Funda Wande

BALA WANDE (MATHS) QUALITATIVE STUDY: 2021 IMPLEMENTATION

AUGUST 2022
Contents
1. Introduction
Bala Wande is the mathematics arm of the Funda Wande project, and has the tagline: Calculating with confidence. In the introductory video resource about the Bala Wande programme, Bala Wande is described as a package that: ‘helps the teacher to teach numeracy in the classroom’. The Bala Wande (BW) package includes the following components:

- A termly Learner Activity Book (LAB)
- A termly Teacher Guide (TG) detailing the tasks' and how to work with them in class. It includes captioned photo sequences for some tasks, and details of lesson outlines and consolidation and assessment tasks
- Support videos illustrating some of the enacted activities to be used in class
- A resources box that includes bead strings, multilink cubes, ten frames, number cards, etc. for the teacher and every learner
- A home language/English dictionary that details key mathematical vocabulary, phrases, and representations for the grade
- Coaches in the EC, Subject Advisers in the WC, and Teaching Assistants in Limpopo, with termly training sessions for teachers and Teaching Assistants

Bala Wande is being trialled in three provinces with different languages of learning and teaching (LoLT) in each province in the selected schools (with BW materials developed in the three languages). The provinces include varying models of support for implementation of the core programme of teaching and learning materials:

- In the Eastern Cape, 29 schools in 2021 implemented the BW programme in a model involving support from external coaches. The LoLT in these schools is isiXhosa.
- In the Western Cape, 50 schools in 2021 implemented the BW programme in a model involving support from district Subject Advisers in 7 of the province’s districts. The LoLT in some of these schools is isiXhosa and Afrikaans in other schools.
- In Limpopo, 80 schools in 2021 implemented the BW programme in a split model involving LTSM only in 40 schools, and LTSM and support from Teaching Assistants in another 40 schools, who worked alongside teachers in Grade 1 classes supporting the Language and Mathematics lessons. The LoLT in these schools is Sepedi. This qualitative study was focused on two schools in the LTSM + Teaching Assistants group.

\[^{1}\] Using Mason and Johnston-Wilder’s (2006) distinction between ‘task’ and ‘activity’, tasks refer to worksheets presented in the BW LAB as the intended focus of the lesson, and activity describes the enactment of the task.
BW departs from the DBE learner workbooks in terms of its dual Home Language/English presentation of the teaching and learning texts, and its inclusion of an extensive Home Language-English dictionary which includes not just vocabulary translations, but also translations for phrases, explanations and language linked to key representations.

On the curriculum content side, BW works with a repackaged version of the CAPS curriculum, with somewhat greater attention to number working in Grade 1 in comparison to CAPS allocations (Evans & Sorto, 2021). Analyses have also shown more attention to place value and its precursor base ten thinking in the BW materials in comparison to the DBE workbooks (Morrison & Askew, 2022). In the literature, the importance of base ten thinking in helping learners to move beyond counting in ones to calculate answers has been highlighted (Wright et al., 2012). Given the extensive South African evidence of the ongoing use of counting-based approaches to calculation, this latter emphasis is responsive to the need for progression.

A common lesson structure is suggested for all teaching lessons (Monday – Thursday each week), with a consolidation/assessment task tagged on to a shorter teaching session every Friday. The content coverage, sequence and pacing for the Grade 1 curriculum is stipulated on a day-to-day basis, building on the CAPS model of weekly prescription of curriculum coverage. The CAPS model, when introduced, was responsive to earlier waves of evidence of poor coverage and pacing levels of the enacted curriculum in early grade mathematics (Ensor et al, 2009).
On the intention side, the breadth of the BW package suggests a programmatic initiative that seeks to improve Grade 1 Mathematics teaching and learning in ways that play through broadly into improved learning outcomes in mathematics. This contrasts it from interventions such as the DBE workbooks which offered a primarily resource-oriented initiative. A package of learning and teaching materials (LTSM) with accompanying resources form the core of the programme. Attached to these LTSM across the three provinces are different models of personnel support described earlier.

In this qualitative study of BW implementation in Grade 1, our focus is on understanding how the BW package is taken up in classroom enactment. Given the breadth of the materials and support package, we attend to the elements that are widely seen in classroom working, and those that tended to be less visible. We also detail the experiences of teachers and other school-based personnel in the context of implementation, including teaching assistants, heads of department and principals. In order to understand how BW implementation differs from the general CAPS curriculum based classrooms, a set of parallel control schools are included in this qualitative study.

It needs to be noted at the outset that this qualitative study of BW implementation occurred in the midst of Covid-related disruptions to schooling. The vast majority of our school visits occurred with classes operating on rotation models in which half the class attended on any particular day. Only two of the six BW schools in our sample had stopped using rotation by Term 4 (Schools B and C). This followed earlier periods of complete closure of schools. We were thus interested in what was enacted in the name of the BW project in a far-from-ideal context of implementation.
2. Methodology
Two BW schools were selected in each participating province, with two parallel control schools serving a similar learner demographic and in geographical proximity to the BW school also selected. On the mathematics side, the data collection linked with this qualitative study consisted of the following, across the BW (‘treatment’) and ‘control’ schools:

- A baseline mathematics lesson observation, document review of available BW texts, DBE and other workbook texts for two learners (one identified as ‘strong’ and the other identified as ‘weak’ by the class teacher), teacher interview, HoD interview and principal interview in April/May 2021 – in each treatment and control school. A count of number of pages of learner work on mathematics completed and partially completed was drawn up for the two selected learners in each observed class.

- Observation of two consecutive mathematics lessons, document review of available BW texts, DBE and other workbook texts for two learners (one identified as ‘strong’ and the other identified as ‘weak’ by the class teacher), teacher interview, HoD interview and principal interview in October/November 2021 – in each treatment and control school. A count of number of pages of learner work on mathematics completed and partially completed was drawn up for the two selected learners in each observed class.

Our data sources included video-taped lesson observations, classroom fieldnotes from across the observation team members, a summary of classroom textual materials across learning materials and exercise books, photographs of the school and classroom setting, photographs of any pages that the teacher was working from in the teaching and/or learning texts being used, and audiotaped interviews with the school-based personnel. We draw on all these sources to explore the state of play with implementation of the BW package of materials and training.
3. Executive Summary
Following two rounds of lesson observation and study of a sample of learner workbooks and teacher texts, we concluded that there was relatively poor fidelity of implementation of the BW programme by the end of 2021. This was evident in limited adherence to lesson structure timings and schedules for sub-activities. The register activity was implemented in a minority of observed lessons towards the end of the year. We also noted widespread use of the BW LABs, but pages were not covered sequentially, and the concept development stipulated in the BW TG was rarely worked with in its intended form.

