Seeking synergy: The need for research at the literacy/ numeracy interface

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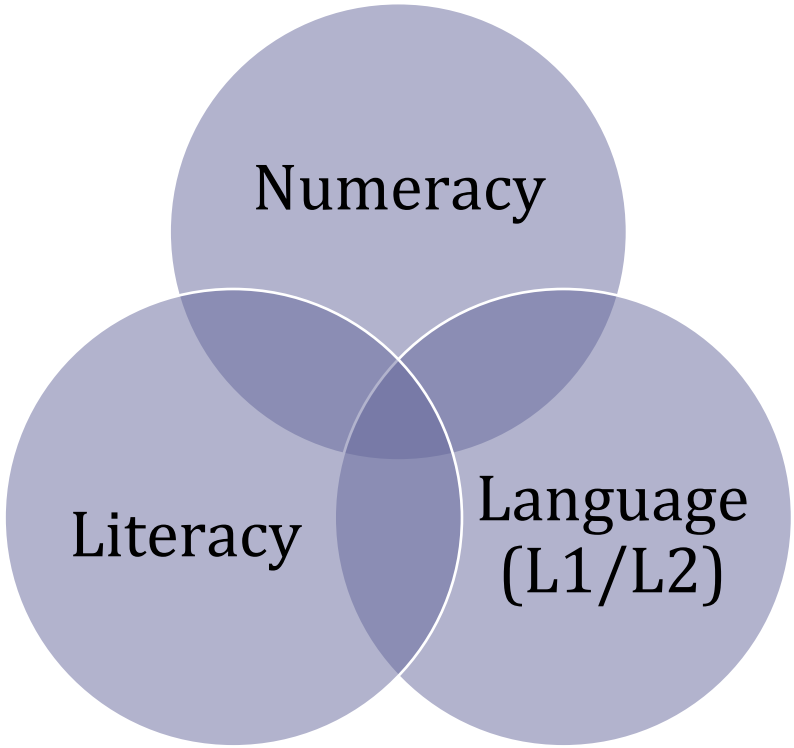
Background to the study

- **Involvement is ELT, particularly with respect to L2 learners**
- **Concern about the language of learning and teaching (LoLT) issue in South Africa**
- **Concern about young South African learners' literacy and numeracy outcomes**



Focus of concern for the study

Language as a tool in mathematics teaching/ learning

Observations of playground versus classroom language behaviours in the research sites starkly demonstrate how the linguistic *joie de vivre* children display on the playground shut down once they enter mathematics classroom environment.

Context of the study

Research site: Two Grade 4 mathematics classrooms in township schools:

School A: LoLT = MT initially, with transition to English in Grade 4

School B: LoLT = Straight for English

Unit of analysis: Mathematics teachers' ways of using talk to support their learners' conceptual and linguistic development.

Concern contd.

"Children have to learn to use language for a range of purposes and in a range of cultural and situational contexts."

(Gibbons, 2003)

But how do school children manage this if they have only limited access to the LoLT?

Do they in fact achieve this?

Classroom talk in relation to learners' conceptual development

Why Talk?

"Proficiency in oral language provides children with a vital tool for thought. Without fluent and structured oral language, children will find it very difficult to think."

(Bruner, 1983)

"Learning floats on a sea of talk"

(Barnes, cited by Simpson, Mercer and Majors, 2010).

