

Word Morphology and its Role in Reading Development and Reading Disabilities

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The Message

1. Morphology is exciting and important for reading
2. Morphology works because it helps integrate (**bind**) letters, sounds, and meaning
3. Morphology is important for struggling readers

Morphology describes how words are composed of ***morphemes***, the smallest units of meaning

Prefix + Base + Suffix or Base + Base

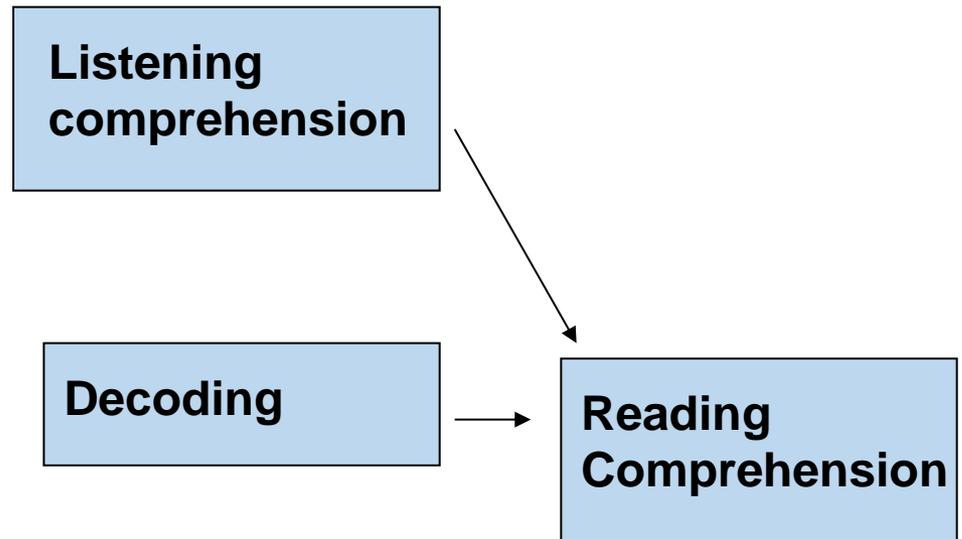
Examples: walked = walk + ed (an inflection)
 design = de + sign (a derivation)
 deadline = dead + line (a compound)

Morphological awareness is **sensitivity** to morphemes and ability to **manipulate** them

Outline

1. How reading works
2. How morphology contributes
3. The promise of morphology for struggling readers

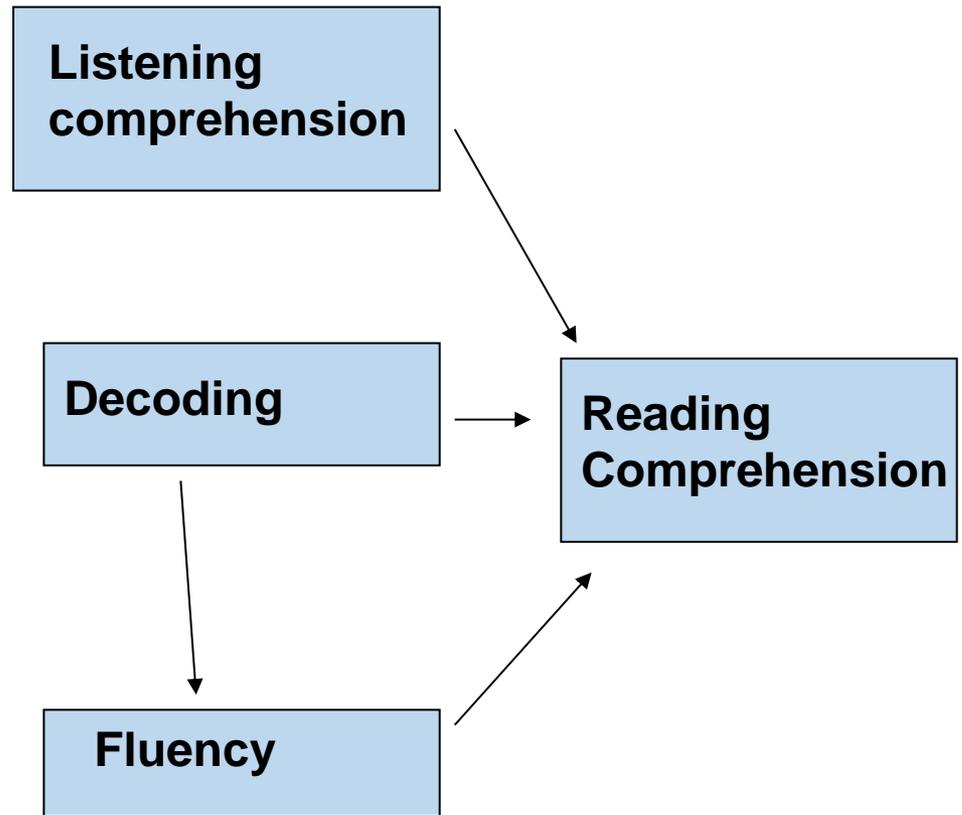
How reading works: 1. The Simple View of Reading



Gough & Tunmer, 1986

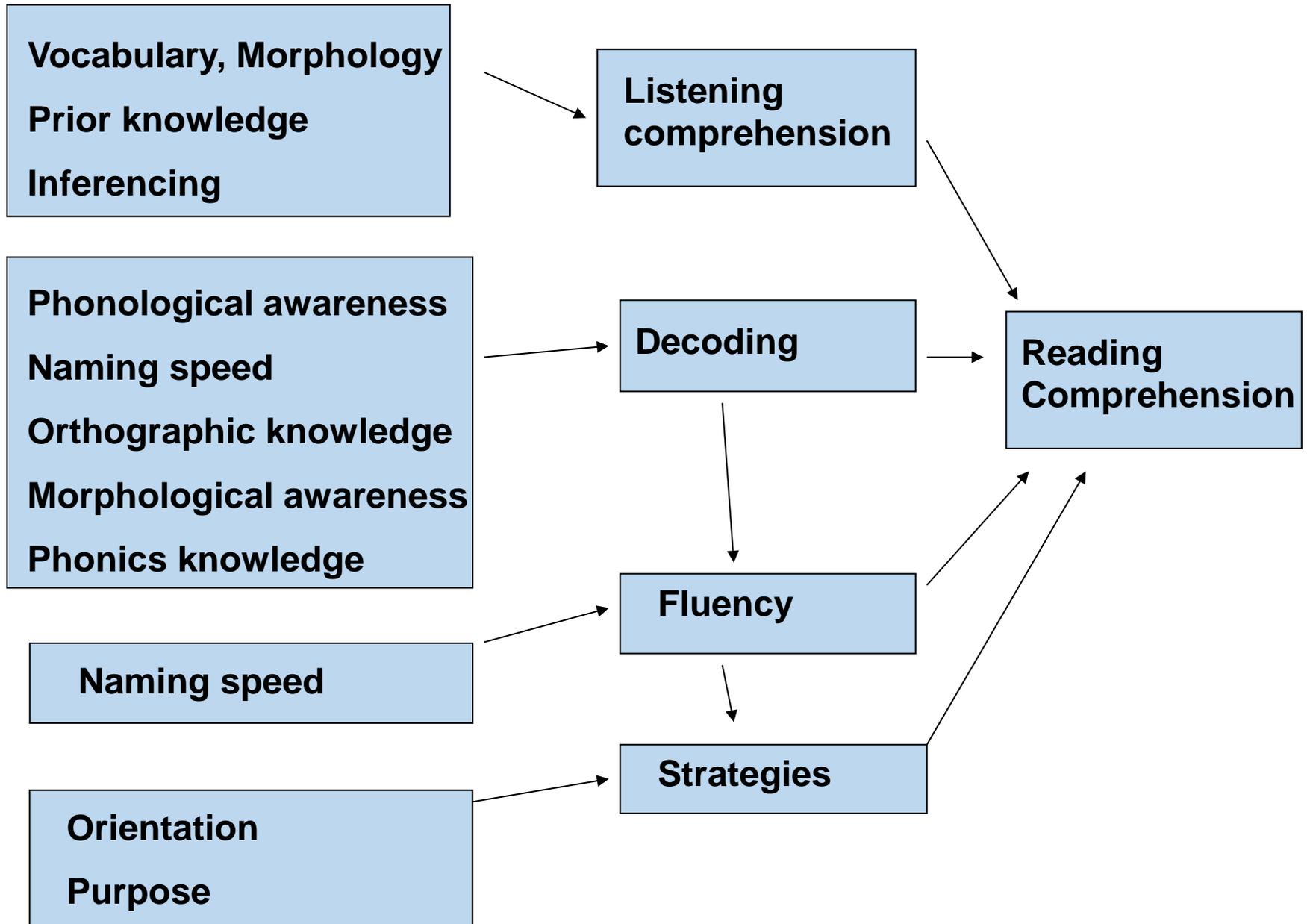
Both decoding and
language comprehension
are needed

