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African Language/English Bilingual Curriculum Materials: What Educative Supports Does the Bala Wande Package Offer Teachers?

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Introduction

In this chapter, our focus is on curriculum materials developed for early grade mathematics classrooms in a South African research and development project known as Bala Wande. Two key features of this project distinguish it from earlier larger scale intervention materials in South Africa. First, is its presentation of Home Language text in its Teacher Guide (TG) and accompanying Learner Activity Book (LAB) coupled with a full subtitling in English. This fully bilingual model has been developed for three South African languages (isiXhosa, Sepedi and Afrikaans). The model is responsive to the evidence in South Africa of the press for access to English among historically disadvantaged South African population groups as the language of access to socioeconomic mobility, even in the likelihood of this move occurring in the midst of less access to understanding of subject content in schools (Setati, 2008). Second, the extensive inclusion of attention to number structure marks a key difference between the Bala Wande materials and the Department of Basic Education's National Workbooks, in which attention to number structure is much more sporadic and diffuse (Morrison & Askew, 2022).

We explain the importance of these two distinctions in the South African context later in this chapter. For introductory purposes, we make the point that both of these distinctions imply elements of curriculum materials that are substantively 'new' in the terrain. What constitutes the substance of this newness and how the new elements are framed is important to understand

in the conditions of the broader early grades' context, in order to interpret the affordances and constraints that are likely to ensue in teachers' work with the materials in classrooms where mathematics is taught in home language medium.

In this regard, our interest lies in exploring the extent to which the Bala Wande materials can be described as 'educative'. Schneider and Krajcik (2002) describe educative materials as materials that are aimed at enhancing teachers' pedagogical practices. The distinguishing feature of educative materials according to these authors is that they are: 'curriculum materials designed to address teacher learning as well as student learning' (p. 221). While based in work located in science education with goals of moving towards reform-oriented practices, the sense of need for improvements in teaching is widely pointed out in mathematics education also, although what constitute aspirations for teaching may vary across contexts, conditions and cultures.

Different aspects and extents of 'scripting' have been described by Remillard and Reinke (2012) as a key feature of educative curriculum materials. In a South African terrain that has seen a return to relatively high degrees of scripting in the last decade, and with this feature carried through into the Bala Wande curriculum materials, we focus on the following research questions in this chapter:

1. In what ways can the bilingual presentation of tasks and activities in Bala Wande materials be considered as educative for teachers?
2. How does this bilingual presentation of BW materials support the presentation of structural views of early number?

We address these questions in this chapter in the following sections, which we outline here as an advance organizer for the reader. We begin with a brief outlining of the background that leads to particular interest in the Bala Wande aspects of bilingual presentation and structural presentation of early number. We also detail the ways in which these two aspects are presented in the Bala Wande materials, with reference to the literature bases on these aspects. The writing on key features of educative materials and, in particular, aspects that have been considered as useful for looking at teacher learning are then presented, and used to lead into our analysis of an illustrative strand of tasks drawn from the 2021 Grade 1 Bala Wande Teacher Guide (Funda Wande, 2020a) and Learner Activity Books (Funda Wande, 2020b).[1] This analysis leads us, in turn, into a discussion of key aspects that are likely to need consideration to further strengthen the use of home languages as resources for the teaching and learning of early number in contexts of language diversity.

South African Background

Performance in mathematics at all levels of the education system in South Africa continues to be low, with evidence of learning lags beginning in the early grades and growing across grades (Spaull & Kotze, 2015). There is also evidence of gaps in teachers' mathematical content knowledge (Venkat & Spaull, 2015) and in their pedagogic content knowledge (Carnoy & Chisholm, 2008). Alongside this, there is also widespread evidence of largely traditional, teacher-led pedagogic forms in which collective chorused responses to closed teacher questions are common in the early grades (Hoadley, 2018).

Multilingual Mathematics Learning in South Africa

The national language policy in South Africa provides for home language medium instruction in the early grades (Grades 1–3), with the majority of children nationally in recent years learning in home language medium classrooms. However, the complexity of seeing language as a resource for learning in South Africa is marked sharply and clearly in outcomes that show lower performance for children learning in home language in comparison to those learning in English. Mohohlawane (2019) puts the situation in relation to reading outcomes succinctly in these terms:

> learners that are receiving their Foundation Phase education in indigenous South African languages are still performing far below their counterparts that are receiving this in English or Afrikaans.
>
> p. 127

Setati (2008) noted though, that work within mathematics education on multilingualism had tended to ignore the political role of language. In her paper, she points to the tensions between the epistemic access to mathematics provided by learning in a language that one is familiar with and the press from parents and some teachers for English in particular, which – in South Africa – is seen as the language of socioeconomic access. She concludes this paper by noting what is required:

> The challenge is bringing together the need for access to English and the need for access to mathematical knowledge.
>
> p. 114

While waves of curricular reform in the decade and a half that have passed since Setati's publication have included the dissemination of national learner workbooks in all eleven official South African languages, they present what Sapire and Essien (2021) describe as 'multiple monolingualism', with children expected to continue to work within the boundaries of a single language.