Extended time (30 mins to an hour being common) was given to individual marking of learner work in classrooms, with incorrect answers painstakingly erased and correct answers written in. In Limpopo, Teaching Assistants helped with this marking, likely bringing the time taken for this down in these schools. Early finishers simply waited for the end of the period, leading to extensive ‘dead’ time for many.

The support received from Subject Advisers/Coaches/Teaching Assistants was viewed positively across all three provinces, with all three personnel categories described as available and supportive of teaching. Teaching Assistants in particular, were described positively by teachers, Heads of Department and Principals.

Guidance on how to support teachers to work with the focal concept is provided in the BW Teacher Guide and in exemplar videos, with use of both of these materials encouraged in the training offered at the start of each term. In spite of these supports, teaching of the focal concept did not always follow the logic of the tasks as detailed in the Teacher Guide, with teachers’ use of manipulatives such as the ten frame derailing the mathematical idea in focus. This derailing also meant that tasks and manipulatives intended to support moves on from counting into more efficient calculating based on place value in the base ten number system were used with the ongoing promotion of counting in ones to solve problems. Teachers’ lack of familiarity with the tasks, materials and resources/manipulatives in the BW package, suggests the need for training to pay more attention to supporting teachers with concept development. This could include attention to the rationales underlying mathematical tasks and how to orchestrate the tasks in classrooms.

Some resources are being used more frequently than others: ten frames and multilink cubes in particular among these. As noted already, these resources are often used with a counting orientation, rather than efficient working using base ten structure. However, there were more indications in BW schools of teacher awareness of the need for efficient working and working with base ten structure in comparison to control schools, even though this awareness did not often manifest coherently into instruction. This awareness would appear to be coupled with the widespread presence of base ten oriented tasks and resources in BW. Future work needs to look at how training can best support the integration of this awareness into pedagogic actions.
4. Detailed Study
Aims and Findings
The terms for the qualitative study of Funda Wande implementation in Grade 1 were to offer more in-depth understandings of the processes of intervention translation into classroom enactments that could complement the quantitative studies of outcomes. Our foci within the qualitative study of BW implementation are informed by two key lenses:

- the key features of the BW package that we outlined earlier and how these are taken up by teachers and learners;
- aspects of the South African ground in early grades’ mathematics, and – in particular – the main challenges that the features of the BW package aimed to address

In considering the data in relation to these two lenses, we also bring in international early grades’ mathematics education literature on avenues to support strong foundations in early mathematical learning, and the findings from other mathematical interventions in South Africa. While the findings from the quantitative evaluations of learning outcomes were not available at the time of our data collection, we do probe these findings in this report from the qualitative data perspective, to understand what might figure as causal mechanisms underlying the patterns of performance that are emerging. Key amongst these findings was learning outcomes data showing statistically significant differences in favour of the BW Learning & Teaching Support Materials (LTSM) and LTSM + Teaching Assistant treatment schools in mathematics (and language) in Limpopo province at the end of 2021 (Ardington & Henry, 2021). Current midline findings from the Eastern Cape also show that on some of the number fluency tasks (though not on the more conceptual tasks) learners in the BW assessment sample are performing at higher levels than learners in the parallel control schools (Ardington & Henry, 2022).
4.1 GUIDING AIMS

In this report, we focus on the following aspects relating to BW:

- BW implementation in qualitative terms, including teacher behaviours and experiences in the context of working with BW materials and training
- Aspects of the quantitative evaluation findings that can be usefully understood in terms of the qualitative data analysis
- Similarities and differences in the ways in which mathematics is taught and learned when looking across:
  - treatment and control schools;
  - the three provinces with their different support models;
  - over time across 2021

4.2 CONTEXTUAL BACKGROUND IN EARLY GRADES' MATHEMATICS IN SOUTH AFRICA

Over the last decade, an increasing base of evidence has been gathered on the environments and nature of teaching and learning in early grades’ mathematics in South Africa. The last decade has also seen a raft of interventions that have pointed to some of the possibilities for improving learning outcomes, while detailing the challenges and constraints that continue to make change at scale difficult to achieve.

Going into the decade, there was evidence of poor understandings of progression in early grade number teaching (Ensor et al, 2009), that helped to explain the ongoing prevalence of counting in ones seen in the work of Hoadley (2007) and Schollar (2008). Weitz & Venkat’s (2013) example from Grade 1 ANA tests offered illustrations of how assessments that marked only for outcomes rather than processes were complicit in teachers’ acceptance of inefficient counting-based approaches to working out answers to numerical problems. Morrison (2018), Venkat, Askew & Morrison (2021) and Graven and Venkat (2021) all provide examples of interventions involving tasks and representations that attend to base ten structure and number relations that have improved learning outcomes over time. In this work, early number is marked as a key site for attention.

While primary teachers’ mathematical content knowledge continues to feature as a binding constraint, studies in the last decade have also pointed to problems with coherence in early mathematics teaching (Venkat & Naidoo, 2012; Mathews, 2021), with ambiguity in teacher talk and poor connections between examples leading to repeated working from first principles and little emphasis on using an established and growing bank of known facts for further development (Askew et al, 2019). The need for support for early grades’ mathematics teaching is flagged in these studies.
Policy responses in the last decade have involved moves to highly structured prescriptions on curriculum coverage as seen in the CAPS Curriculum (DBE, 2011) weekly schedules, largely reflected in the DBE ‘Rainbow’ workbooks. While not thoroughly researched, some evidence has pointed to improving coverage of the curriculum through the widespread provision and take up of the workbooks (McKay & Spaull, 2022). The need for structured offerings for curriculum coverage has been taken up in the majority of interventions working at, and for, scale in early grades mathematics. The Gauteng Primary Language and Mathematics Strategy (Fleisch, 2014) and the Magic Classroom Collective (MCC) work in the Eastern Cape (Porteus, 2022) both included lesson plans linked to learner materials, with the latter placing the need to build confidence and comfort with mathematics teaching in home languages (isiXhosa in the MCC case) at the heart of their work. Fleisch (2018) has also noted the usefulness of the ‘triple cocktail’ approach in which high quality structured lesson plans are linked with good quality materials and skilled instructional coaching support.

All of the features highlighted in this brief overview of the background are taken up in the BW package: structured learning and teaching materials, emphasis on base ten structure across tasks, representations and resources, prescribed sequences of lessons with teacher support in the form of training for materials use, exemplar videos and the Teacher Guide, as well as from coaches, Subject Advisers and in-class Teaching Assistants.