How reading works: 2. The Simple View of Reading plus Fluency

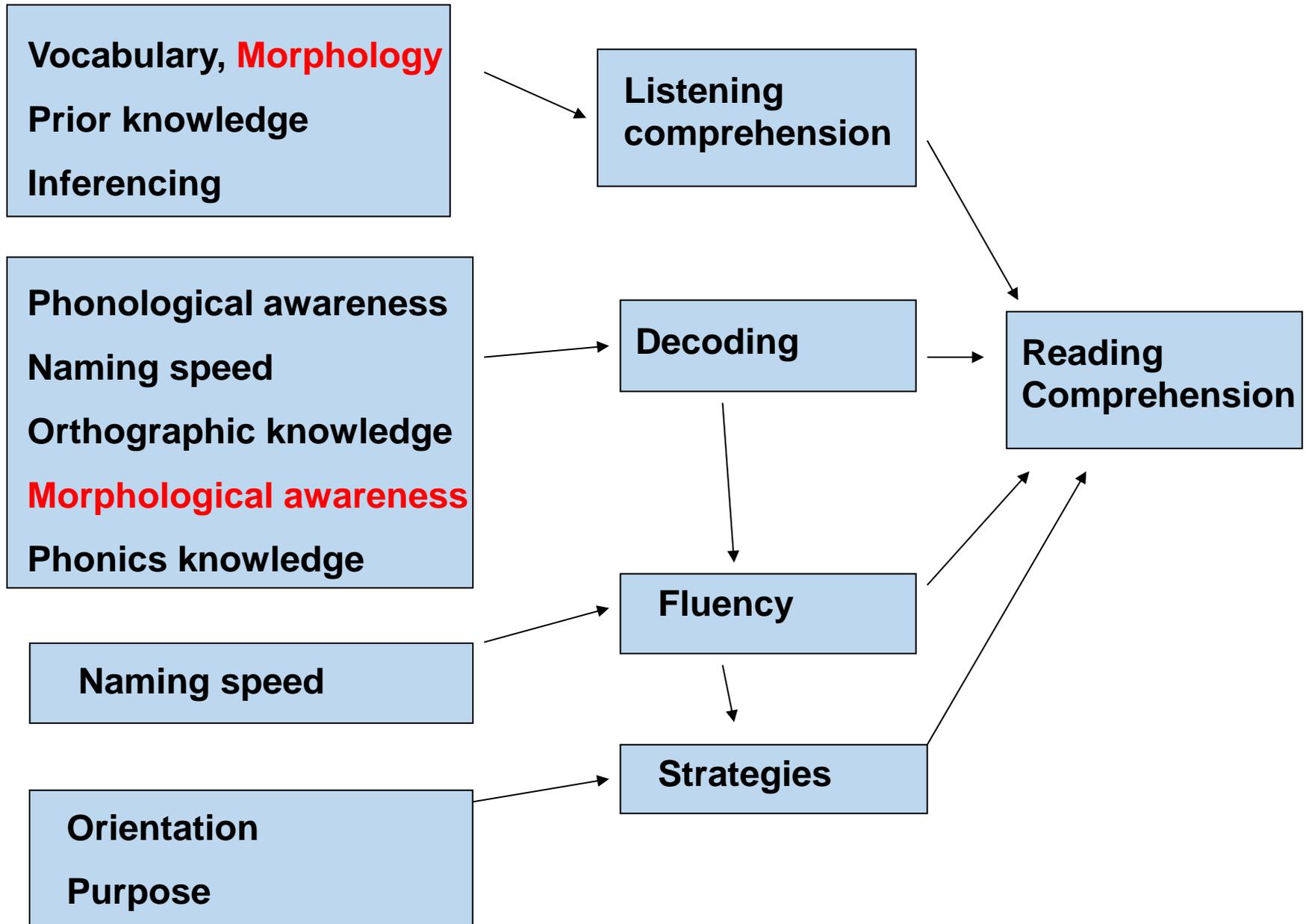


Adequate speed of word reading is essential

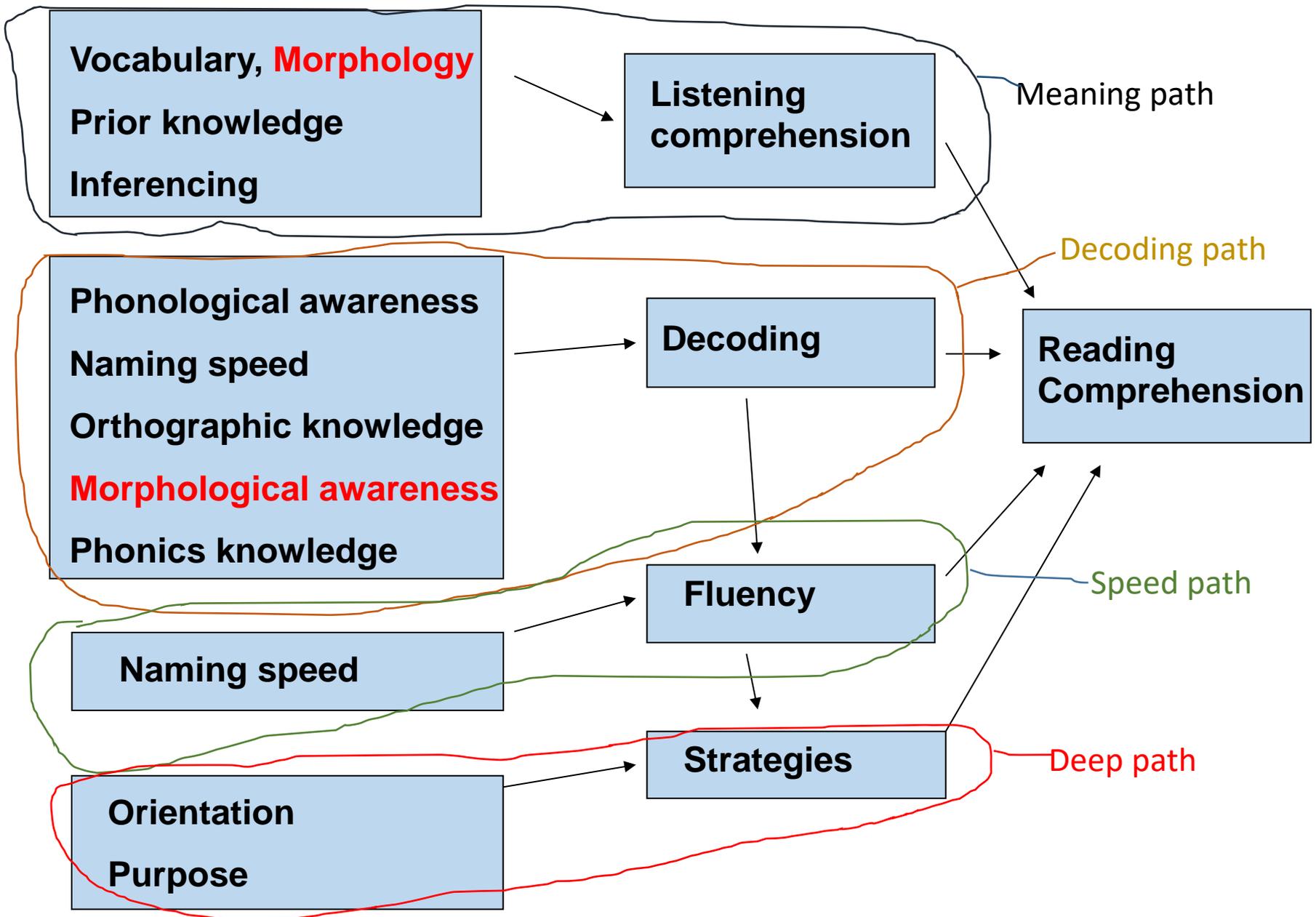
How reading works: 3. The Not-So-Simple View of Reading