Attention to Number Structure in South Africa

Although the definition of 'structure' has been described as largely undefined (Kieran 2018), we use the term *number structure* to describe the skilful organization of numbers using number relations, number patterns, the part-part-whole construction of number and the properties of operations (Venkat et al., 2019; Wright et al., 2006). Empirical data shows South African learners' dependence on counting-based strategies (Schollar 2008) and working with examples in highly separate ways that negate attention to connections between established and derived results; for instance, 'I know eight plus eight is sixteen, so eight plus nine has to be one more, making the answer seventeen' (Venkat & Naidoo 2012). This lack of awareness regarding number relations, seen in teaching and learning, plays through into the repeated need to work with number problems using 'first principles' counting in ones approaches.

The Bala Wande materials – noting the imperatives on the ground for access to both mathematical meaning-making and access to English – published the first mathematics teaching and learning texts that were fully bilingual. A growing body of literature points to language as 'central to the processes of mathematical thinking, learning and teaching' (Radford & Barwell, 2016, p. 283). Thus, we consider the bilingual language presentation as a key cog in children's conceptualization of number structure.

Bala Wande Materials

In the Bala Wande Teacher Guide (Funda Wande 2020a), each page of detail on particular activities or concepts in one of the home languages has a facing page with the same details in English. This provides teachers with easy access to explanatory text on some concepts and activity outlines in the African language of the text and in English. This is important in the face of some evidence suggesting that early grades' teachers prefer teaching mathematics through the medium of English as they are more familiar with mathematical terms and vocabulary in English than in the African language (Essien et al., 2015). In the Learner Activity Books, task instructions and explanations in home languages are subtitled immediately below, in a smaller font, with the same instructions and explanations in English (see https://fundawande.org/learning-resources for the website that gives access to the Bala Wande materials – all of which are published in Open Access format).

Further, while earlier interventions have included English-Home language bilingual dictionaries to support teachers with bridging between specialized mathematical terms that they may only previously have encountered in English (e.g. Botes & Mji, 2010), Bala Wande offers more immediate access to equivalent terms and phrases in English in these texts, although an English–Home-language bilingual dictionary (Funda Wande, 2020c) is also included in their materials package. This dictionary elaborates explicitly on the philosophy of fluid and responsive moves between languages and between mathematical registers based on the multilingual nature of learner needs in South African classrooms in these terms (English version below but isiXhosa version precedes this in the text):

> This bilingual dictionary includes the daily list of lesson vocabulary that is included in the lesson plans and the teacher's notes. In the dictionary you will find explanations and diagrams for the lesson vocabulary. [. . .]
>
> If you have learners in your class who are not yet comfortable in the LoLT (Language of Teaching and Learning), try and explain the word in a language they understand. You can also use gestures or pictures to help you explain a concept. Another strategy is to let learners who speak the same language discuss the concept in their home language, and explain to each other.
>
> Funda Wande 2020c, Introduction, English–isiXhosa bilingual dictionary

The Bala Wande Teacher Guide advice for teachers on work with language more broadly reflects the bilingual presentation of materials and similarly calls for teachers to freely use moves between languages as needed to support children's mathematical learning, referencing and equating 'code-switching' and 'translanguaging' within this advocacy:

> Ootitshala abaninizi bemathematika baseMzantsi Afrika bayazixuba iilwimi xa befundisa ngeenjongo zokunceda abafundi babo babe nokuqonda isigama semathemaetika. Oku kuthetha ukuba bayathsintshatshintsha phakathi kweelwimi ezimbini okanye ezingaphezulu xa becacisa imathematika. Uphando lubonisa ukuba ukwenza oku kuba luncedo kakhulu kubafundi. Ukuxuba iilwimi kunceda ootitshala nabafundi bakwazi ukusebenzisa izakhono zabo zolwimi ekufundeni endaweni yokunyinwa lulwimi olunye. Esi siqhelo sisetyenziswa nakumazwe ngamazwe kwaye sibizwa ngokuba yi-'translanguaging' ukuwela imida yeelwimi.
>
> Funda Wande, 2020a, 10

> Many South African mathematics teachers already code-switch to help their learners understand mathematical concepts and terms. This means that they alternate between two or more languages when explaining mathematics. Research has shown that this is a very useful practice that does indeed help

> learners to understand. Code-switching allows teachers and learners to draw on all of their language skills to learn, rather than to be limited by one language only. This practice is used internationally and is also called 'translanguaging'.
>
> Funda Wande, 2020a, 11

While nuances in how code-switching and translanguaging may differ are described in the multilingualism literature base (García & Wei, 2014), the Bala Wande messaging is clear about foregrounding the need for mathematics teaching and learning to occur through a fluid combination of verbal and textual multimodal resources. This contrasts with what Sapire and Essien (2021) have described as the monolingualism model that pervades the national workbooks. In this model, teachers and children in particular medium classrooms are confined to the singular language of the text, regardless of the widespread evidence of multilingual proficiency and dialect-oriented spoken language in South Africa. The guidance is also interesting given the evidence from Poo's (2022) study showing lower prevalence of moves between mathematical registers in the Sepedi medium instruction she observed in comparison to what was seen in English-medium instruction settings. Putting these two bodies of evidence together leads to our sense of the potential in the Bala Wande materials for a broadening of the narrow representational repertoire in language and mathematical terms that has tended to prevail in African home language classrooms.

