

FOUNDATION PHASE MATTERS:

LANGUAGE AND
LEARNING IN
SOUTH AFRICAN
RURAL
CLASSROOMS

Brian Ramadiro and
Kimberley Porteus

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Overview

Two decades after the first democratic election, the patterns of inequality in the landscape of public education in South Africa persist. The majority of children living outside of middle class contexts are not learning to read, write and work with numbers at grade level in the early years of education. While the top quintile of schools in general meet curricular aspirations, the performance patterns of the majority of schools are relatively flat, with little evidence of independent reading and writing by the end of Grade 3. These 'underperforming schools', representing upwards of 70% of the system, share a common typology: they were systematically neglected under apartheid, have low mean school socioeconomic status (SES), and predominantly serve children who speak mainly (an) African language(s), with little access to English at home or on the school playground. The point about English is crucial because, for as long national and provincial departments of education - in contradiction to language policy - continue to treat English as the default language of instruction beyond grade 3, as reflected practically in matters such as curriculum and learning and teaching support materials' provisioning, children who have not mastered enough English to learn through it as the only or primary language of instruction from the end of the foundation phase will continue to struggle to learn on grounds of language alone. Despite intentions, our system of primary schooling (re)produces learning difficulties, resulting in significant learning delays and a massive need, yet to be met, for remedial education programmes for a large number of our children. The work of educational change is made that much more difficult by persistent poverty,

unemployment and inequality. While the potential contribution of education to alleviating these socioeconomic challenges is frequently overestimated, it is hard to see how they could be resolved outside of a public education system capable of serving the majority of children.

The Nelson Mandela Institute (NMI) was founded in 2007, in response to research suggesting that education policy and practice were not, by and large, serving poor and rural schools (NMF, 2004; DoE, 2005). Starting late in 2009, and grounded in early formative work, the NMI established an intervention research architecture bringing together rural foundation phase teachers, teacher educators and researchers into a long term collective. The collective included approximately 70 teachers across the rural Eastern Cape, serving 2,500 children annually, from 2010 to the present. Combining theory and practice, the study asked whether it is possible to create a set of bilingual rural foundation phase classrooms, using the 'home language' or 'mother-tongue', and producing sustainable literacy and mathematics results over time. In our case, the languages involved were isiXhosa as the mother-tongue or most familiar community language, and English as the high status language. Framed by educational design research and focused on the universe of the rural foundation phase classroom, the study sought to better understand: a) instructional practices in rural and poor classrooms; b) the factors that reproduce them; and c) design principles that can be foundational in shifting practices. Amongst teachers, learners and parents, the work became known as the Magic Classroom Collective (MCC) – magic because teachers and children began to experience the magical acts of early reading, writing and mathematics.

This report summarises the intervention experience, the lessons emerging from it, and implications for policy and practice. The first sections of the report describe the literature and formative work contributing to the study design. The points of departure combine three premises. First, 'mother-tongue' based bi/multilingual education - a system based on using a child's strongest language(s) for teaching and learning - is the most effective strategy to build successful foundation phase classrooms in poor urban and rural South Africa. Second, the promise of mother-tongue based bi/multilingual education is currently undermined by an educational knowledge project (in the form of instructional tools and teacher support systems) that is not well aligned to the linguistic resources of the majority of children, nor to their instructional contexts. And finally, the generation of an educational knowledge

project more accountable to children's and teachers' linguistic resources and instructional contexts is likely to contribute to improved literacy and mathematics results, sustained over time, in foundation phase classrooms. The report brings these premises together into a framework for thinking about and accounting for educational change in the study.

The study is framed by educational design research methodology, within the broader area of intervention research. Education design research is 'the systematic study of designing, developing and evaluating educational interventions as solutions for complex problems in educational practice, which aims at advancing our knowledge about the characteristics of these interventions and the processes of designing and developing them' (Plomp, 2007:13). The study focused on three units of analysis: teacher instructional practice, learner performance outcomes, and intervention process design.

The baseline involved three activities: observation of instructional practice, an analysis of the perspectives and experiences of teachers, and an analysis of learner performance through the administration of a Grade 3 systemic evaluation in home language literacy and mathematics in 2007. The observation of instructional practice and analysis of teachers' perspectives and experiences were undertaken continuously across the study. In 2014, the Grade 3 mathematics assessment was re-administered and in 2015, the literacy assessment was re-administered.

At the heart of the study are iterative design cycles to develop an instructional toolkit for Grade R, 1, 2 and 3, calibrated and field tested within the social and linguistic context of rural children and their teachers. Calibration means that the materials place the primarily isiXhosa speaking rural child (and teacher) at the centre, holding theoretical assumptions accountable, in the first instance, to their linguistic and sociocultural context. Field testing ensures that ideas, tools and practices undergo the rigorous test of real classrooms. For each school-term cycle, tools are designed, developed, produced and distributed. Teachers are brought together to orient them to the tools, ideas and practices, and are provided with some support in the classroom. Teachers, instructional coaches and researchers talk and reflect about their use in the classroom, identifying lessons for redesign.

The most important findings of the study take the form of design principles.

The report presents the design process in three phases and discusses the process questions and the rationale underlying the emerging design principles. The design principles emerging from each phase of work are presented for home language literacy, English FAL, and mathematics.

The way classrooms looked, worked and performed in 2014 and 2015 is very different from the way they looked, worked and performed in 2007. In 2007, the mean Grade 3 learner score in isiXhosa home language literacy was 11.7%. By 2015, the mean score was 33.2%. The difference in means is thus 21.5%, a result which has a high degree of statistical significance ($p < 0.0001$). This represents an annual growth rate of at least 2.7%; in reality the growth rate is probably higher, concentrated in the latter years.¹ In 2007, the mean score of learners in isiXhosa-medium mathematics was 19%. In 2014, the mean was 56.0%. The difference in means is thus 36.9%, a result which has a high degree of statistical significance ($p < 0.0001$.) This represents an annual growth rate of at least 5.3%.² Rather than all learners being clustered below 20%, learning performance becomes more distributed over time, into a bell curve of sorts. The lowest performers (between 0 and 20%) have all but disappeared. There is an emergence of strong learners, with 11% of children scoring over 60% in literacy, and 44% of children scoring over 60% in mathematics. These, then, are becoming more 'normal' classrooms, with a much wider range of learner performance, some weaker and some stronger. In a system marked by a stubborn line of low-performance, these are promising results. The report assesses the limitations of these gains and opportunities for consolidating and building upon them. The degree to which these advances can be maintained or indeed increased, depends on several factors, chief among them being the depth of improvement achieved in teacher content and pedagogical knowledge, as well as the ability of the education system at the school and district institutional levels to provide the necessary ongoing support and leadership.

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- 1 Calculating an annual growth rate depends upon which year is considered to be the beginning of the intervention. Spreading these results across the entire 8-year span from 2007 to 2015, this represents a 2.7% annual growth rate. The work of the MCC only began systematically in 2010. If the growth is spread across these 5 years, it represents a 5.4% annual growth rate.
 - 2 Spreading these results across the entire 7-year span between 2007 and 2014, this represents a 5.3% annual growth rate. Given that the work of the MCC started systematically in 2010, if the results are spread across these 4 years, it represents a 9.2% annual growth rate.
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Adopting the approach of the ReSEP team (van der Berg et. al., 2016), the report concludes by using the experience of the MCC as a lens through which to identify and prioritise binding constraints in the system and to propose key interventions that could contribute to the transformation of foundation phase instructional practice on a wider system scale.

The first major binding constraint emerging from this experience is the alienation of the knowledge project serving education itself. 'Knowledge project' is used to refer to the intuitions, assumptions and methods that shape the traditions of educational research, curriculum development, teacher education and policy work. The critique of the knowledge project serving education is twofold. First, current educational expertise does not work through the languages of the majority of children and teachers. Second, current educational expertise is not sufficiently embedded within the day to day instructional practice of poor and under-resourced schools. The implications of these weaknesses are discussed across this report. An agenda for building a more embedded landscape of expertise, accountable to the contextual affordances offered by and constraints present in classroom practice in poor and under-resourced schools, will require a range of different strategies over time.

The second binding constraint emerging from the MCC experience is weak institutional functionality at the level of provincial and national systems. Described in more depth in the work of the ReSEP team (Spaull et al, 2016; van der Berg et al, 2016), this binding constraint speaks to the capacity of the educational bureaucracy to ensure minimal conditions for teaching and learning. The experience of the MCC focuses priority on weaknesses that impact teacher learner ratios and basic instructional resourcing.

The third binding constraint is the lack of a legitimate basis of authority for professional support. This relates to the basis of professional support and mentoring, as well as wider systems of support, for example, district and university based support systems. The lack of legitimacy reaches back to dehumanising systems of authority under apartheid, exacerbated by little contextually valid instructional expertise as well as the apparent limited success at instituting more humane and democratic forms of accountability during this period.

The final constraint is the combination of weak instructional practice (teacher content knowledge and pedagogical skill) and opportunities for children to

learn which are too often insufficient and of low quality, documented in the work of others in the past and in the work of the ReSEP team more recently. While functioning somewhat independently, these two aspects are closely related. This constraint is discussed across this report in some detail.