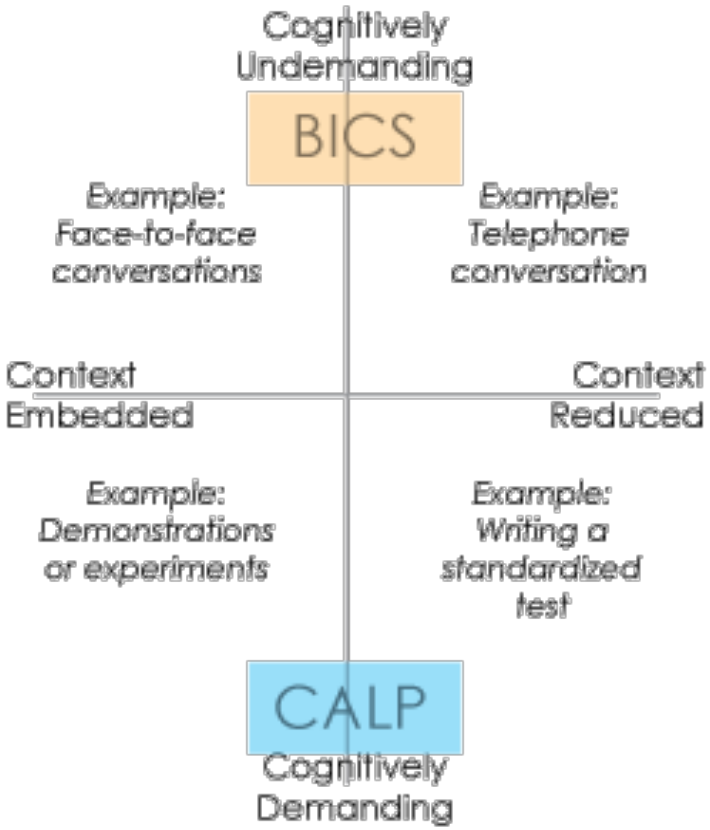
Jim Cummins' BICs/ CALP distinction

There are TWO basic kinds of classroom talk:
Basic Interpersonal Communication Skills (BICS), and
Cognitive Academic Language Proficiency (CALP).

Both are necessary in the classroom, but CALP is the key to more effective engagement with academic discourse.

Where acquisition of a second language is the stepping stone to actually learning in that language, this distinction becomes especially important one.

Simple language, everyday structures, familiar topics ...



Gestures, facial expression, concrete objects of reference ...

Absence of non-verbal cues, abstract language ...

Field specific vocabulary, complex language structures, abstract concepts, new ideas ...

BICS/ CALP distinction contd.

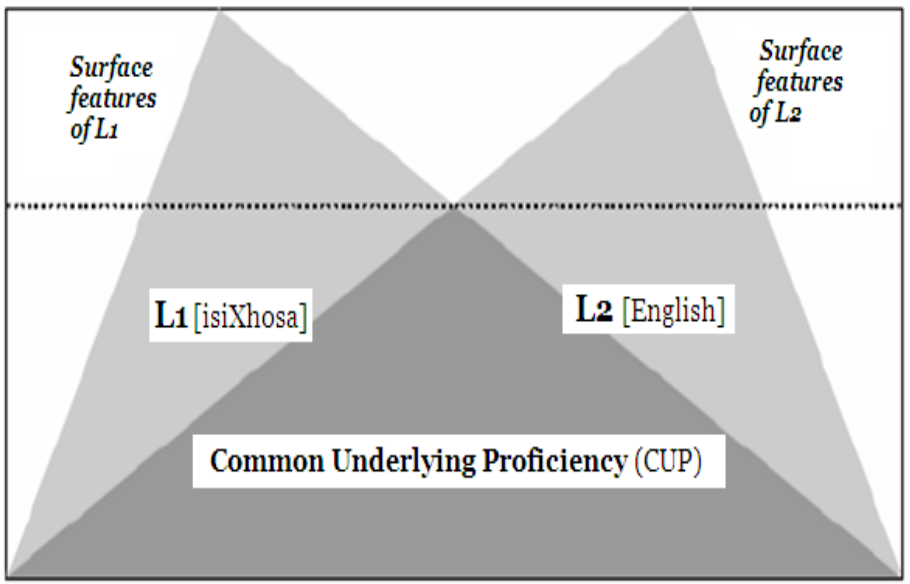
Problems are likely to arise if we are not adequately sensitive to the differences between "the surface or conversational aspects of children's language and the deeper aspects of proficiency that are more closely related to conceptual and academic development."