Number Structure in Bala Wande Materials

Morrison and Askew's (2022) paper points to the ways in which Bala Wande's extensive use of 'structured representations' (representations that are designed to promote some or other aspect of number relations – for example, double decker dot arrangements for showing doubles or odd/even numbers, or ten frames for showing base ten relations) can be contrasted with their more limited presence in the 2021 Department of Basic Education's (DBE) national mathematics workbook for Grade 1 (DBE, 2021). Morrison and Askew note that the DBE materials therefore send a weak conceptual signal regarding the importance of number structure, with Bala Wande materials sending much stronger signals in this regard. They argue that the Bala Wande tasks offer better links to the literature base that tells us that a rich network of number relations provide a strong foundation for learners' flexible and efficient mental computation (Foxman & Beishuizen, 2002; Heirdsfield & Cooper, 2002). Conversely, learners who do not develop an understanding of number structure and relations are

thus forced to solve calculations in higher number ranges using time-consuming and error-prone counting strategies.

There are several explicit references in the Bala Wande materials on the need to work with number structure from the outset. For example, the conceptual development aspects detailed as goals for the first week in Grade 1 include mention of:

> a structured way of counting … by getting learners to put counters onto the items they want to count and then transfer the counters into a ten frame. … learners start to see that it is easier to compare amounts of things using a structured representation. They should start using the structured representation to make comparisons.
>
> Funda Wande, 2020a: 41

An example of how attention to number structure in Bala Wande is signalled is in the daily 'Register' activity. This activity involves a laminated class poster consisting of multiple ten frames that children each fill in by making a dot in one block with an erasable-marker as they enter the room (see Figure 7.1).

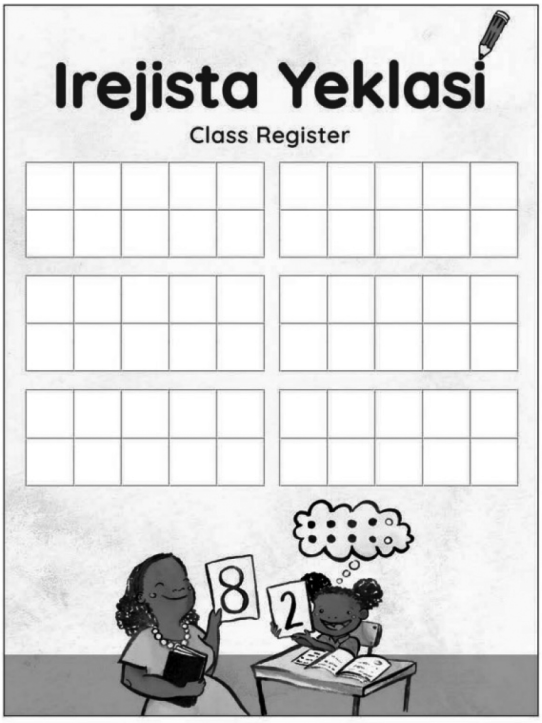

Figure 7.1 Bala Wande register poster.

Once all learners have registered their presence on the register chart and are in their seats, the teacher looks – with the class – at the poster and asks 'How many children are in class today?' In the Teacher Guide and in the accompanying video excerpt, there are instructions for teachers on how to work this activity and how they should encourage children to state the total number.

Usuku ngalunye	**Each day**
Sebenzisa irejista ukuze ubale abafundi abaseklasini.	Use the register to count the learners in the class.
Ebhokisini kukho ipowusta yerejista yeklasi eyodwa. Ngosuku ngalunye umfundi ngamnye uza kuziphawula ngokubeka ichokoza okanye abhale oonobumba bokuqala begama lakhe kwirejista.	In the box there is a special class register poster. Each day each learner will mark themselves by putting a dot or their initials on the register.
Qinisekisa ukuba abafundi bazalisa izakhelo zamashumi kwirejista ngokulandelelana.	Ensure that the learners fill the ten frames on the register in order.
Ekuqaleni kwesifundo semathematika bala inani labafundi abakhoyo, umz., balishumi, ngamashumi amabini, ngamashumi amathathu, amashumi amane [*sic*, text includes 'anesine' here]. Ngamashumi amane [*sic*, anesine] abafundi abakhoyo namhlanje.	At the start of the maths class, use the register to count the number of learners present. For example, ten, twenty, thirty, forty, four. Forty-four learners are present today.
Lo msebenzi uphindaphindwa yonke imihla ubethelela imbono yokuba ukuhlela nokubala ngamashumi. kuyasebenza kwaye kwenza abafundi bayeke ukubala ngoononye. (Funda Wande, 2020a: 14)	This repeated daily activity reinforces the idea that grouping and counting in tens is efficient and steers learners away from counting in ones. (Funda Wande, 2020a: 15)

The Teacher Guide offers the following isiXhosa instructions with parallel English translation on the next page:

A learner who comes in late is asked to add his 'dot' into the register chart stuck on the front wall. The child fills in the 43rd circle (3rd circle in the fifth row) and sits down.