Of interest in its programmatic ambitions is the complexity of the package. To teach a BW lesson, a teacher is expected to read the weekly overview and the daily lesson outlines provided in the Teacher Guide, become familiar with the resources to be used in each lesson, facilitate a register activity that promotes counting in tens and ones rather than in ones to find out the number of learners in class, and then teach – at the brisk pace demonstrated in the video clips – the concept development in focus for the lessons in that week. This is then followed by learner working with the associated tasks in the Learner Activity Book. Consolidation and assessment activities are included for use in Friday lessons for each week. Several recent reports on interventions point to limited reading capacity among teachers (e.g. Porteus, 2022) and the consequent need for pared down and simple materials packages (e.g. Brombacher & Roberts, 2022; Venkat & Graven, 2022). The BW package is relatively extensive, with several elements that need to be brought together for successful teaching: reading of the Teacher Guide, watching the exemplar videos, using the Dictionary if needed, looking over the relevant pages in the TG/LAB, and ensuring that the manipulatives needed for whole class and individual/paired working are distributed and collected in. A key part of our qualitative interest is therefore in how this package is taken up and used in Grade 1 mathematics lessons.
4.3 **FIDELITY OF IMPLEMENTATION IN OBSERVED LESSONS**

We consider fidelity of implementation in relation to key aspects of the BW package: the stipulations for lesson structure and via this, for the use of classroom time; the nature and extent of the use of the BW materials; and the use of the resources and manipulatives provided as part of the BW package to support mathematical learning.

**4.3.1 LESSON STRUCTURE AND CLASSROOM TIME**

The Bala Wande Teacher Guide for Grade 1 stipulates a ‘standard’ lesson structure for use across all four teaching lessons in each week (Days 1 - 4 or Monday - Thursday). This involves a short introductory ‘register’ activity as learners enter the classroom, that incorporates attention to counting in tens and ones, rather than only in ones. The register activity flows into a short discussion about the date, weather and birthdays. This is followed by a 15 minute ‘Mental Maths’ focus with tasks specified in the Teacher Guide. The enactment of these tasks is illustrated using ‘photo stories’ in some cases, and in exemplar video clips that are available freely as part of the materials package and used as part of the teacher training sessions. 75 minutes are then allocated for a combination of teacher-led whole class ‘concept development’ work linked with the lesson task, followed by mainly individual work in the LABs. The image below (figure 1), taken from the BW TG, Sepedi (p. 20 & 21), shows the structure of the BW lessons for Days 1-4 in a flow chart.

**Figure 1: BW lesson structure guidelines: Monday-Thursday**

![Flowchart showing BW lesson structure guidelines](image-url)
The structure of BW lessons for Day 5 (Friday) comprises of assessment and/or consolidation tasks and is 60 minutes long. This lesson structure is also presented in a flow chart in the BW Teacher Guide as for Days 1-4 but differs for specific weeks. The image below (Figure 2), taken from the BW, TG, Sepedi (p. 20 & 21), shows the structure of the BW lesson for Day 5.

**Figure 2: BW lesson structure guidelines: Friday**

The rationale for focus on use of time in the context of Bala Wande implementation follows a long history of evidence of poor use of instructional time in South African classrooms and very slow pacing and coverage of work in primary classrooms (Reeves & Muller, 2005). The CAPS curriculum introduced a much more prescriptive approach to pacing and coverage of the curriculum, and interventions such as GPLMS – with their prescriptions of pacing and coverage at the lesson level – indicated some successes in improving coverage and pacing, and at least, initial successes with improving learning outcomes (Fleisch et al, 2016), although these proved hard to sustain. There is also some evidence that pacing and coverage have improved over the last decade in the context of the introduction of the DBE workbooks (McKay & Spaull, 2022).
We studied the ways in which instructional time within mathematics lessons was used across all observed lessons in the October/November 2021 visits. In Table 1 we provide quantitative summaries of time segments (in minutes) allocated to different parts of the BW lessons in treatment schools and in Table 2 we do the same for DBE (CAPS) lessons in control schools. The lesson structure for treatment schools is taken from the daily schedule in the BW Teacher Guide which is closely aligned to the CAPS (e.g., 7 hours of mathematics instruction per week for Grade 1).

Table 1: Instructional time in Treatment Schools

<table>
<thead>
<tr>
<th></th>
<th>Treatment Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EC</td>
</tr>
<tr>
<td>Day 1</td>
<td></td>
</tr>
<tr>
<td>Register</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>5: DBE reg.</td>
</tr>
<tr>
<td>Mental Maths</td>
<td>24</td>
</tr>
<tr>
<td>Whole class work</td>
<td>38</td>
</tr>
<tr>
<td>Individual work</td>
<td>23</td>
</tr>
<tr>
<td>TOTAL DAY 1</td>
<td>90 min</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Treatment Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EC</td>
</tr>
<tr>
<td>Day 2</td>
<td></td>
</tr>
<tr>
<td>Register</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>(5: weather)</td>
</tr>
<tr>
<td>Mental Maths</td>
<td>12</td>
</tr>
<tr>
<td>Whole class work</td>
<td>-</td>
</tr>
<tr>
<td>Individual work</td>
<td>45</td>
</tr>
<tr>
<td>TOTAL DAY 2</td>
<td>65 min</td>
</tr>
</tbody>
</table>

| Ave lesson time across both days p/school | 77,5 | 88 | 82,5 | 134 | 74,5 | 68,5 |
| Ave lesson time across both days p/province | 82,75 | 108,25 | - | - | - | - |

Table 1 shows that instructional time varied across treatment schools and across the two consecutive lessons observed at each school during the October/November visits. 2 of the 12 lessons observed kept to (or close to) the 90-minute guideline for mathematics lessons as stated in the BW Teacher Guide. Thus, more than 80% of the lessons observed during these visits did not keep to the suggested lesson time. The shortest lesson observed was half of the suggested time for a mathematics lesson (WC, School E, Day 2: 45 minutes) and the longest lesson was one and a half times as long as suggested (Limpopo, School D, Day 1: 136 minutes). Treatment schools in the EC
and Limpopo had longer mathematics lessons (on average about 83 min and 108 min per lesson, respectively) than schools in the WC (about 72 min). Most lessons observed at treatment schools on the second day were shorter than those observed on the first.