There is a risk that L2 learners' "conversational skills [are] interpreted as a valid index of overall language proficiency."

(Cummins, 1994)

BICS/ CALP in relation to L1/L2

South Africa's Language in Education Policy advocates 'additive bilingualism' which enables children to build on from their L1:



Moving between BICS and CALP

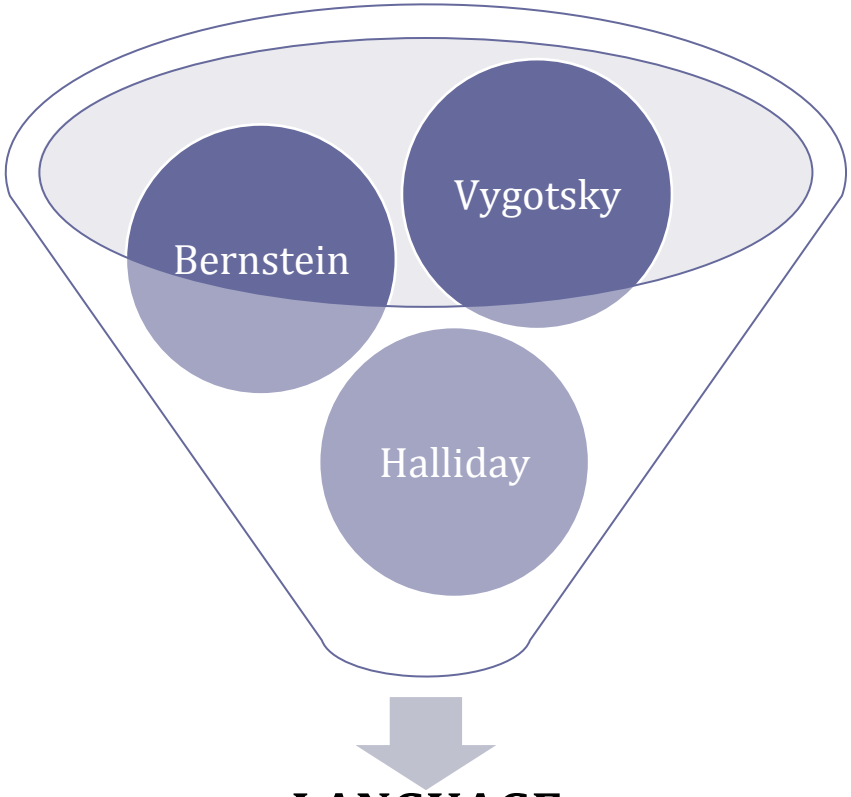
A central purpose of education involves helping children move along the mode continuum from common-sense ways of thinking and talking about things towards more formalized ways of doing so.

(Gibbons, 2003)

Progressing along the BICS/ CALP 'mode continuum' ....

Children's existing words for quantity	**Same**	**Bigger**	**smaller**
↓	↓	↓	↓
More precise comparative language	**Equal**	**more than**	**less than**
↓	↓	↓	↓
Abstract representation	**a=b**	**a>b**	**a<b**

(after Davydov) (adapted from Renshaw & Brown's written description, 2007, p. 533)