T: Sizakubala ukuba bangaphi abantu abazileyo esilolweni. Ok, siyayazi ngubani lo wonke ephelele?	*T*: We are going to count the number of people that are present. Do we know what is this full number?
Class: NguTen.	*Class*: Ten.
T: NguTen ne? Masiye Ke	*T*: Ten right? Let's count.
Class: Ten, twenty, thirty, forty, fifty.	*Class*: Ten, twenty, thirty, forty, fifty.
T: Hayi! Forty ngaphi?	*T*: No! Forty-what?
Class: Forty-three.	*Class*: Forty-three.
T: Forty-three. Good. So sibayi forty three apha ngoku, phi?	*T*: Forty-three. Good. So we're forty-three where?
Class: Esikolweni.	*Class*: In school.
T: Esikolweni. Eklasini. Good.	*T*: In school. In class. Good.

The video excerpt, involving an expert teacher working with an isiXhosa medium class, presents exemplar teaching of the register task with English subtitles listed alongside as follows:

In the Teacher Guide excerpt, there is specific guidance on when and how the register activity should be used in lessons, with counting in tens flagged as an 'efficient' approach that 'steers learners away from counting in ones'. But there is, additionally, explicit direction in the Teacher Guide text and in the video clip on the exact sequence of number words to use for counting in tens, with home language number words used in the text and English number words used in the exemplar video. In the latter, for example, the teacher begins to model the way of counting she expects using the register poster thus:

T: Sizakubala ukuba bangaphi abantu abazileyo esilolweni. Ok, siyayazi ngubani lo wonke ephelele? (*Gesturing a circle around the first block of ten.*)

Class: NguTen.

Here, there is acceptance of 'ten' as the total value of the composite unit with no recourse to counting in ones. This working with ten as a composite unit continues in the further count, with the teacher attentive to some children continuing to recite the multiples of ten number sequence and losing the focus on enumerating the total number of children in class in this process, seen in her interjection: 'Hayi!

Forty ngaphi?' At this juncture, the class offer 'forty-three' in response. This too is accepted without any return to counting in ones, and the teacher further clarifies through questioning that the referent for the 'forty-three' is the number in class.

There is explicitness on the exact sequence of number words to be used to leverage work with base ten number relationships (e.g. *balishumi, ngamashumi amabini, ngamashumi amathathu*, … – in the isiXhosa Teacher Guide). Thus, the numerical language for attending to base ten number structure in the structured resource context is modelled explicitly. This approach, with text and videos exemplifying fluid moves between linguistic and between mathematical registers to support attention to number relations is a common feature of the Bala Wande teacher support materials, and works in conjunction with the structured resources within the Bala Wande package to encourage attention to number structure. This explicit modelling of language use, to foreground number structure, contrasts with the approach seen in earlier policies like the Foundations for Learning programme, which introduced structured resources like abaci into schools without direction on how teachers' language use with number needed to change to support attention to base ten thinking.

What this contextual framing alerts us to is the aspects of Bala Wande that are likely to be encountered as shifts in the landscape – namely, the ways in which language is expected to be worked with in order to support progression in early number beyond counting in ones. Our focus in this paper is in looking more deeply at the nature of the supports offered to teachers in the Bala Wande materials for working with these two 'new' features. We do this through an exploration of some of the ways in which the materials offer educative supports for multi-modal language working for attention to early number structure.

Educative Curriculum Materials – Analytical Concepts and Categories

A number of studies have considered features of what are now referred to as educative curriculum materials or ECM, drawing on the early work of Bruner (1977) and Ball and Cohen (1996). Remillard's extensive attention across a number of studies to the ways in which teachers might be supported to work with curriculum materials was particularly useful to us in thinking about the Bala Wande materials. An early distinction made by Remillard (2000) was to contrast the idea of curriculum designers devising materials aimed at 'speaking

through teachers' with those aimed at 'speaking to teachers'. The former approach tends to prescribe teachers' instructional actions, while the latter – offering suggestions and perhaps even some prescriptions on instructional actions – would also attend to enhancing teachers' awareness of the rationales underlying the mathematical and pedagogical choices presented in curricular texts.

Davis and Krajcik (2005) extended the focus on educative materials highlighted in the earlier Schneider and Krajcik (2002) work , offering a range of aspects through which the nature of educative attention in texts could be studied:

1. help teachers attend to student thinking
2. provide subject specific content support
3. help teachers connect ideas within a given discipline
4. communicate curriculum designers' rationale for pedagogical choices
5. foster teachers' ability to effectively mobilize curricular materials within a specific classroom context.

This list of aspects offered us some lenses for thinking about the nature of the educative elements present within the Bala Wande materials. Our attention was directed towards the bilingual presentation and number structure aspects that we have highlighted as 'new' in the texts and therefore in particular need of more educative slants.

