

**HOW DOES THE EARLY
READING TRAJECTORY
IN NGUNI LANGUAGES
DIFFER WHEN WE
INTERVENE OR DON'T?**

**SMALL AND BIG
PROBLEM SPACES
IN READING**

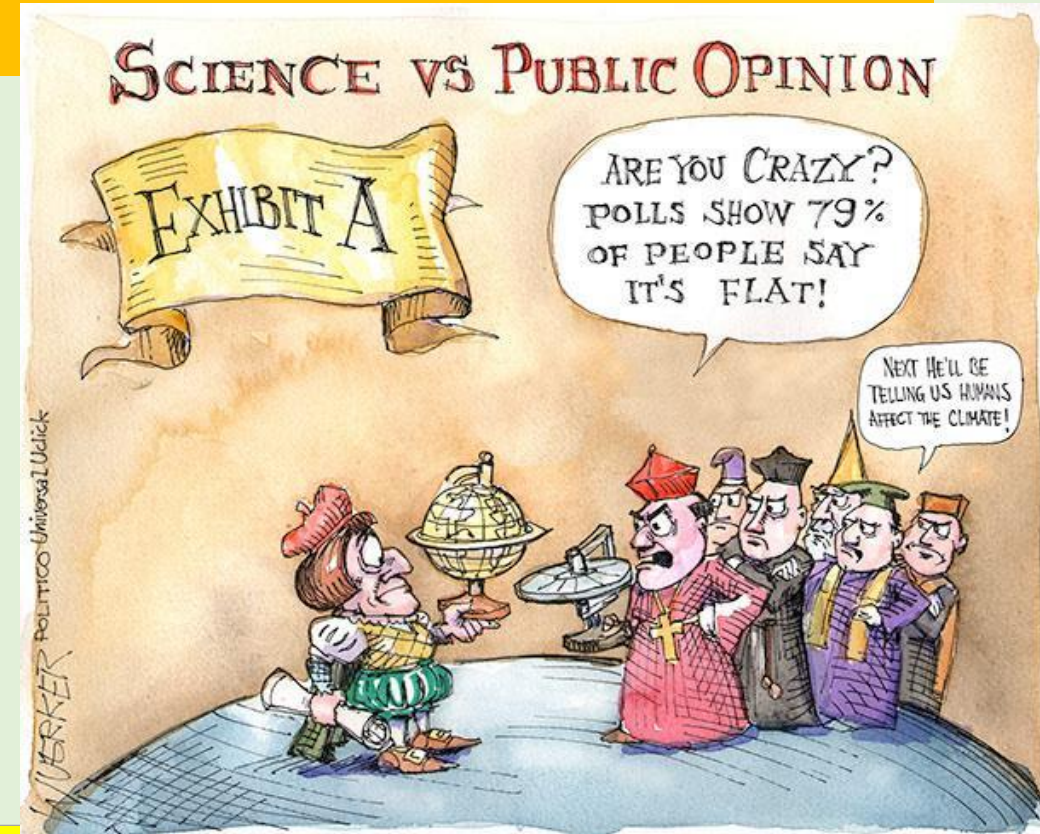
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13 September 2019

WHAT IS THE PURPOSE OF SCIENCE?

“The very core of why we do science (is) to prevent ourselves from being misled by our own experiences and prejudices” (Ben Goldacre. 2008. *Bad Science*. London: Harper Collins, p xii.).



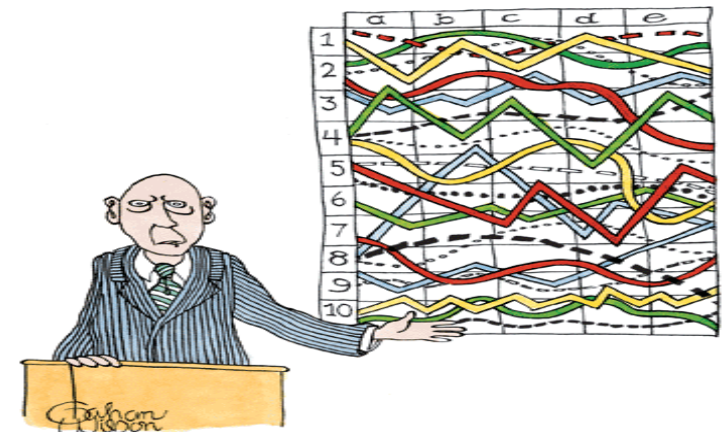
“The researches of so many eminent scientific men have thrown so much darkness upon the subject that if they continue their research we will soon know nothing” (Artemus Ward).

OUTLINE

Small and big problem spaces

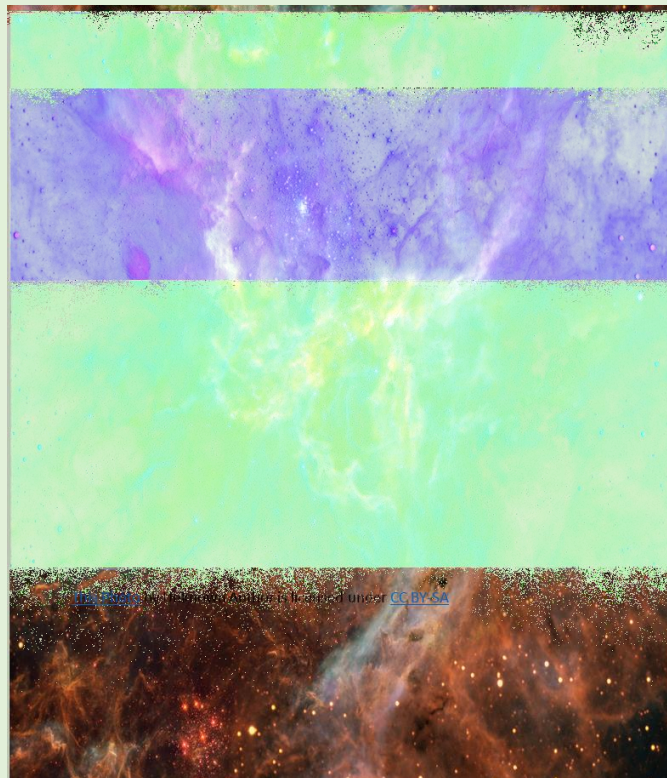
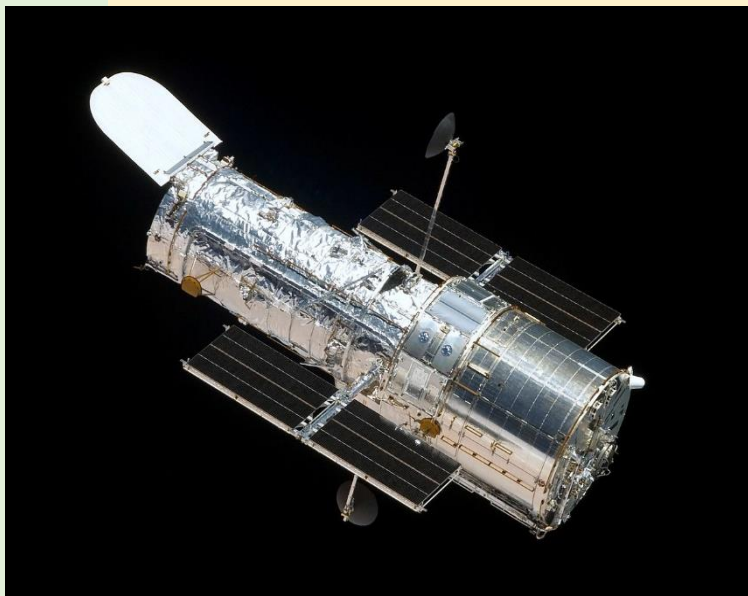
- Some theory
- Some neurocognition
- Some decoding
- Some reading comprehension
- Some data
- Some relationships

Simple straightforwardness or nuanced complexity?