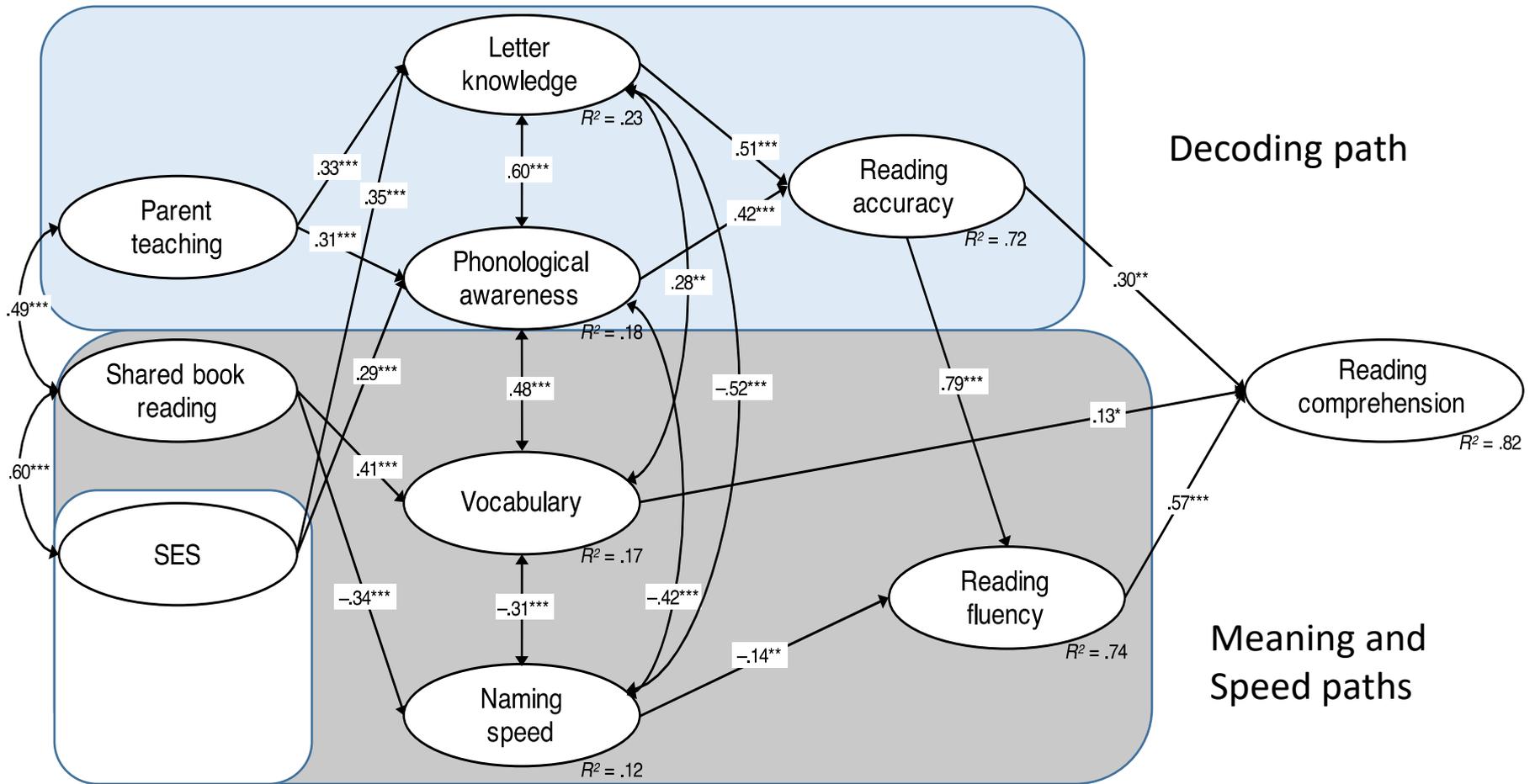
How reading works: 3 The Not-So-Simple View of Reading



How reading works: 3 The Not-So-Simple View of Reading



Home literacy environment, emergent literacy skills, and reading skills (Inoue, Georgiou, Parrila & Kirby, 2018)



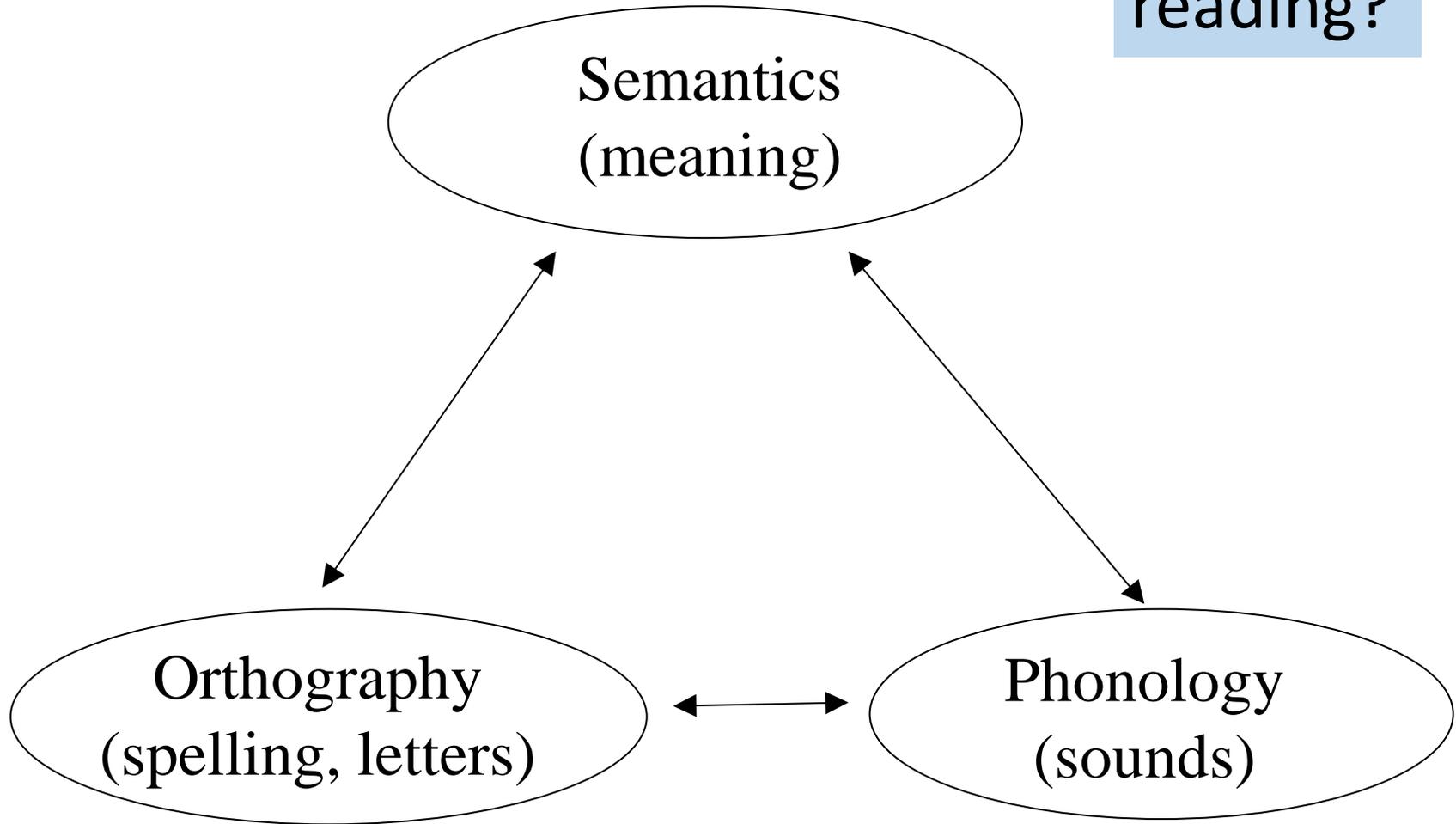
Kindergarten

Grade 1

Grades 2-3

* $p < .05$. ** $p < .01$. *** $p < .001$

What is reading?



