Comprehension Strategies Should Be Taught Explicitly

• Comprehension difficulties in 4th Grade Readers
  – 38% have trouble reading and explaining a paragraph

• Indexing
  – good readers associate words and phrases with objects and actions in the environment or mental images of objects and actions and use their ideas of these objects and images to make sense of what they are reading
  – This strategy improves performance
Paper (20%) and Project (20%)

• Issue in Acquiring Literacy Naturally
• Paper
  – Background Literature Review
  – Question to be addressed
  – Expected Results and Implications

• Application
  – My Matching Games
  – Read With Me
  – Example
Example Project

• Alphabet

• Bicameral Orthographies
  – Uppercase and Lowercase Letters
  – Latin, Cyrillic, Greek, Armenian, Coptic
  – Signal Capitalization
  – The girl talked to Leaf.

• Unicase scripts
  – Chinese, Japanese, Korean Arabic, Farsi, Hebrew, and Thai
Egyptian hieroglyphs (pron.: /ˈhaɪər.ə.ɡlɪf/ HYR-o-GLIF, /ˈhaɪ.roʊ.ɡlɪf/) HY-roh-GLIF) were a formal writing system used by the ancient Egyptians that combined logographic and alphabetic elements.
The **Phoenician alphabet**, called by convention the **Proto-Canaanite alphabet** for inscriptions older than around 1200 BC, was a non-pictographic consonantal alphabet, or **abjad**.[1] It was used for the writing of **Phoenician**, a Northern **Semitic** language, used by the civilization of **Phoenicia**.
Coptic or Coptic Egyptian (Met Remenkēmi) is the latest stage of the Egyptian language, a northern Afro-Asiatic language spoken in Egypt until at least the 17th century.
The **Greek alphabet** is the script that has been used to write the **Greek language** since the 8th century BC.
Letters and Shape Differences

• The shapes of the English letters (A, B, D, E, F, G, H, I, J, L, M, N, Q, R, T, Y) are significantly different in upper and lowercase.


• Teach both for children learning to read.
Letters and Shape Differences

- Shape Differences make letter learning more difficult.
- Three levels of categorization
  - Superordinate, Basic, Subordinate
- Shape differences signal a difference in basic level categorization
  - Animal, Bird, Robin
  - Furniture, Chair, Bench
Letters and Shape Differences

• Successive Matching Task
  – Same or Different name
  – Physical vs. Name Matches
  – AA 80 ms faster than Aa
Test of Value of Capitalization

• Read My Books
  – Capitalization: Present or Not
  – Settings
    • Set Appropriate Rate of Presentation
    • Speech Playback Off
    • Text
    • English
    • Show all Words
  – Good Night Gorilla
    • Caps
    • No Caps
Representing capitalization of letters while preserving their category similarity to lowercase letters.
My Matching Games

- Tile Matching
- Written Words Differ in Shape
  - Uppercase vs Lowercase
- Written Words Differ in Size
  - Large vs Small
- Prediction
  - Size differences will be easier than shape differences.
My Matching Games

• Settings
• Easy Layout
• No Baldi, No Voice Volume
• Adjust Max Text Size
  – Equal Size in Uppercase vs Lowercase task
  – Size Difference in Lowercase task
Critical Periods

• Language experience is important
• Influence of top-down knowledge
  – FLMP
  – ECM emergenist coalition model
• Recent talk by Virginia Marchman
What is fluency in understanding?

Adults listen *predictively*, anticipating how speech will continue by integrating linguistic and contextual information on multiple levels from moment to moment in real time....

- LEXICAL
  - kan-ga → roo
- SEMANTIC
  - let’s read a → book
- MORPHOSYNTACTIC
  - those are → [plural]

...and very young children do too!

Swingley, Pinto, & Femald (1999); Femald, Swingley, & Pinto, (2001); Zangl & Femald (2007); Lew-Williams & Femald (2007); Song & Fisher (2005); Styles & Plunkett (2009); Mani & Plunkett (2010); Johnson & Heutig (2011); Borovsky, Elman & Femald (2012).
The "looking-while-listening" procedure

Fernald et al. (1998, 2006, 2008)

"Where's the baby?"

Reaction Time (RT)

Accuracy
Children become faster and more accurate in online interpretation of familiar words over the 2nd & 3rd years.

Where's the DOGGY?

Proportion Fixations to Target Picture

Time from target word onset (msec)

Zangl & Fernald (2007)
English-speakers begin to shift to the correct picture sooner when the verb is informative.

![Graph showing the proportion of time looking to the target for different verb and noun positions.](image)

- **Verb** (Window 1)
- **Det** (Window 2)
- **Noun** (Window 3)
- **Post-Noun** (Window 4)

Proportion looking to target

Time in ms from sentence onset

26-mos-old English speakers ($n = 22$)
Similar developmental changes for Spanish-learning children

Proportion looking to target

¿Dónde está el PERRO?