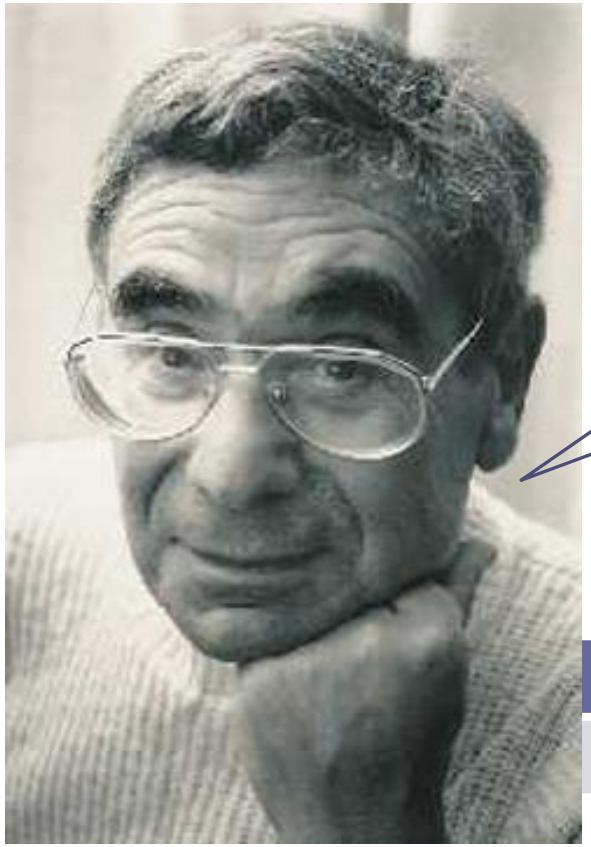
LANGUAGE

shaped by context

used for different purposes

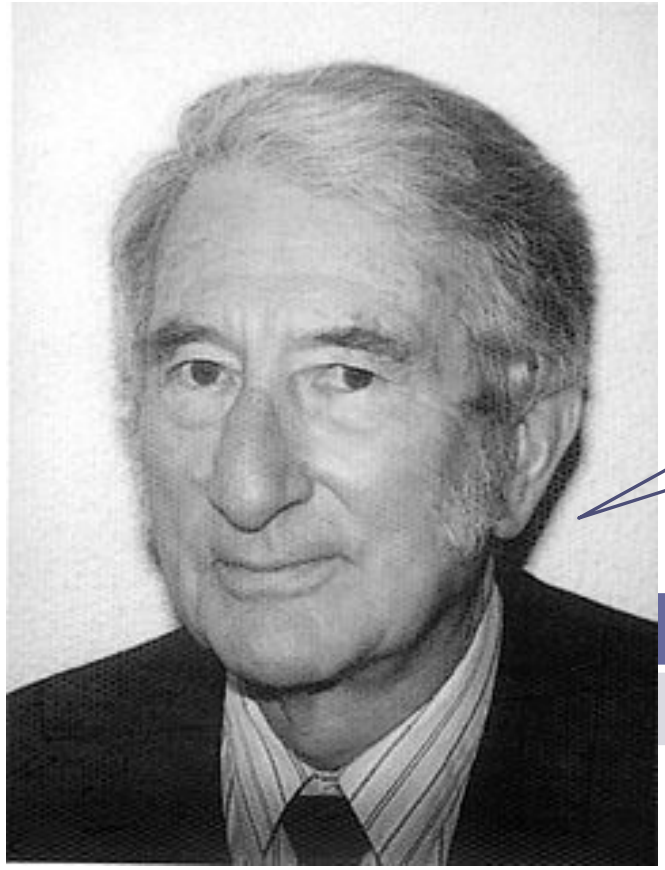
Vygotsky proposed a close "reciprocal" / "interfunctional" relation between thought and language, and an essential relationship between talking and thinking.

(Kozulin, in Vygotsky, 2013, p. xlvii)



“As a child progresses through a school, it becomes critical for him to possess, or at least be oriented toward, an elaborated code if he is to succeed.”

(Bernstein, 1964, p. 67)



“As we learn more about the power of language, and its penetration into everything we do and think, so we also come to realize that intervening in the processes of language is an extraordinarily complex affair … “

(Halliday, 2007, p. 12)

Grade 4 marks a year of major transitions (linguistic and other) …

Moving from FP to IP involves:

- **changing from MT (L1) to L2 LoLT(mainly);**
- **moving from 'Learning to Read' to 'Reading to Learn';**
- **encountering a hugely expanded range of content areas;**
- **coping with more cognitively-demanding tasks;**
- **surviving with less careful attention to the scaffolding of the vocabulary and syntactic structure of the language of such tasks;**
- **moving ever further along the mathematical 'mode continuum'.**

Moving along the mathematical 'mode continuum' (1)