The experience of the MCC suggests that there are no simple solutions to shifting the instructional practice of foundation phase classrooms sustainably and on a large scale over time. Such shifts will take focused investments and on-going hard work. However, the MCC experience leads to a conclusion that is ultimately optimistic. The two most important suggestions emerging from it are that the system of education must be held better accountable to the language resources of the vast majority of our children, and the instructional contexts of teachers. The value of any investment made into the system will in the end reflect whether or not it is held closely accountable to these two domains.

The experience of the MCC is used as a lens to make eight recommendations for policy and practice centred on building bilingual instruction capacity in the system. Taken together, these recommendations contribute toward a policy level 'roadmap' focused on early learning success.

In 2016, the Eastern and Southern African Regional Office of UNICEF (ESARO) commissioned a review of the impact of language policy and practice on children's learning across 21 countries in the region (Trudell, 2016). The review affirms that use of language(s) with which a child is familiar for teaching and learning, particularly when supported by use of appropriate instructional methods and quality materials, significantly enhances learning outcomes, compared to the use of (a) language(s) that a child, and sometimes also a teacher, is not adequately familiar with. In more than 90% of the countries studied, language policy supports the use of local languages for instruction, particularly in the early grades of primary schooling. Classroom practice across the region however, 'does not generally conform to these pro-local language policies' and the 'lack of alignment between national policy and classroom practices in effect nullifies the policy's intended effects' (ibid: vii.)

The report supports the basic proposition emerging from this study. Simply teaching through a child's home language on its own, without adequately resourcing this form of instruction, will not translate into quality education. In order to realise the potential of mother-tongue based bilingual instruction, the education

system must invest into quality research, teacher education, and curriculum and materials development held tightly accountable to the linguistic contexts of children and their teachers. It is hoped that the experience of the Magic Classroom Collective, its starting points, methods, experiences and design principles, as well as the implications for policy and practice emerging from it, will contribute toward our collective understanding of the work required to build a system of education more accountable to the majority of our children.

Key Terms

The following terms are used purposefully across this report:

- *African languages*: South Africa is a multilingual country with eleven official languages and several non-official indigenous African and international languages (RSA, 1996). We use the term 'African languages' to refer to the nine official indigenous African languages.
- *Middle class children*: In the context of the bifurcated political economy of South Africa, these are largely children of the professional classes, with access to top quintile schools. They primarily speak powerful languages of power at home, viz., English or Afrikaans, or use a considerable amount of English or Afrikaans in their homes, communities or the playground.
- *Middle class schools*: Roughly the top 20% of public schools, charging relatively high school fees, known as 'ex-Model C' schools. Enjoying relatively high levels of learner performance, they reflect the following typology: historically privileged, high mean school SES, and at least 25% of children who speak English as a home language or as one of their home languages.
- *Mother-tongue Based Bi/multilingual Education (MTBE)*: An education system based on the use of a language or language(s) most familiar to the child when she or he begins schooling and for as long as needed. These are typically languages used in the home and/ or in the immediate community of the child. Additional languages are introduced as subjects. Additional languages may be used as languages of teaching and learning, in some combination with

the 'mother-tongue(s)' or largely on their own, when the child knows them well enough to learn through them.

- *Social and linguistic context*: The study focuses attention on the social and linguistic context of children and teachers. This phrase is used to focus attention on the socio-cultural, economic and linguistic differences between working class and middle class schools, the educational consequences of the major fault-lines of inequality in society.
- *Working class children*: In the context of the bifurcated political economy of South Africa, the term 'working class children' refers to the majority of children who live their lives outside of middle class social and educational privilege. These are children of the urban and rural poor, inside and outside the formal economy. The majority live and play in an African language, with little access to English written materials or spoken 'school-like' English outside of the classroom.
- *Working class schools*: Poor urban and rural working class schools, roughly the bottom 60% of public schools, not charging school fees. Marked by low levels of learner performance, they reflect the following typology: historically neglected, low mean school SES, and few if any children who speak English as a home language.

The Problem

1. INTRODUCTION

The Nelson Mandela Institute for Education and Rural Development (NMI) was established through a partnership of the Nelson Mandela Foundation (NMF), the University of Fort Hare (UFH), and the Department of Education. More than ten years after the first democratic election, there was growing concern about education serving rural communities. In 2004, the Nelson Mandela Foundation published *Emerging Voices* (NMF, 2004), focusing on the perceptions and experiences of rural parents and teachers. The book suggested that rural communities remained committed to public education but were increasingly concerned about educational developments in post-apartheid South Africa, believing them to be biased in favour of urban and middle class children. In 2005, the Ministerial Committee on Rural Education published another report (DoE, 2005) putting forward over 80 recommendations to improve schooling in rural areas, reflecting the analysis of a large number of academics and senior policy makers.

Both reports focused attention on the lack of systematic and sustained research to better understand the transformation of public schooling in rural communities. The establishment of the NMI was largely a response to these reports. The mandate of the Institute was to challenge current patterns of policy making, research and teacher education and development – patterns that seemed to stand at some distance from the reality of rural communities and schools. The mandate was activist in orientation, aiming to build ideas and tools to help

transform the system to some scale.

The first few years of work of the NMI was marked by a range of activities (from teacher development to community mobilisation) deeply embedded in rural schools and communities. Across this formative period, the team became increasingly interested in two areas of work noted in the two founding reports: classroom-based teaching and learning as well as the relationship between learning and language resources. The team was increasingly convinced that the educational enterprise was not well aligned to the social and linguistic context of the majority of our children and teachers. As such, rural teachers did not simply need 'more training', but rather a toolkit (material tools and pedagogical practices) that was better aligned to their classrooms. Our analysis was that the most important contribution we could make was to go back to dig new trenches: to establish the basis of a knowledge project more accountable to the children and their teachers.

During this period, the institute created a research and learning architecture bringing together researchers, lead teachers and rural foundation phase teachers into a long term learning collective. Framed by educational design research, the work sought to establish iterative cycles of inquiry accountable to the activity of rural foundation phase classrooms. The initial concept paper is entitled, 'Bilingual, Interactive and Differentiated Foundation Phase Classrooms' (Ramadiro, 2009). Amongst teachers, learners and parents, the work became known as the Magic Classroom Collective (MCC): 'magic' because many teachers and children began to experience success with reading, writing and mathematics. This monograph summarises the work, the lessons emerging from it and their implications for policy and practice.

2. WHAT IS THE PROBLEM?

By the end of Grade 3, assumptions about learning in schooling begin to undertake a radical shift. Regarding literacy and numeracy, up to Grade 3 the focus of teaching and learning is on learning to read proficiently and with some meaning, and building a basic sense of numbers. After Grade 3, the curriculum assumes that children can read and write with meaning in order to learn, and have a strong sense of numbers upon which to build more complex mathematical skills. Across the globe, when children are not supported to master a certain level of

literacy and mathematics before Grade 3, they are unlikely to succeed in schooling without intensive (often, individualised) remedial intervention (McCormick and Zutell, 2015). This The South African education crisis must be understood with this as the backdrop. The crisis is commonly understood and described using both national (Annual National Assessments) and international assessment (PIRLS, SACMEQ) results. An interesting new extension of this work is Pretorius and Spaul (2016), who undertook the first large scale analysis of oral reading fluency in English. Regardless of the assessment tool, the majority of South African children perform extremely poorly in reading, writing and mathematics in the early phases of primary education (Fleisch, 2008; Spaul, 2013b, 2010; Taylor and Yu, 2009; van der Berg, 2008). Beyond the low results across the system, it is characterised by a stark bimodal distribution (Fleisch, 2012; van der Berg, 2008; Taylor and Yu, 2009; Spaul, 2013a.) The wealthiest quintile of schools is producing some reading results, while the remaining schools are strikingly non-productive. The word bimodal is used to suggest that the current system of public education represents two distinct universes of schools – a small universe serving 20% of the nation’s children and a vast universe of schools serving the remaining children.

Using data from the Progress in International Reading Study (2006), Taylor and Yu (2009) explored the stark inequality through three indicators -- historic school typology (historically “white” vs. historically “black”), socio-economic context (individual and school SES), and language resources. The analysis articulates the profound differences between the two universes of schooling. The data confirm the conflation of indicators and the severity of the inequality which their combined effect produces. Across the world there is a well-known statistical relationship between a child’s socioeconomic background and a child’s educational performance. Children from middle and upper class homes, statistically speaking, have a much better chance at educational success than children from less advantaged backgrounds. In a graph, this is presented as a curve (an “SES gradient”) whereby educational performance systematically increases with a child’s socioeconomic status at home. The task of a democratic state is to try to flatten this curve – working to increase the chances for success, especially among children born into less resourced homes and communities.