Time (ms) from noun onset

0 200 400 600 800 1000 1200 1400 1600 1800

0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

2;6

2;0

1;6

Hurtado, Marchman & Fernald (2007)
Online language processing measures may be useful for earlier diagnosis of children at-risk for language delay

Adapted from Thal, Bates, Goodman & Jahn-Samilo (1997)
A follow-up study of TD children 5 years later...

Is efficiency in spoken language understanding at 25 months related to later language and cognitive skills as 8 years of age?

Marchman & Fernald (2008)
### Significant correlations between language measures in infancy and school-age outcomes

<table>
<thead>
<tr>
<th></th>
<th>Language measures at 25 mos.</th>
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<tbody>
<tr>
<td></td>
<td>Reported CDI Vocabulary</td>
<td>LWL RT</td>
<td>LWL Accuracy</td>
<td></td>
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<tr>
<td>CELF-4</td>
<td>Overall ELI</td>
<td>.48**</td>
<td>-.49**</td>
<td>.45**</td>
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<tr>
<td></td>
<td>Expressive Vocabulary</td>
<td>.26</td>
<td>-.43**</td>
<td>.68**</td>
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<tr>
<td>K-ABC-II</td>
<td>Overall MPI</td>
<td>.53**</td>
<td>-.40*</td>
<td>.47*</td>
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<tr>
<td></td>
<td>Sequential Processing</td>
<td>.59**</td>
<td>-.59**</td>
<td>.49**</td>
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</tbody>
</table>
RT (but not vocabulary) predicts language and cognitive outcomes in Spanish.... and big SES effects

<table>
<thead>
<tr>
<th>Predictor: 24-months</th>
<th>5 year outcome</th>
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<tbody>
<tr>
<td></td>
<td>Spanish Expressive Language</td>
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<tr>
<td>Vocabulary</td>
<td>.19/.20</td>
</tr>
<tr>
<td>RT</td>
<td>-.44**/-0.46**</td>
</tr>
<tr>
<td>SES (HI)</td>
<td>.36*/.35*</td>
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</tbody>
</table>

Second number in each pair controlling for English exposure
Amount of caregiver talk mediates the relation between SES and RT

\[ \text{AWC} \ 18 \text{ mos} \]

(a) 12.2* → \[ \text{SES} \]

(c) -3.9* → \[ \text{RT 24 mos} \]

(b) -.19** → \[ \text{RT 24 mos} \]

(c') -1.5

Otero, Marchman, Weisleder, Hurtado & Fernald (2013)
Infant Language Processing

- Marchman Study
  - [http://babylab.stanford.edu](http://babylab.stanford.edu)
- Top Down Processing
- Speed of Understanding
- Predicts Language Skill
- Predicts Cognitive Skill
- Importance of
  - Caregiver Input
  - Vocabulary
Current Practice in Reading Instruction

- Grounded in Spoken Language
- Focus on Decoding
  - Print to Sound
- Essentially Ignores Structure of Orthography
Phonics Instruction

• The primary focus of phonics instruction is to help beginning readers understand how letters are linked to sounds (phonemes) to form letter-sound correspondences and spelling patterns and to help them learn how to apply this knowledge in their reading.
Oversight in Phonics Instruction

• Current Question
  – What sound does the letter x make

• New Question
  – What letters spell the sound x
  – How do you spell the sound x
  – Why Our Children Can't Read and What We Can Do About It: A Scientific Revolution in Reading [Paperback] by Diane Mcguinness
Possible letters and letter combinations and example words with their pronunciations.

<table>
<thead>
<tr>
<th>Letters</th>
<th>Pronunciations in Words (In Red)</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>BAT</td>
</tr>
<tr>
<td>c k ck</td>
<td>CAT KICK BACK</td>
</tr>
<tr>
<td>d</td>
<td>DOG</td>
</tr>
<tr>
<td>f ff ph</td>
<td>FLY BLUFF PHONE</td>
</tr>
<tr>
<td>g</td>
<td>GATE</td>
</tr>
<tr>
<td>h</td>
<td>HAT</td>
</tr>
<tr>
<td>j g dge ge</td>
<td>JUG GYM JUDGE GEM</td>
</tr>
<tr>
<td>l ll</td>
<td>LOT HILL</td>
</tr>
<tr>
<td>m mb</td>
<td>MAN BOMB</td>
</tr>
<tr>
<td>n kn</td>
<td>NOW KNOT</td>
</tr>
<tr>
<td>p</td>
<td>POT</td>
</tr>
<tr>
<td>r wr</td>
<td>RAT WRONG</td>
</tr>
<tr>
<td>s ss c ce</td>
<td>SIT BASS CITY DICE</td>
</tr>
<tr>
<td>t</td>
<td>TOP</td>
</tr>
<tr>
<td>v</td>
<td>VOTE</td>
</tr>
<tr>
<td>w</td>
<td>WON</td>
</tr>
<tr>
<td>y</td>
<td>YES</td>
</tr>
<tr>
<td>z</td>
<td>ZOO</td>
</tr>
<tr>
<td>ch tch</td>
<td>CHEW ITCH</td>
</tr>
<tr>
<td>sh ti ce</td>
<td>SHOW NATION OCEAN</td>
</tr>
</tbody>
</table>
Table. The possible spellings of the phonemes in English.

