The linguistic challenges of the transition from primary to secondary school

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The research project

- The language of school seems importantly different from the language that children encounter outside school, but to date there is little linguistic research;

- If there are differences, might these be more of a barrier to accessing the curriculum for children from lower SES backgrounds, partly explaining their under achievement?

- What sort of differences might there be between the language of primary school and the language of secondary school?

- Could these partly explain issues that some students seem to face at KS3?

How to investigate this?

Existing research in linguistics has shown that people- even expert researchers and teachers- are not good at describing and analysing the language that they use. Our brains just aren't wired up to do this.

We therefore needed to collect data, in the form of written texts and transcribed speech, from schools. We need large quantities of data, from as many schools as practical, and therefore we needed to use specialist computer software for the analysis.

Written data
- Worksheets
- Textbooks
- Exams and assessment tasks
- Lesson presentations
- Vocabulary/glossary booklets

Spoken data
- Audio recordings of lessons (teacher talk only)

Subjects: English, maths, science, history, geography (EBacc, apart from an MFL)

Also: Interviews with pupils and teachers to help us to understand their perspectives and interpret the data.

13 schools have contributed data, across the North of England;

5 secondary, 8 primary, across all Ofsted categories, but skewed towards the higher end;

Of these, 5 primaries feed 3 of the secondaries. 30 students from these 5 were interviewed twice in Y6, and twice again in Y7 after the transition;
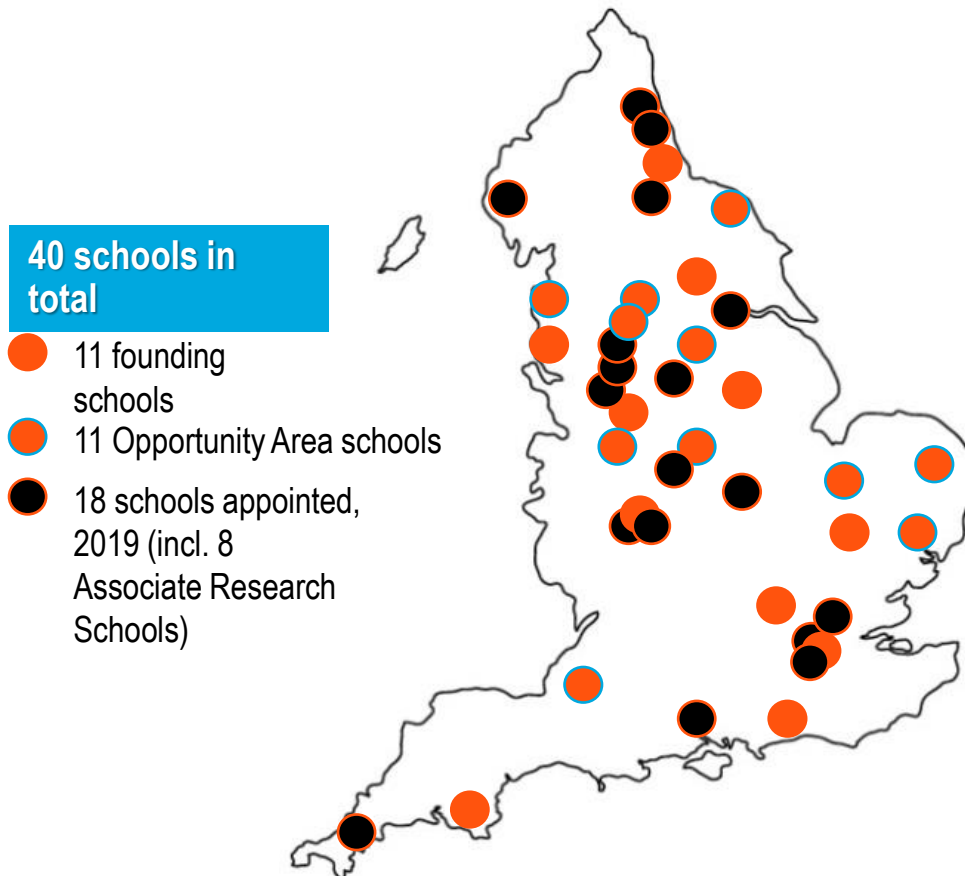
The school materials comprise a huge dataset, 1000s of files, several million words

To collect this, and for other aspects of the research design, we needed advice:

The Research School network

A collaboration (EEF and IEE) to create a network of schools that support the use of evidence to improve teaching practice.
https://educationendowmentfoundation.org.uk/tools/guidance-reports/

40 schools in total

● 11 founding schools

● 11 Opportunity Area schools

● 18 schools appointed, 2019 (incl. 8 Associate Research Schools)

1 Prioritise 'disciplinary literacy' across the curriculum

2 Provide targeted vocabulary instruction in every subject

1 Develop pupils' language capability to support their reading and writing

What our software can do

Show the most frequent words...