The 1994 moment was celebrated for the birth of the “rainbow nation.” In reality, there are relatively few integrated schools. Schools that served “white”

children in the past (the “ex-Model C” schools) became integrated to some extent (the promised ‘rainbow nation’ schools), largely available to middle class children. This small subset of schools demonstrates a SES gradient; children from more resourced homes have a systematically better chance of performing than other children. Charging relatively high school fees, these schools continue to enjoy a relatively high average school SES, and have at least 25% of learners who speak English at home. The combination of these elements creates very specific (and unique in South African terms) conditions for language learning. First, historically privileged schools attract (and monopolise) the teachers with a strong command of English. Second, due to language hierarchies, with at least 25%³ of children speaking English at home means that English becomes an important language of communication between learners – in the classroom, outside the classroom, and on the playground. This establishes a distinct and important context for informal language learning, in particular for those children who do not regularly use English at home. Unsurprisingly, teaching through English by English-proficient teachers produces some results in this context. While the results still disadvantage poorer children and children who do not speak English at home, the schools enjoy a sense of educational success.

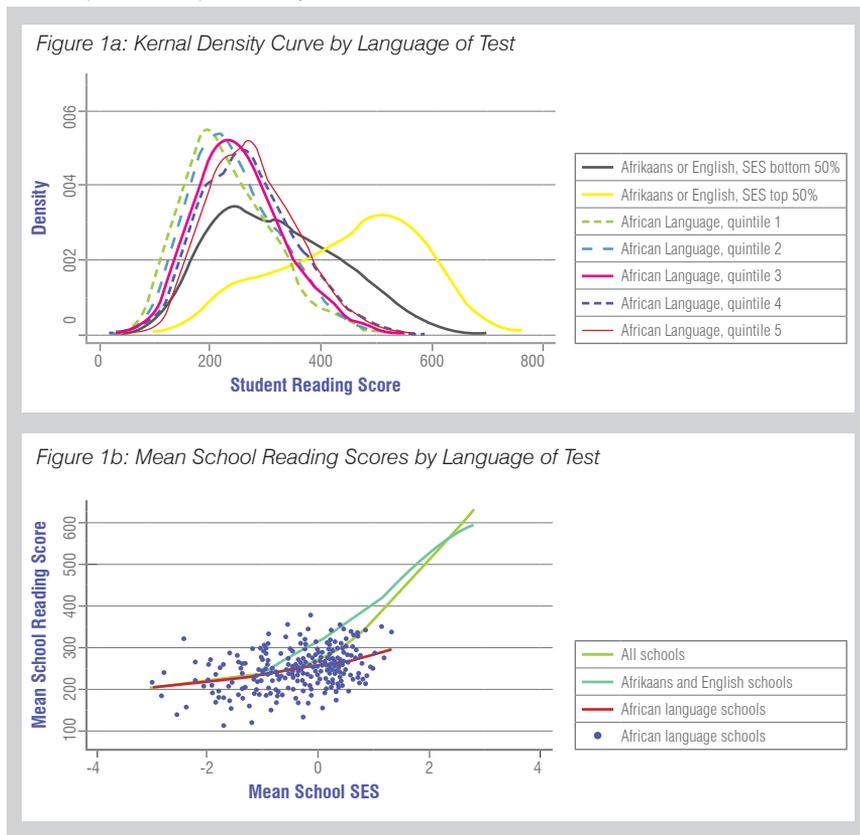
The vast majority of schools, however, have very different language affordances and therefore operate quite differently. The vast majority of “historically black” schools remain segregated by default and continue to primarily serve black poor and working class rural and urban children, who predominantly speak (an) African language(s) at home. Taylor and Yu’s work suggests that in this context, whether or not a school teaches through English or an African language in the foundation phase, in general it does not produce good reading results. The relationship between a child’s home SES and educational performance is relatively flat. This means that children in these schools have an equal chance of failing regardless of whether English or an African language is a medium of instruction. Taylor and Yu could not identify any school of this typology (low school SES, less

3 Taylor and Yu (2009) simply used 25% as a cut off. It may be that the tipping point to differentiate language contexts is not exactly 25%. The point is that once a critical mass of children in a school speak English at home, it produces an environment whereby English is spoken naturally in a peer context. This creates specialised learning conditions, not available to the majority of South African schools.

than 25% English speakers, historically black) that scored above a low minimal benchmark reading score (see Figure 1-b.) That is, they could not identify one sustainable outlier. The conclusion is that the schooling, or education, system as a whole, is not equipped to support poor rural and urban children to succeed.

The work of the NMI became focused on understanding schools in the lowest quintiles (see arrow, Figure 1a). The vast majority of rural schools in South Africa are located in the lowest quintiles (the lowest average school SES). The team was interested in the simple question: if there are currently no sustainable outliers, what would it really take to turn around a cohort of these poor urban and rural schools?

Figure 1: Performance, Socio-Economic Context, and Language Resources (Taylor and Yu, 2009. Reprinted with permission)



3. LOCATION OF THE PROBLEM

There is a rich literature attempting to understand the source of the marked lack of effectiveness of foundation phase classroom teaching for the majority of children in South Africa. One interpretation of the basic bimodal graph is to suggest that expertise in the system is concentrated in wealthy schools and therefore the way to transform the system is to better share those skills and capacities with teachers serving poorer schools. That is, because teachers in middle class schools have stronger content and pedagogical knowledge, these ought to be shared better throughout the system. This analysis locates the problem on the ground: in poor schools, at the levels of teachers and principals. This analysis leads to the suggestion that the system simply requires more investments into (more of the same) knowledge base and teacher development initiatives, especially in poor schools. This has been the implicit assumption behind a massive proliferation of teacher development initiatives since 1994, harnessing established expertise to undertake more training on wider scales.

An alternative interpretation is that the severity of the data patterns challenge this as a starting point. If the knowledge base and teacher development infrastructure underneath the performance of middle class was equally valid in poorer schools and communities there should be a large enough sub-set of schools *systematically rising above* the disadvantages of the past, to which we could turn for lessons and likely answers. Teachers and principals could be held accountable to the practice of these schools, and the expertise that has guided them there. However, given that the overwhelming majority (almost without exception) of previously disadvantaged schools serving African language speaking children is not performing, it is unreasonable to hold that teachers in these schools are simply dysfunctional; there must be another source of the problem.

The patterns of performance point to an alternative hypothesis. An alternative hypothesis suggests that the problem is rooted within the educational expertise guiding the system. That is, top quintile schools perform so much better *because* the educational expertise dominant in the system is well aligned to the educational context of top quintile schools. By and large the research, curriculum, teacher development and policy work informing educational practice is dominated by educationists largely embedded within the educational context of top quintile

schools. Teachers in the majority of schools are not failing because they do not have the expertise of top quintile schools, but rather because they have not been provided with research, curriculum, policy and teacher development that is well calibrated to the context of the majority of schools. The alternative analysis is that the dominant educational expertise successfully serving the top quintile of schools is not yet serving the majority of schools, and may even inadvertently be holding back the majority of schools in some way.

4. EARLY OBSERVATIONS: THE DATA IN THE WORLD

In its early work, the NMI undertook a number of activities to better understand the landscape of rural schooling. This work informed our approach and understanding of the data patterns presented above. As relationships with rural teachers deepened, friendships emerged, classrooms were visited and conversations unfolded outside of formal engagements, the team learned more about the experiences of teachers and refined its analyses of the ‘problem(s) behind the problem(s)’.

The team focused on teachers’ understandings and practice in relation to language and literacy development in their classrooms. Children in their classrooms speak isiXhosa, with little access to English in their home and community lives, a context largely shared by teachers. As we engaged with teachers about literacy, there were several observations which we found ourselves making repeatedly. First, teachers found it difficult, on the one hand, to distinguish between the development of spoken language and of literacy, and on the other hand, to identify and take advantage of interdependencies between the two. Second, for purposes of teaching and learning, teachers made little distinction between language and literacy development in the home language (HL) and in the first additional language (FAL) and therefore between pedagogical strategies appropriate to each. From a HL point of view, a consequence of this is that the potential role of HL to contribute to general cognitive development and acquisition of literacy skills and habits is diminished. Thirdly, teachers were uncertain about what success for HL and FAL literacy, grade by grade, looked like in the foundation phase.

In theory, the decision about a school’s language of teaching and learning rests with a school governing body (RSA, 1997). One or two schools claimed to

teach through the medium of English in the foundation phase. In our observation of classrooms, we found that, at best, teachers taught bilingually through English and isiXhosa, given that children understood very little English. While using English-based materials, teachers and learners engaged in complex code-switching and/or trans-languaging practices (Setati and Adler, 2000), many of which were not structured to assist learners to develop English language content or proficiency, nor to expand home language resources systematically. The desire for English as a medium of instruction appeared to have undermined teachers' and schools' ability to distinguish in practice between home language literacy development and English *language* development. Across Grade 3 classrooms, there were few (if any) learners who read independently.

The schools that taught in and through isiXhosa were also having little success. Teachers had little understanding of how to build early literacy programmes in order to foster independent reading and writing. Much of the HL literacy programme consisted of drills around a limited set of phonic patterns and repeated choral reading of a small set of texts. Little or no classroom time was spent on reading comprehension and interpretation activities and writing activities consisting almost exclusively of copying from the chalkboard. To the extent that literacy was taught, it was largely focused on copying words off the board. While some teachers engaged children in a narrow set of board-based phonics exercises, there was a weak connection between these activities and independent reading activity. Teachers wondered out aloud whether in poor rural schools and in the foundation phase it was at all 'fair' to expect a child to learn to become an independent reader and writer.