Table 2: Instructional time in Control Schools

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Control Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EC</td>
</tr>
<tr>
<td>Mental Maths</td>
<td>9</td>
</tr>
<tr>
<td>Whole class (w-c) work</td>
<td>39</td>
</tr>
<tr>
<td>Individual (indiv) work</td>
<td>37</td>
</tr>
<tr>
<td>TOTAL</td>
<td>85</td>
</tr>
<tr>
<td>TOTAL DAY 1</td>
<td>85</td>
</tr>
<tr>
<td>Day 2</td>
<td>Control Schools</td>
</tr>
<tr>
<td>Mental Maths</td>
<td>13</td>
</tr>
<tr>
<td>Whole class (w-c) work</td>
<td>71</td>
</tr>
<tr>
<td>Individual (indiv) work</td>
<td>26</td>
</tr>
<tr>
<td>TOTAL</td>
<td>110</td>
</tr>
<tr>
<td>TOTAL DAY 2</td>
<td>110</td>
</tr>
</tbody>
</table>

Table 2 shows that instructional time varied across control schools and across the two consecutive lessons observed at each school, which is similar to what occurred at treatment schools. Taking the average duration of the two consecutive lessons observed during Oct/Nov 2021 offered another metric for comparing the BW and control schools. The average durations of lessons in the EC and Limpopo control schools were about 128 minutes and 124 minutes respectively, while the average duration of lessons in the WC control schools was much shorter, at about 68 minutes long. Most of the lessons observed at control schools on the second day were longer than the first day\(^2\), which is the opposite of what occurred at treatment schools.

A key result when looking across all October/November lessons for both treatment and control schools is that the average length of mathematics lessons was longer in the control than in the treatment schools (see Table 3).

\(^2\) Two consecutive lessons were observed in all schools except School D, where the teacher (who was newly appointed) explained that she only taught Life Skills on a Friday.
### Table 3: Average length of a mathematics lesson in BW and Control schools per day (minutes)

<table>
<thead>
<tr>
<th></th>
<th>Day 1</th>
<th>Day 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bala Wande schools</td>
<td>95</td>
<td>80</td>
</tr>
<tr>
<td>Control schools</td>
<td>97.5</td>
<td>114</td>
</tr>
</tbody>
</table>

Beneath this overall picture though, the average length of mathematics lessons was slightly longer in the treatment schools in the Western Cape in comparison to the control schools. In the other two provinces, this result was reversed, with average lesson lengths shorter in the treatment schools in comparison to the control schools (see Table 4).

### Table 4: Average length of a mathematics lesson in BW and Control schools per province (minutes)

<table>
<thead>
<tr>
<th></th>
<th>EC</th>
<th>Lim</th>
<th>WC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bala Wande schools</td>
<td>82.75</td>
<td>108.3</td>
<td>71.5</td>
</tr>
<tr>
<td>Control schools</td>
<td>127.75</td>
<td>124.3</td>
<td>67.75</td>
</tr>
</tbody>
</table>

The higher learning outcomes in mathematics in BW schools in comparison to the control schools in the Eastern Cape and Limpopo reported in Ardington and Henry’s reports (2021; 2022) would thus tend to suggest better use of time in lessons in treatment schools in these two provinces.

The BW register activity and mental maths are important parts of the daily schedule of implementation of lessons in the programme, as each helps to develop learners’ use of number structure (e.g., base-ten). We discuss the enactment of these parts of the mathematics lessons in this section and focus on the whole class and individual activities in section 4.4.

In the register activity, each learner must make a mark in an empty ten-frame (on the BW register chart) upon entering the classroom. One ten-frame must be filled before learners make their marks in the next ten-frame. Once all learners have made their marks, the teacher would ask the class how many learners were present. The class is then expected to enumerate the number of learners present by counting in
tens and ones. For example, if 32 learners made a mark in the ten-frames, the class would count: ten, twenty, thirty, thirty-two. The register activity is not allocated a specific time in the BW daily schedule, but is expected to kick-off the daily morning routine (this includes a discussion of the date, weather and birthdays) which is common in Foundation Phase classrooms.

From Table 1 it is clear that not all treatment schools included the BW register activity during the October/November observed lessons. Further, the BW register, where used, was sometimes implemented in ways that suggested a poor understanding of the purpose of the task, which is to move learners away from counting in ones and enculturating them into counting in tens and ones. For example, in School D (Limpopo) in the May 2021 observation round, learners were called up to make their marks on the BW register. After everyone made their mark, the teacher asked one learner to use the register to enumerate the number of learners present. The learner pointed to each mark on the ten-frames and counted in ones from one to twenty-seven and then stated his answer as 27. The teacher did not encourage the learner to use the ten-structure of the resource to enumerate more efficiently, but rather allowed him to count in ones (an inefficient and error-prone strategy) and praised him for counting correctly. In the first lesson observation at School D in October, there was no attention to enumerating the total after the learners present had placed marks in the register poster. In contrast, in the first lesson observation at School E (WC) in November, learners seemed able to say the total present [14] immediately without counting in ones.

During the October/November teacher interview at School C (Limpopo), researchers asked the teacher why the BW register activity was omitted on both observation days. The teacher replied that it was the teaching assistant’s job to do the Bala Wande register, not hers; she was responsible for the DBE register. While this teacher’s response points to a poor grasp of the value of the BW register activity within the implementation of BW lessons, the Teaching Assistant at this school also noted that poor punctuality made the register activity hard to run. We return to the broader issue of developing learners’ base ten thinking in Section 4.4.3.

On the mental maths side, Table 1 shows the presence of a mental maths activity at all treatment schools observed during the October/November observation period. Whilst mental maths formed part of each lesson observed, the manner in which this was done varied across treatment schools and across consecutive lessons at schools. In many treatment schools the teacher used her own mental maths task rather than
the one set out in the TG for the particular lesson or used the mental maths task in the TG in a superficial way. Exemplifying the former, on the first day of observation in School F (WC) the teacher’s mental maths task consisted of forward and backward counting in ones in the 1-20 number range, identifying particular numbers on the 1-20 number line, giving the number after/before/between numbers and additive tasks (oral) in the 1-10 number range; this was followed by learners using multilink cubes on the mat to show tens and ones in teen numbers (‘focus group’ work); and for individual work learners were asked to complete the number before/after task in the BW LAB for Term 3 on page 11 (Week 2, Day 2) and 13 (Week 2, Day 3). According to the BW TG for Term 3, the mental maths task linked to Week 2, Days 2 and 3 is the same, that is, ‘Practice bonds of ten using your number bond flash cards’. During the teacher interview the teacher was asked about her choice of mental maths activity because it did not follow the task set out in the TG. The teacher replied that she did not use the BW mental maths task because she felt that many of the BW tasks were repeated and were, therefore, unnecessary. She further added that learners were lagging behind in terms of content coverage, and thus her selection of tasks was based on what she thought learners needed to know for the following grade. Whilst the mental maths task used in this case differed to that set out in the BW TG, it should be noted that the task did not seem haphazard; it showed a clear connection to the individual written tasks, as both focused on identifying numbers before/after/between particular numbers.

