Language as a Resource in Foundation Phase (FP) Multilingual Mathematics Classrooms

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Overview

1. Perspectives on language as a resource in multilingual mathematics classrooms

2. Linguistic features that influence mathematics teaching and learning

3. Making mathematics meaningful for multilingual learners

Context

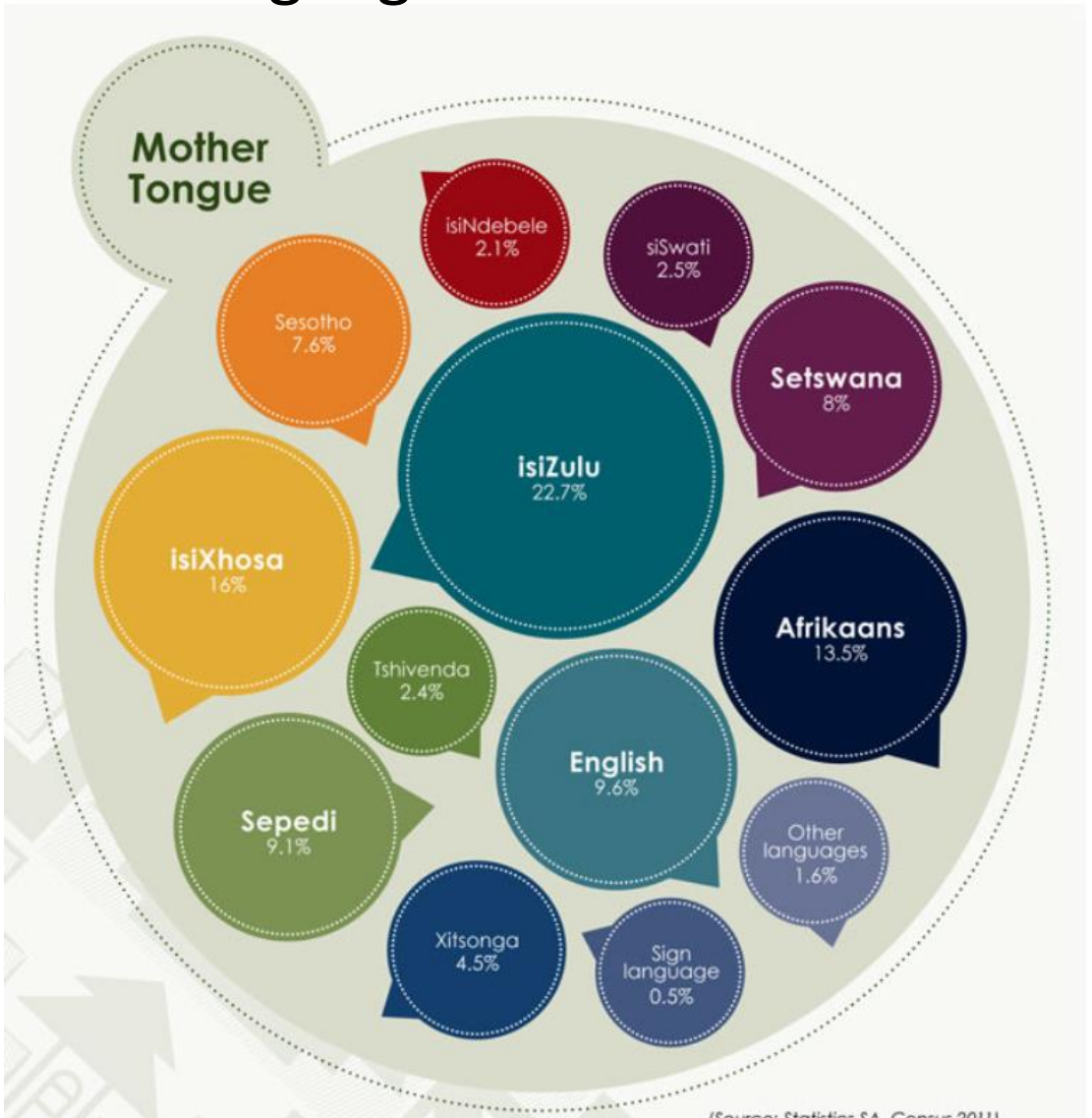
Policy: stipulates FP instruction in all the 11 official languages