5. THE PROBLEM BEHIND THE PROBLEM: LANGUAGE AND SOCIO-ECONOMIC CLASS

These early observations supported the emerging hypothesis that the problem behind the problem is not simply a lack of skill or motivation among teachers in poor schools. A more accurate description of the problem behind the problem may be that teachers have not been provided with ideas and tools that are truly workable in their classrooms on a sustainable basis. Said another way, the team began to suspect that the 'knowledge project' in education is not well aligned to the social and language resources of the majority of poor and working

class children and their teachers. There are two elements of the critique. The first element focuses on the linguistic resources of children and teachers. The critique is that the knowledge project implicitly works from an English speaking normative social universe and starting points, and does not field test or generate enough research placing African language children and teachers at the centre. As such, our ideas about literacy and mathematics do not build upon the language resources of African language speaking children and teachers. The second element focuses on social class and its relation to education. The critique is that the knowledge project implicitly works from a more middle class schooling context, underestimating the exigencies of the poor and working class, deeply rooted in historic neglect and the marginalisation of communities and schools.

The notion of a 'knowledge project' is used to refer to the ideas, assumptions and practices that frame the educational enterprise and that ultimately shape the work of teachers in their classrooms. It is expressed through research, curriculum, teacher development practices, and in policy (defined broadly to include legislation, regulations and guidelines). The suggestion is that the educational expertise of the current educational knowledge project is not embedded well enough (linguistically, methodologically, and otherwise) in the context of the majority of children and their teachers. Acknowledging a range of other influences on educational success, the team hypothesised that a knowledge project better aligned to the social and linguistic contexts of children and teachers will make a greater contribution to educational performance in foundation phase classrooms (Alexander, 1999). From this perspective, the low levels of productivity and motivation of teachers in their classroom are largely regarded as a result, rather than a cause, of chronic failure. As such, to improve teacher motivation in the end is dependent upon a knowledge project (curriculum and teaching tools) that provides stronger scaffolding for success.

6. HYPOTHESIS CONFIRMATION: THE MISS BRIAN YEAR

In 2008 a senior lead investigator of the team, Brian Ramadiro, taught for a year and a half in a Grade 3 isiXhosa HL rural classroom, living with the question: What would it really take to create a successful classroom in the context of rural schooling, and what are the minimal conditions required to make it work? At the time it was still uncommon for males to work in the foundation phase in rural

schools, so children sometimes addressed Ramadiro as 'misi', probably derived from the English 'Miss', an accepted term of address for a female teacher.

A starting point was that teaching is more difficult in communities with weak traditions of school-like literacies and materials to support literacy development, than it is in middle class contexts. While recognising that resources, on their own, do not produce instructional transformation, the team did not, however, set out to build a model of classroom practice that requires no teaching and learning resources. We believed that carefully selected teaching and learning resources were essential in the context of text-poor schools.

Drawing upon literacy research (Temple et. al, 2014), a classroom with the essential teaching and learning resources was set up. These provisions were aligned to CAPS expectations (DBE, 2011). Through a methodology of community mobilisation known as *ilima lokufunda*⁴, we came together with communities to clean and refresh foundation phase classrooms.⁵ Walls were painted with colour: a physical confrontation with the dreary wear and tear dominating the aesthetic of classrooms. Modest child-friendly furniture and educational provisions conducive to literacy learning were acquired.⁶

4 *Ilima* is an isiXhosa word referring to households coming together to assist each other during planting and harvesting seasons. Here *ilima lokufunda* refers to a work-party with a goal to create physical conditions conducive for teaching and learning.

5 Expecting poor parents to volunteer their labour in the context of public schooling is not without its dilemmas. Manual labour (skilled and unskilled) represents an important resource for accessing paid employment. In middle class schools, schools often pay for these services. In communities with a high unemployment rate, why should poor parents volunteer these, their only tradable skills? In order to mediate these contradictions, it became exceedingly important that these days were framed by a notion of solidarity, whereby principals, teachers, academics, learners, youth and teachers worked hand in hand.

6 Heavy desks were replaced with lighter moveable stackable tables and chairs. A larger desk established a professional corner for the teacher. Cubby holes provided individualised space for children to take care of their curricular resources. Chalkboards were moved lower on the wall so that teachers and children could both use them. A book case with a hard plastic door enabled children to see and retrieve books from their classroom library. A large mat (carpet) could be rolled out for story time and other activities. Pin boards enabled teachers to display learner work.

Figure 2: Ilima lokufunda: Before and After



We did not design curriculum in preparation for the teaching year. The initial intention for the year was to rely on materials used by the teachers as a starting point, and build upon them across the year. We asked teachers to share their teaching and learning resources with us. They were exceedingly limited. They included sets of workshop notes, hand-outs, and a few trade books. Put together, it was a poor base on which to teach. Teachers must have had their own sense of how these sets of materials came together to make up a teaching year, but found it hard to explain assumptions and logics underneath these sets. We also reviewed isiXhosa literacy materials available from well-known publishers, selected some stock for the classroom, and drew upon these materials.

As Ramadiro worked his way through this period, he reached several overarching conclusions about the available materials. He concluded that much of the available materials had been written in English, and back-translated to isiXhosa, and as such were not based on the linguistic logic of isiXhosa. They did not take advantage of the home (oral) language resources of children in isiXhosa as the basis to build reading and writing skills. Second, taken together they did not constitute a balanced reading programme guided by contemporary reading research (Pressley, 2006). There was no set of materials that combined a whole reading approach with systematic language skills (phonics, grammar etc.) in

isiXhosa. There was no truly bilingual instructional toolkit, building home language literacy and balancing it with English acquisition.

The year was challenging. The most difficult part of the year was the social environment of the school. The relationship between teachers and children was too often mediated through corporal punishment. With no cleaning staff, for example, children spent an inordinate amount of time cleaning, often under the threat of corporal punishment. Teachers largely avoided their classrooms. They often came late and left early. The Grade 3 class was often the only one still in session after lunch. Breaks took longer than scheduled. Teachers spent long periods of times sitting in their cars with each other. There were tight cliques, and tensions between these cliques. The day to day talk between teachers was rarely about teaching. Some teachers were supportive of the work, others watched suspiciously. It became increasingly clear that the challenge of supporting teachers to shift their practice was not limited to expanding teaching practice at an individual level; without building alternative communities of practice, supportive of change and inspired by the challenge of teaching itself, teachers were unlikely to achieve or sustain new patterns of practice over time.

This period established three starting points. First, the basic material conditions conducive for success were not in place in most schools. Second, the required knowledge or 'technology' (curriculum, instructional ideas, materials and tools) was faulty. Finally, the professional support required for success (teacher development, classroom support, teacher professional networks, and district level support) was fragile. This period suggested that these conditions were mutually generative – there would be no sustainable gains unless they were understood as an integrated whole.

By the end of the 'Miss Brian Year', the NMI was under pressure to undertake teacher training on a wide scale. We became increasingly convinced that the chronic problems confronting poor rural schools were located, in the first instance, in the lack of valid knowledge and tools through which to support the transformation of instructional practice in this context. As such, simply 'more of the same' teacher training or curriculum distribution was unlikely to produce different results. Before engaging in more training on a wider scale, we were convinced that we had to go back and dig new trenches: to establish the basis of a knowledge project more accountable to rural children and their teachers.

Research Design

1. INTRODUCTION

From 2009/10, the NMI began to restructure its work to establish a new research and learning architecture for knowledge generation. We created this architecture by bringing researchers, lead teachers and rural foundation phase teachers into a long term interactive collective, drawing from educational design research methodology. We have sweated it out with approximately 80 rural Foundation Phase teachers serving over 2,500 learners in the rural Eastern Cape, building the practice, systems and bi/multilingual tools to expand quality teaching and learning practice over time.

The primary site of this study is the classroom itself, with a special interest in instructional interactions between teachers, tools and children. While most policy research locates itself at higher levels of the system (national and provincial), this study locates itself in the classroom, and peering upward, asks what is required of the higher levels to serve the universe of classroom practice.

2. RESEARCH QUESTIONS

The overarching research questions guiding the longitudinal intervention design research were:

Working at the level of the classroom, and combining knowledge from theory and classroom praxis, *is it possible* to create a set of mother-tongue based isiXhosa-English bilingual rural foundation phase classrooms producing

sustainable literacy and mathematics results over time? If so, what does it take to do so?

- What can be learned through this process about instructional practices in these classrooms, and the forces and factors that reproduce or restructure them?
- What are the design principles emerging for curriculum and in service teacher development to contribute to classroom level transformation?

3. POINTS OF DEPARTURE

The point of departure of this study combines the following premises:

- Mother-tongue based education - a system based on using a child's strongest language(s) for teaching and learning, in particular for the first six to eight years of school - is the most effective model to build successful foundation phase classrooms in poor urban and rural South Africa;
- The promise of mother-tongue based education is currently undermined by an educational infrastructure and knowledge project that is not well aligned to the linguistic resources of the majority of children and their teachers, nor the instructional contexts.
- The generation of an educational knowledge project (especially instructional tools and teacher support systems) that is more accountable to the language resources of African language speaking children and the instructional contexts of their teachers *can contribute* to increased and sustainable literacy and mathematics excellence in foundation phase classrooms.