Whole Language

How to teach reading?

Semantics

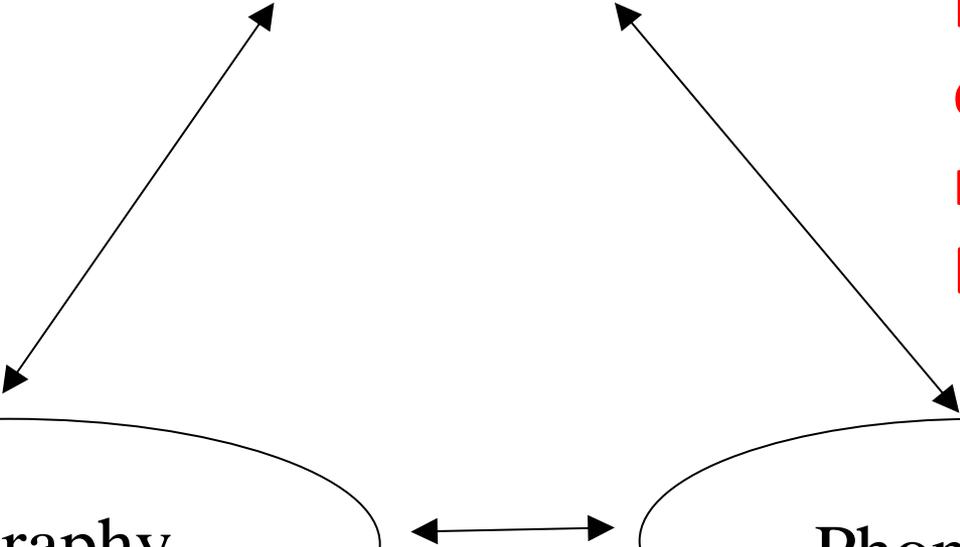
Perhaps everything is needed for English

Orthography

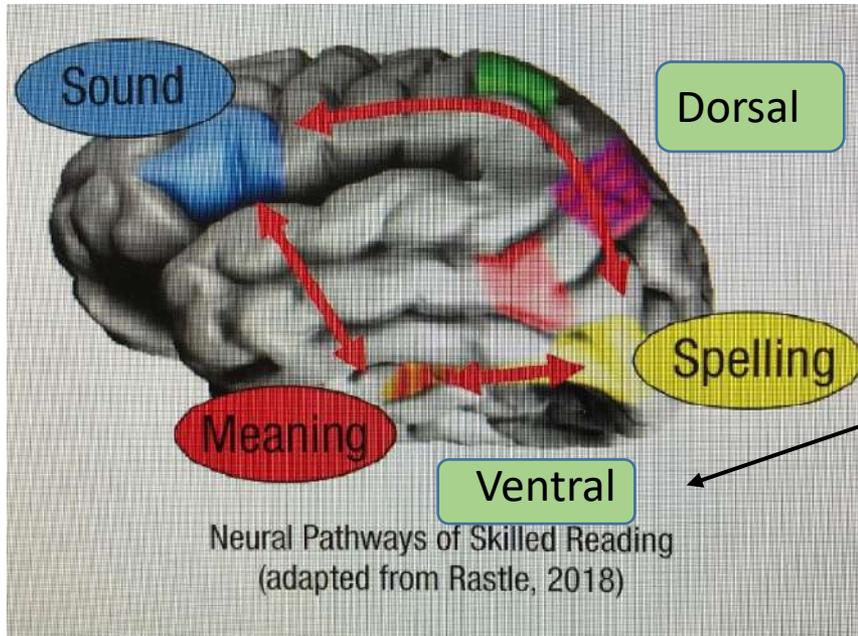
Phonology

Whole Word

Phonics



The Reading Network (Left hemisphere)



- Two pathways:
 - Dorsal: Spelling to Sound to Meaning, for sounding out
 - Ventral: Spelling to Meaning to Sound, for whole word recognition
 - Developing automaticity and integration

For more on the Reading Network, see:

Castles, A., Rastle, K., & Nation, K. (2018). Ending the reading wars: Reading acquisition from novice to expert. *Psychological Science in the Public Interest*, 19, 5-51.

Dehaene, S. (2009). *Reading in the brain*. New York, NY: Penguin Viking.

So what about Morphology?

- There are **bases** and **affixes**
- English uses three kinds of morphology:
 - Inflections (plurals, verb tenses, etc.)
 - English has very few compared to languages such as French
 - Derivations (adding prefixes and suffixes to make new words, for example **un + help + ful**)
 - Compounds (book + shelf) (two bases)
- Remarkably, outside of Linguistics classrooms, morphology is seldom taught systematically

Morphology

English is fundamentally Morpho-phonemic

English orthography “is not merely a letter-to-sound system riddled with imperfections, but instead, a more complex and more regular relationship wherein phoneme and morpheme share leading roles”
(Venezky, 1967, p. 77)

English spelling pays some attention to phonology, but more to morphology (why is there a “g” in sign?)

Morphology is a key to learning **vocabulary**, and vocabulary is key for language. We know about 50,000 distinct words by age 20, so we learned 2500 per year, or 7 per day. **How?**

Children should learn how their language works.

Whole Language Instruction

Semantics

Where is
morphology?

Morphology
binds
semantics,
orthography,
and phonology

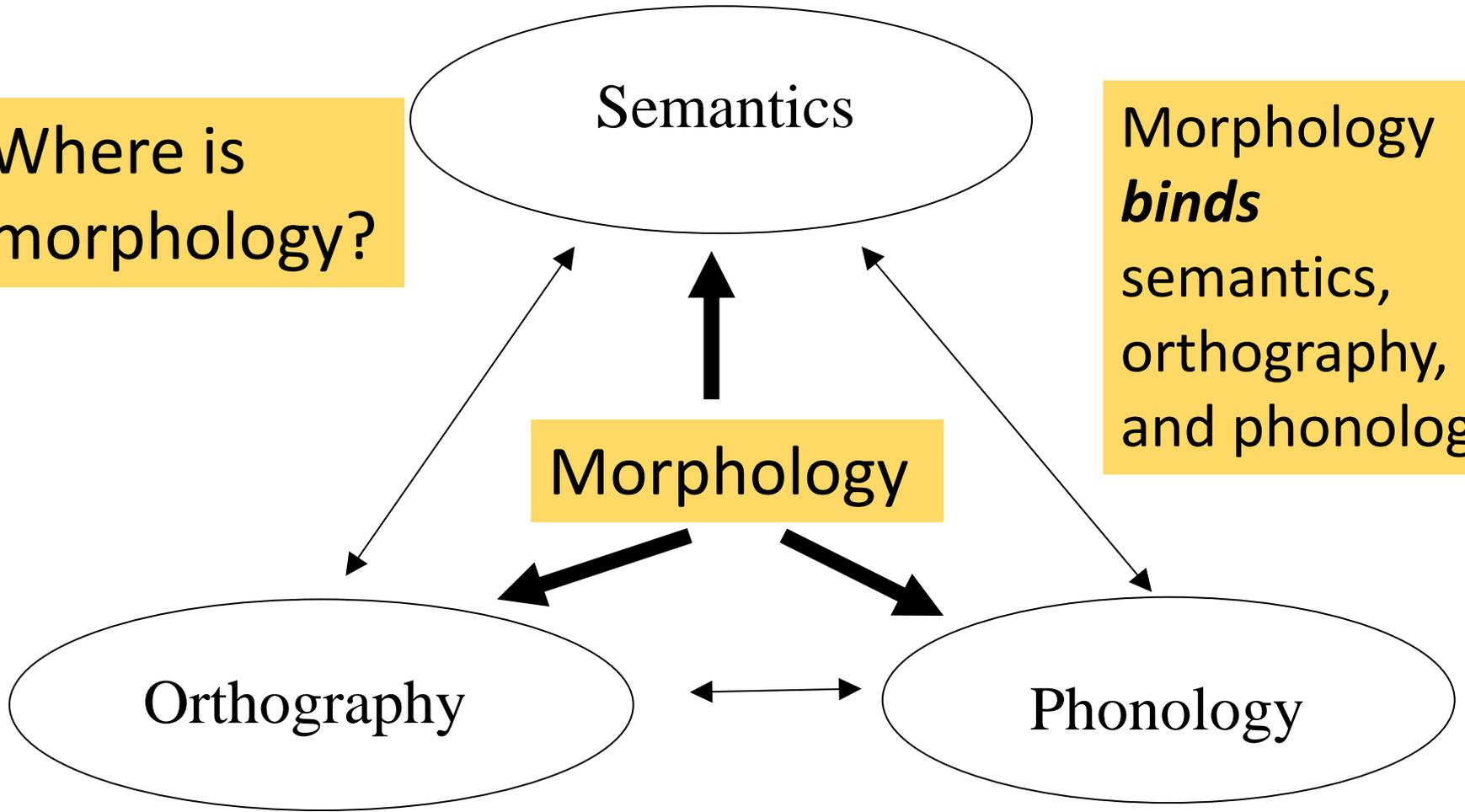
Morphology

Orthography

Phonology

Whole Word Instruction

Phonics Instruction



How do we measure morphological knowledge or awareness?