Practice:

-***Option A:*** In a classroom where **different languages** exist, **only one is used** at any one time *(Sapire & Essien 2021)*

- Imposing education in one language creates ***'multiple monolingualism'***

- ***Option B:*** English immersion, views **English as the best language** for teaching mathematics from FP level *(Mohohlwane, 2020)*



Gaps

Multilingual learners are often disadvantaged by:

- **a lack of recognition** of their multilingual proficiency

- **lack of infrastructure** to support the use of multiple languages in mathematics classrooms

- systematic **suppression of learners' home languages**

(Barwell, 2018)

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Using language as a resource reduces the unequal conditions of learning mathematics in multilingual classrooms

(Essien & Sapire 2023, Essien 2018, 2020; Planas 2018)

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Language as a Cultural Resource

Language ***(and time):***

- universally obtainable resources
- the most common of resources to all situations

Adler, 2000

Language as a Resource: *beyond learning new vocabulary*

- **Multiple meanings**
- **Non-language semiotic resources:**
  - Gestures, intonation, manipulatives
- **Learner's 1st language**

Moschkovich, 2015

Monoglossic & heteroglossic approaches to language (*USE*)

- **Monoglossic:** only **one pure language** should be used, speaking or writing
- **Heteroglossic:** recognises **multiple languages**

Sapire & Essien 2021

Planas & Setati-Phakeng, 2014

Language as a Right / Problem / Resource

- **Right:** language rights affirmed in the Constitution
- **Problem:** multilingual learners viewed as less capable of learning mathematics
- **Resource:** use of multiple languages is supportive of mathematics learning and teaching

Barwell, 2018

Sources of Meaning in Multilingual Mathematics Classrooms

Mathematical meaning:

- arises from the relations between various languages, discourses & voices
- is shaped by the stratifying effects of language

Linguistic features that influence mathematics teaching and learning

- *Polysemy*
- *Homonymy*
- *Homophony*
- *Homography – shared with other disciplines*
- *Homography – shift of application*
- *Specialist terms*
- *Irregularities*
- *Mathematical concepts expressed in more than one way*
- *Related mathematical terms*
- *Imprecision*

Ambiguous words

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above altogether angle as great as average base below

between big bottom change circular collection common complete

coordinates degree difference different differentiation

divide down element even expand face figure form grid high low

make match one place power reflection right root row same

similar some square times top

Polysemy: ***English as LoLT***

- ***Difference***: answer to a subtraction problem / ***Difference***: general comparison
- ***Even***: divisible by 2 / ***Even***: smooth

Examples of mathematical words shared with standard English and have comparable meanings, but with a more precise mathematical meaning.

Polysemy refers to words that share the same form (spelling & pronunciation) and have two or more different but related meanings. *E.g. mouth*

(Tshuma, 2020)

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Polysemy: *isiZulu as LoLT*

Ngaphezulu: a Nguni word shared by isiNdebele, isiZulu, Seswati and isiXhosa

> ***Ngaphezulu***: the spatial relationship between two objects (where one object is above or on top of another object)

> ***Ngaphezulu***: expresses an ordering of superiority; one quantity is more than another

- Having two different ways to interpret the same word may be **a source of ambiguity** in FP mathematics classrooms *(Mostert & Roberts, 2022)*

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Making Mathematics Meaningful for Multilingual Learners

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1. ***Exploit ambiguity to the learners' advantage:*** explore examples in which the everyday/specialist meanings of the words coincide.