"I'll pause for a moment so you can let this information sink in."

SMALL AND LARGE PROBLEM SPACES



A large problem space is complex and challenging; it takes up a lot of our time and attention. It is very important. We can spend years on it and even then we don't necessarily reach the end. (We will probably have to spend a lot of money on it too....) But, oh, the joy of knowledge!

A small problem space is, well, small. It shouldn't take up much time and attention. It can be dealt with easily. It must do its job but it's not so important. (Do we really need to spend much money and time on it?)

SMALL AND LARGE PROBLEM SPACES IN READING

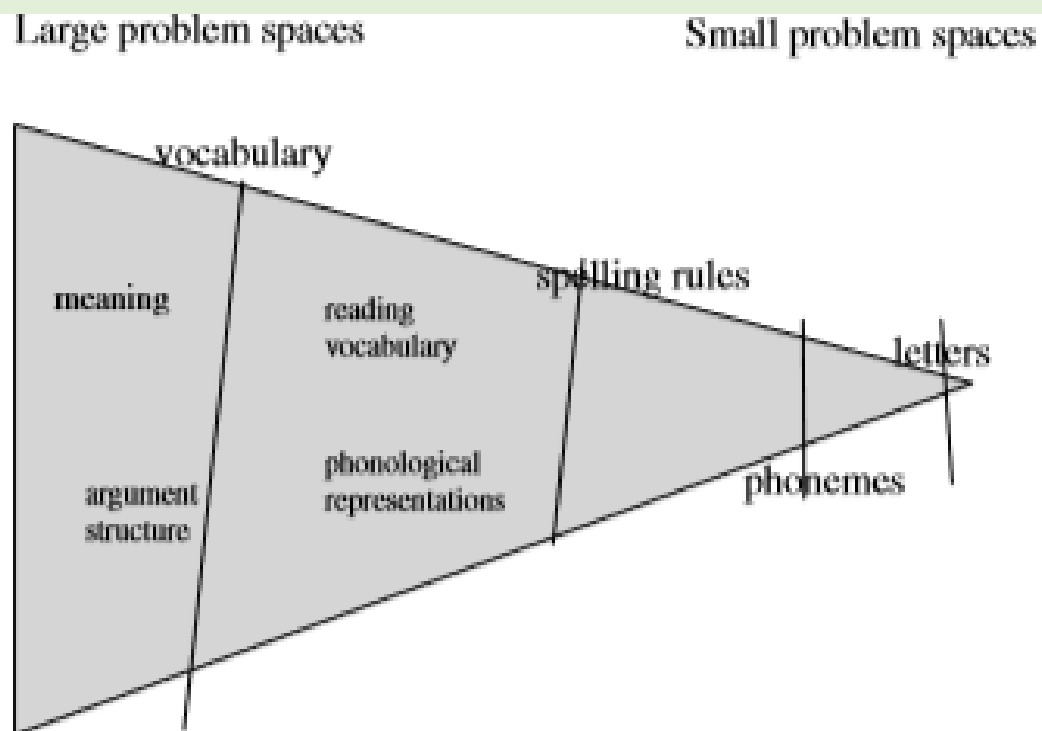


FIGURE 7.4. A representation of the various problem spaces associated with literacy.

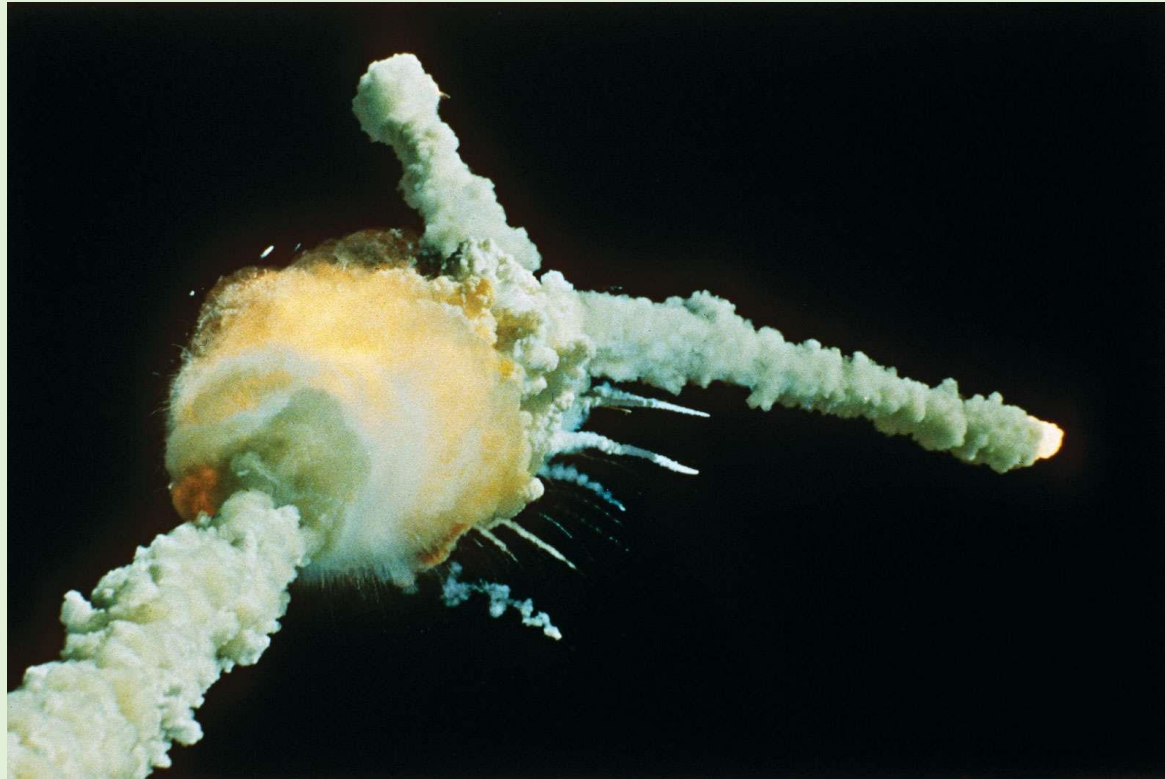
Reading is all about comprehension, meaning making, vocabulary

Decoding?

Oh yes, we need it, but it's a small problem space. Don't worry too much about it.

If we focus on the big things, the small things will fall into place.

WHAT HAPPENS WHEN SOMETHING GOES WRONG IN THE SMALL PROBLEM SPACE?