4. PURPOSE

The overarching purpose of the study was to co-create a set of demonstration classrooms, and extract generative design principles. Three sub-goals were pursued.

1. **Literacy and Mathematics Curriculum Development:** to design and field test instructional tools calibrated to the social and linguistic context of African language speaking children and their teachers.
2. **Teacher Development and Support:** to experiment with models for teacher

professional development and support workable in the context of rural primary schools;

3. **Method:** to contribute to an understanding of process and method, considering how curriculum development, teacher development and support can come together methodologically to promote the development of quality primary schooling in rural South Africa.

5. CONTEXT

The notions of linguistic and socio-cultural context are central to this study. They deserve some explanation. The critical idea across this study is not the significance of the nuance of every socio-cultural variable. In other words, we are not advocating that the key to change in the system lies in catering to the detail of socio-cultural contexts in any kind of postmodern sense. Socio-cultural and linguistic contexts are used in so far as they help us locate or, at least, point to, the major fault-lines of inequality in the system of public education in South Africa. The major fault-line frames the bifurcation of the public education system, between the 20% of schools that are performing to some extent ('middle class schools'), and the remainder of schools, which remain largely unproductive ('working class schools'). Middle class schools share particular linguistic and socio-cultural contexts. Relatively privileged under apartheid, these schools have relatively high mean SES, over 25% of children who speak English in their homes, and teachers who are proficient users of English. The majority of children attend working class schools and have a very different linguistic and socio-cultural profile. Deeply undermined under apartheid, these schools have low mean SES, little historic success, serve children with little access to English at home or on the school playground, and, too often, some teachers in these schools are not proficient users of English. For these reasons alone, it must be obvious that not all solutions that work in the 'middle class' 20% of schools will work in the rest.

The work is located in the rural Eastern Cape province of South Africa. The schools in the MCC form three small clusters, one in each of Mbizana, Mqanduli and Qunu. The notion of rural is not oppositional to urban, nor are rural spaces separated from urban spaces in any essentialist way. A long history of cyclical migration among both adults and children continues to mediate social continuity between these geographic and social spaces. The many newly established

informal settlements outside of major cities and towns across the country are a concrete instance of this continuity. However, rural communities and schools are at both an epistemic and physical distance from the centres of political power, in places whose voices and experiences have little influence on policy. While cyclical migration continues in rural communities, outward migration of education talent is a strong trend, with the result that rural schools have become the least capable set of schools to mediate and naturalise post-1994 educational policy and curriculum in their own settings. Chronic failure, combined with systematic neglect by the system, has shaped their recent histories of school management, their teaching and learning culture, and their expectations of what schools are.

The work places rural children at the centre, children who speak and play in an African language, with little access to English in their day to day lives. In our case, this means children who speak isiXhosa, who have little access to print materials at home, little access to quality ECD services, and few opportunities for joyful interactions with print outside of school. While children have learned to speak isiXhosa before they begin school, in general they have had little opportunity to develop the school-like language associated with regular access to print material in the home and/or in a quality pre-school programme. The parents of such children do not have many strong and positive experiences with schools, or a shared culture of learning with schools.

The work also places rural teachers at the centre, teachers are who are, at the very least, bilingual in isiXhosa and English. However, often they are not so-called 'balanced' bilinguals (Baker, 2006), with equal control of both their languages. While teachers (have to) conduct much of their written professional communication in English and their speech often is peppered with English, they rarely use English-only with colleagues, friends and family, in their homes or communities. Like other teachers in comparable contexts in South Africa, their instructional practices tend to be authoritarian, teacher centred, and based on rote-learning (Hoadley, 2016). Such instructional practices are discussed throughout this report.

6. SIGNIFICANCE

Fifteen years after the advent of democracy, Taylor and Yu (2009) could not identify any low-SES 'historically black' primary schools producing sustainable reading results above a low minimal benchmark. While there was rich

literature speaking to the crisis and suggesting solutions to the crisis (discussed below), there were no longitudinal intervention research programmes combining researchers and teachers that had *demonstrated in practice* how to turn around foundation phase classrooms in poor and rural communities. As summarised by van der Berg, et al (2016:51), ‘unfortunately there have been almost no success stories, at least in terms of improving reading outcomes verified by a rigorous evaluation’. Moreover, while there was a small but important research community focusing on the importance of African languages in South African primary schooling (prominent and influential is the work of PRAESA in early literacy, led by Carole Bloch (e.g., 2002; 2000), there are no longitudinal attempts to apply bilingual language theory systematically to the entire enterprise of foundation phase classroom teaching. This study seeks to contribute to the existing literature an interventional approach that is rigorously tight and answerable to praxis. In the domain of foundation phase teaching and learning in South Africa, there are few research architectures that bring research capacity together with teachers in systematic iterative cycles of work over time, accountable to shifting the literacy and mathematics results of children, unbound from the limitations of short-term projects. The study is rooted in, and seeks to help resolve, the crisis in primary schooling described above.

School Improvement Literature

1. INTRODUCTION

In her comprehensive review of classroom-based research in the Foundation Phase in South Africa, Hoadley (2016) concludes that a research tradition of empirical classroom-based research in South African education is extremely limited, both in scale and methodological design. Research that has attempted to identify relationships of causation, have, in the main, suffered from a range of methodological weaknesses, and have been challenged by the complexity and inter-relationships between 'variables' that impact the daily workings of a classroom.

Despite these limitations, Hoadley argues that the simple consistency of findings across large- and small-scale studies in South Africa and other developing countries, enables us to describe the prevalent day to day practices in classrooms of the poor and the working class. Across the literature there is an overwhelming concern about the ineffective use of instructional time, the lack of opportunities to learn; the 'communalising' of pedagogy with weak evaluative practices; the lack of reading and writing opportunities; weak teacher knowledge (content and pedagogical); slow pacing and low cognitive expectations; the lack of print material and effective teaching tools in the classroom; the lack of differentiated teaching and low levels of teacher motivation and morale (Ensor et al, 2002; Hoadley, 2016, 2003; Hoadley and Gallant, 2014; Nag et al, 2014; Schollar, 2008; van der Berg et al, 2016.)

There is broad consensus on a combination of factors needed to improve

classroom practice: the better use of instructional time and expanded opportunities to learn; greater curricular coverage, including pacing, progression and planning; a stronger priority placed on reading and writing through balanced literacy instruction; more meaningful and differentiated feedback to learners and stronger teacher knowledge and commitment (Hoadley, 2016; Pretorius, 2014; van der Berg et al, 2016.)

While there is some common understanding of the look and feel of the classrooms and ideas about what they could look like, there is much less available intervention-based research that concretely demonstrates the possibilities of moving from here to there (Hoadley, 2016; van der Berg et al., 2016). In Hoadley's (2016:9) words, 'there is consistency across studies of teaching and learning, across developing country contexts, around what is going on in classrooms, and there is great similarity in relation to pedagogic forms found. There is some but very limited evidence around interventions that work in these contexts'.

2. TWO MAIN TRADITIONS

There are two main traditions of research that have historically grappled with the question of school improvement. School effectiveness research has attempted to take advantage of large scale learner performance data to consider the educational production function of systems. Beginning with the ground-breaking work of Coleman (1966, et al) and his colleagues in the 1960s, this work has helped us better understand the systematic role that socio-economic inequality has on patterns of learner performance. Controlling for SES, school effectiveness research attempts to identify what else makes a difference. Over the past 15 years a number of South African studies have taken advantage of available large scale data sets to give us a broad understanding of the landscape of inequality in the system (Spaull, 2013a, 2013b; Taylor and Yu, 2009; van der Berg, 2008). Across the world, these studies have contributed to our understanding of the system, but have been less able to contribute to our understanding of how to change them. First, they are inherently limited by the confines of consistent measurability. While some inputs are relatively easily measured (school SES, governance), most classroom related pedagogical activity is less easily isolable for measurement. This work often tells us little about processes of teaching and learning and therefore offers little insight at the

chalk-face. As highlighted in the work of Raudenbush (2005), there is a growing recognition of the limits of conventional input/output models of change. Learner outputs are not produced by isolated inputs into the classroom or school, but rather by how these inputs are used, in other words, by instructional practice. As such, the unit of analysis is not so much measurable indices of input and output, but rather a situated and nuanced understanding of instructional practice, and the factors and exigencies that either reproduce or restructure them (see Fleisch and Schoer, 2014).

The second set of studies that have grappled with classroom level change comprise a variety of school intervention approaches. In her review, Hoadley (2016) reviewed the intervention oriented school improvement studies and her most important conclusion is that there is a paucity of this type research in South Africa. Consistent with the limited literature focusing on instructional interventions in the developing world (Nag et al, 2014), there are extremely few intervention studies focused on the foundation phase in the country. Moreover, while there have been a number of educational interventions aimed at school improvement, few have demonstrated impact at the level of learner performance, and none have thrived (Hoadley, 2016; van der Berg et al, 2016.)