2. ***Appraise mathematical ability***: learners may have a high ability in mathematics, yet unable to communicate that ability

3. Contextualise & localise mathematics: use a context or theme that learners are familiar with; use learners' home cultures *(1st language)* to support learning

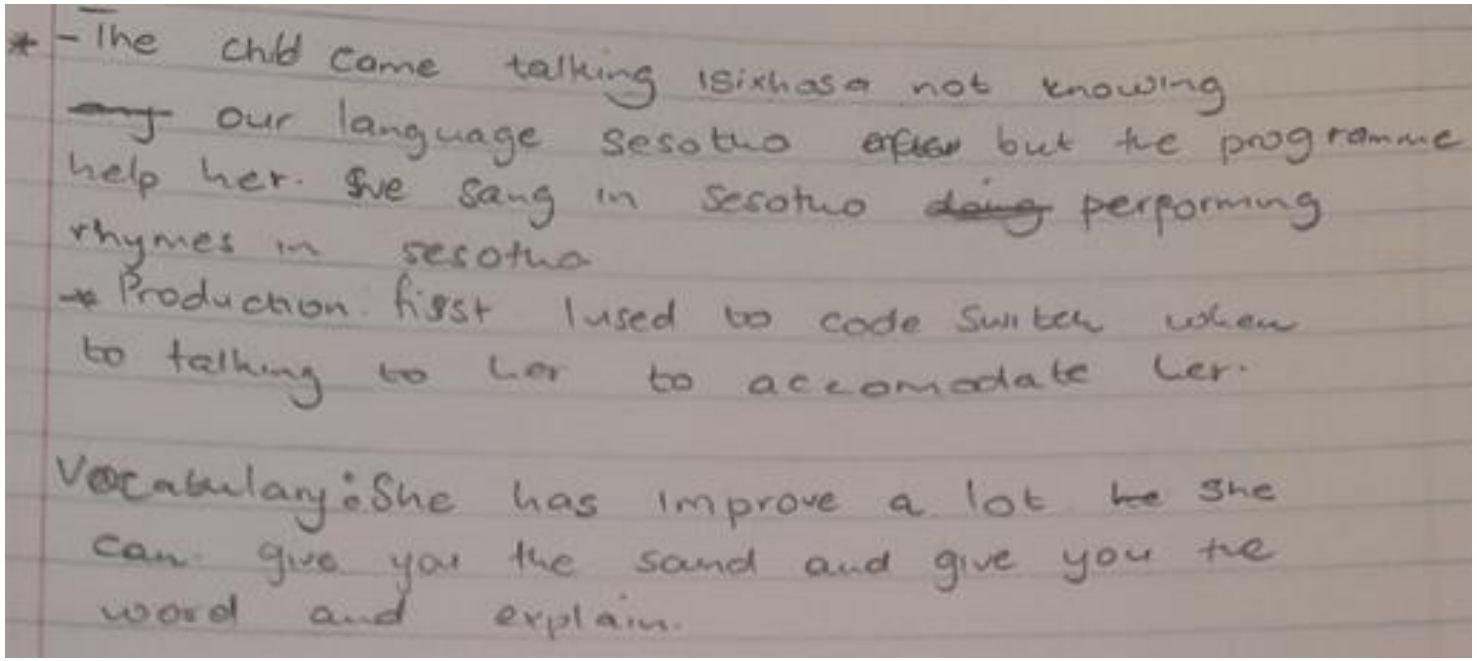
(Durkin & Shire, 1991; NCTM, 2012)

4. Use ***heteroglossic approaches*** to leverage on linguistic diversity

(Essien & Sapire, 2023)

Urban Environment	Rural Environment
-Schools in the inner city, less diverse -Schools in communities with several African languages spoken **Eg**: **Count from 1 – 10 in**: - *Swahili* - *Lingala* - *Tshivenda* - *isiXhosa* - *Ndebele* - *Xitsonga* **Count from 1-10 in isiZulu *(prescribed LoLT)*** **-** Use of **urban lok'shin lingua** in mother-tongue education ***(Sibanda, 2019)*** - Focus is on **meaning making**, not the correct syntax 	- Acknowledge the **different dialects** of the common language