4.3.2 USE OF MATERIALS

The instructional core continues to be a key area of concern in early grade mathematics, with evidence of gaps in teachers’ content knowledge, a lack of coherence in instruction, and work with manipulatives also pointing to evidence of constraining learning.

There were many commonalities in the range of instructional materials being used in treatment schools (see Table 5). The BW LAB and an exercise book were used in all schools while the DBE workbook was used in all schools except School B (EC).
### Table 5: Teachers’ work with instructional materials in Treatment schools

<table>
<thead>
<tr>
<th>School</th>
<th>Schw</th>
<th>LAB</th>
<th>TG</th>
<th>Charts</th>
<th>Assess</th>
<th>Workbook</th>
<th>Exercise</th>
<th>Work-sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>EC</td>
<td>✓</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>✓ Hwk</td>
<td>✓ + HL</td>
<td>X</td>
</tr>
<tr>
<td>B</td>
<td>EC</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>lim</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>D</td>
<td>lim</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>E</td>
<td>WC</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓ Hwk</td>
<td>✓ + HL</td>
<td>X</td>
</tr>
<tr>
<td>F</td>
<td>WC</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Even though the instructional materials used in treatment schools were similar, how these materials were used varied across schools. At Schools D and E the BW LABs were completed sequentially and most tasks were marked, while Schools A, B, C and F used LABs selectively with varied marking amongst these. Differences in the use of BW LABs was thus evident across treatment schools in the Western Cape (School E sequential use and School F selective use) and Limpopo (School D sequential use and School C selective use). Similarities in the use of BW LABs in the EC treatment schools include: selective use of tasks and completion of tasks in LABs for homework. DBE workbooks were rarely used sequentially in treatment schools and were used more often for homework than the BW LAB.

Lesson observation and follow-up Interviews gave us access to teachers’ first-hand experiences with instructional materials. Many teachers routinely erased incorrect answers in LABs while they facilitated individual work, followed by either explaining something to the learner or giving the correct answer. At School D the teacher was asked if she was aware that some learners were simply filling in random numbers when completing the task and she replied, “They just write so that I leave them alone. I just rectify them.” Some teachers’ (Schools B, D and F) thought tasks in the LAB were repetitive, others said that they did not use the games because it took too much time (Schools A and B) while most teachers said they enjoyed using the LAB because it was colourful, the tasks were clearly set out and it “feeds you with the resource, before we had to improvise” (Teacher, School B).

There were also differences in the extent of reference to the BW Teacher Guide, with some teachers making no reference to the Teacher Guide in their work with LAB tasks, instead working directly with the LAB, while others made overt reference to the Teacher Guide document during lessons and used this in their selection and sequencing of tasks. At School B the teacher was observed using the TG during her lesson on money, yet she failed to refer to the BW poster linked to the lesson, even though it was up on the classroom wall (hence the cross after the tick). Treatment schools in Limpopo and the Eastern Cape reported using the Teacher Guide (amongst other sources) for instructional planning while treatment schools in the Western Cape used the ATP and their ‘usual methods’ for planning, rather than the Teacher Guide.

---

3 The first tick for using BW register and/or calendar; second tick for using BW chart provided for the lesson.
Exercise books were present in all treatment schools and how these were used also varied across schools and across lessons. For example, in School D’s May visit, the main mathematics writing activity involved simply writing a page of ‘7s’ in learners’ exercise books for more than 50 minutes, whilst the exercise book was not used at all during the two October/November lessons. Two treatment schools used one exercise book for both language and mathematics tasks while four schools used a separate exercise book for mathematics tasks. There were almost no indications of use of the BW dictionaries in treatment schools.

As part of the data collection, we looked at the number of pages completed across the Bala Wande, DBE and exercise books during the October/November classroom visits. This measure was taken for two learners in each class – one described as mathematically ‘strong’ by the teacher (Learner 1) and the other described as mathematically ‘weak’ (Learner 2). Counts of the number of pages completed by both learners in treatment schools yielded the findings and analysis shown below in Figure 3:

**Figure 3a: Completed pages in Bala Wande workbooks**

![Completed pages in Bala Wande workbooks](image)

**Figure 3b: Completed pages in DBE workbooks**

![Completed pages in DBE workbooks](image)
The graphs in Figure 3 show School E as somewhat an outlier when looking at the number of pages completed across both the Bala Wande (BW) and DBE workbooks. School E also had the smallest difference in the number of completed pages between the stronger and weaker learner, although we noted in this, and some of the other schools, that teachers sometimes guided the class to fill in answers as they completed tasks in a whole class setting. Exercise books included mathematical work in all treatment schools, and on this index too, School E had the highest number of completed pages.

Looking at the number of full and partially completed pages across the different texts for the stronger learner (Learner 1) offered a metric of the ‘maximal’ coverage across the treatment and control lessons. These results are summarized in Table 6.

### Table 6: Number of full and partially completed pages in Term 3 workbooks for Learner 1

<table>
<thead>
<tr>
<th></th>
<th>BW (full + partial)</th>
<th>DBE (full + partial)</th>
<th>Exercise book</th>
<th>Total pages</th>
<th>2 schools combined</th>
<th>Difference between schools</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eastern Cape</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School A</td>
<td>43</td>
<td>55</td>
<td>30</td>
<td>128</td>
<td>181</td>
<td>75</td>
</tr>
<tr>
<td>School B</td>
<td>42</td>
<td>[Not used]</td>
<td>11</td>
<td>53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control 1</td>
<td>-</td>
<td>89</td>
<td>37</td>
<td>126</td>
<td>198</td>
<td>54</td>
</tr>
<tr>
<td>Control 2</td>
<td>-</td>
<td>23</td>
<td>49</td>
<td>72</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Limpopo</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School C</td>
<td>51</td>
<td>48</td>
<td>36</td>
<td>135</td>
<td>227</td>
<td>43</td>
</tr>
<tr>
<td>School D</td>
<td>59</td>
<td>30</td>
<td>3</td>
<td>92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control 3</td>
<td>-</td>
<td>20</td>
<td>12</td>
<td>32</td>
<td></td>
<td>69</td>
</tr>
<tr>
<td>Control 4</td>
<td>-</td>
<td>8</td>
<td>29</td>
<td>37</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td><strong>Western Cape</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School E</td>
<td>76</td>
<td>83</td>
<td>56</td>
<td>215</td>
<td>247</td>
<td>183</td>
</tr>
<tr>
<td>School F</td>
<td>26</td>
<td>[not used in class]</td>
<td>6</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control 5</td>
<td>-</td>
<td>24</td>
<td>18</td>
<td>42</td>
<td></td>
<td>77</td>
</tr>
<tr>
<td>Control 6</td>
<td>-</td>
<td>34</td>
<td>1</td>
<td>35</td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

When looking at the total number of pages of work (full and partially complete) in the stronger learners’ books across treatment and control schools, it becomes evident that treatment schools in Limpopo and the Western Cape had substantially higher numbers of pages of work than control schools in the same provinces. The picture in the EC looks different – the total number of pages of work are comparable across the treatment and control schools.