The first decade after democracy saw a number of large scale school improvement programmes (Fleisch, 2008; Taylor, N, 2008). Given the pressures of the time, most were not designed within a research paradigm, with evaluation strategies developed late in project cycles. These studies were primarily focused on supporting teachers to understand the new curriculum framed by outcomes based education. During this period, value was placed on teacher autonomy and independence, with few detailed procedures to support instructional practice. There was little evidence that these wide scale efforts translated into improvements at the level of the classroom.

Fleisch (2014) draws our attention to the work of Mourshed, Chijoke and Barner who study the international literature on improvement of school systems. They suggest that too often school systems in less developed countries look to school improvement models from more developed countries, with higher levels of resources, teacher training, teacher autonomy and unstructured peer learning. Their work suggests that in systems characterised by chronic low performance, interventions with the highest impact focus on the instructional core, combining

highly structured instructional materials, performance systems and classroom-based support and evaluation.

In the second decade of South Africa's democracy there has grown a small but important intervention literature focused on the instructional core. Schollar's unpublished work (2005) (cited in Hoadley, 2016), compared project evaluations of two large scale primary schooling projects – Imbewu and Learning for Living. He characterised the focus of Imbewu as learner-centred methods, and the application of the more progressive elements of outcomes based education. The Learning for Living Project focused narrowly on reading, involving teacher training and the provision of reading resources. Schollar could find no learning gains in reading and writing related to the work of Imbewu, although he acknowledged gains made in reference to a greater understanding of Curriculum 2005. The Learning for Living programme showed gains in reading and writing outcomes as compared to control schools. Another intervention, The Systematic Method for Reading Success (Hollingsworth, 2009; Piper, 2009), employed one of the most robust evaluation strategies. It was a highly structured reading intervention programme including 55 thirty minute lessons, carefully sequenced, and building from letter, sound, and word recognition to reading comprehension strategies. Utilising a pre-test / post-test method on the intervention group and a control group, the evaluation found a large impact on reading outcomes. While there is a danger in overgeneralising from these few experiences, there is some evidence that structured intervention programmes, focused on the instructional core of reading and writing, lead to some improvement.

The Gauteng Province Literacy and Mathematics Strategy (GPLMS) was an interesting intervention programme conducted roughly simultaneously and in parallel with the current work (Fleisch and Schoer, 2014). It was a massive state sponsored school intervention programme serving approximately 800 'under-performing' schools in the relatively resourced province of Gauteng. At the centre of the programme was a combination of lesson plans, instructional materials, and classroom level instructional coaching. The central tool was lesson plans, described as 'systematic, paced and easily accessible', the purpose of which was to 'introduce and gradually institutionalise a repertoire of practices that will improve teachers' time on task and establish new daily and weekly routines' (Fleisch and Schoer, 2014:3.) For purposes of this discussion, it is important to

focus attention on the methodology of the curricular design. First, the intervention did utilise a curricular toolkit that was written for the purposes of mother-tongue instruction. A strength of the overall model was that there was investment upfront into a set of African language materials. The materials, however, were outsourced to available educational experts, with little time or value placed on iterative field testing. In the end, they were largely back-translated from English logic, even while the mediation was somewhat more nuanced than conventional materials. There was, in fact, no mechanism to assess in practice whether or not these tools were indeed of high quality (every aspect usable in context) or easily accessible. The intervention relied on established expertise, with little applied research focused on the intervention design itself. Fleisch and Schoer (2014) undertook an analysis to better understand whether this massive investment had had an impact on learner outcomes. Due to a range of test related methodological complexities, no definitive conclusions were drawn. While a level of improvement was found amongst intervention schools, it was difficult to isolate the source of this improvement and separate it from test related effects. Its potentiality may have been undermined by a relatively short time span of high dose intervention. As noted by the authors, the inconclusive results do not undermine the potential promise of this intervention architecture. On-going work explores the effects of this intervention.

3. LANGUAGE, LITERACY AND LEARNING

3.1 Language as Decisive

The current study stands apart from other intervention studies by approaching the issues at the interface of language and learning as decisive -- a primary binding constraint, a fundamental problem behind the problem. Language specialists (e.g., Alexander, 1999; Heugh, 2002) have put on the education agenda the relationship between language and student performance and this has been recently taken up by prominent education researchers (Fleisch, 2008; Howie et al, 2007; Taylor and Yu, 2009), and yet few interventions have focused on the relationship between language, literacy and learning as decisive. Apart from the important work of PRAESA in the Western Cape, the Additive Bilingual Education (ABLE) project in the Eastern Cape (Koch, Landon, Jackson, et al, 2009) was the only significant intervention in which the language factor was placed at the centre

in foundation phase classrooms.

South Africa is a multilingual country with eleven official languages (RSA, 1996). Nine are indigenous African languages that were previously marginalized and which the Constitution enjoins the state to take progressive measures to modernise and develop, so that, together with Afrikaans and English, they can become valued and valuable languages in important domains such as school, higher education, formal economy and public administration (Alexander, 2003). The political economy of language and education is starkly bifurcated (Taylor and Yu, 2009), with children who speak English as their HL or one of their HLs, and to a less extent children who speak Afrikaans as their HL or one of their HLs, attending the top socio-economic quintile of schools. The poorest 60% of schools serve exclusively children who speak an African language. As such, language use becomes inextricably mixed with the inequalities of provisioning, entrenching pedagogies and classroom cultures inimical to learning.

There are two main explicit approaches to the role of language in learning—the ‘straight to English’ approach (associated with, for example, Taylor and Vinjevoel, 1999), and mother-tongue based bilingual education approach (associated with, for example, Alexander, 1999; Bloch and Alexander, 2003; Heugh, 2002).

For many education scholars and educated South African people the English-only approach is the default position, not arrived at by careful consideration of its implications, but through ‘common sense’ or a ‘folk theory’ about the role of language in learning. This is no more than a reflection of the fact that this social strata (educated South Africans) has internalised the dominance of English as inevitable and permanent and, crucially, that it has the greatest access to the most rarified or prestigious forms of this language (Alexander, 2014). From the National Curriculum Statement to Curriculum Assessment Policy Statements (CAPS) it is established practice in the various provincial and national education departments to divorce curriculum planning and provisioning from language. This is especially deleterious for African languages. Questions about the use and resourcing of African languages in teaching and learning, if considered at all, are handled through down-stream translation activity, or statements that more research is needed. Hoadley (2016), for example, while acknowledging the importance of language in the literature, curiously characterises the literature on the link between language and lack of performance in the system as ‘not well understood’, ‘not

straightforward', and 'far from conclusive'.

Many educationists are not *against* the fact that the larger work of educational development (research, curriculum writing, teacher education and development) proceeds through an English medium professional practice. Many take for granted that children in South Africa are largely already being taught through their mother-tongue in the foundation phase, with only passing acknowledgement that the education architecture required for teachers to do this successfully (research, curriculum, teacher training and development) does not exist in the main or is at *the earliest stages of construction*.

This approach can be seen across the education system. Since early in the post-democratic policy process, language policy became separated from curriculum policy. While language policy was informed by research in the area of language and education, the curricular policy in the end was not held accountable to language policy. In particular very little has been done to give effect to an important constitutional and language policy goal of extending the use of African languages as media of instruction beyond the foundation phase.

The four pillars of educational innovation – research, teacher development, curriculum, and policy have continued to be conducted uncritically through English. The two most common ways through which educational knowledge is made available to teachers are curriculum and teacher training and development. As such, both deserve special mention. Currently, English (and Afrikaans in a few institutions) are the only languages used for teacher education. Recently there have been attempts to incorporate African languages but still in largely English based initial teacher training programmes. Teacher development and support (both pre-service and in-service) are almost exclusively conducted in English and built through the prism of English. In general, it is still the case that teachers who speak an African language (like isiXhosa) and will teach African-language speaking children (for example in isiXhosa) are trained in English, and then asked to spontaneously back-translate their educational lexicon and learnings. As such, the massive investments into teacher training and development activities fail to provide African language-speaking teachers with a consistent and precise technical lexicon and discourse with which to think and work through content and pedagogy in their classrooms. In fact, little has been done, except in a few pilot projects (e.g., Braam, 2012; Koch, et al 2009) to understand in detail effective teaching and learning through an African language at the chalk-face.

3.2 Mother-Tongue Based Bilingual Education

The so-called 'mother-tongue', for purposes of education, is that language(s) which children know best when they begin primary schooling (Obanya, 2004). The form of (mother-tongue based) bi/multilingual education discussed here is one which seeks to build on (a) language(s) that a child knows best by using this language as a primary tool for learning and teaching while introducing other languages as languages for communication. When a child is ready and the requisite pedagogical conditions created, the other language(s) may be used in some combination with the home language(s) as languages of teaching and learning. This is also the form of additive bi/multilingualism (Baker, 2006) envisaged by the language in education policy of 1997 (RSA, 1997). In principle, the language in education policy states that children can learn through any language provided two minimum conditions are met. First, they must know the language well enough to learn through it, and second, their teachers must know it well enough to teach effectively through it (Alexander, 1999; Cummins, 2000). All things being equal, successful education systems use a child's mother-tongue for instruction and where a language other than the mother-tongue is used, the system makes absolutely certain that children and their teachers know this language well enough to learn and teach through it. It is only on the African continent where the legacy of our own forms of colonialism is reflected in the fact that, as a general principle, the vast majority of children are taught through a language that they and, far too often, their teachers, do not know well enough for effective learning (Alexander, 2003; Ramadiro, 2013; 2016a).