SMALL AND LARGE PROBLEM SPACES IN READING

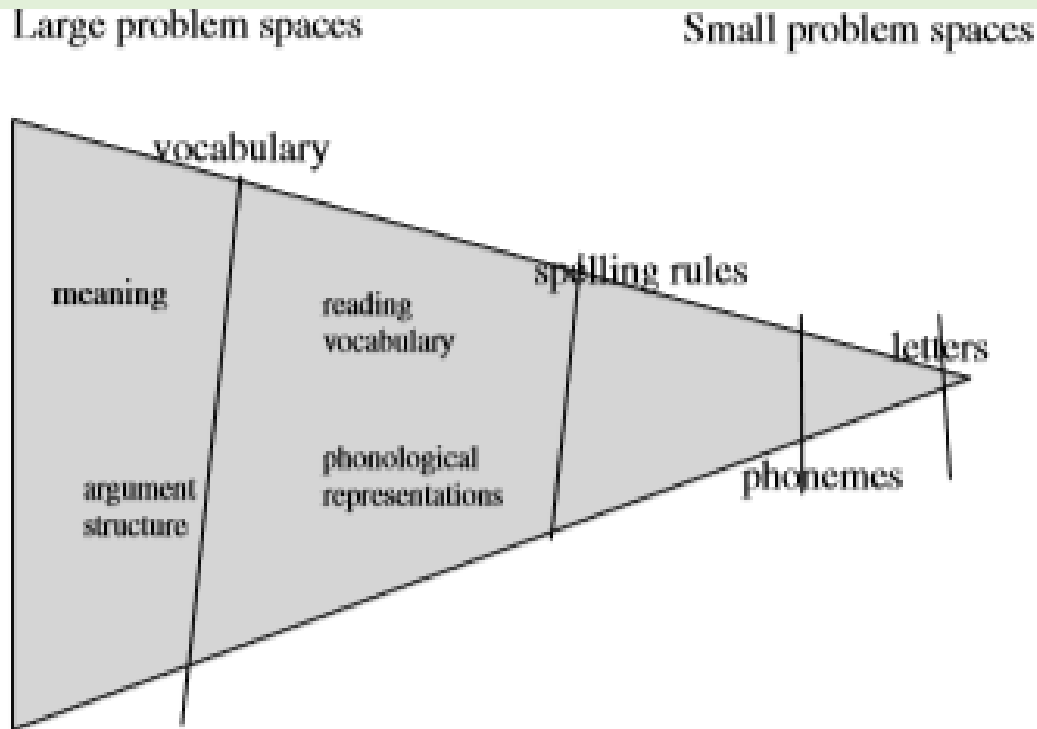
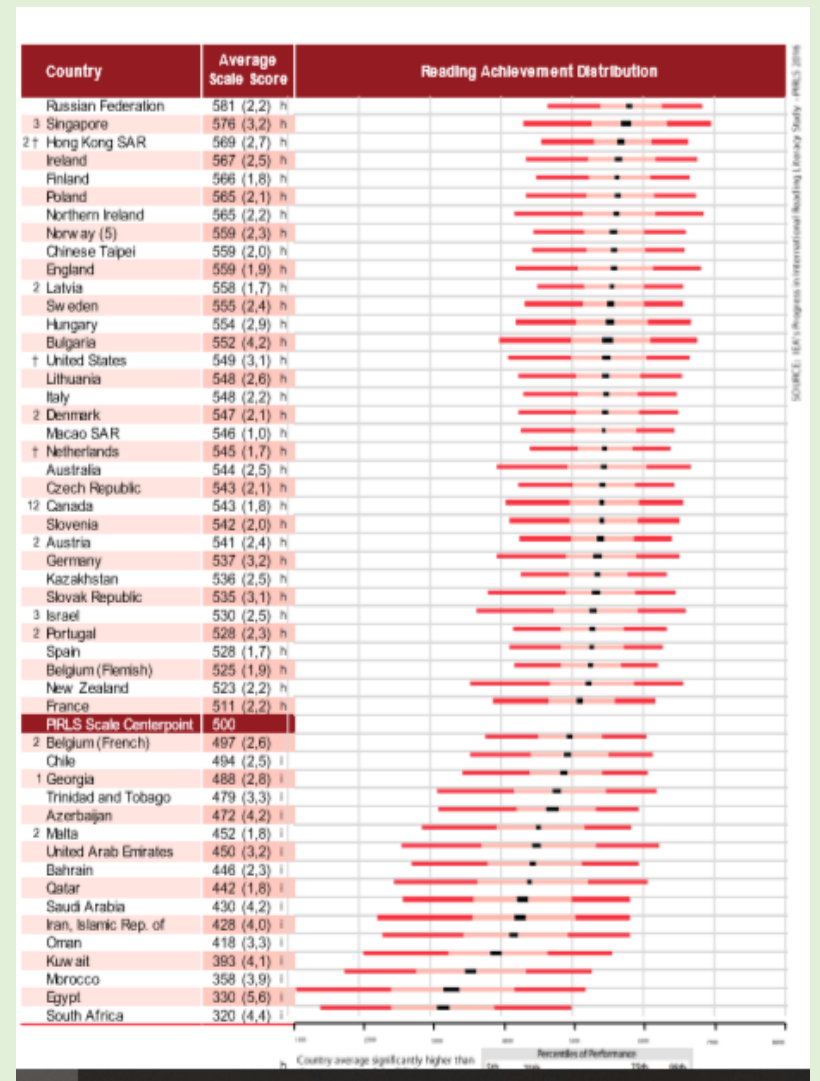


FIGURE 7.4. A representation of the various problem spaces associated with literacy.



SOURCE: IEA Progress in International Reading Literacy Study (PIRLS) 2006



CHILDREN WHO CANNOT READ AT ALL (ZERO SCORES IN FOUNDATIONAL LITERACY)

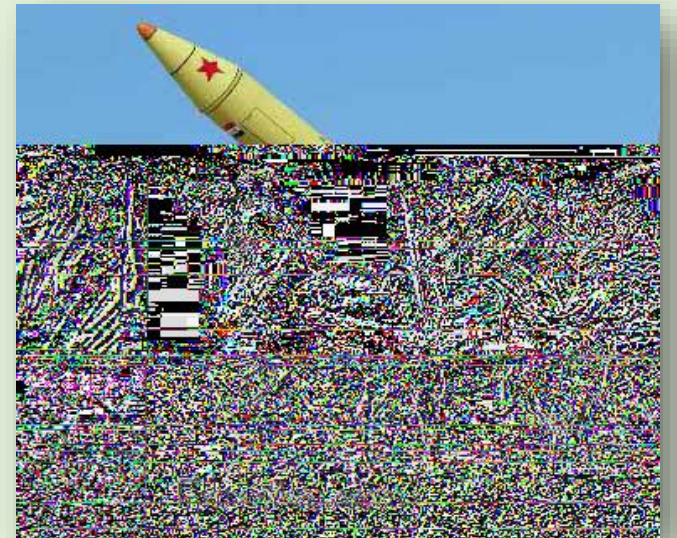
| | Grade 1 | | Grade 2 | | Grade 3 | |
|---------------------------------|--------------|--------|----------------------|-------------|-------------------|-----|
| Letter-sounds | Nigeria | 90% | Setswana | 8% | | |
| | Ghana | 30-70% | Xhosa | 9% (urban) | | |
| | Setswana | 18% | Zulu | 18% (rural) | | |
| | Zulu (rural) | 56% | Xhosa | 12% (EC) | | |
| Word reading | Ghana | 54-92% | 36% Setswana | | Swahili, Kenya | 17% |
| | Zulu/Swati | 45% | Xhosa | 42% | Home Lang, Kenya | 18% |
| | Setswana | 60% | Zulu | 32% | Home Lang, Uganda | 38% |
| | Zulu (rural) | 80% | | | Xhosa | 28% |
| | | | | | Zulu | 19% |
| Composite literacy score | | | 52% Zambia (Whole L) | | | |
| | | | 39% Zambia (phonics) | | | |

TRAJECTORY

Latin *trans* 'across' + *jacere* 'throw' (first used in English in the late 17th century)

The path followed by a projectile flying or an object moving under the action of given forces

The reading development path of learners prompted by the action of (mainly) classroom forces