We were mindful too of the critiques levelled at more prescriptive materials. Firstly, we noted their standardization that works against the possibilities for engendering differentiated instruction tailored responsively to individual needs. Secondly, there is acknowledgement in national and international literature that educative materials tend not to engender changes in teaching on their own. Rather, it is the case that teachers require one-on-one support (coupled with educative materials) to take on new practices (Cobb & Jackson 2015). Bala Wande's research model included different mechanisms for the delivery of this support in different provinces – each province with a different language of learning and teaching (LoLT). In the Eastern Cape province, where isiXhosa is a prominent language and also the LoLT, coaches were hired and trained to support teachers in the implementation of the Bala Wande project. In the Western Cape province, with Afrikaans-medium schools, education department-employed Subject Advisors were asked to support the Bala Wande rollout as part of their broader teacher support role. School-leaver teaching assistants in Limpopo province Sepedi-medium schools were selected for the Bala Wande project, were trained to support teachers in class with lesson implementation. Whilst one-

on-one support was delivered differently to Bala Wande teachers in different provinces, a similarity was that all teachers involved in the project received three days' training on how to work with the Bala Wande materials. This training was intended to offer additional routes for communicating the aims and rationales for the choices of tasks and approaches used in the Bala Wande package, in a South African terrain where a lack of a reading culture among teachers has been documented (Porteus, 2022).

Methodology

Our focus in this chapter is on a qualitative text-based analysis of the ways in which the fully bilingual home-language–English presentation in the Bala Wande materials should be deployed alongside structured resources to direct teaching attention to number structure. We use this analysis to consider the extent to which the Bala Wande materials can be considered educative. The Bala Wande materials package that we drew from for our analysis consisted of the following:

1. Bala Wande Teacher Guide (Funda Wande, 2020a) linked to the Learner Activity Book for each of the four terms in Grade 1 (Funda Wande, 2020b). The Teacher Guide includes captioned illustrated sequences detailing key parts of the sequence of task interactions.
2. Video clips illustrating and discussing how tasks and activities should be worked with.
3. Resources box, including teacher demonstration and learner manipulatives and equipment.
4. English/ Home Language Bilingual Dictionaries (Funda Wande, 2020c).

The Bala Wande lesson structure details the following:

- Mental maths
- Concept development (whole class)
- Pair/individual work on worksheet/Learner Activity Book and game-based tasks

With Morrison and Askew's (2022) analysis already pointing to the high prevalence of structured representations in the Bala Wande materials, our focus in this chapter is on how teachers are asked to intertwine language and representational moves as a key route to engendering awareness of number structure in the texts. In order to do this, we analyze selected tasks drawn from

the Grade 1 Term 1 texts, when the attention to translanguaging and number structure was first introduced to Grade 1 teachers. We chose tasks that involved use of ten frames, a representation that was introduced in the first week of Term 1. The tasks that we have chosen are reflective of the broader use of structured representations in the Bala Wande materials, but focusing on the ways in which attention to language and number structure are encouraged in a small number of tasks allows for a more in-depth analysis of the nature of support they offer for educative use.

The tasks we work with are drawn from the lessons in Term 1 Week 6. The focus of Term 1 Week 6 tasks is labelled as 'Match, sort, count and compare numbers 6 to 10.' In the Term 1 Teacher Guide, weekly overviews of the focus of tasks in the LAB are provided, rather than detailed instructions for every task. Five video extracts are provided for Term 1 tasks with one linked to the focal week, leaving several tasks more open to interpretation on how to engage with them in classrooms. Davis and Krajcik's (2005) list of aspects for studying the educative features of materials, introduced above, is drawn into our analysis.

Analysis

The Teacher Guide excerpt following Figure 7.1 above details the Register activity with a high degree of specification on instructional sequence and, therefore, would fall within Remillard's 'speaking through teachers' category. The scripting of the counting in tens number sequence to use in enumerating the number of learners in class as seen in the ten-based register chart can also be viewed as supporting the mobilization of the register resource – one of Davis and Krajcik's educative aspects – in ways that draw attention to the efficiencies offered by the base ten number system. Given prior South African evidence of teachers ignoring base ten structure in their instructional work with structured resources (Venkat & Askew, 2012), the interpretation of this scripting of the sequence of number words to use as educative would seem to be justified. Flexibility in the language to be used for saying number words is seen in the video clip, where instructional talk in home language is coupled with acceptance of learners' fluent use of the tens sequence number words in English. This kind of flexibility is core to translanguaging approaches to learning, with Makalela (2015) noting its usefulness for both epistemic access and for developing linguistic repertoires.