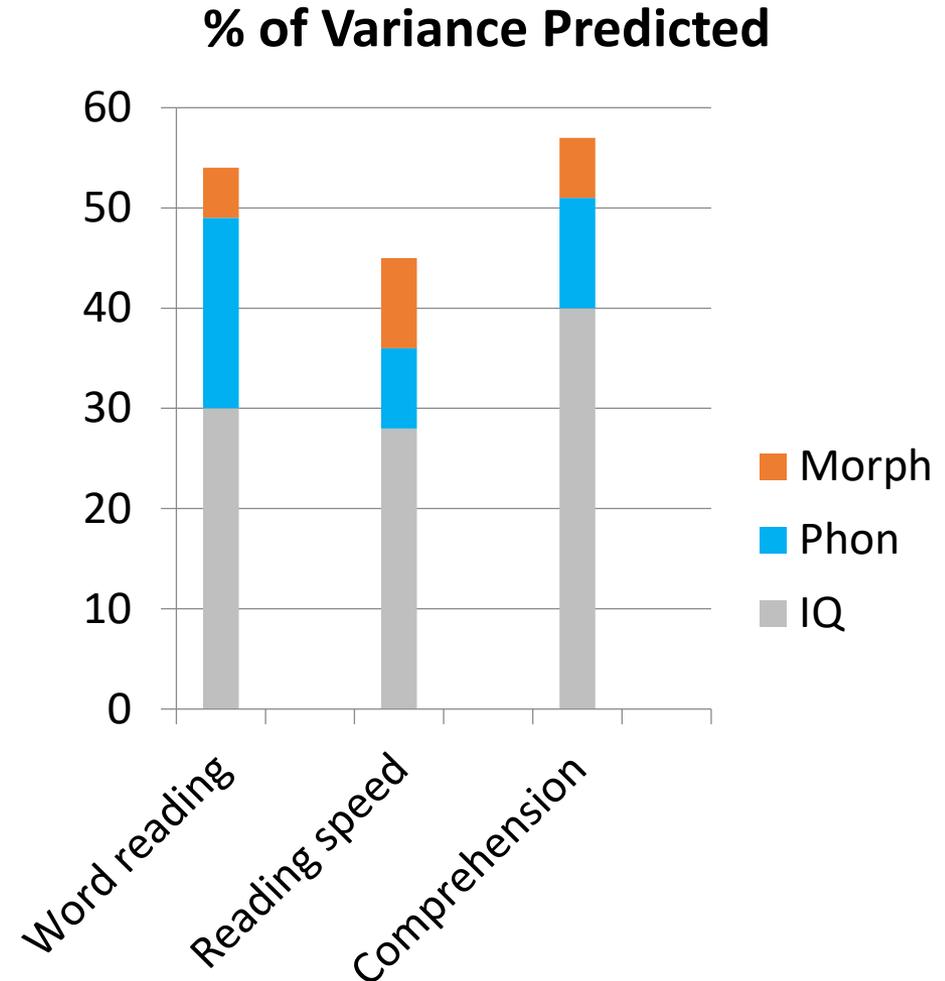
- Some examples:
 - Word Analogy: **walk** is to **walker** as **think** is to _____
 - Composition: (farm) My uncle is a _____
 - Decomposition: (driver) Children are too young to _____
 - Pseudoword derivation: The teacher said she was too _____.
A. sigglition. B. siggly C. siggling D. sigglize
 - Base Identification: What is the main part of these words?
A. Teacher B. Unhelpful, C. Construction, D. Business

Morphological knowledge predicts reading ability

Grade 3: After controlling verbal and nonverbal IQ, and phonological awareness (Kirby, et al., 2012)

Other studies show the same, with other predictors controlled, in many languages, e.g., Arabic (Tibi & Kirby, 2014), French (Kirby, Desrochers, & Thompson, 2010)

True for adults too (Kotzer, Heggie & Kirby, 2019)



Morphological awareness is often the strongest predictor

Grade 5 Children (standardized regression coefficients)

Predictor	Word Reading	Reading Comprehension
Verbal IQ (vocabulary)	.05	.31***
Nonverbal IQ (Matrices)	.09	.02
Phonological awareness	.28***	.02
Naming speed	.18**	.15*
Orthographic processing	.22**	.19**
Morphological awareness	.30***	.37***
% accounted for	59%	61%

Kirby, Deacon, Parrila, etc, in preparation)

Poor Morphological Awareness characterizes unexpected poor comprehenders

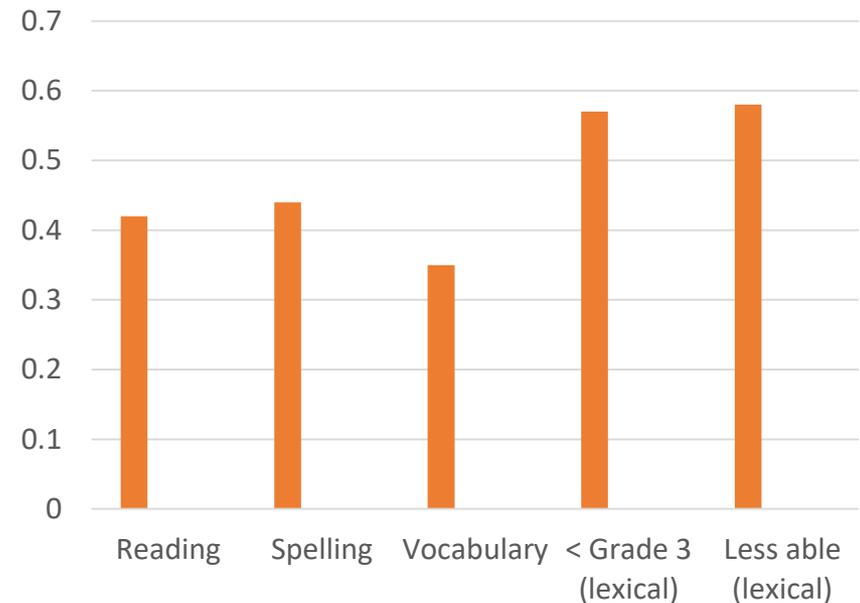
- “unexpected poor comprehenders” are students with adequate word reading ability but poor reading comprehension
- Grade 5 poor comprehenders performed worse on morphology tasks (derivation) in grade 3 than average readers (Tong, Deacon, Kirby, Cain, & Parrila, 2011)
- In Chinese ESL students, poor and average comprehenders performed worse in morphology than good comprehenders (Li & Kirby, 2014)

Morphological instruction improves reading

Meta-analyses (e.g., Bowers, Kirby & Deacon, 2010) have shown that morphological instruction (compared to regular class instruction)

- Improves reading, spelling, vocabulary
- Is more effective for younger children
- Is more effective for less able children
- Medium effect sizes