In contemporary South Africa, mother-tongue based bilingual education is premised on access to good teaching of, at least, the mother-tongue and English. Given the current importance of English as a language of access to further education and the economy, most parents and educationists agree that access to high levels of English is a key goal of the education system. The question is how best to achieve these aims?

South African and international work on language, literacy and learning provides us with a number of solid starting points for approaching the relationship between language, literacy and learning (Cummins, 2000; Heugh, 2003). The social and linguistic context of children (the language infrastructure of their day to day lives) shapes the limits and opportunities for language learning, development

and use (Obanya, 2004). While there is some diversity between the socio-linguistic contexts of poor and working class children in South Africa (Plüddeman, 2011), these differences are less salient than the differences between working class children as a whole and children attending top quintile schools. Regarding English in South Africa, because poor and working class African language speaking children live in sociolinguistic ecologies different to that of their middle class English speaking counterparts or those children who have access to middle class schools, educational tools that embody socio-linguistic assumptions of middle class communities and schools are unlikely to work well in working class schools.

The single most important resource children bring with them as they enter school is their mother-tongue(s). Children learn oral language relatively easily in the spontaneous context of the home and community. By the time they enter school, they have acquired a wide range of knowledge about the world, a large vocabulary, have a good command of the grammar of their home language(s), and are adept at using their languages in a variety of social contexts. In the popular imagination young children are thought to learn additional languages easily (McLaughlin, 1992). To be accurate, young children learn languages easily in a very specific context: in intimate, relaxed and informal interactions with caregivers and siblings, friends in the playground, and members of their community. That is how they learn language – not because they are intending to learn language – but in the course of doing other things with the people around them. In fact teenagers and literate adults have been shown to be superior to young children in learning new or additional languages in formal and high pressure settings such as classrooms. The only dimension on which young children are superior to teenagers and literate adults in instructed language settings is in the area of pronunciation (in particular, accent). Thus schools in which little unscripted English is used in the classroom and the playground are difficult and ineffective places to learn an additional language. Even in classrooms with high opportunities to learn, learning a new language well enough to conduct everyday communication and let alone to learn through it, takes time. The international consensus is that, depending on social, linguistic and pedagogical conditions, children can take *minimally* 6 to 8 years to learn a new language well enough to begin to use it as a primary language of learning (Alexander, 1999; Cummins, 2000).

There is also consensus in international research that the early years of learning in primary schooling are fundamental – if not achieved well they have a devastating impact on the entire trajectory of a child’s learning without intensive individual remediation. If most of the conditions for successful schooling are present, using the mother-tongue for learning and teaching allows for the early productivity of the classroom, with children able to participate in classroom activities, and interact with teachers and other children. Use of a language children understand, of course, is but only a starting point.

Another conclusion from research is that without enough home language literacy skills, reading and writing in an additional language in these contexts is not only often without any meaning, but impossible at any kind of scale (Ramadiro, 2012). A lack of home language literacy skills undermines reading and writing in an additional language over long periods of time.

Taylor and von Fintel (2016) undertook the first detailed longitudinal analysis considering educational performance and language of instruction in the foundation phase. They took advantage of a set of school level language policy transitions to account for variables that are otherwise confounding. Their analysis finds that good (African language) mother-tongue instruction in the early grades significantly improves *English acquisition* as measured by *English performance* in Grades 4, 5 and 6. While the system of public schooling is failing to serve children who speak an African language at home as a general trend, poor and urban schools that teach children through an African language do systematically better than schools who attempt to go straight for English. Given that the conditions for success of African language based mother-tongue instruction are arguably not in place, these results are particularly remarkable. That is even when the system is working against African languages as media of instruction, children still gain more within mother-tongue based classrooms.

Framework for Change

1. INTRODUCTION

It is widely acknowledged that the system of public education is in crisis, and that this crisis has its roots in the brutal and inhumane legacy of education under apartheid. There is recent broad consensus about where the fault lines lie. (See reference documents discussed at a policy dialogue hosted by the National Education Collaboration Trust (NECT, 2017) for a summary of the consensus.) There is perhaps much less clarity and consensus about what is required to turn the system around. The intervention study reported here resonates with aspects of the broad consensus but is motivated by a different set of hypotheses about how we might unleash systemic change over time. They are presented here as three elements of an overarching framework for change.

2. ELEMENT 1: THE KNOWLEDGE PROJECT

This study is based on a premise that one of the primary constraints obstructing change is embedded in the chasm between educational expertise and the social and linguistic realities of our children and teachers. By the knowledge project we refer to the combined traditions of research, teacher development and support, curriculum development and policy work that ultimately shape the intuitions and assumptions guiding teachers in their classrooms. It is educational expertise, as a collective project, that informs, guides and reproduces the public education system over time. While many analysts' attention has turned to

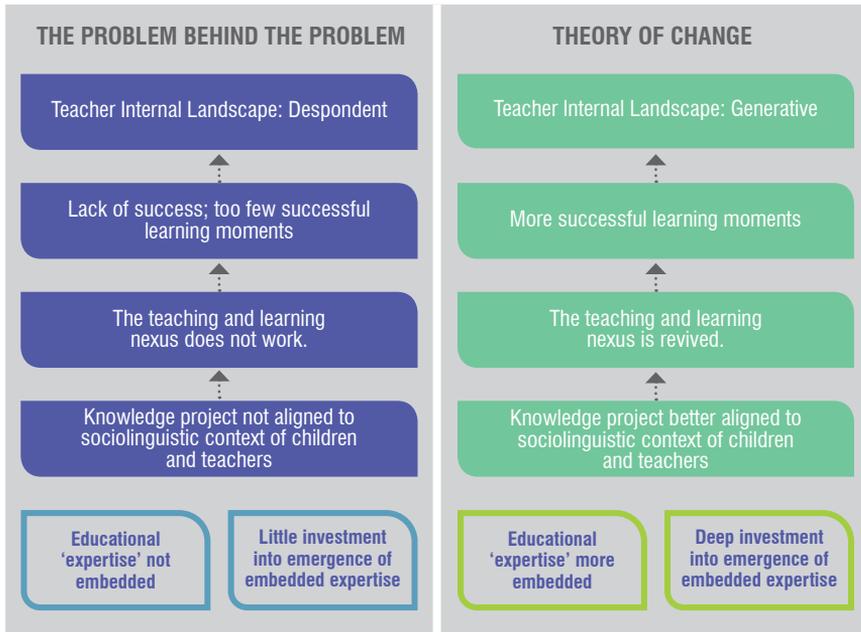
accountability systems for teachers (an important notion) (e.g., van der Berg et al, 2016; Spaull et al, 2016), we are even more concerned about the accountability of educational expertise itself.

The left hand column of Figure 3 below summarises the basic relationships that we believe are currently at play. We argue that there are at least two reasons why the knowledge project stands at a distance from the social and linguistic context of children and their teachers. First, traditions and structures of research, teacher education and curriculum development do not allow, or expect, experts to spend time sweating it out in rural schools. To the extent that senior educationists engage with schools, visits are ritualised, and perfunctory, limited to days (or hours).

The second problem is that there has been little systematic investment into a nurturing local expertise that can ‘talk back’ to the less embedded expertise. A more ‘distant’ set of expertise is not inherently damaging, if it exists within a balanced ecosystem of expertise, where local players organically hold more distant expertise in check. The imbalance is not resolved by methods alone – whether participatory, affirmative, or otherwise. We suggest it is ultimately resolved through a long term investment into building infrastructure and networks for knowledge generation, embedded in the realities and possibilities of poor and working class schools. In the short term this can be addressed in part through much deeper interactions of field testing and design between educationists and practicing teachers, and greater investments into the educational design process.

The framework for change schematically represented below suggests that as our expertise becomes more accountable to the social and linguistic systems of the local community, our ideas, tools and practices become increasingly more workable in the context of poor and working class classrooms. With more successful learning interactions, teachers’ basic trust in the teaching-learning nexus at an individual and more collective level is reconstituted.

Figure 3: Framework for Change: Ecosystem of Educational Expertise



3. ELEMENT 2: MOTHER-TONGUE BASED BI/MULTILINGUAL EDUCATION

As discussed above, the starting point of this study is the proposition that mother-tongue bi/multilingual based education is the most effective strategy to build successful foundation phase classrooms in rural South Africa, and that the promise of mother-tongue based bilingual education is currently undermined by an educational knowledge project that is not well aligned to the linguistic resources of the majority of children and their teachers, nor the instructional contexts of their classrooms.

The central purpose of the intervention study is to establish bilingual, interactive, and differentiated foundation phase classrooms that demonstrate their productivity by sustainable improvements in literacy and mathematics results.