Further, the inclusion of the curriculum writers' rationale for advocating counting in tens rather than in ones on the grounds of this being more 'efficient'

tends to fall on the 'speaking to teachers' side. The curriculum designers' rationale (another of Davis and Krajcik's educative aspects) is explicitly communicated here. Additionally, this reference to the press for efficient working can also be read as an attempt at communicating 'brevity' as an aspect that is valued in mathematics (and therefore falling within the subject-specific support educative aspect) – in a context where such attunements to valued mathematical practices are frequently absent

In this section, we focus on the tasks and activities for the focal Term 1 Week 6, providing a task outline and detail on the supports offered in the Teacher Guide and video clip, before analyzing the supports for language use and number structure in relation to the educative descriptors introduced above. The tasks are detailed as follows (English version below, the same details are available in isiXhosa on the previous page of the Teacher Guide). The first two lesson tasks are linked with a farm scene poster showing different numbers of farm animals. In these 'farm animals' tasks learners need to count, sort and compare the number of animals using counters and ten frames. Ten frames continue to be specified for use across the counting and comparison tasks in the third and fourth lessons during the week.

The skills and understandings to be developed during the week include: 'accurately count objects (up to 10 objects)' and 'instantly recognize the numbers 6, 7, 8, 9, 10 shown in ten frames' alongside being able to recognize and write the numbers 6 to 10 in symbols and words (p. 139).

This set of tasks is of interest to us in its ongoing foregrounding – not just of counting as an end in itself, but of seeing numbers in the 1–10 range in the ten frame resource. Teachers are encouraged to use this resource – which is in use from Week 1 onwards, to support children to see numbers in the 6-10 range in relation to 5 and 10 as 'benchmarks' (Van de Walle & Lovin 2007) that allow for

Table 7.1 Bala Wande Teacher Guide (Funda Wande, 2020a, p. 139)

Day	Lesson activity
1	Use matching and sorting to count 6–10 objects
2	Use matching and sorting to count 6–10 objects. Write the number symbols
3	Use matching and sorting to count shapes (number range 6–10)
4	Compare numbers (6–10)
5	Consolidation and assessment for learning

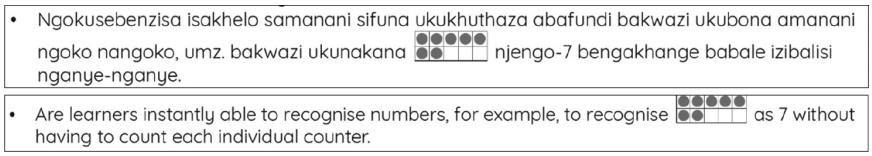

Figure 7.2 Teacher Guide notes on what to look out for.

conceptual subitizing of the total quantity, rather than counting in ones – a skill that has been noted as helpful for later progress and attainment in mathematics (Clements et al., 2019). The notes on what teachers should look out for during the week are explicit about this aspect in both languages – see Figure 7.2 (Funda Wande, 2020a, pp. 140, 141).

In the exemplar video (an isiXhosa lesson with English subtitles) that accompanies the farm animals tasks the teacher asks a learner up to place a counter on each of the six rabbits. She then checks that the class know that there are ten spaces in the ten frame, and moves each counter into a ten frame alongside the poster on the board with children counting the six counters as she moves each one into the ten frame. Pointing to the ten frame with the counters, she asks: 'U-five no-one ngubani? ('What number do five and one make?') The class chorus 'Six' and the teacher then writes the numeral '6' alongside the ten frame on the board. The 'Conceptual Development' notes accompanying the video in the Teacher Guide echo this sequence of actions, noting that 'a continued use of a structured way of counting' is a key goal for the week (as in preceding weeks) that can be achieved by:

> getting learners to put counters onto the items they want to count and then transfer the counters into a ten frame (as they did in the range 0 to 5).
>
> Funda Wande, 2020a: 141

This activity is repeated in the context of counting the numbers of different shapes in the task presented in Week 6 Lesson 3. This illustration of counting on from 5 rather than starting from 1 in the Teacher Guide and the video reflects, as before, an attempt to support teachers with translating curriculum intentions into the mobilization of resources in instruction. As before, the mixed use of home language with English number words is also exemplified here, reflecting a philosophy of language use in the service of effective mathematical learning.

In Lesson 4, attention shifts to comparing quantities by putting counters into the ten frame in order to more easily identify and compare the quantities.

The notes to teachers for this activity provide illustrations of what to do in a captioned photo sequence:

> Photo 1: Two children at front, one with a pile of yellow counters in her hands and the other with a pile of red counters in his hands, and a caption from teacher's mouth asking: 'Ngubani onezininzi?' ['Who has more?']
>
> Photo 2: Image shows the two children having put their counters into ten frames on the board – 8 yellow counters and 6 red counters, respectively.
>
> Photo 3: Shows teacher pointing to the ten frames with the sentence: 'U-8 ungaphezulu kuna 6' ['8 is more than 6'] written above on the board. (Funda Wande, 2020a, 160)

Below these images, the notes offer an outline for how the activity should proceed and why the ten frames are being used as follows:

> Sebenzisa amanani ahlukeneyo ezibalisi ukuze abafundi bafumane ithuba lokuthelekisa amanani. Sebenzisa isigama esithi 'ingaphezulu kuna-' okanye 'ingaphantsi kuna-'. Imiboniso yezakhelo zeshumi inceda abafundi babone ukuba zeziphi ezininzi kwaye zeziphi ezimbalwa
>
> Use different numbers of counters to allow many learners opportunities to compare numbers. Use the language of **more than** and **less than**. The ten frame displays help learners to see which is more and which is less.'
>
> Funda Wande, 2020a, 160