Effect of Morphological Instruction

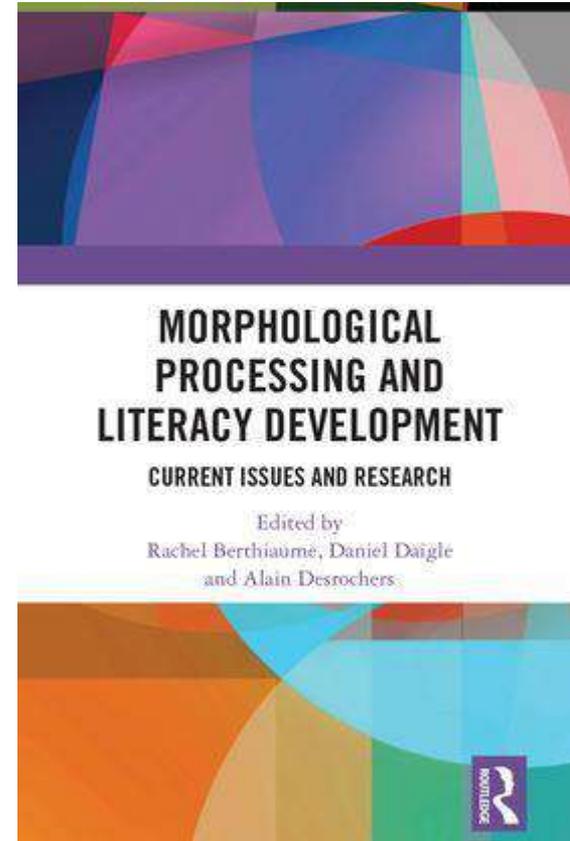


Effect sizes: .2 = small
.5 = medium
.8 = large

Morphology and reading

R. Berthiaume, D. Daigle, & A. Desrochers (Eds.), *Morphological processing and literacy development: Current issues and research*. New York: Routledge.

Including a chapter by Kirby & Bowers,
The effects of morphological instruction on vocabulary learning, reading, and spelling.



Effect sizes of Morphological instruction (from Bowers, Kirby, & Deacon, 2010)

	Outcome Variable			
	Sub-Lexical			Supra Lexical (Comprehension)
	Morphological	Non-Morphological	Lexical	
	M vs. Control (AT)	M vs. Control (AT)	M vs. Control (AT)	M vs. Control (AT)
All Readers (all effects)	0.65 (0.51)	0.34 (0.08)	0.41 (0.12)	0.28 (-0.08)
Less Able Readers	0.99 (1.25)	0.63 (0.25)	0.57 (0.24)	0.67 (0.39)
Younger (K - 2)	1.24 (1.25)	0.49 (-0.16)	0.57 (-0.07)	0.27 (-0.22)
Older (Gr 3 - 8)	0.62 (0.24)	0.24 (0.20)	0.37 (0.15)	0.29 (0.08)

Note. M = Morphological instruction group, C = Control group, AT = Alternative Treatment Group.

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- Generally effective, compared to controls
- More effective for younger and less able
- Weaker compared to alternative treatments

Note. M = Morphological instruction group, C = Control group, AT = Alternative Treatment Group.

Effect sizes at Lexical (word) level (Bowers, et al., 2010)

Outcome (lexical level)

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Effect size	0.41 (0.05)	0.49 (0.05)	0.35 (0.20)

Effective for word reading, spelling, and vocabulary
This may be the main locus of its effect.

You don't have to choose between Morphology and AT, you can combine them

Effects sizes of morphological awareness instruction

(Goodwin & Ahn, 2010, 2013)

Outcome	Effect size	
	Goodwin & Ahn, 2010 Literacy difficulties	Goodwin & Ahn, 2013 All students
Phonological awareness	0.49	0.48
Morphological knowledge	0.40	0.44
Decoding	0.23	0.59
Spelling	0.20	0.30
Vocabulary	0.40	0.34
Reading comprehension	0.24	0.09

Effects sizes of morphological awareness instruction

(Goodwin & Ahn, 2010, 2013)

Effect size

Outcome	Goodwin & Ahn, 2010 Literacy difficulties	Goodwin & Ahn, 2013 All students
Phonological awareness	0.49	0.48
Morphological knowledge	0.40	0.44
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Reading comprehension	0.24	0.09

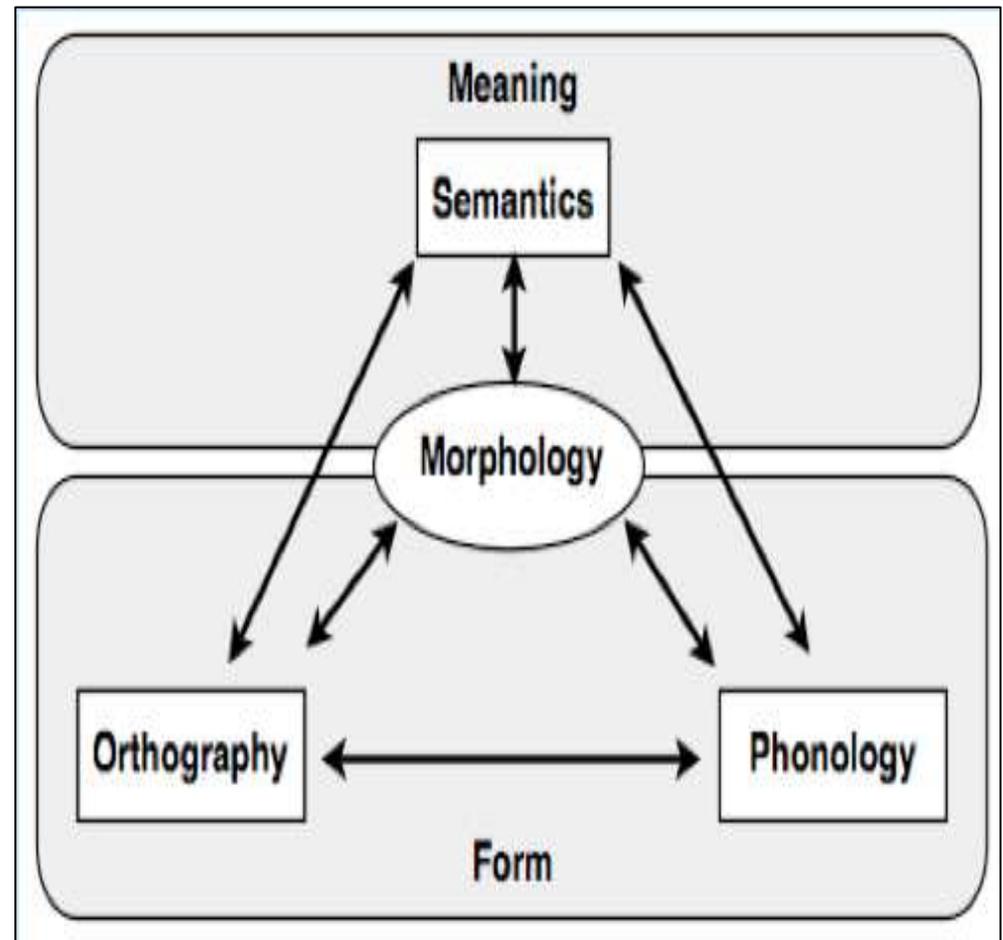
- Generally effective
- Still effective for those with literacy difficulties
- Weaker for comprehension

Effects of Morphological Instruction

- Broadly effective
- Especially for younger (Lyster did it with pre-school children) or **less able**
- Whereas *predictive* studies showed the **strongest** effects on reading comprehension, *instructional* studies showed **weaker** effects on reading comprehension
 - Comprehension (and fluency) may come after practice and automaticity
- We know enough now to advocate morphological instruction be included in literacy programs
- But we need to know more about how best to teach it

How morphology contributes (A)