What stands out in the EC are the stark variations between the 2 treatment schools and between the 2 control schools with regard to the total number of pages completed. Learner 1 at treatment School A completed 75 pages more than Learner 1 at treatment School B.
School B and Learner 1 at control School 1 completed 54 more pages that his/her counterpart at control School 2. This difference in the volume of written work produced by Learner 1 in treatment schools in the EC is echoed in Limpopo and the WC with a difference of 43 pages in the former and 183 pages in the latter.

This mixed picture makes it hard to draw straightforward conclusions on associations between work completion as measured by the number of pages across the various texts and learning outcomes. Ardington & Henry’s (2021; 2022) findings of better learning outcomes in the Eastern Cape and Limpopo BW schools in comparison to these two provinces’ control schools are associated here with lower and higher counts respectively of page completion.

Looking at the nature of work with the different instructional materials available in the control schools offered some interesting parallels and a sense of the range of sources being worked with in the ‘mainstream’ context. These results are presented in Table 7.

Table 7: Teachers’ work with instructional materials in control schools

<table>
<thead>
<tr>
<th></th>
<th>DBE Workbooks</th>
<th>Exercise Books</th>
<th>Photocopied Worksheet</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>✓ Homework</td>
<td>✓</td>
<td>✓</td>
<td>Sifunda, Izibalo, ATP Clonard Home Educ</td>
</tr>
<tr>
<td>2</td>
<td>✓ Sent home for revision</td>
<td>✓</td>
<td>✓</td>
<td>ATP and NECT</td>
</tr>
<tr>
<td>3</td>
<td>✓ In class &amp; as homework</td>
<td>✓ Not used often</td>
<td>✓</td>
<td>ATP and NECT</td>
</tr>
<tr>
<td>4</td>
<td>✓ Many tasks from DBE</td>
<td>✓</td>
<td>✓</td>
<td>DBE, NECT and ATP</td>
</tr>
<tr>
<td>Lim</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>✓ Only for reinforcement</td>
<td>✓</td>
<td>✓ Differentiated worksheets</td>
<td>ATP</td>
</tr>
<tr>
<td>6</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>ATP</td>
</tr>
</tbody>
</table>

Table 7 shows many of the same instructional materials being used across control schools and the varied use of these materials. 5 of the 6 control schools used the DBE workbooks in class and 3 of the 5 schools also used this book for homework. School 5 did not use the DBE book in class – the teacher preferred using worksheets as she could tailor these for different ability groups. The DBE workbook was only used for consolidation of concepts in School 5.

Whilst all control schools used exercise books, School 3 reported using them only minimally. Most of the work in School 4’s exercise books were photocopies of DBE tasks completed by learners and marked by the teacher. When asked about this phenomenon, the teacher struggled to explain the reason for this, except acknowledging that the class had enough DBE workbooks for each learner.
The teacher at School 1 (EC) drew on the largest number of extra resources and reported that whilst she used the recovery ATPs for planning as instructed, she much preferred using the Sifunda and Zibalo resources than the DBE book.

### 4.3.3 USE OF RESOURCES/MANIPULATIVES

All teachers said they enjoyed using the BW manipulatives and reported using them daily. The most common manipulatives used across lessons in all schools were the multilink cubes which were mostly used as counters. This pointed to a limited range of the manipulatives actually being used (see Table 8) – which reflected what we noted as the differences in condition of the manipulatives we saw in our school visits.

#### Table 8: Teachers’ use of resources/manipulatives in treatment schools

<table>
<thead>
<tr>
<th>BW Resources</th>
<th>EC School A</th>
<th>EC School B</th>
<th>Limpopo School C</th>
<th>Limpopo School D</th>
<th>WC School E</th>
<th>WC School F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number line</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Bead string</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multifix blocks (100)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plastic cup</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magnetic ten frame with counters</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-D shape attribute blocks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BW number cards 0-20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>BW dot cards 0-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>BW number name cards 0-10 HL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>BW number name cards 0-10 Eng.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own resource³</td>
<td>chart coins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For Learners</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 plastic cups</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 small bead strings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 dice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 multifix blocks to share</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>6 BW number cards</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 BW dot cards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 BW number name cards</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 plastic ten frames and counters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 chart⁴</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Treatment schools in the EC (Schools A and B) mostly used the multilink cubes from the BW resource box; the rest of the BW resources looked unused. Despite being told that BW resources were used daily, we did not see any manipulatives in use in School B during the 2-day visit in October 2021.

³ Not part of BW resource pack

⁴ Not part of BW resource pack
At Schools C and D in Limpopo, the multifix blocks and cups looked well used while other resources in the box looked unused. The teacher at School D communicated limited grasp of how manipulatives were supposed to work, particularly in relation to the idea of tens and units. When asked about which manipulatives she enjoyed working with in the resource box, the teacher said that she did not like any of them. By way of explanation she described the bead string as only having 10 beads which were not enough.

Whilst tens-based resources were used in lessons, these were often not used in a way that foregrounded reasoning in tens and ones. At School E (4 Nov, Day 1) learners used ten frames to do subtraction with bridging through ten. During the teacher’s interview, the teacher was unable to explain how the ten frames helped learners to complete the particular task, which indicated a poor grasp of how this resource was supposed to work. At the other treatment school in the WC (School F), the teacher used many manipulatives in her lessons – some were from the BW resource box and others were self-made. The manner in which Teacher F led learners to use the manipulatives – with learners seated in a circle on the mat, each with a brightly coloured A3-sized ‘place mat’ on which to work, all manipulatives kept in a recycled ice-cream container beside them, and an overt emphasis on tens and ones during working – pointed to a strong connection between her pedagogic and organizational capacities. The teacher demonstrated everything she wanted learners to do using demo-sized manipulatives, she used multiple representations to demonstrate a concept and made good use of mathematical talk in ways that connected well to her actions on the resources. The teacher at School F also extended the resources in the box by making numeral cards 11-20 for each learner. Despite doing very well with the resources she selected, Teacher F showed a poor grasp of the value of the bead string (a ‘newer’ resource) as a bridging resource between more concrete working with counting objects and the more abstract number line, stating that she did not like using these because the beads were tied (to the string) and therefore could not be separated.