THE READING PYRAMID



**SURFACE BEHAVIOUR OF
READING (SOCIAL & TEXTUAL)**



**COGNITIVE-LINGUISTIC
PROCESSES**



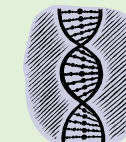
NEUROLOGICAL STRUCTURES



NEURONAL PATHWAYS



HEREDITARY/GENETIC LEVEL



COGNITIVE COMPONENTS OF READING

LANGUAGE PROFICIENCY

Listening comprehension
Vocabulary
Grammar (morphology/syntax)

COGNITIVE PROCESSES

Working memory
Phonological processing

EXECUTIVE CONTROL

Cognitive self-control
Cognitive flexibility

COMPREHENSION

DECODING

READER RESPONSE

SIMPLE VIEW OF READING

**READING COMPREHENSION (RC) =
LANGUAGE PROFICIENCY + DECODING**

YS

SOCIOECONOMIC AND CULTURAL CONTEXT

HOME

SCHOOL

COMMUNITY

ORAL LANGUAGE PROFICIENCY

Listening C
Vocabulary
Grammar
(morphology/
syntax)

EXECUTIVE CONTROL

Working memory
Cognitive self-control
Cognitive flexibility

READING COMPREHENSION

DECODING

READER RESPONSE

NEUROLOGICAL STRUCTURES AND PATHWAYS

NEUROLINGUISTIC COGNITIVE AFFECTIVE SOCIOCULTURAL MODEL OF READING

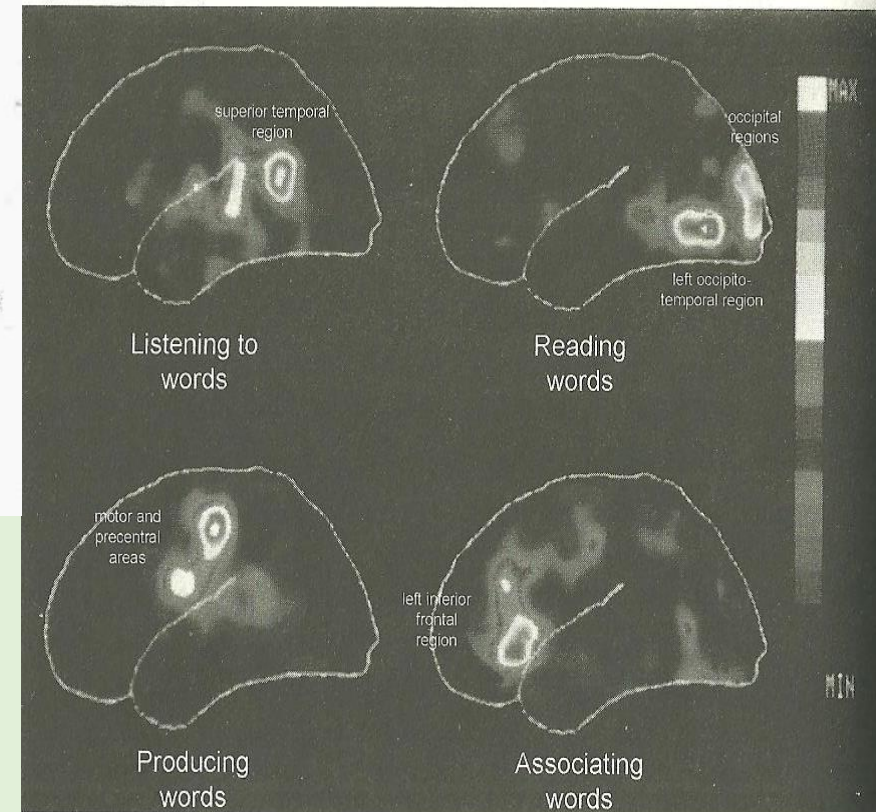
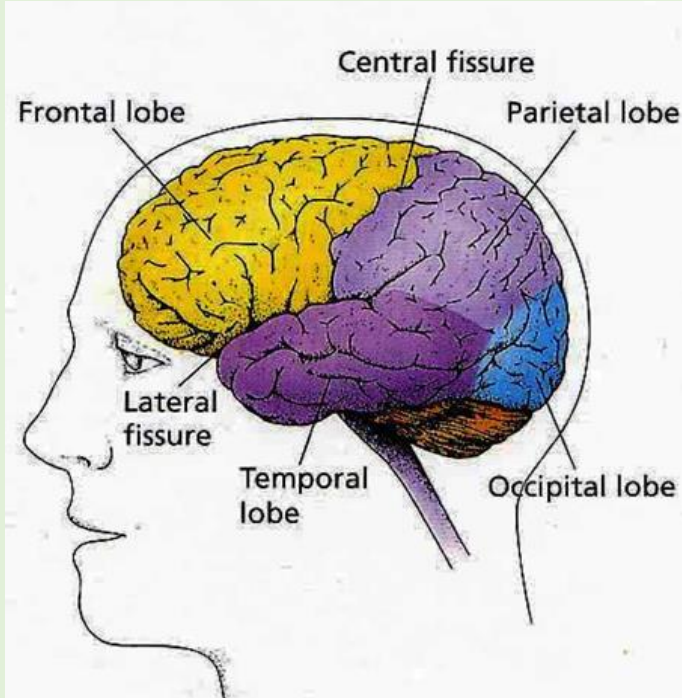
THE LANGUAGE BRAIN AND THE READING BRAIN

Reading is a recent cultural tool in human history, tied up with the development of writing systems (\pm 5000 years).

We are not genetically programmed to *acquire* reading as we do language. Reading is not 'biological' or 'natural'. It must be learned.

The reading brain uses existing evolutionary structures and processes to establish new neuronal pathways to 'read' written language.

- form new areas of specialisation
- make new connections
- new circuits become automatic



THE VISUAL WORD FORM AREA – WHY 250 MILLISECONDS MATTER (Dehaene 2009)

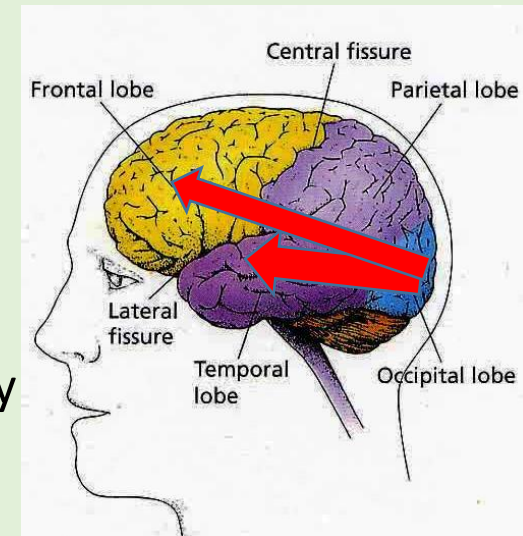
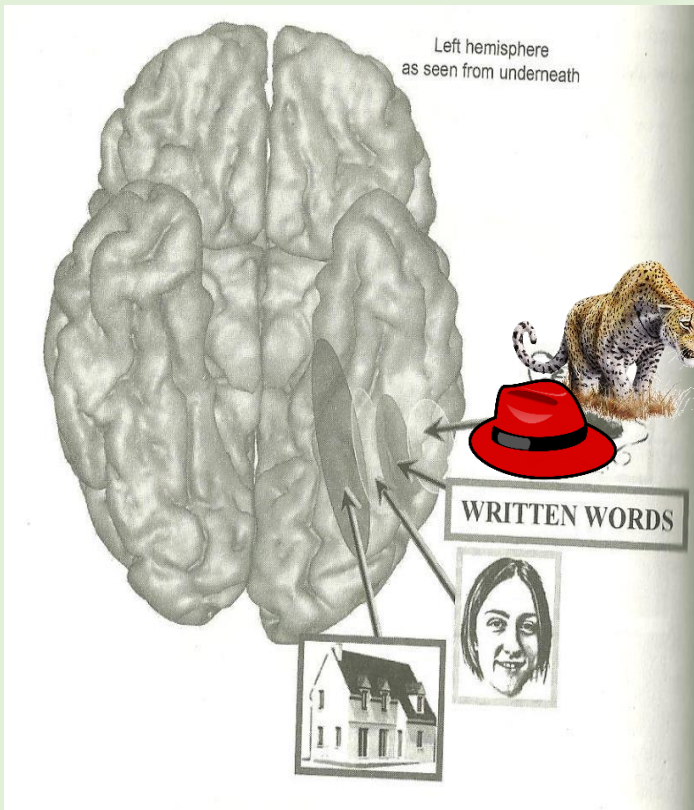
Brain divides visual labour into categories, each processed by specific patch in the visual cortex: landscape; faces; tools/objects; digits