/A/  a (table), a_e (bake), ai (train), ay (say)  Long A; Fonzie's greeting
/a/  a (flat) Crying baby; baby lamb; home alone
/b/ b (ball)  Beating heart; drum
/k/  c (cake), k (key), ck (back)  Nutcracker; golf shot; camera
/d/  d (door) Knocking; dribbling ball
/E/  e (me), ee (feet), ea (leap), y (baby)  Long E; shriek
/e/  e (pet), ea (head)  Rocking chair; creaky door; hard of hearing
/f/  f (fix), ph (phone) Angry cat; clothes brush; electric fan; soda fizz
/g/  g (gas) Croaking frog, gulping soda
/h/  h (hot) Out of breath; warm breath; tired dog
Table. The possible spellings of the phonemes in English.

<table>
<thead>
<tr>
<th>Phoneme</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>/g/</td>
<td>g (gas) Croaking frog, gulping soda</td>
</tr>
<tr>
<td>/h/</td>
<td>h (hot) Out of breath; warm breath; tired dog</td>
</tr>
<tr>
<td>/i/</td>
<td>i (I), i_e (bite), igh (light), y (sky) Long i</td>
</tr>
<tr>
<td>/i/</td>
<td>i (sit) Crying puppy; icky sticky; baby pig</td>
</tr>
<tr>
<td>/j/</td>
<td>j (jet), dge (edge), g[e, i, y] (gem) Scrub brush; wood rasp; jump rope</td>
</tr>
<tr>
<td>/l/</td>
<td>l (lamp) Flying saucer; mixer</td>
</tr>
<tr>
<td>/m/</td>
<td>m (my) Mmm mmm good; delicious sound</td>
</tr>
<tr>
<td>/n/</td>
<td>n (no), kn (knock) Mosquito; motorboat</td>
</tr>
<tr>
<td>/O/</td>
<td>o (okay), o_e (bone), oa (soap), ow (low) Long O; Oh, I see</td>
</tr>
<tr>
<td>/o/</td>
<td>o (hot) Say ah; doctor sound; cool drink; yawn</td>
</tr>
<tr>
<td>/p/</td>
<td>p (pie) Popcorn; water drip; stone skip; soap bubbles</td>
</tr>
<tr>
<td>/kw/</td>
<td>qu (quick) Coffee pot; typewriter</td>
</tr>
</tbody>
</table>
Table. The possible spellings of the phonemes in English.

/kw/  qu (quick) Coffee pot; typewriter
/r/  r (road), wr (wrong), er (her), ir (sir), ur (fur) Chain saw; angry lion; robot; growling dog
/s/  s (say), c[e, i, y] (cent) Flat tire; hair spray; sizzling bacon
/t/  t (time) Ticking clock; timer; automatic sprinkler
/U/  u (future), u_e (use), ew (few) Long U
/u/  u (thumb), a (about), e (loaded), o (wagon) I dunno; mother bear; punch in the stomach; foghorn
/v/  v (voice) Electric shaver; airplane; vacuum
/w/  w (wash) Lariat; fly rod; washing machine
/ks/ or /gz/ x (box, exam) Soda can; grease gun
/y/  y (yes) Sticky mess
/z/  z (zoo), s (nose) Buzzing bee; arc welder; zipper
Table. The possible spellings of the phonemes in English.

/OO/  oo (boot), u (truth), u_e (rude), ew (chew) Ghost; howling wolf; owl
/oo/  oo (book), u (put) Lifting weights; chin-up bar
/oI/  oi (soil), oy (toy) Seal; squeaky gate; spring
/ou/  ou (out), ow (cow) It hurts; inoculation; sting
/aw/  aw (saw), au (caught), a[l] (tall) Poor thing; crows
/ar/  ar (car) Spinning tire; grinding gears; gargoyle
/sh/  sh (ship), ti (nation), ci (special) Be quiet; watering the lawn
/hw/  wh (white) Blow out the candle
/ch/  ch (chest), tch (catch) Old train; antique car; chipmunk
/th/  or /th/ th (thick, this) Peeling tape; angry goose; wet shoes
/ng/  ng (sing), n (think) Gong; string bass
/zh/  s (measure) Sawing wood; sander
Orthographic Structure

• two broad categories of orthographic structures
  – statistical redundancy
    • Position sensitive measures
    • Bigram frequency
  – rule-governed regularity
    • Phonological constraints
    • Scribal constraints