### Table 9: Teachers’ use of resources/manipulatives in control schools

<table>
<thead>
<tr>
<th></th>
<th>EC</th>
<th>Limpopo</th>
<th>WC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>School 1</td>
<td>School 2</td>
<td>School 3</td>
</tr>
<tr>
<td>Counters</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Number line</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>100 chart</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Number cards</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Abacus</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number track</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subitising dots</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The most commonly used resource in control schools was counters made from bottle tops. This is similar to treatment schools where the multilink cubes, used as counters, were the most commonly used resource. The number line was used in 4 of the 6 control schools, and often seen pasted onto learners desks. Control schools in the WC made more use of manipulatives (9) compared to control schools in Limpopo (4) and the EC (7). A similar observation can be made at treatment schools: WC schools used 14 different learner and teacher resources while Limpopo schools used 5 and EC schools used 7.

This analysis showed wide variation in ways of working with the Bala Wande programme sequence in terms of lesson structure, use of instructional time, coverage in learner workbooks and use of instructional material and resources. Control schools also showed a lot of variation in how lessons were structured, coverage in learner workbooks and the use of instructional materials and resources. Overall, this suggests limited fidelity of implementation of BW during 2021.

4.4 TEACHERS’ ENACTMENTS OF LESSONS WITH BW MATERIALS PACKAGE

In the previous section, we noted the relatively limited fidelity of implementation across the schools in all three provinces. While in the last section, our focus was on the various ‘elements’ of the Bala Wande package, here, we consider teachers’ enactments of lessons in more holistic ways in the context of the particular constellation of materials that were used.

The slow pace of work in primary classrooms has been documented in South African research for two decades (Hoadley, 2018). As noted already, the Bala Wande recommendation is for 90 minute mathematics lessons each day, with a common structure for the teaching-focused Monday-Thursday lessons. We have already provided overview data showing that this lesson structure was infrequently adhered to, with few examples of instruction that followed the whole lesson plan, and within this, of coherent introductory explanation of the focal concept. There were extensive periods of individual working on a set of tasks, with the teacher (and teaching assistants in Limpopo and the Eastern Cape in October/November visits) marking, erasing and correcting work during this period. Early finishers simply sat and waited through this time, usually until the end of the period; no additional work was given to these learners to complete.

In this section we deal with three key phenomena seen, in different ways, across the Bala Wande classes.
4.4.1 LIMITED TEACHING OF HOW TO PRODUCE THE ANSWER USING THE CONCEPT IN FOCUS

A fundamental part of learning in mathematics is learning how to solve problems. While there was some variation, in the majority of lessons there was limited attention in the whole class activity to demonstrating how to go about solving the problems being worked with using the concept in focus in the task setting.

We give two examples of this. In School B, an initial introduction of different coins and instruction that the first task involved circling the correct coin, gave way directly to individual working on a coins task in the LAB (Term 4, Week 3, p23 & 24), with the teacher circulating and marking/correcting individual work. In the following lesson focused on p.25, we saw several learners unable to draw coins making up a given amount, and among the learners able to do so, there are answers such as 70c and 10c to make up 80c. In School C, the instructional explanation for the same coins task suggested that breaking down 5 fingers (which learners showed as representing 50c) into any two groups – e.g. 30c and 20c was acceptable as a way of putting coins together to make up 50c.

We have already noted that the BW tasks and manipulatives pay extensive attention to base ten thinking. Thus, the intention with many tasks is for teacher demonstration and explanation to focus on calculation strategies like ‘bridging through tens’ to solve addition and subtraction tasks such as $8 + \_\_ = 14$ or $11 - 5 = \_\_$. BW tasks such as the ones on page 2 of the Term 4 LAB include two ten frames representations to emphasise the idea of ‘making up to ten’ or ‘taking away to ten’. In several lessons, we saw these manipulatives (and multilink blocks) available and being used by the teacher and learners. However, in many cases, the ways in which they were being used tended to sideline the focus on bridging through the ten. In School D, in the first lesson observation in October, the teacher used the magnetic ten frames on the board alongside an adapted version of the part-part-whole diagrams in the book to go through the problems on page 2, Term 4 LAB – shown in Fig 2 below. Learners in the class had each been given 20 multilink cubes, but swapping of cubes between learners meant that they did not have two clear ‘ten’ sticks to work with, and no instruction to keep a ten stick whole was issued. The initial part of the explanation alongside the $8 + \_\_ = 14$ task is also shown in Figure 4.
Figure 4: BW Term 4 LAB, p2 task and teacher instruction

While a method for producing the answer is given here, there is no explanation for why the addition question involves taking away eight blocks. In subsequent individual follow-up, the teacher said to a learner:

‘I gave you ten blocks. You were supposed to not destroy (separate) the ten blocks I gave you. You should let the ten blocks stay intact.’

However this had not been stated before, and in the teacher’s demonstration on the board using the ten frames, her mixing up of the colours in making 14 makes it difficult to see the 8 ‘inside’ the 14 – see Figure 5:

Figure 5: School D teacher working with ten frame for 8 + __ = 14

In this lesson as in others, the teacher’s subsequent reminder to not ‘destroy’ the ten suggests an awareness of the strategy for themselves, but instructional explanations frequently fell short of communicating the concept in focus to learners clearly.
In School C, on the first day of the November observation, the teacher and TA demonstrated a BW addition game where each person counts to three, and then opens some fingers on their hands. Hands showing 5 fingers are matched across the two people to make 10 and the remainder are then added to the ten. In its playing out, the teacher demonstrates counting on in ones from the six fingers on her hand through the seven fingers on the TA’s hand, instead of focusing on making up the ten.

There was, therefore, evidence of a range of coherence in enactments, but across the majority of these, the logic and focus of the tasks in the LAB was either not in focus, or actively disrupted in instruction.

**4.4.2 POOR USE OF MANIPULATIVES**

Resources and representations are an important part of the Bala Wande package. As noted earlier, many of these resources are intended to support attention to number relations and base ten structure, as well as supporting moves between representations of early number concepts.