Letter/word recognition is located at the same coordinate – the left ventral occipital-temporal region (Brodmann 37)

Invariance principle; we have to learn to recognise words regardless of how they appear – font, size, character. Attention to relevant details develops with practice. b d

After about 300ms of seeing words, the visual cortex links with language networks

Basic neuronal mechanisms linking occipital lobe to the language domains in temporal and frontal lobes can be established over a period of 2-3 years – but many more years to develop fast, efficient processing.



WHAT DO WE MEAN BY SKILLED READING?

Does reading as a construct change over time?

Does reading represent the same cognitive processes at different points in time?

Is what happens in the brain of a skilled Grade 3 reader the same as what happens in the brain of a skilled Grade 1 reader?

Different processes come into play at different stages of development and contribute differentially to performance as proficiency increases

Ph Awareness

Word reading

Context Fluency

Comprehension

M Awareness

Letter-sounds

(ORF)

literal inferential

accuracy

speed

automaticity

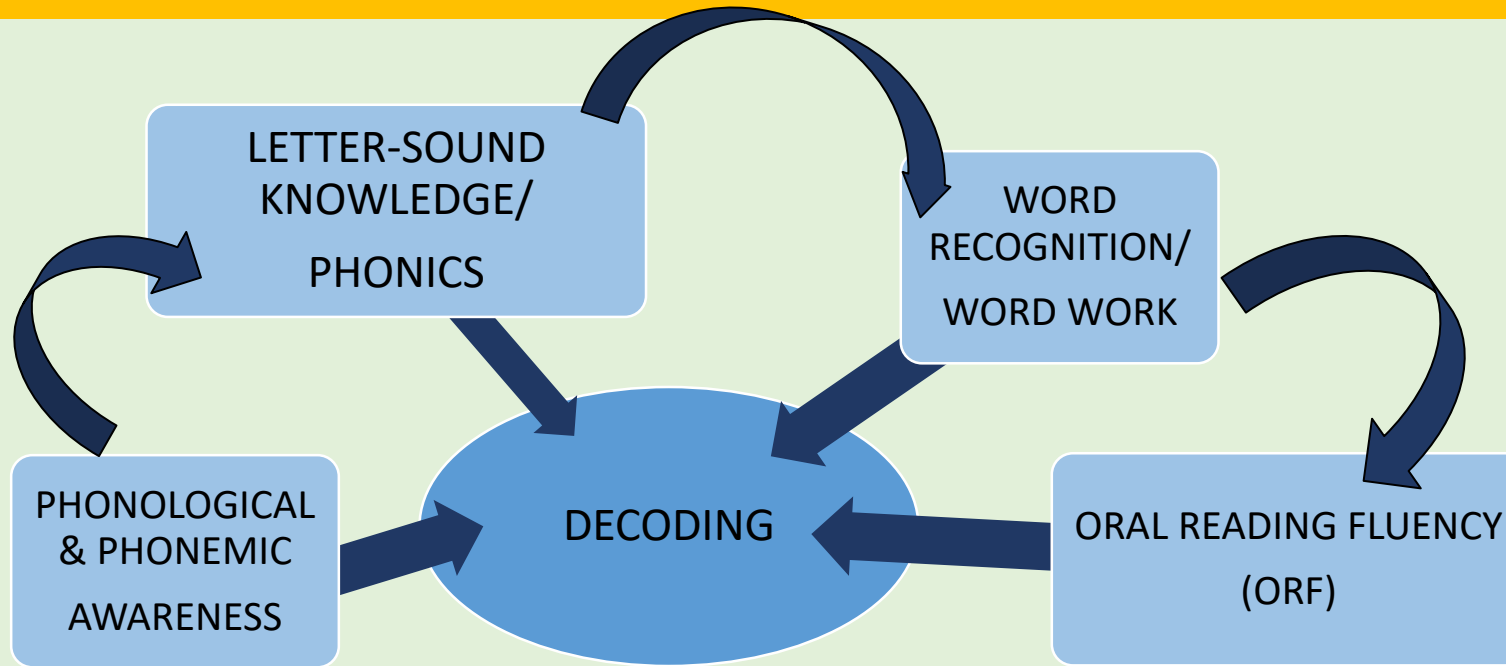
metacognition

The importance of some processes as drivers of early reading development diminish as proficiency increases and are replaced by qualitatively different processes



Building decoding impetus for comprehension:
We need a lift off!

COMPONENTS OF DECODING



DECODING

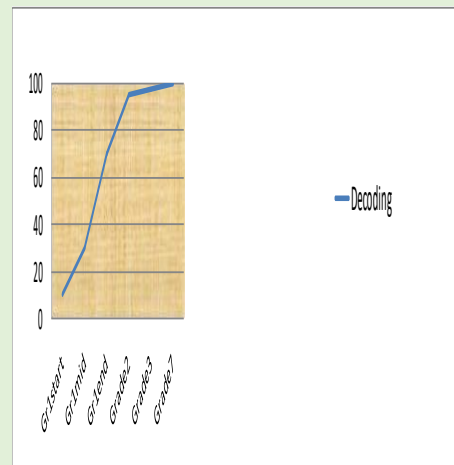
Constrained skills

They enable reading

Necessary but not sufficient

Early mastery critical

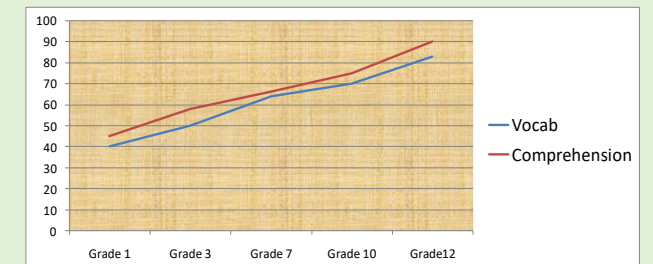
(mid Grade 2)