5. Use communicative repertoires: multilingual learners draw on multiple language systems

code switching	translanguaging
	***code meshing*** ***metrolingualism*** ***plurilingualism*** ***language crossing***

a. in mathematics classrooms, multilingual learners may display translanguaging behaviours in relation to a repertoire of multiple languages *(MacSwan, 2017)*

b. translanguaging has more potential for meaning-making than code-switching *(Poo & Venkat, 2021)*

Transition between languages should be the learners' choice and not enforced by the teacher *(Webb & Webb, 2013)*

6. Remove reading difficulties: whether text is written in the 1st or 2nd language, readability is important

7. Questioning techniques:

a. **open ended questions** prompt learners to give reasons for their answers, stretch learners to think and verbalise their thoughts

b. **adequate response time**: to allow learners enough time to think about / respond to questions, teachers to consciously manage the duration of pauses after questions *(Dicker, 2015)*

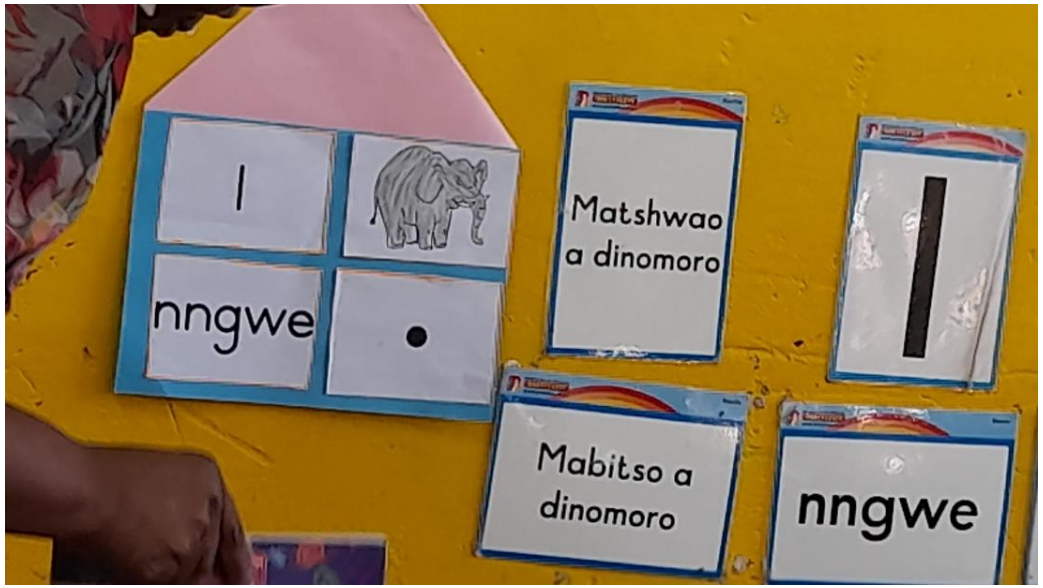
c. Create opportunities for **learners to ask questions**

8. Language use in the classroom: simple and straightforward to prevent communication gaps

a. **discourse development strategies** *(E.g. exploratory talk)* can increase numeracy, mathematical reasoning & language skills, by **discussing their ideas** learners can **make meaning** in their own minds ***(Barwell, 2018)***

b. **story telling** creates a classroom in which mathematics is **appreciated, understood and enjoyed**

MLIP / Reading Tree



- ***How many windows are there in Mr Elephant's house?***

LTSM developed for FP is mainly made of translated / reversioned mathematics into African languages

- There are concerns about the **quality and consistency of these translations and the extent to which the expression of African language mathematics discourse** is being systematically developed and leveraged to support mathematical meaning making ***(Roberts, Tshuma, Moloi & Sommerdyk, 2022)***

  - LTSM development at FP level should adopt a more **bilingual approach** to the materials: Eg: *Bala Wande* & *Magic Classroom Collective (MCC) implemented in the **Eastern Cape province***.

    - detailed research work is required to develop African language registers for mathematics *(MCC worked with **isiXhosa teachers**, **mathematics experts** and **isiXhosa linguists**)*

Monolingualism is the Illiteracy of the 21st Century

Roberts, Leite, & Wade (2018)

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Thank you

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