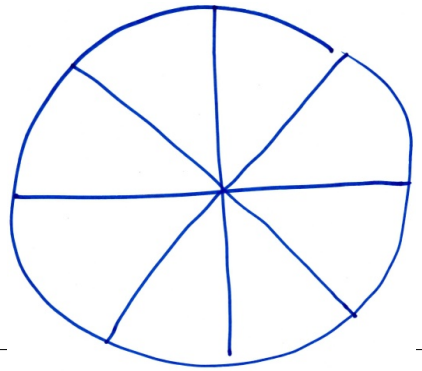
Weaker 'semantic gravity' ["the degree to which meaning relates to its context" (Maton, 2011)]

Children are now having to grapple with increasingly abstract mathematical ideas and concepts.

Moving from context-embedded to context-disembedded

Teacher in class:

Zanele, you tell me that you like cake so much. Tell me would you rather have a quarter of a cake or an eighth of a cake? And why? Which one?



Teacher in interview:

I think they should come to a stage where they know if I give this, this is what I mean, without being given any example. Otherwise they won't grow mathematically.

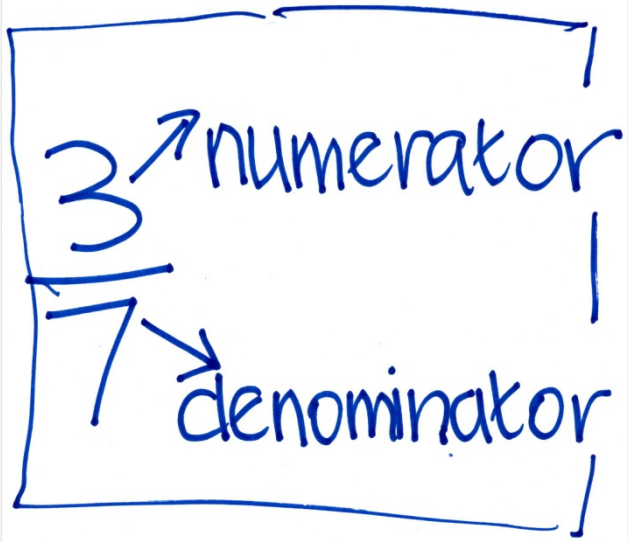
Which is bigger?

$1/4^{th}$ or $1/8^{th}$

Moving along the mathematical 'mode continuum' (2)

Greater 'semantic density' [the degree to which meaning is condensed within symbols, terms, concepts etc. (Maton,2011)]

Children are having to grapple with mathematical ideas that have much more meaning packed into them.



Making mathematics meaning:

Language works as a semiotic system (a meaning-making resource). Halliday saw a child's progress towards recognising and then realising the full meaning-making potential of language as being achieved through learning from more competent others, and that this "tutelage" constitutes "a vicarious form of consciousness".

(Foley, 1991)

Politics or Pedagogy: Which prevails?

Politics:

English is perceived as the language of upward social mobility and economic opportunity. Such is the perceived 'power' of English that many appear to have been blinded to the epistemological implications of choosing English as the dominant LoLT and language of assessment.

Politics or Pedagogy? contd.

Some language stats:

Grade 4 learners by home language and LoLT (2007)

	Percentage of learners by home language group	Percentage of learners by LoLT	Percentage increase/ decrease
Afrikaans	10,3	12,3	+2
English	6,9	79,1	+72,2
TOTAL	**16,9**	**91,4**	

(Data derived from DBE, 2010, pp. 12; 16.)

Politics or Pedagogy? contd.

Pedagogy:

91,4% of South Africa's Grade 4 learners are *officially* learning mathematics through either Afrikaans or English, neither of which is the home language for more that 70% of them.

Most of them are thereby denied the opportunity of fully utilizing their most powerful form of cultural capital (after Bourdieu, in Bourdieu & Passeron, 2000), viz., access to the language in which they are most proficient as a resource for thinking, and for communicating their mathematical reasoning.