VOCABULARY & COMPREHENSION

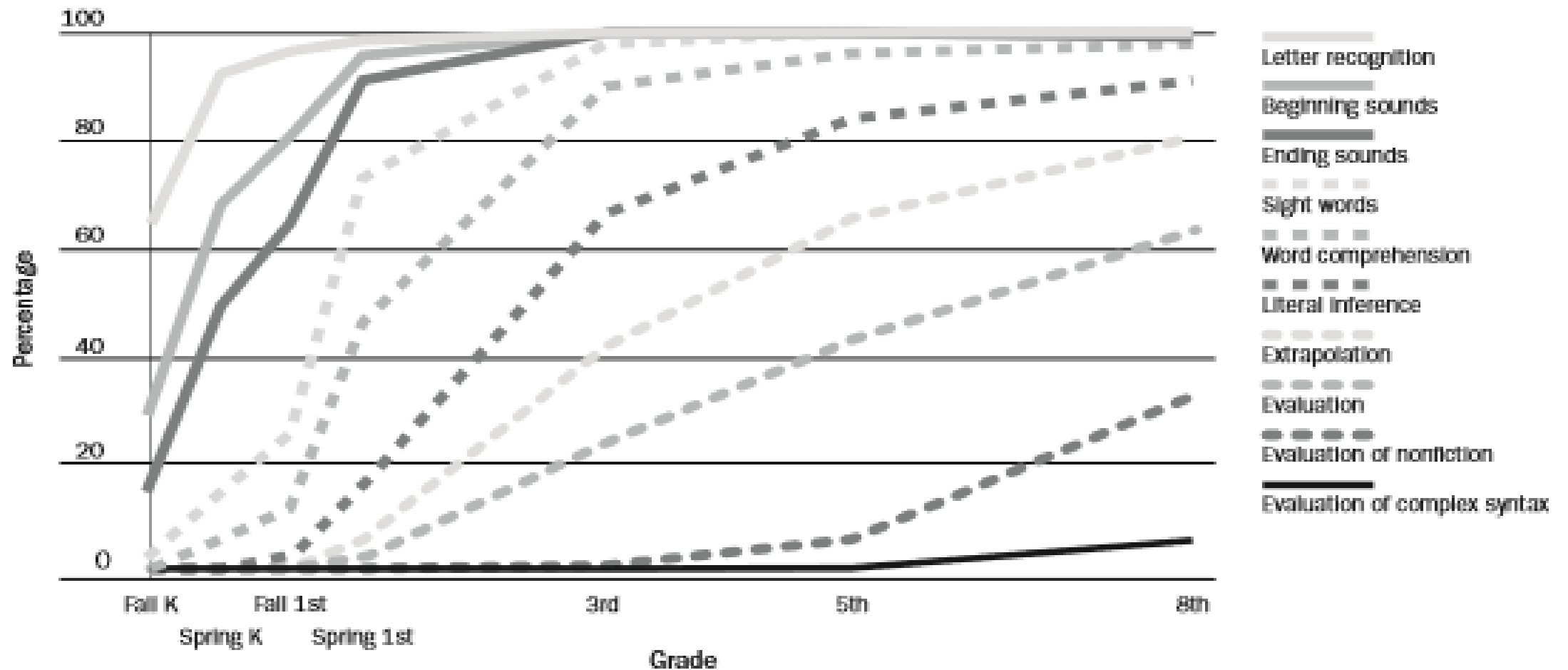
Unconstrained skills

Lifelong development (Paris 2005)



Patterns of Literacy among US students (Reardon, Valentino & Shores 2012)

Figure 1. Percentage of Proficient Students, by Literary Skill, Grades K-8



LETTER-SOUND KNOWLEDGE: LETTERS CORRECT PER MINUTE

(percentage of learners scoring zero is given in brackets where possible)

| | | | Grade R | Grade 1 | Grade 2 | Grade 3 |
|--|------------------------------------|---------------------------|------------------|------------------|-----------------|---------|
| Letter sounds | Clayton et al. 2019 | English UK | 27.9 | | | |
| | Good et al. 2000 | English USA | | 47 | | |
| | Jukes et al. 2017 (n=2,220) | Swahili Int # | | 10.4 | 11.4 | |
| | | Swahili Con | | 4.8 | 6.6 | |
| | Piper et al. 2018 (n= 4,385) | Swahili Int (PRIMR) | | 8 | 17 | |
| | | Kenyan Int Home languages | | 4 | 11 | |
| | | Swahili Con | | 7 | 13 | |
| | Taylor et al. 2017 (n = 2,600*) | Setswana coaching Int | | 25(0=18%) | 43 (0=8%) | |
| | | Setswana Con | | 22 | 39 | |
| | Spaull et al. 2018 (n = 740) | N Sotho | | | 31 | 43 |
| Tsonga | | | | 35 | 47 | |
| Zulu | | | | 27 | 36 | |
| Menendez & Ardington 2018 (n = 8,776) | Xhosa baseline | | | 19 | 31 | |
| | Zulu baseline | | | 15 | 18 | |
| Saldru/Funda Wandu (n=1,180) | Xhosa baseline | | 5 (0=52%) | 28(0=28%) | | |
| ZenLit (2018) (n= 990) | Xhosa Int (urban) | | 46 (0=1%) | 66 (0=1%) | 74(0=0%) | |
| | Xhosa Con (urban) | | 24 (0=8%) | 41(0=6%) | 47(0=2%) | |
| | Zulu Con (rural) | | 5(0=55%) | 11(0=35%) | 16(0=27%) | |

SINGLE CONSONANTS VS DIGRAPHS/TRIGRAPHS

SALDRU | Funda Wande Coaching Evaluation May 2019

| | Mean letters correct per minute | Percentage of learners obtaining zero |
|--|--|--|
| Grade 2 single letters | 28 | 12.4% |
| digraphs/trigraphs | 10 | 52% |

PERCEPTUAL LEARNING OF THE CODE

- Initially beginners cannot easily tell letters apart
- Practice is necessary for habituation
- Larger numbers of letters take longer to tell apart and automatize
- Notion of a word is different in African languages
- Dense print is read more slowly in the conjunctive orthography of Zulu and Xhosa

Ndiyahamba ngomso. Ndilungiselela uhambo. Kufuneka ndilungiselele nosana. Nalo luyahamba. Ndinetikiti lohambo.

(I'm going tomorrow. I'm preparing for the journey. I must also prepare the baby. She too is going. I have a ticket for the journey.)

VISUAL SIMILARITY/DISSIMILARITY

It is easier to develop automaticity in reading when orthographies have visually dissimilar words - common amongst English words.

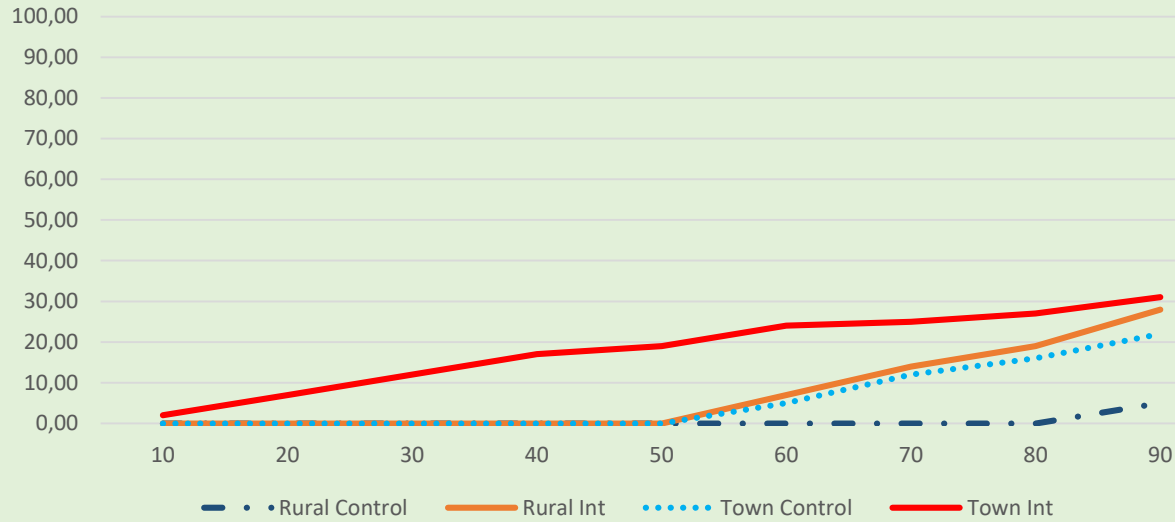
In contrast, the complex morphology of agglutinating languages results in many letter sequences with visually similar CV patterns. There are over 30 visually similar syllable sequences in Zulu (Land 2016)

| | |
|------------------------|-----------------------------|
| <i>Ndizakuthanda</i> | I will love you |
| <i>Ndisezakuthanda</i> | I will still love you |
| <i>Ndisezanithanda</i> | I will still love you (all) |

