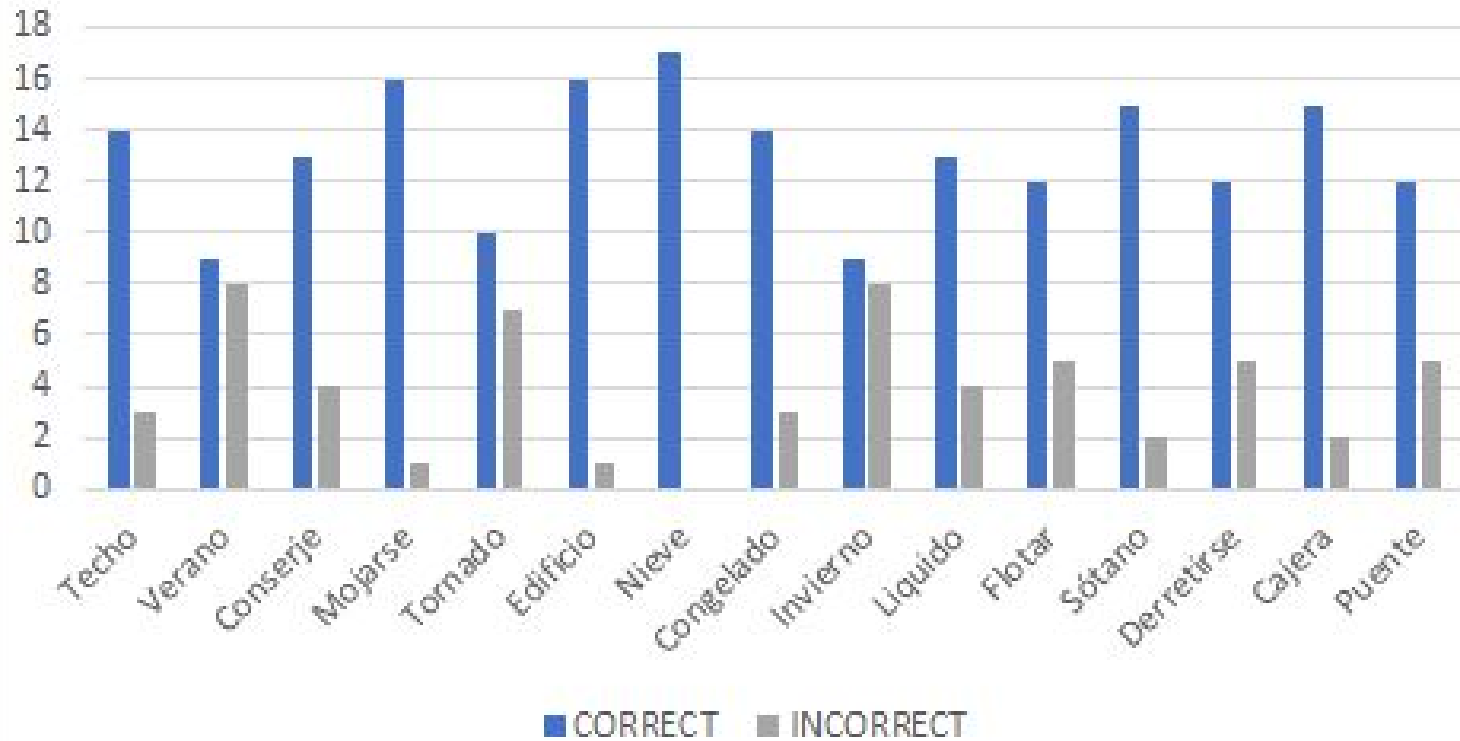


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Comprehensive Vocabulary Test

- The 4 year-old students were tested on the following words:
 - Ceiling-Techo
 - Summer-Verano
 - Janitor-Conserje
 - To be soaked-Mojarse
 - Tornado-Tornado
 - Building-Edificio
 - Snow-Nieve
 - Frozen-Congelado
 - Winter-Invierno
 - Liquid-Líquido
 - To float-Flotar
 - Basement-Sótano
 - To melt-Derretirse
 - Cashier-Cajera
 - Bridge- Puente

Comprehensive Vocabulary Test Results



17 students, 15 words

Interesting Patterns

Words in which most mistakes were made:

- 1) Invierno (winter) and verano (summer)
 - 8 errors each
- 2) Tornado (tornado)
 - 7 errors
- 3) Conserje (janitor), flotar (float), derretirse (melt)
 - 5 errors each

Words for which fewest mistakes were made:

Nieve (snow)

- 0 mistakes

Productive Vocabulary Test

- Students were shown an image and had to say which word was shown in the image
- They were prompted with questions such as, “what is happening to the ice cream in this image?” to avoid ambiguity
- They were asked the same words as for the comprehensive vocabulary test

EOWPVT- Modified (A)

Samples: Te voy a mostrar algunos dibujos y quiero que me digas la palabra en español que usarías para nombrar cada dibujo o cada grupo de dibujos.