Several aspects of these support materials are of interest. First, across all four lessons (Lesson 5 is always a consolidation/assessment lesson), there is clear specification of the tasks to be used (in Lessons 1 and 2 here) and how the teacher should work with them – aligned with the 'speaking through teachers' perspective. However, in Lesson 4, for example, while one whole class activity example is illustrated, the teacher is asked to work with other similar examples chosen by the teacher, thereby leaving room for teachers' selections of appropriate follow-up examples. Thus, the Bala Wande materials are not at the extreme end of scripted orientations on speaking through teachers. On the language side, in Lessons 1 and 2, we see once again the teacher using English words for the numbers alongside isiXhosa. This is important and responsive in relation to Essien et al.'s (2015) findings noting that Foundation Phase teachers found 'pure' home language forms difficult to use in classrooms as number words in the African languages are often longer to both say and to write in words than their English parallels. As in the register video excerpt, this video excerpt

thus also carries through the messaging on translanguaging, with integration of multiple languages and multimodal registers incorporated in this brief excerpt.

On the mathematical side, the emphasis on seeing six as composed of 'five and one' without counting in ones is carried in the orchestrated connection between placing counters in one-to-one correspondence with the rabbits, then 'sorting' the counters into the ten frame and drawing attention to the base-5 structure in the teacher talk. It is this kind of assembly of mediational means for focusing on number structure that was noted as sometimes lacking in the analyses of Askew et al. (2019). The follow up activity draws attention to more than and less than number relations within the ten frame setting. In completing the instructional section, the conceptually subitized quantity is linked with its symbolic representation. Once again, the prescription of how to combine talk relating to subitized, rather than counted, versions of number with structured resources suggests a 'talking through teachers' orientation.

Discussion

We return to these tasks in relation to the list of aspects offered by Davis and Krajcik (2005) as avenues for making materials educative by speaking to teachers. In relation to guidance about attending to student thinking, there are markers in the Teacher Guide about distinctions to look out for that are noted as important in early number learning – for example, able to/not able to instantly recognize quantities in the ten frame, ability to recognize and write number symbols and accurately counting up to 10. While remaining at rather dichotomized levels of description rather than detailing progressions for these aspects, these descriptions are directed at teachers, and thus represent illustrations of 'speaking to teachers' with a focus on what to look for in student thinking.

Subject specific content support tends, more often, to be dealt with implicitly via the detailing on what tasks to use and how to use them. Remillard and Reinke (2012) acknowledge that even whilst this approach tends to speak through, rather than to teachers, this kind of scripted detail can be useful for inexperienced teachers and teachers trying to work with unfamiliar approaches:

> explicit scripts have the capacity to offer new pedagogical repertoire and routines, allowing teachers to consider and try out new questions to ask, words to use, and instructional moves to make. . . . Through use of these scripts, teachers might begin to develop new instructional repertoires and styles of interacting with students.'
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> p. 13

We noted above the explicit message to steer away from counting in ones. Thus, efficiency is flagged as a mathematically valued aspect of progression in early number learning. This functions as the rather succinct global rationale offered in the Bala Wande Teacher Guide for a range of underlying prescriptions – counting in tens rather than ones, counting on from fives, etc. In this rather limited explication of the rationale for pedagogic choices, we see more limited attention to this aspect of educative materials, suggesting a prioritizing of take up and trying out of a new pedagogical repertoire in advance of more detailed attention to the rationales underlying language, resource and representational choices. The global reference to moving on from counting in ones also tends to mean that the burden of connection falls upon the resources and the language that are carried through across tasks, rather than expecting the teacher to explicate connections in her talk. As noted already, ten frames are used recurrently across the tasks in Term 1 and into subsequent terms, with language patterns in counting also carried across these tasks. In later Grade 1 tasks, ten frames are connected with part-part-whole images and used to connect addition and subtraction, but as before, these connections tend not to be flagged explicitly at the mathematical content knowledge level. Rather, the educative focus is on helping teachers to connect ideas within early number through the recurring use of particular language patterns in counting linked with structured resources that support these counting patterns. When coupled with the global rationale for efficient counting, there is a danger that many of the subtleties of task presentation can be missed. For example, in the counting of the various farm animals task above, one-to-one correspondence actions are linked with arranging the count into the structured ten frame arrangement, and thereon into a count using number words and a final symbolic representation of the quantity.

There is no explicit drawing attention here to the fact that multiple representations of numbers are involved, nor to this being important within early number learning. Similarly, there is subtlety in how the steps of working in the farm activity are presented that is not explicitly discussed. For example, the counters are not counted out as they are placed onto the rabbits in the farm image; they are counted in ones only as the teacher transfers them into the ten frame. For the task goals at hand this is useful, as the first laying out of counters deals with the one-to-one correspondence needed for counting, followed by the counting itself in a format that then allows for focus on composition in relation to 5. However, if a teacher interprets the task as only about identifying the number of rabbits, there are dangers that the task can play out with attention to counting only. If children count as they are laying counters out onto the rabbits, the move

to the ten frame would have to be carefully mediated to avoid a sense of simply counting again. To do this well, the teacher would have to draw attention to understanding 6 in terms of its 5-wise relations.