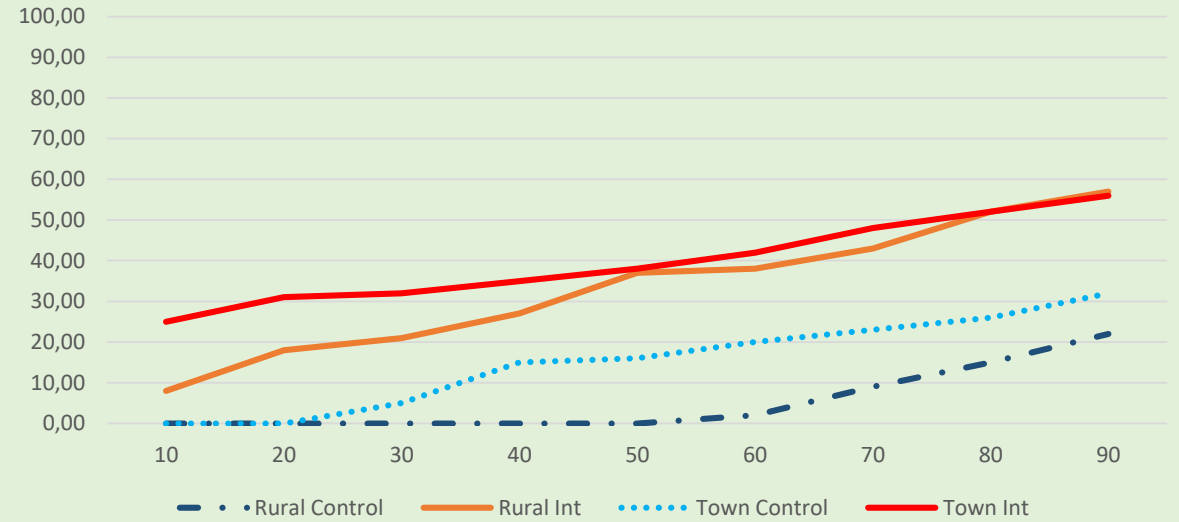
This requires attention to detail and hence more cognitive work while reading; there is loss of meaning if any of the bits within the linguistic unit are decoded inaccurately.

Who's gaining fluency and comprehension?