Connections between written, word and symbolic number representations were seen relatively frequently across the observed lessons, with learners asked to select, or come up and write the number that has been spoken of in symbolic form, or write it in words. However, work with some of the key base ten related representations tended to work against attending to the underlying mathematical concept. The ten frames, in particular, were often worked with in ways that disrupted the usefulness of this resource for focusing attention on ‘bridging through ten’ in calculations. Following the example from School D above, we saw in School E similar (mis)use of ten frame images in calculations that tended to rely predominantly on counting in ones, rather than using ten as a benchmark (see Figure 6). Here, a ‘doubles’ frame, rather than a ten frame, was used to demonstrate subtraction as ‘crossing out’ circles, and later moved to counting out and removing the ‘take away’ number of multilink cubes. While correct answers were produced through this approach, the problem-solving method tended to leave aside the task focus on ‘bridging through ten’ through crossing out circles in a specific order on ten frames. In the second example in this figure, 12 – 4 is depicted on a ten frame-like image (actually a 12-frame), negating attention to bridging through ten in the process of using the diagram in this way.
Figure 6: School E, teacher depiction of ten frames

The most fluent instructional use of resources was seen in School F where multilink cubes separated into ten sticks and loose cubes were used consistently with parallel working on a number line for addition and subtraction problems in the 1-20 range. However, in this class this teacher’s use of the resources was not linked to a specific Bala Wande task or lesson, with learners working on a range of different pages in the Term 3 LAB. Instead, the teacher described this choice as dictated by her sense of priorities related to working with using tens and units based counting for enumerating quantities in the 11-20 range.

4.4.3 FOCUS ON BASE TEN STRUCTURE AND NUMBER RELATIONSHIPS MORE GENERALLY

In the previous two sections, we have pointed to multiple examples of ways in which the BW emphasis on using base ten structure was sometimes disrupted in the context of instruction, producing the reversion into counting that has been documented so widely in South Africa. Given this, it was instructive to look at the control schools to understand the ways in which BW lesson enactments overlapped and differed from the enactments seen in these parallel schools.

What we noticed in undertaking this exercise was that there was much greater use of manipulatives like counters and bottle tops in the control schools in comparison to that seen in BW schools. While we noted that manipulatives like the ten frames were defaulted into use with counting in ones rather than using base ten thinking strategies, the presence of these ‘structured’ resources did appear to have supported increased awareness of the possibilities of more efficient strategies among the BW teachers. We saw several instances of this awareness in the BW schools in teacher’s communication of irritation at children unable to produce answers quickly, or as noted above, not realizing the need to bridge through ten. This awareness occurred though, largely in the absence of clear pedagogic moves to encourage working with base ten structure. In contrast, in the control schools, there was almost no mention of the need to work with tens, or to work quickly.
As noted already, it was in School F that we saw the most coherent and fluent reference to the construction and use of place value, shown through the use of multilink cubes linked with jumps on a number line. The whole class example space included children, having made 17 as 1 multilink 10 stick and seven loose cubes, being asked to add three more cubes. The ensuing discussion checked that the resulting ten loose cubes could be represented with another ten stick. We saw examples of counting on from the first number, but beyond School F, few instances of coherent teaching for base ten linked strategies, although we could see points where children were able to offer answers as recalled facts.

This lack of feature of base ten thinking in the control schools mirrored the lower presence of base-ten oriented tasks, representations and manipulatives in the control schools. Instead, in the control schools, there was more focus on ordinal relations (what comes before/after, though this was quite frequently linked with quantitative reasoning through being linked, for example, to heights or to word problem situations involving cardinal quantities). Of interest is the finding from Sapire et al’s (2022) work based on lesson observation of what they describe as ‘high agency’ teachers (n=19) that procedural counting (which seems to run parallel to what we would call quantitative reasoning involving enumeration of some quantity or measure) was also seen in their observed lessons. In summary then, given that BW places more emphasis on base ten thinking across tasks and representations/manipulatives, there is a more ‘distributed’ presence of working with ten as a benchmark in the BW lessons, with indications of some teacher awareness of the need to work with this aspect, although this is not coherently or explicitly integrated into instruction. Similarly, there was awareness that addition and subtraction are related in interviews, but mixed responses on whether BW’s presentation of addition and subtraction problems together was appropriate for Grade 1 learners. Nevertheless, in the vast majority of cases, addition and subtraction tasks were demonstrated with instructions to solve through counting as separate, rather than as linked tasks. A lack of linking was more marked in the control schools, with Schools 5 and 6 Oct/Nov observed lessons presented with a mix of tasks involving addition, subtraction and division, making it hard to discern if there was actually a concept in focus.
5. Conclusions
5 CONCLUSIONS

Looking at the take up and use of the BW programme in 2021, we can see that lesson enactments and interview data point to a largely resource-based orientation, with LABs, manipulatives and Coaches/Teaching Assistants/Subject Advisers all spoken about in positive terms by teachers and Heads of Department. In most schools, knowledge of the detail of implementation rested with teachers with few examples where detailed knowledge of the programme was communicated by either Heads of Department or Principals. Teaching Assistants in Limpopo were viewed in very positive terms by all school-based personnel, with largely positive experiences of BW training communicated by the Assistants themselves, with less enthusiastic comments about BW training from the teachers.

Teachers’ understandings of the concepts in focus in the BW teaching and learning materials remain fragile, but – as we have noted – there appears to be greater awareness of aspects such as the need for efficient working among BW teachers than among control school teachers. This leads us to suggest that more time is likely needed for BW to bed down as an initiative that extends beyond the resources it offers. Specifically, training in the context of increased familiarity with the BW tasks and resources can start to attend more consistently to the rationales and instructional repertoires needed for coherent teaching of the concept. This will involve time to focus on orchestrating instructional talk alongside the use of the BW representations and manipulatives in ways that show children how to produce answers to problems, and why some approaches are more efficient than others.

In terms of broader messages, the ubiquity of time in class spent marking and correcting individual work across BW and control schools is leading to extended periods of ‘dead’ time for many learners. Teaching Assistants help to cover the marking load, but an option to consider, given the relatively piecemeal inclusion of the game activities detailed in the Teacher Guide and in some of the videos, is to include openings for these activities to be worked with by early finishers in pairs or small groups. This would provide opportunities for learners to become increasingly familiar with the representations and resources in the BW package in more independent work settings, while also filling the dead time productively for many more learners.

Training in the Covid-disrupted 2021 year, necessarily in many ways, had to deal with getting teachers familiar with the models, materials and resources in the BW package. Our findings suggest that, over time, leveraging ongoing gains is likely to require a multi-year package of training that continues to bring teachers to the level of greater familiarity with BW, but starts to fill in with more of the mathematical underpinnings of tasks and task sequences, how they subtly differ over time in graded sequences, and what to listen for in learner responses. We have highlighted already the gaps in mathematical and/or pedagogical knowledge of the teachers in our sample, and the issue of teacher knowledge as a binding constraint on development in South Africa has been widely written about (Van der Berg et al., 2016). As resources become more familiar, improving learning through their use is thus going to depend on teachers who are able to appreciate the rationales for tasks, their presentations and sequence.
6. References
REFERENCES