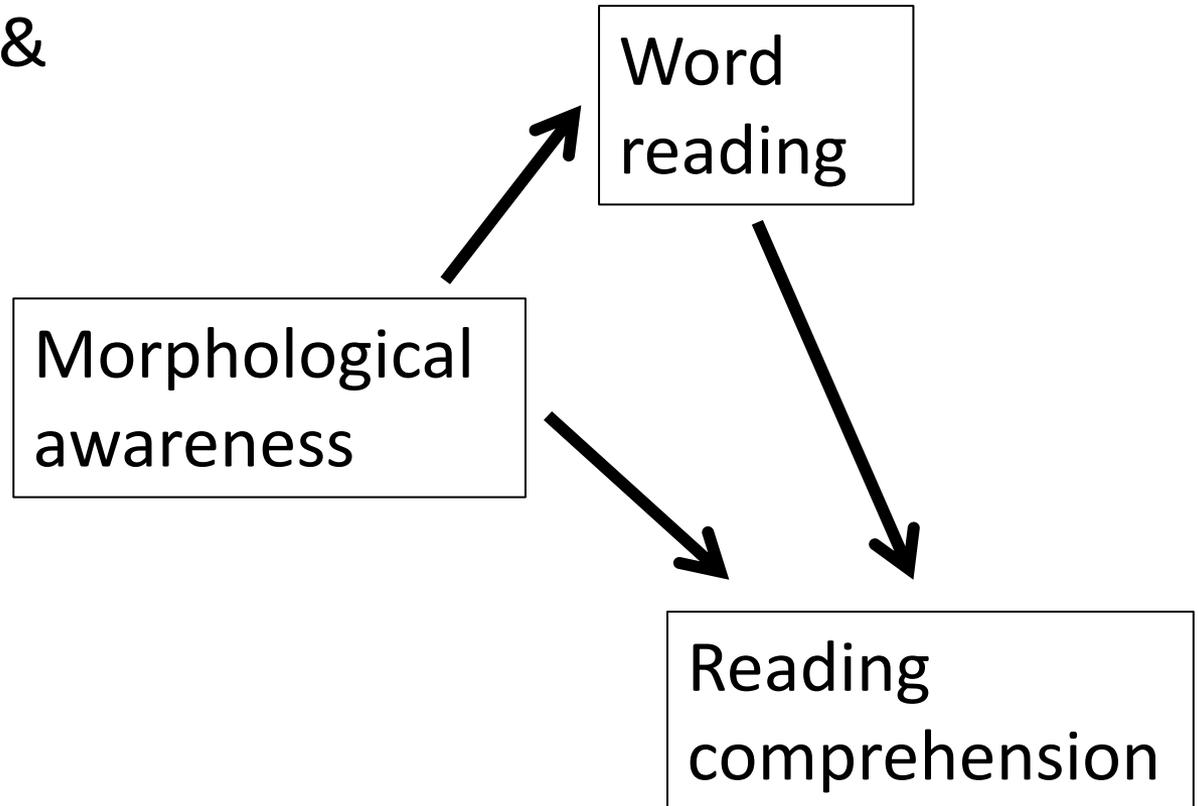
- Morphology is a part of lexical quality (Perfetti, 2007) and helps *bind* orthographic, phonological, and semantic representations (Bowers, et al., 2010; Kirby & Bowers, 2017, 2018)
- This is how it contributes to word reading



How morphology contributes (B)

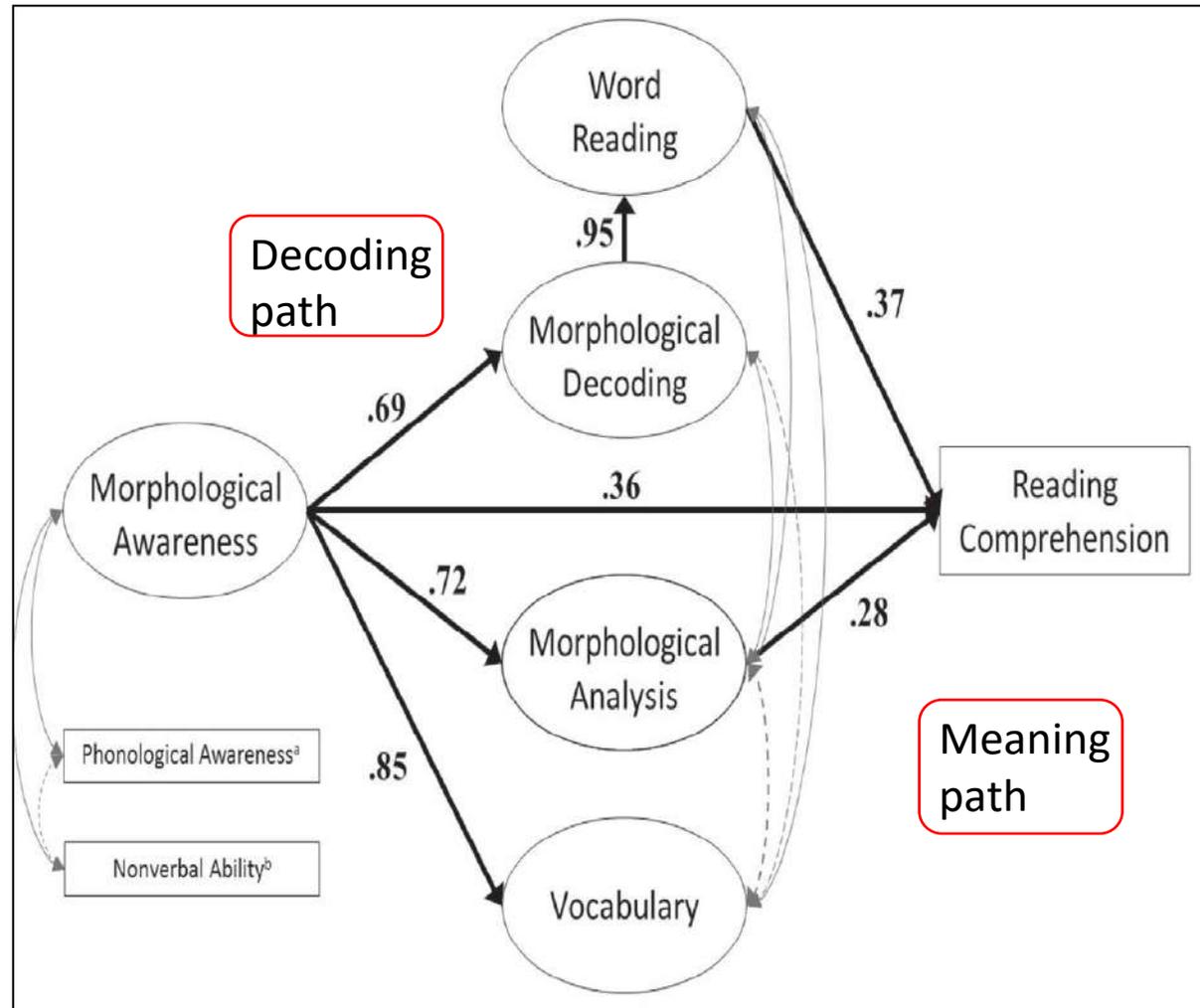
- Deacon, Kieffer & Laroche, 2014:

- Word reading partially mediates the effect of MA on reading comprehension



How morphology contributes (C)

- Levesque, Kieffer & Deacon, 2017:
- MA contributes to word reading through M. Decoding
- MA contributes to reading comprehension (a) directly, (b) through M. Decoding and word reading, and (c) through M. Analysis



Implications for instruction: General principles

- **Integrate** morphological instruction with other aspects of literacy (binding phonology, orthography, and semantics)
 - Reading, spelling, vocabulary
 - Teach how it applies (teach for transfer)
- Integrate morphological instruction with **content** learning, addressing key words and morphemes
- Teach **bases** and **affixes**; teach **bound bases**
- **Never too young** to start
 - Oral then written
- Use it with **struggling readers**
- Make use of errors (discovery → disco + very) to demonstrate how to test them
- **Problem solving**, not just rules and content

Implications for instruction: What can go wrong (grade 8)

- Displacement:
 - “dis means not and placement means to place something so displacement means to not place something”
- Depicted:
 - “not picted”
 - “when you get discluded”
 - “de + pict + ed to depict means to figure out something”
- Humanitarian:
 - “something that eats humans”

Implications for instruction: Tools

- Word matrices
- Word sums
- Structure test
- Meaning test
- Three orthographic change rules:
 - Silent –e: hope → hoping
 - Consonant doubling: hop → hopping, not hoping
 - y to i: carry → carriage, busy → business