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	Lemma	Frequency ?		Lemma	Frequency ?		Lemma	Frequency ?
1	the	20,312 •••	14	you	4,974 •••	27	can	2,016 •••
2	.	20,011 •••	15	:	4,133 •••	28	this	2,001 •••
3	be	12,305 •••	16	•	3,590 •••	29	[	1,863 •••
4	[number]	12,179 •••	17	#	3,318 •••	30	]	1,862 •••
5	a	10,825 •••	18	it	3,246 •••	31	use	1,785 •••
6	of	9,016 •••	19	what	2,870 •••	32	cell	1,776 •••
7	to	6,946 •••	20	do	2,757 •••	33	for	1,741 •••
8	)	6,706 •••	21	that	2,524 •••	34	how	1,672 •••
9	and	6,466 •••	22	your	2,511 •••	35	not	1,583 •••
10	,	6,237 •••	23	have	2,461 •••	36	so	1,581 •••
11	(	6,104 •••	24	on	2,359 •••	37	or	1,479 •••
12	?	5,744 •••	25	-	2,228 •••	38	from	1,418 •••
13	in	5,069 •••	26	s	2,105 •••	39	make	1,406 •••

Most frequent words in our KS3 Science corpus

A more useful measure: comparing two corpora to find 'key words'

	Word	
1	s	...
2	cell	...
3	force	...
4	your	...
5	energy	...
6	name	...
7	water	...
8	reaction	...
9	light	...
10	how	...

	Word	
11	object	...
12	chemical	...
13	what	...
14	acid	...
15	c	...
16	mass	...
17	t018	...
18	mark	...
19	okay	...
20	oxygen	...

	Word	
21	b	...
22	explain	...
23	m	...
24	use	...
25	element	...
26	graph	...
27	atom	...
28	variable	...
29	particle	...
30	substance	...

Key words from the KS3 Science corpus compared to a 'reference' corpus of general English texts.

The software has ranked the words that are most frequent in the KS3 corpus in comparison to the reference corpus.

We are using the same technique to compare KS2 and KS3 corpora.

We can study individual examples to understand how a word is used.

.

E.g. *name*

… write down the *names* of the compounds that I've done on the board

Name the four components found in an animal cell.

One of the elements in carbon dioxide is carbon. *Name* the other element.

… fill in those words so we'll go through and we'll have a look < *name* M> can you make sure that you're giving me all your attention please?

Focus point 1: The change in science vocabulary

Our KS2 Science corpus

Years 5 & 6: **223, 894 words in total**, **244 separate files**

Number of different words: **7578**

Our KS3 Science corpus

Years 7 & 8: **324, 719 words**, **672 files**

Number of different words: **8599**

The additional 1,000 words in KS3 are likely to be specialist and challenging. There is also an issue of new meanings of known words.

Most frequent content words in the science corpora:

Years 5 & 6			Years 7 & 8	
rank	Word (lemma)		rank	Word (lemma)
1	water		1	cell
2	go		2	force
3	plant		3	water
4	light		4	light
5	animal		5	energy
6	think		6	reaction

Some of the very frequent KS3 science words have different meanings in everyday language:

Reaction

Everyday use: "I wish my parents had that sort of *reaction*"

Typical example from Y7 (a textbook)

"Cytoplasm - this is a 'jelly-like' substance where the chemical *reactions* in a cell take place."

The same is meaning found in **Y6 materials**, but quite rare (only 13 examples)

"The dyes used in most paints and fabrics are made in chemical *reactions* in factories."

Force

Everyday use: "so many people had come out of the armed *forces* that they were getting short after a while"

"they named it in his honour and cos because he was sort of like the driving *force* behind it"

"he didn't really have any skill but he just had brute *force*"

Y6 textbook

The weight of the book is pulling downwards, so you have to give an upwards *force* from your hand to stop the book falling

Y7 textbook

The driving force from the engine is much bigger than the resistive *forces* from air resistance and friction.

Word selection

Word consciousness
involves being aware
and interested in
words and word
meanings
(Anderson & Nagy, 1992)

What words matter most?
A curriculum consideration

- What words/knowledge do you want pupils to know?
- In what order?
- How are you prioritising?
- How/when are you checking?

Year 8 science lesson on <u>efficiency</u>:

Energy

Rate

Proportion

Dissipated

Transfer

Processes

Thermal store

Insulation

Year 6 literacy text:

Amara is being set a project based around selecting items to put in a suitcase that tell us about herself and her family.