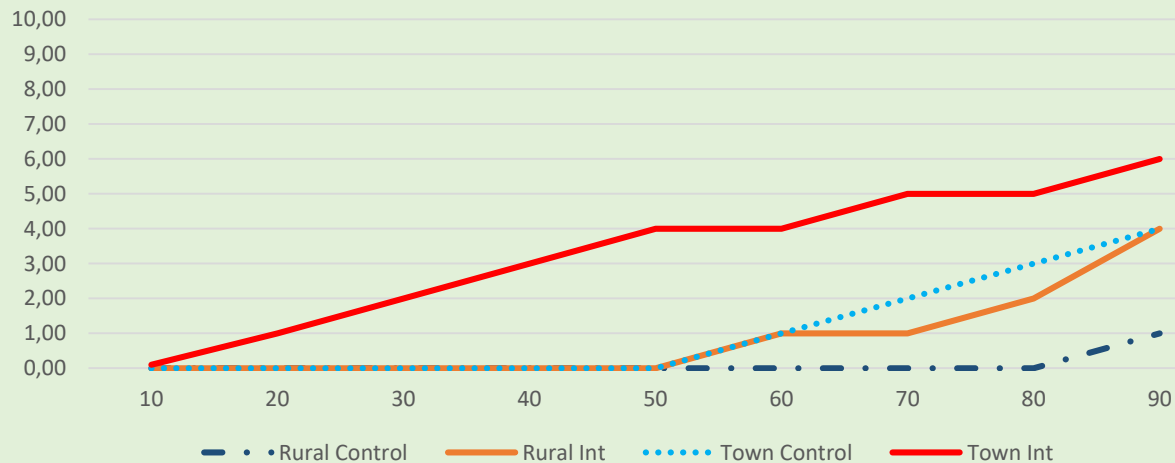
Grade 1 ORF



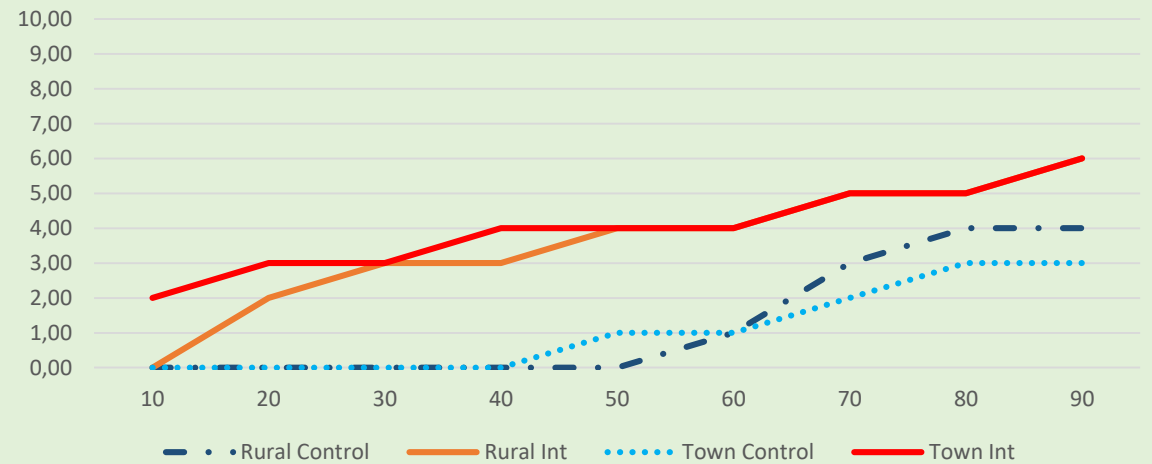
Grade 2 ORF



Grade 1 Oral Reading Comprehension



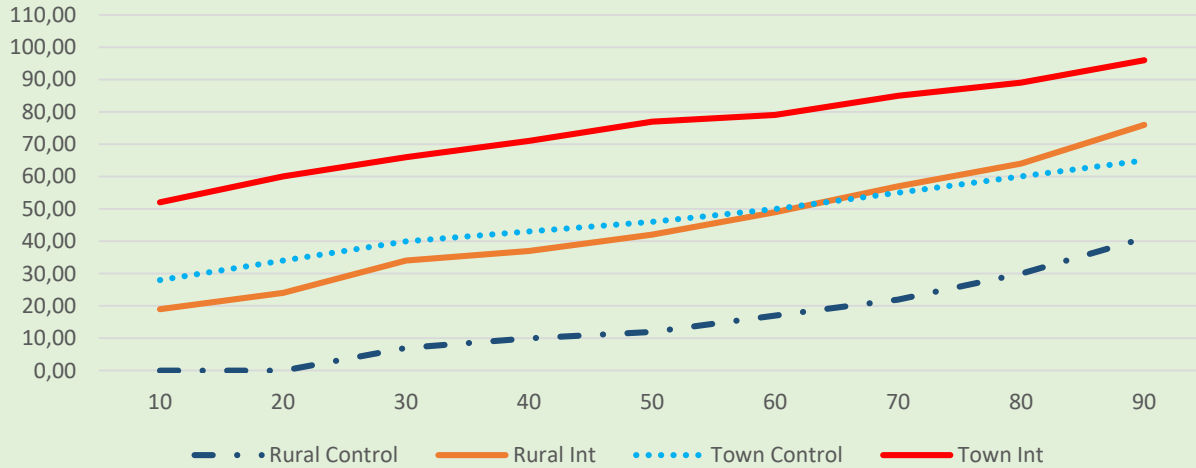
Grade 2 Oral Reading Comprehension



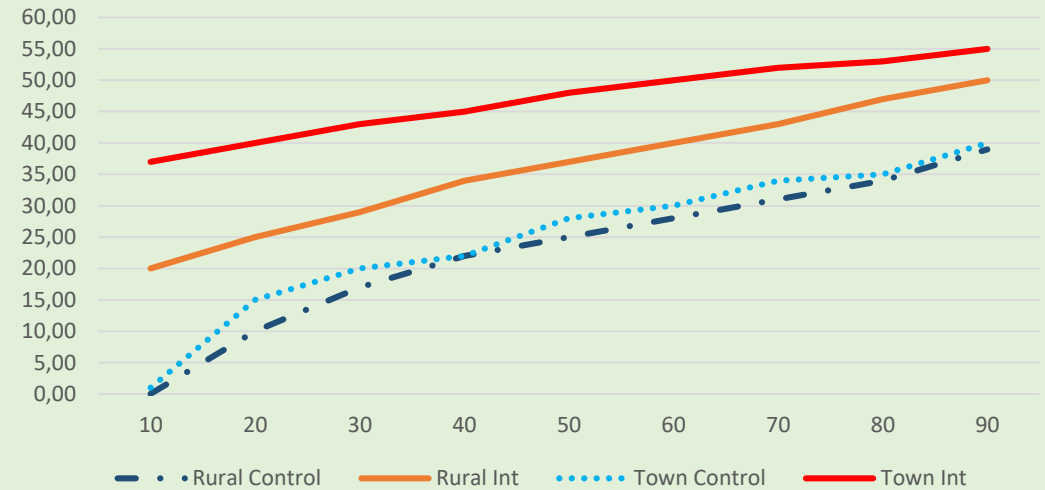
Who's lifting off where in Grade 3?

Zenlit Nguni data 2017 (Xhosa and Zulu (n-330))

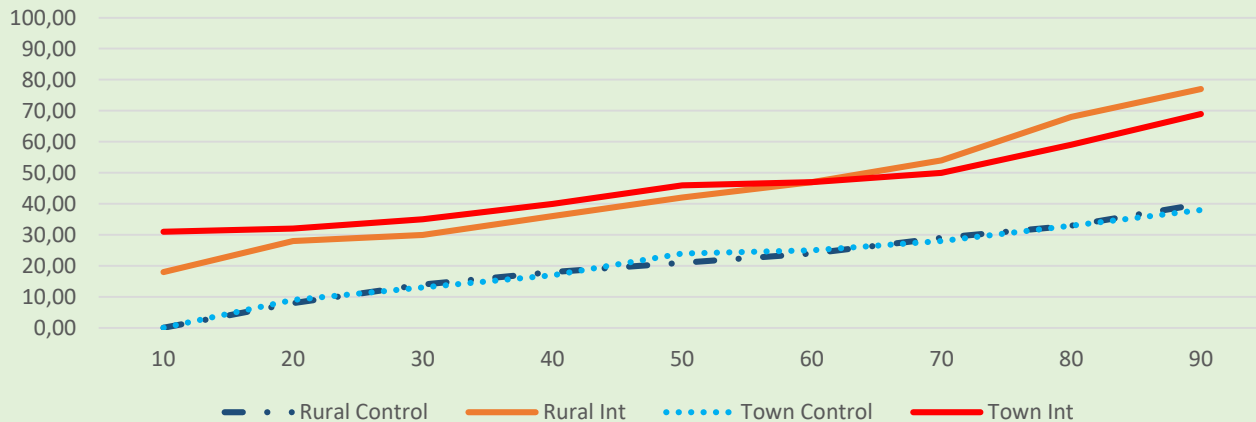
Grade 3 letter sounds



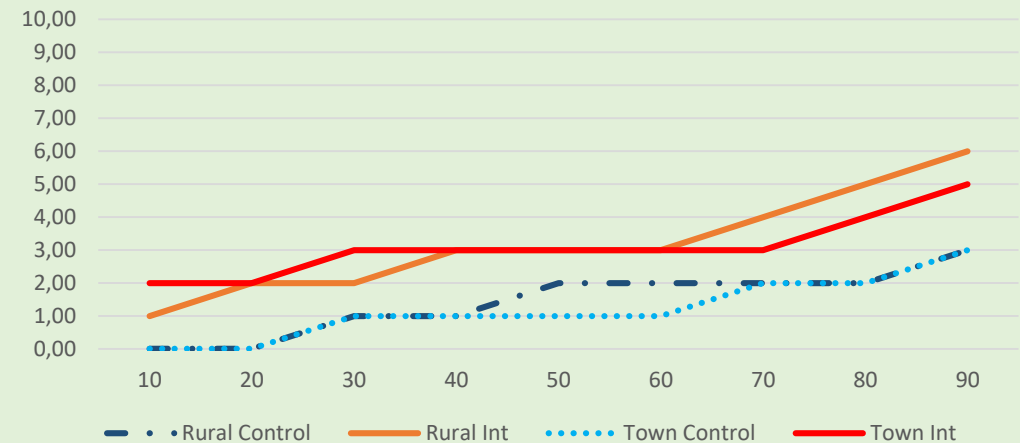
Grade 3 Word Reading (wcpm)



Grade 3 ORF



Grade 3 Oral Reading Comprehension



MULTIPLE REGRESSION:
What predicts WORD READING in NGUNI
languages(Zulu/Xhosa) n = 988
Adjusted R square = 0.59

| | Beta | Standard error | <i>Beta</i> β | <i>p</i> |
|--------------------|------|----------------|------------------------|----------|
| | | | | |
| Letter sounds | .37 | .017 | .60 | .000 |
| Phonemic Awareness | .84 | .100 | .22 | .000 |

MULTIPLE REGRESSION:
What predicts READING COMPREHENSION in
Nguni languages(Zulu/Xhosa) n = 988
 Adjusted R square = 0.66

| | Beta | Standard error | <i>Beta</i> β | <i>p</i> |
|--------------------|-------|----------------|------------------------|----------|
| Letter sounds | .006 | .002 | .08 | .004 |
| Phonemic Awareness | .046 | .01 | .10 | .000 |
| Word reading | -.028 | .006 | -.22 | .000 |
| ORF | .089 | .004 | .89 | .000 |

THANK YOU

Human history becomes more and more a
race between
education and catastrophe
HG Wells