Instruction: Word Matrix and Word Sums

un dis	please	ing	
		ure	able
		ant	ly ness

Word sums:

please/ + ing → pleasing

please/ + ant + ly → pleasantly

un + please/ + ant + ness → unpleasantness

please/ + ure/ + able → pleasurable

dis + please → displeasure

ad
contra
e
inter
pre
in

ed
ing
s
ion
ory
able
ably
ability
ment

dict

*“say,
declare”*

bene
“well”

male
“bad, evil”

vale
*“farewell,
goodbye”*

ate ed
ing
s
ion

or i | al
ship

ion ary es

um
a

non
con
in
dis
extra

sense
"feel, perceive"

ible
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ibility
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ate	ion	al	ly ism
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	ize or ise	es ed ing

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us

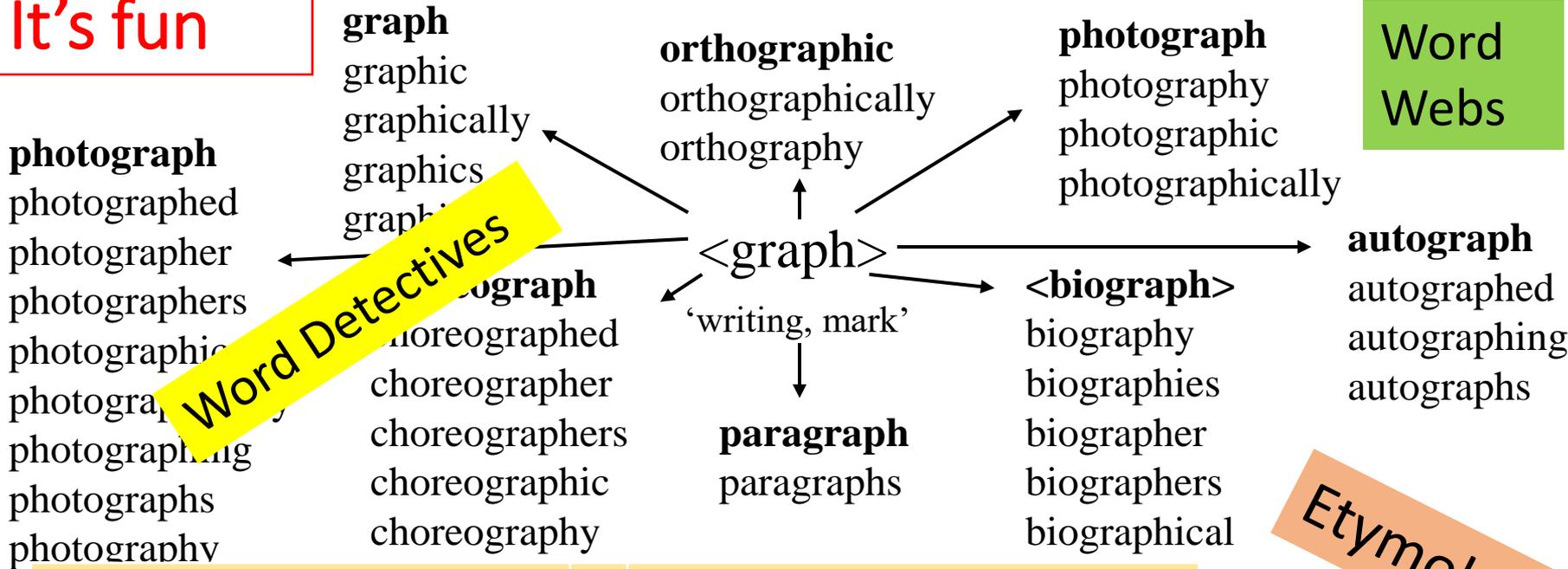
Instruction: Structure and Meaning Tests

- Morphological hypothesis testing
- The **structure** test: the learner demonstrates that all of the hypothesized morphemes in a word sum are plausible morphemes in other words
- The **meaning** test: the learner shows that the base and the more complex word share a common meaning
 - if not transparent, can be explored in the words' etymological origins

For more on instruction, see

www.wordworkstakington.com

It's fun



Word Matrix

Word Sums

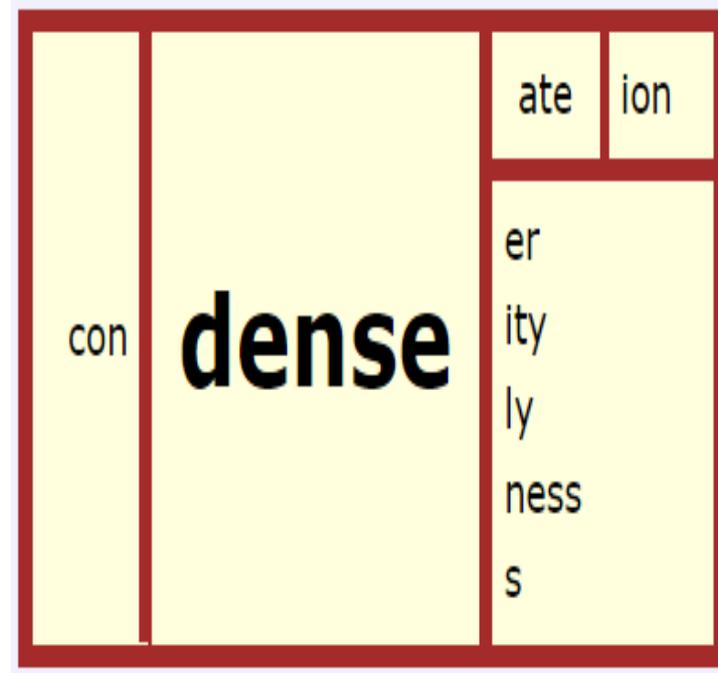
			ing			please/ + ing → pleasing
			ure	able		please/ + ant + ly → pleasantly
	un	please				un + please/ + ant + ness → unpleasantness
	dis		ant	ly	ness	
						dis + please → displease

Testing hypotheses about morphological structure

Future directions: Content area Vocabulary

- Grade 8 Science words:
- Unit on Fluids: Buoyancy, Viscosity, **Density**, Particle, Volume, Pressure, Hydraulic, Submarine, Hydrodynamics
- Teach about these words and their families, to increase lexical quality

- Perhaps also at University?



dichlorodifluoromethane =
di+chloro+di+fluoro+meth+ane



May help in second language learning

An unfamiliar base in L2 may be more familiar in L1

ame <i>"love"</i>	i ic	able
	or	ous

des en	am <i>"love"</i>	abil	idad
		able	
		ar	se
		or	ad

Latin, am(are) "to love"

Key area: Morphology-oriented curriculum for the reading disabled

- Since Elbro & Arnbak (1996) there has been an argument that children with phonologically-based reading problems have a “relative advantage” in morphology
- Morphology could act as a mediating system, helping with the orthography → phonology link that is faulty
- Morphology would not replace phonology, but enhance it
- Such a curriculum needs to be developed and tested

The Message Again:

1. Morphology is exciting and important for reading
2. Morphology works because it helps integrate (**bind**) letters, sounds, and meaning
3. Morphology is important for struggling readers

What's next?

- Morphology in other languages
 - Arabic – has a nonlinear morphology (with Sana Tibi)
- Morphological instruction for struggling readers (with Jeff MacCormack and Peter Bowers)
 - Build on a relative strength
- Teachers' knowledge of morphology
- Encourage integrated curriculum development
- ???

Thank You!

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Resources

www.wordworkskingston.com

www.etymonline.com/index.php?allowed_in_frame=0&search=battle&searchmode=none

<http://www.affixes.org/>

www.neilramsdn.co.uk/spelling

www.vocablog-plc.blogspot.com

www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/WW_Morphology.pdf

Common affixes

Prefixes	Suffixes	
	Vowel suffixes	Consonant suffixes
a-, ad-, al-, be-, bi-, com-, contra-, de-, di-, dia-, dis-, en-, ex-, in-, inter-, intro-, mis-, non-, ob- , para-, per-, pre-, re-, se-, sub-, syn-, tele-, trans-, un-	-ability, -acle, -acy, -al, -ance, -ate, -ed, -eer, -ence, -er, -ery, -ian, -ibility, -icle, -ing, -ion, -ique, -ism, -ity, -ive, -ize, -or, -ory, -ous, -ule, -ure	-cy, -dom, -ful, -hood, -less, -let, -ling, -ly, -ment, -ness, -ry, -s, -ship, -some, -st, -th, -ty, -ware