In our broader looking across the resources, we noted too that a relatively small number of key structured representations are carried through across the tasks in the Grade 1 Teacher Guide and Learner Activity Books – ten frames, part-part-whole bar diagrams and number lines amongst these. Part-part-whole diagrams, for example, are introduced in Term 1 in the context of breaking a column of multilink cubes into two pieces and representing the lengths of the whole and two parts. They are then used across the remaining terms to work with number combinations involving a missing whole, to connect addition and subtraction sentences linked to particular part-part-whole sentences and to solve missing addend problems. Whilst this kind of careful selection of key representations does find support in the literature (Askew & Brown 2003), there is limited explicit attention to discussing the rationales for the importance of these connections in the Bala Wande texts. Given the gaps in content and pedagogic content knowledge bases that we noted earlier, our sense is that the texts do not attend to the connections aspect as educatively as is likely to be needed in the South African context.

We have already noted that the Teacher Guide contents and videos are geared extensively towards supporting teachers to mobilize the curriculum resources and use the language patterns modelled in the Teacher Guide and the video clips that are provided in the Bala Wande package. The prescription on how to work with the materials – at the level of content, sequencing, pacing and resources, tends to mean that responsively attending to learner thinking – as an aspect in Davis and Krajcik's list – is less in focus, even though there are some examples of responsive working in the video clips. The emphasis on teacher mobilization of resources in instruction rather than on responsive attention to learner offers has been noted in the broader South African terrain and linked to the widespread evidence of gaps in primary teachers' mathematical content knowledge (Venkat & Sapire, 2022).

Taken together, and given the South African contextual features that we outlined earlier and the evidence of Bala Wande suggesting a substantively 'new' focus on how language can be used to support working with number structure, we would argue that the Bala Wande resources are more educative in relation to some of the aspects identified by Davis and Krajcik (2005) than others. Supporting the mobilization of curriculum materials with the structured counting in tens and ones patterns in teacher talk appear as key educative priorities, with content

knowledge support and mathematical connections featuring more implicitly. Pedagogical rationales tend to be presented at more global, rather than at the more granular level of tasks. The need to move on from counting in ones to using base ten structure for more efficient counting and calculating is flagged early and consistently across the Grade 1 Bala Wande resources. On this aspect, there is therefore communication of the writers' rationales for their pedagogical choices. However, as noted above, this feature is not carried through consistently across other ideas that are also important – for example, connecting between representations, and what progression in terms of representations and in terms of the detail of stages of moves from counting to calculating strategies can consist of.

Attention to learner thinking in instruction tends to be largely absent, getting mention largely as something to be dealt with in the weekly assessment tasks rather than woven into instruction. We note very limited attention to supporting teachers to tailor instruction towards particular student responses, or to highlighting common errors and misconceptions and how these might be handled responsively. This emphasis on a rather singular instructional model is mirrored in the National Workbooks and other large-scale instructional materials in South Africa, and may be reflective of a current context of weak teacher content knowledge in which the need for common understanding of key ideas and language and resource use for coherent instruction takes priority over the need for more differentiated instruction.

Concluding Thoughts

Taken together, we see that the case for considering the combination of tasks, resources and illustrative videos offered here as educative on the multilingual and mathematical fronts is stronger in some categories than in others. There is a new emphasis on guidance on the language patterns associated with counting in tens and with using base ten structure for teachers, alongside structured resources. We would suggest that the emphasis of the materials is geared towards being educative in relation to providing supports for flexible and fluid use of moves between languages and between multimodal representations in coherent ways during instruction in the context of structured resources. This takes into account the need that has been flagged extensively in South African research for progression beyond rudimentary counting in ones approaches.

From a policy perspective, what our analysis suggests may be required up ahead – in the Bala Wande and broader CAPS contexts – is the need for a tailored sequence of training for teachers as they start to become familiar with the language patterns needed to draw attention to number structure in the context of working with structured resources such as ten frames. What we mean by this is that while initial attention in training may simply be to encourage teachers to practice and try out tasks with their associated resource and language repertoires, over time this could expand to reflecting on this use in training sessions. Expansions can involve increased attention to 'speaking to teachers' rather than 'through teachers' with increased attention to rationales for task choices and their presentation and sequencing gradually configured into the training that is offered. Longitudinal research of this process could then track the fluency and flexibility of teachers' linguistic repertoires in the context of working with early number structure. Without this, there is a danger, not just that mathematical subtleties of language use in home language settings will be missed, but also that the broader coherence of mathematics will continue to be disrupted.

Notes

1 The isiXhosa version of Funda Wande, *Bala Wande* (2020a, 2020b, 2020c) are used for analysis purposes.

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