Some consequences …

Table 1: Average % marks in Mathematics by grade (2011-2013)

Phase/ Grade		2011	2012	2013	2011-2013	
					Grade Average	Phase Average
Foundation Phase [FP]	1	63	68	60	63,6	
	2	55	57	59	57	53,6
	3	28	41	53	40,6	
Intermediate Phase [IP]	4	28	37	37	34	
	5	28	30	33	30,3	32,1
	6	30	27	39	32	
Senior Phase [SP]	9	n/a	13	14	-	-

(Data derived from DBE, 2012; 2013)

Some consequences contd

Table 2: Average % marks in Language by grade (2011-2013)

Phase/ Grade		2011	2012		2013		2012-2013			
							Average		Phase Average	
		Language	HL	FAL	HL	FAL	HL	FAL	HL	FAL
FP	1	59	58	-	60	-	59	-	55,5	-
	2	52	55	-	57	-	56	-		
	3	35	52	-	51	-	51,5	-		
IP	4	34	43	34	49	39	46	36,5	46,6	37
	5	28	40	30	46	37	43	33,5		
	6	28	43	36	59	46	51	41		
SP	9	n/a	43	35	43	33	43	34	-	-

(Data derived from DBE, 2012; 2013)

Further consequences in relation to SES …

Table 3: Average % ANA marks in Language (Home Language [HL] & First Additional Language [FAL]) and Mathematics by grade and quintile [Q] (2013)

Phase/ Grade		LANGUAGE						MATHEMATICS		
		HL		Range	FAL		Range			Range
		Q1	Q5		Q1	Q5		Q1	Q5	
FP	1	57,6	75,7	18,1	-	-	-	56,6	68,6	12
	2	52,4	70,6	18,2	-	-	-	55,5	70,6	15,1
	3	48,5	59,8	11,3	-	-	-	49,6	66,6	17
IP	4	40,9	61,7	20,8	36,7	54,8	18,1	31.8	52,9	21,1
	5	35,2	63,8	28,6	33,5	59,5	26	28,7	50,8	22,1
	6	46,6	70,5	23,9	43,3	59,2	15,9	34,6	54,3	19,7
SP	9	32	54,6	22,6	30,4	47,5	17,1	11,7	26,7	15

(Data derived from DBE, 2013)

Some figures from the site schools ex Grade 4 Mathematics ANAs 2014:

SCHOOL A

No. Of learners	95
Average	27,31%
Highest score	78,00%
Lowest Score	4%

SCHOOL B

No. Of learners	65
Average	37,94%
Highest score	70,00%
Lowest Score	8%

SANC SCHOOLS' AVERAGE: 40,99%

Comments from the site teachers:

Teacher A: They are supposed to be taught in English, and even the instructions they are going to get when they are writing language, content subjects – they are writing them in English, so I'm supposed to speak English, but I can't do otherwise. So – most of the time, I speak Xhosa – the one that they understand.

Comments contd.

Teacher B: Language is very important, because maths isn't only about numbers: add this, subtract this. There's lots of language involved. There's English language first of all: that is a challenge to these learners. And also the maths language itself. So if one doesn't have English as a language and also the maths language, then … there's no learning and teaching that is taking place.

If the political will prevails …

Our mathematics teachers will need much more <u>sustained and systematic support</u> in developing the kinds of skills and insights that will enable them to scaffold their learners in the dual challenge of:

- ***mastering*** **the LoLT; while at the same time,**
- **trying to gain epistemological access to mathematics *through* this LoLT.**

Synergizing the literacy/numeracy interface …

- **Draw on what we know about second language acquisition;**
- **Draw on what we know about literacy development through a second language;**
- **Take more seriously research which highlights the benefits of additive bilingualism;**
- **Further strengthen our insights around the linguistic demands of the language of mathematics;**
- **Help our mathematics teachers, rather than pointing the finger of blame at them and thereby contributing to a perpetuation of a "discourse of deficit " .**

Thank you!

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