I'm glad I'm not the only one who feels like this **assignments** is impossible. Mom is an only child, and both her parents have passed away. Dad hardly ever talks about his family. So I don't know how full my suitcase will be.

"First, let me say   learn about your family just b   nket, or something as sim   nd everyone has a story, a beginni   s the lock. He looks at us, and I think he can see that most of us are anxious. "There's no wrong way to do this. You just have to ask questions of your loved ones and **document** what they tell you." Mr Rosen tells us that out suitcases will be on display at the school-wide spring festival. "And the more creative, the better. Maybe your suitcase carries actual, **tangible** items. But some things you won't be able to put in your suitcase; some things are **intangible**, and yet, you carry them with you. Think about how you will **represent** the places you come from, the people who are important to you."

identity

Word selection

a. Look again at existing schemes of learning. What are the key concepts?
b. Pre-test (find the top 10 most troublesome)
c. Avoid picking too many
d. Use the Leeds corpus
e. You might get it wrong

Focus point 2: The changes in maths

Comparing Written Maths Ys 5&6 with Written Maths Ys 7&8, using 'Keywords'.

We used 'Keywords' to find which words are significantly more frequent in KS2 than KS3, and in KS3 than in KS2.

Words that occur in KS3 Written Maths materials more than KS2

#	Word		#	Word		#	Word	
1	probability	•••	11	interior	•••	21	bracket	•••
2	student	•••	12	elevation	•••	22	simplify	•••
3	able	•••	13	negative	•••	23	pattern	•••
4	increase	•••	14	p	•••	24	enlargement	•••
5	rule	•••	15	y	•••	25	nth	•••
6	decrease	•••	16	hcf	•••	26	e	•••
7	north	•••	17	median	•••	27	silver	•••
8	expand	•••	18	gold	•••	28	calculator	•••
9	step	•••	19	mode	•••	29	bronze	•••
10	ratio	•••	20	objective	•••	30	learning	•••

Words that occur in KS2 Written Maths materials more than KS3

	Word			Word			Word
1	fluency	•••	11	santa	•••	21	occupy	•••
2	olo	•••	12	emma	•••	22	measurer	•••
3	cgp	•••	13	inclusive	•••	23	sponsor	•••
4	accept	•••	14	cashew	•••	24	ks2	•••
5	gift	•••	15	session	•••	25	visual	•••
6	peanut	•••	16	teddy	•••	26	holly	•••
7	part-whole	•••	17	imply	•••	27	layla	•••
8	chen	•••	18	condone	•••	28	guide	•••
9	mo	•••	19	pineapple	•••	29	christmas	•••
10	unambiguous	•••	20	tulip	•••	30	lbs	•••

However, just looking at the words by themselves does not tell the full picture. It is useful to look at groups of words:

	Word				Word				Word	
1	fluency	•••		11	santa	•••		21	occupy	•••
2	olo	•••		12	emma	•••		22	measurer	•••
3	cgp	•••		13	inclusive	•••		23	sponsor	•••
4	accept	•••		14	cashew	•••		24	ks2	•••
5	gift	•••		15	session	•••		25	visual	•••
6	peanut	•••		16	teddy	•••		26	holly	•••
7	part-whole	•••		17	imply	•••		27	layla	•••
8	chen	•••		18	condone	•••		28	guide	•••
9	mo	•••		19	pineapple	•••		29	christmas	•••
10	unambiguous	•••		20	tulip	•••		30	lbs	•••

Meta-language, instructions etc

Everyday objects

names

More frequent in KS2

Everyday objects: crayons, flowers, pies, baskets, jars

"Miss Mills is making jam to sell at the school fair. Strawberries cost £7.50 per kg. Sugar costs 79p per kg. 10 glass jars cost £6.90. She uses 12kg of strawberries and 10kg of sugar to make 20 jars full of jam…"

Names: Emma, Layla, Ken

"Tilly has £20. She gives £5.40 to her friend. Tilly now has twice as much money as her friend. How much money did her friend have at the start?"

More frequent in KS3

Technical mathematical language

Probabilities; Median; Mode; Exterior; Elevation; Significant; Interior; Random; Expand; Scatter

Many of these have everyday meanings but are used with specialist meaning:

"Expand the following expressions and simplify where possible"

"Draw a line of best fit, where possible for each of the following scatter diagrams"

Algebraic terms: X, y, a, b, c

If: "If the area of this square is $169cm^2$, calculate its perimeter."