Samples

Sample A: ¿Qué es esto?

Correct: **Correcto. Esto es un gato.**

Incorrect: **Gato** (point to correct picture). **Esto es un gato.**

Sample B: ¿Qué está haciendo el bebe?

Correct: **Correcto. El bebe está llorando.**

Incorrect: **Llorando.** (Point to baby). **El bebe está llorando.**

Directions: Point to each picture and read the scripted question. Do not provide child with any answers. Prompt the child once if needed with the prompts below and note prompting with a "P" on the Student Response Record. Record all responses in the order they are given.

Discontinue Rule: If the child gives no response (NR) or says "I don't know" (DK) to items 1-6, discontinue testing. If the child gives one or more responses to items 1-6, even if incorrect, administer all items.

Prompting:

Examinee Response	Appropriate Prompt
• too-general response	¿Qué tipo?
• too-specific response	¿De qué otra manera lo llamarías?
• naming the action for an object picture	Point and say, ¿Qué es esto?
• naming part of the picture	Circle entire item and say, ¿Qué es esto?
• wrong part of item named	Point to arrow-indicated part and say, ¿Qué es esto?
• naming the object for an action picture	¿Qué está haciendo él/ella?
• naming a single object instead of the group	¿Qué palabra usarías para nombrar a todos los dibujos?

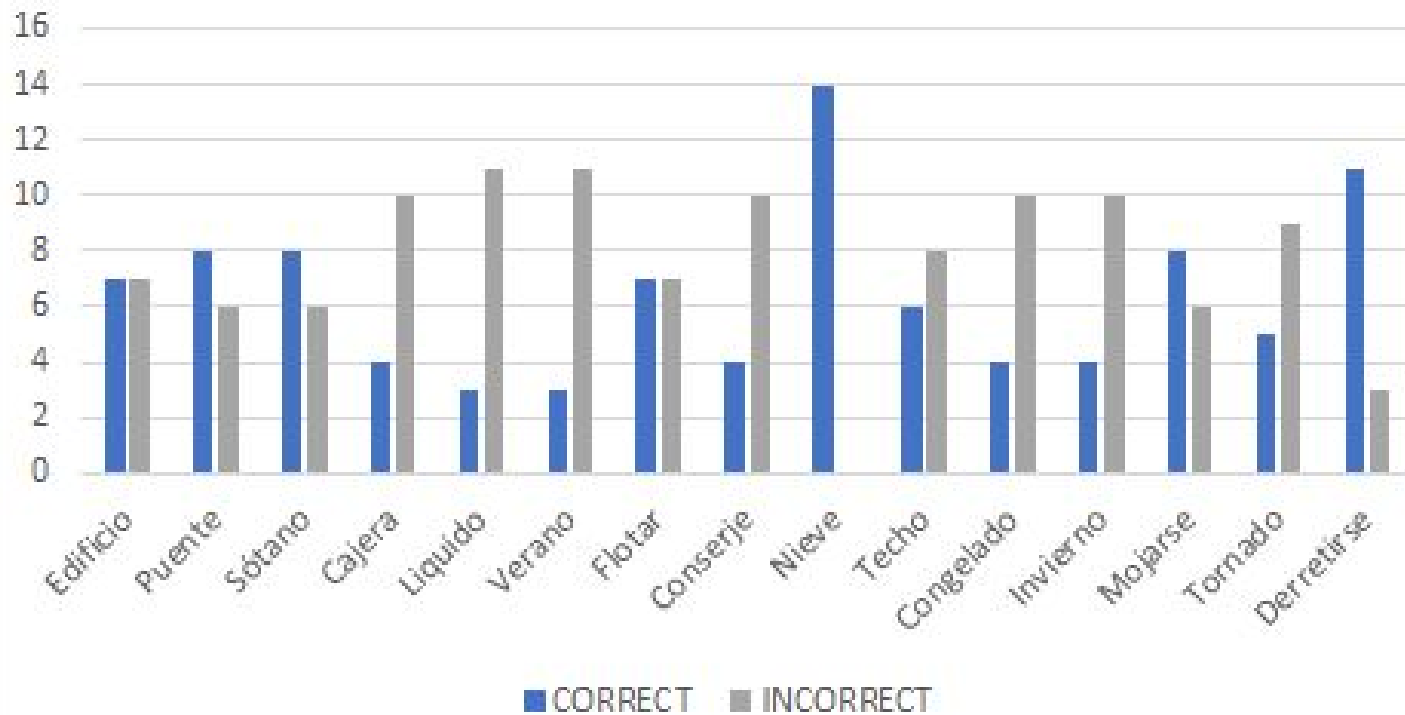
Student Response Record	Correct	Score
1. ¿Qué es esto?	Edificio	
2. ¿Qué es esto?	Puente	
3. ¿Qué es esto?	Sótano	X
4. ¿Quién es esta persona?	Cajera	
5. ¿Qué es esto?	Líquido	
¿Qué son éstas? SKIP	Parras	SKIP

Discontinue testing if student responds "DK" and/or "NR" to the first six items.