From personal to impersonal

Ys 5&6
- Problems clearly related to simple, real-world scenarios
- More familiar, everyday lexis
- Simpler grammar?

Ys 7&8
- Tasks detached from the real-world (e.g. algebra)
- More scientific notation
- New grammar uses?

Reframing texts

"Tilly has £20. She gives £5.40 to her friend. Tilly now has twice as much money as her friend. How much money did her friend have at the start?"

Tilly and her friend have £20 and have shared the money in the **ratio** of 2:1. How much would each child get?

Tilly and her friend share some money in the **ratio** 2:1. Tilly gets £10 more than her friend. How much did they share in **total**?

Two children share £30. Tilly has **x pounds**, her friend has twice as much. How much do they each have?

Focus point 3: tier 2 words

- Tier 1 comprises general, everyday words;

- Tier 2 contains words that are of high utility for mature language users and are found across a variety of domains. Examples include *contradict, circumstances, precede, auspicious, fervent* and *retrospect*... Because of the large role Tier Two words play in a language user's repertoire, rich knowledge of words in the second tier can have a powerful impact on verbal functioning..." (Beck et al, 2002: p. 11).

- **BUT- we found that many (in our data, most) Tier 2 words have more than one meaning.**

Polysemy

Words having more than one meaning; one meaning is everyday (Tier 1), a second meaning is academic (Tier 2)

He searched in his pockets till he *found* a stub of pencil.

The study also *found* that some pollutants are far more damaging when released at higher altitudes.

Tiers and polysemy

Everyday use (Tier 1)	Academic use (Tier 2)
When does she get her A level *results*?	The *results* are shown in the table.
I bet you any money at all if you emailed the suppliers direct you'd get a you'd get a better *response* and a quicker *response.*	the Earth's temperature is rising in *response* to emissions of greenhouse gases from the burning of oil, coal and gas.

Tiers and polysemy

Everyday use (Tier 1)	Academic use (Tier 3)
He's got loads of *energy*. I've got more *energy* in the morning.	The Earth's atmosphere traps some of the *energy* from the sun

Tiers and polysemy

General academic use (Tier 2)	Science academic use (Tier 3)
Like all other dictatorships, the *element* of terror was crucial	Name the elements in this compound and state the numbers of atoms of each *element*

Exploring words: beyond a definition

Morphology

<u>Unemployment</u>

Prefix: 'un'

Root: 'employ'

Suffix: 'ment'

Etymology

<u>companion</u>

Prefix: 'com' meaning with/together

Root: 'panis' meaning bread

Exploring words: Frayer model

What it means	**Picture**
What makes a person who they are	

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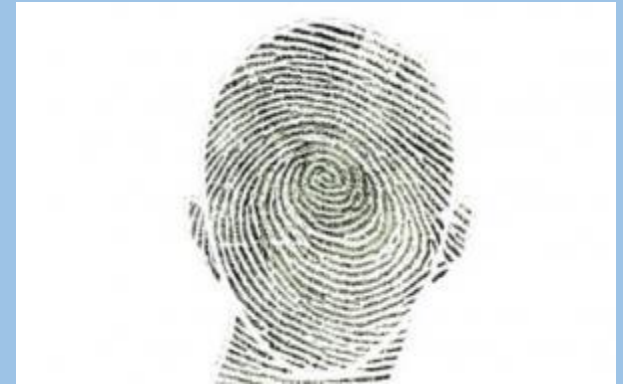
identity

</div>

Linked ideas	**Where the word comes from**
Background Interests Influences	Latin (idem) for *sameness,* ***one****ness*. What makes you an individual, the only **one** of you

Are there parts of the word I recognise?
- con (together) e.g. construct
- centrate (middle) e.g. centre
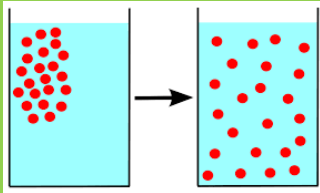
I think this word means…the number of particles or mass of a substance in a certain volume of liquid or gas

An example is…
- A salt solution has a high concentration.

The word in a sentence
The gas particles moved from an area of high

concentration *to an*

area of low **concentration**.

It is not…about focussing on school work. It is not related to solids directly

Why is this word important?
- Tells us how much of a substance is in a certain volume

How does this word fit with other words I know?
Dilute
Dissolve
Solution
Solute
Solvent

Realistic starting points

- Strengthening the academic transition around 1 subject with 1 feeder primary

- Shared CPD opportunities and collaboration e.g. taster day lessons

- Building word consciousness among teachers and children e.g. strategies for explicit vocabulary instruction

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https://researchschool.org.uk/huntington