¿Cómo se nombra esta estación?	Verano	
¿Qué pasa aquí?	Flotar	
¿Quién es esta persona?	Conserje	✓
¿Qué es esto?	Nieve	
¿Qué es esto? SKIP		



Productive Vocab Test Results



14 students, 15 words

Interesting Patterns

Words for which most mistakes were made:

- 1) Líquido (liquid), Verano (summer)
 - 11 mistakes each
- 2) Cajera (cashier), conserje (janitor), congelado (frozen), invierno (winter)
 - 10 mistakes each

Words for which fewest mistakes were made:

Nieve (snow)

- 0 mistakes were made



Comparing the 2 tests

- Overall, more errors were made for the productive test than the comprehensive test (114 vs. 58)
- Students struggled with seasons and states of matter on both tests
- Students had difficulty with conserje (janitor)
- All students identified snow correctly on both tests
- Difficulty identifying verbs
- Productive test: Often identified word in English not Spanish
- Productive test: Often identified other words in image

Comparing the 2 tests (cont.)

- On the comprehensive test:
 - only 2 students scores declined from fall to spring
 - 3 students scores remained the same from fall to spring
 - The rest showed improvement
- On the productive test:
 - Only 2 students scores declined from fall to spring
 - 4 students scores remained the same
 - The rest showed improvement

Why were these the results?

- Comfort level
- Amount of Spanish spoken at home
- Hispanic/Latino parents
- Words such as nieve (snow), are more frequently used
- Clarity of images
- Amount of items in images
- Participation in program



Different Testing Types from *Testing for Language Teachers*- Arthur Hughes

3 main types:

Proficiency Tests:

-measure language ability regardless of any previous training in the language

Achievement Tests:

-typically used to measure the effectiveness of a language course in achieving certain language objectives

Diagnostic Tests:

-measure strengths and weaknesses

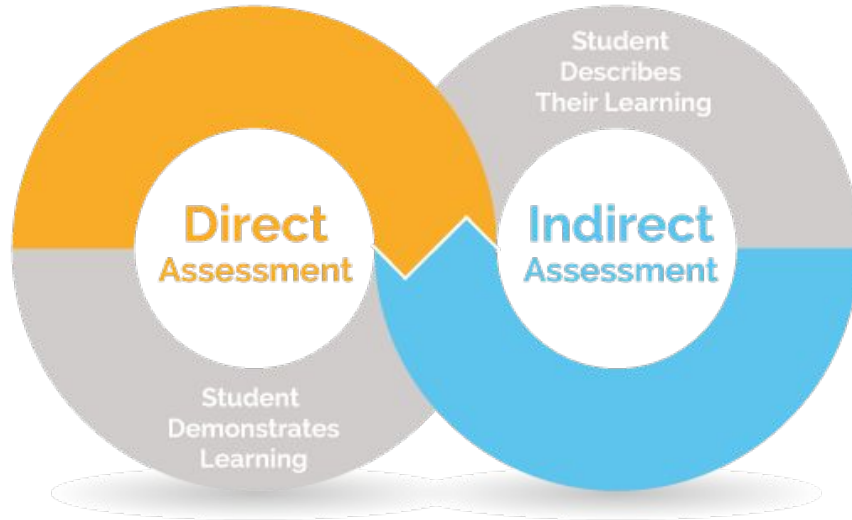
Direct vs. Indirect Testing

Direct tests:

- test the exact skill that needs to be measured

Indirect tests:

- “measures the abilities which underlies the skills we are interested in” (Hughes)



Objective vs. Subjective Testing

-A test is considered objective if there is no judgment exercised on behalf of the proctor in determining whether the answer was correct (Hughes)

Objective	Subjective
Those with a single correct response regardless of who scores a set of responses, an identical score will be obtained	Those items that typically do not have a single correct response
Subjective judgment of the scorer do not influence an individual's score	Subjective judgments of the scorer are an integral part of the scoring process
Also known as "selected response" and "structured-response" items	Also known as "free-response", "constructed-response" and "supply-type" items
Include multiple-choice question, matching and alternative-choice items	Include short-answer and essay items
Assess lower-level skills such as knowledge, comprehension	Require students to produce what they know
Relatively easy to administer, score and analyse	Easy to construct

How to make reliable tests:

- Enough samples
- “Items” should be very different from each other
- Appropriate length
- Candidates should not have too much freedom when responding
- Clear instructions
- Avoid ambiguity
- Familiar testing conditions

(Hughes)

Acknowledgements

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Las aventuras de Maxi, el perro taxista:

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Caminando: <https://images-na.ssl-images-amazon.com/images/I/519BD5RB2GL.jpg>

¡No se salta en la cama!:

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La casa:

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