Figure 4: Framework for Change: B/multilingual Interactive Primary School Classrooms

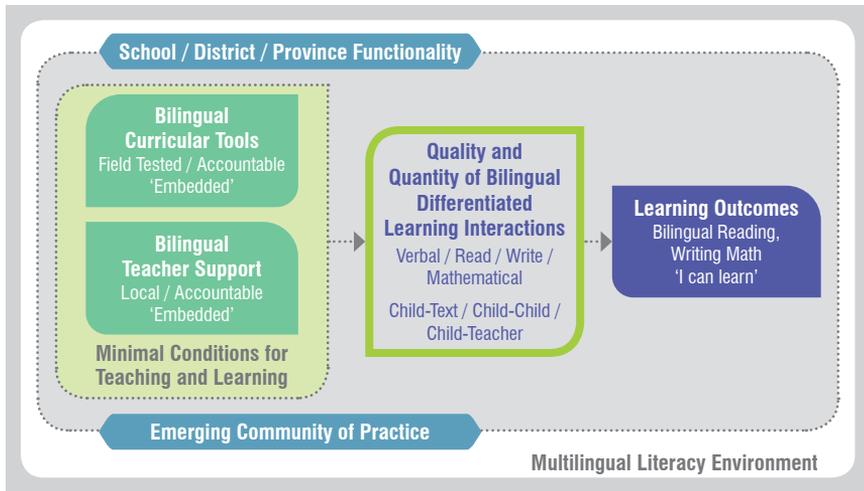


Figure 4 above summarises the framework for change at this level, making explicit our understanding of basic relationships, as well as the goals and logic of the work. The centre of the diagram (in white) focuses on the classroom. There are a number of conditions outside of the classroom that impact the classroom. We highlight two important ones. Multilingual literacy activity, emphasising the relationship between children’s out of school and in-school literacy experiences and their success, and the basic functionality of schools, districts, and provinces. If these levels of the system are not functioning sensibly, gains at the level of the classroom are difficult to make and once made, to sustain.

The rest of the diagram presents a hypothesis about primary relationships inside the classroom. On the left-hand side we identify three conditions that, when taken together, can create a tipping point for teaching and learning in a classroom:

1. The first condition is the availability of high quality bilingual instructional tools (ideas, materials, and practices) calibrated to the social and linguistic contexts of children and their teachers;
2. The second condition is a system of teacher development and support calibrated to the social and linguistic contexts of teachers, capable of generating communities of practice over time;
3. The final condition is a set of minimal classroom materials and physical resources.

The diagram suggests that the intermediary indicator (between the generative conditions and the learning outcomes) is teaching and learning interactions. The framework places less emphasis on learner results per se, and greater emphasis on what we call the quantity and quality of teaching and learning interactions. The suggestion is that when there are enough learning interactions of a high enough quality, they will translate into learning performance. As such, it places more value on the day to day learning interactions and less on teachers preparing children to pass a test. Table 1 presents several axes through which we have come to think about the quantity and quality of learning interactions.

Table 1: Quantity and Quality of Teaching and Learning Interactions

AXIS 1	AXIS 2	AXIS 3	AXIS 4			AXIS 6	AXIS 7
Nature of Interaction	Engagement of Interaction	Closeness of Interaction	Meaning of Interaction			Emotive Quality	Differentiation
QUANTITY			QUALITY				
Reading Writing Speaking Listening	Child: Text/Tool Child: Teacher Child: Child / Children	Individualised Small group Whole class	Linguistic Accessibility	Conceptual Progression / Consolidation	Zone of Proximal Development	Competence Autonomy Connectedness	Differentiation of Purpose

4. ELEMENT 3: CHANGING TEACHERS' PRACTICE

The last element of the theory of change guiding the work responds to the simple question: Can teacher practice change, and if so, under what conditions? By practice we refer to conscious, purposeful sustained activity. Work focused on instructional change in South Africa is forced to grapple with the question of what it takes to change practice, and the related question, what does it take to build motivation – for the individual and the group. Too often educational interventions assume that good tools and modest training on their own create the conditions for changing classroom practice. Without understanding the conditions for change, and the challenges of sustaining change, we are likely to beat each other up, pull out our hair, or throw in the towel.

The relationship between human experience and motive is a complex one. Socio-cultural psychologists argue that whether a human being is actively

motivated and engaged, detached or alienated is a largely a function of the socio-cultural conditions in which they enact their lives (Ryan and Deci, 2000). Ryan and Deci's work suggests that there are three fundamental conditions that regenerate intrinsic motivation: a sense of competence, a sense of autonomy and a sense of an agential community. With just one or none of these conditions available, intrinsic motivation is unlikely to thrive. It is a downward spiral, where failure erodes a sense of competence, autonomy and agential community, which collectively begets failure.

Recognising that the structural inequality in our country bears down extraordinarily heavily on poor and working class schools, what is required for teachers to stand up to this wave, with some sense of personal and collective agency at the level of a school? The work of Shalem and Hoadley (2009) speaks to the political economy of teacher motivation, and establishes the dialectical link between socio-economic inequality and teacher morale. Drawing together data on socio-economic inequality inside and outside of schools, they suggest that the combined effects of the material conditions for teachers in working class schools 'have made teachers' work impossible' (2009:120). With no ability to win, there is no source for competence, autonomy or agential connectedness. They conclude that given the magnitude of the structural barriers to success, the 'real oxygen' required to turn around patterns of motivation is simply the elimination of deep and persistent inequality in the system of schooling. They suggest that until it is really possible to teach effectively, it is not fair to expect teachers to individually rise above their conditions. They locate some of the most important work in education as facing up to the structural inequalities of schooling and society at large.

We draw strongly from socio-cultural activity theorists to suggest how this question may be approached. The starting point of socio-cultural theorists is that changing practices woven into larger historic cultures of practice is extremely difficult. Socio-cultural theorists approach agentive activity by concentrating on tools and motive. They suggest that sustainable shifts in practice require innovations in tools, and a strong socio-cultural motive, embedded in the interactions of four domains: knowledge, tools, behaviour and community (Scribner and Cole, 1981; Vygotsky, 1978; Wenger, 1998; Wertsch, 2007). We reflect upon tools and motive, and the interaction between these key domains across this report.

Methodology

1. STUDY DESIGN

The Magic Classroom Collective (MCC) is framed by educational design research methodology, within the broader school of intervention research (Kelly, 2007; Plomp, 2007). According to Plomp (2007:13), educational design research is ‘the systematic study of designing, developing and evaluating educational interventions as solutions for complex problems in educational practice, which aims at advancing our knowledge about the characteristics of these interventions and the processes of designing and developing them’. It is based on close collaboration between researchers and practitioners. They work together to ‘design and develop workable and effective interventions by carefully studying successive versions (or prototypes) of interventions in their target contexts (Plomp, 2007:13). Unlike conventional research, which assumes that a workable and effective intervention already exists and therefore regards the goal of research as the measurement of its effectiveness, design research first seeks to create a workable and effective intervention and then to validate its effectiveness through quasi-experimental methods, among others. Thus educational design research is most relevant to investigating, ‘educational problems for which no or only a few validated principles (‘how to do’ guidelines or heuristics) are available to structure and support the design and development of activities’ (Plomp, 2007:13). The method is an iterative process of theory elaboration and practical intervention. As summarised by McKenney and Reeves (2012), research takes the form of iterative cycles whereby ‘successive approximations of practical

products' (the intervention) go hand in hand with 'successive approximations of theory' (the design principles.) In the case of the MCC, the core methodological design consists of school-term based cycles of curriculum development, teacher development, classroom-based field testing, and analysis.

The methodological approach draws on the work of socio-cultural theorists, whose key tenets were formulated by Vygotsky (1978). The core of Vygotsky's theoretical contribution is his insistence that higher mental functioning is mediated through culturally developed sets of signs, language being chief among them, and material tools. Human beings have the capability of both perceiving an object, and, under certain circumstances, becoming aware of it. Humans have the ability to have an 'experience of experience' (Bakhurst, 2007:52), a reflective awareness of our own mental states, and an ability to act and produce ourselves in a way that is transformed by this awareness. Vygotsky was less concerned about the awareness itself, but more about the unique functions that are enabled by this awareness.

Design research is consistent with Vygotsky's methodological starting points (Daniels, 2008; Engeström, 2007). It shifts focus away from measuring mental outputs, places emphasis on examining learning through the process of engagement between subjects, mediating tools, and activity motive. Analytic focus is on the processes of dialectical change, focusing on the subject's course of action as it is mediated by new signs and tools in predictable and unpredictable ways. Pure experimental designs place great value on the researcher exercising maximum control over the experiment, whereas in design research the researcher can, at best, 'trigger' (rather than produce) the subject's, 'construction of new psychological phenomena' (Engeström, 2007:365.) The method aims not only to reflect a subject's agency, but to produce, transform, and observe it through new forms of culturally mediated intentionality.

As such, education design research aims to produce three outcomes simultaneously (Plomp, 2007). First, it seeks to build a set of design principles, contributing toward both substantive and procedural knowledge. Second, it seeks to build relevant and effective interventions to meet complex practical situations in education, where no ready-made solutions or guidelines are available. Finally, it seeks to build a community of practice between researchers and practitioners, with a range of theoretical and practical spin-offs.

2. SELECTION OF SCHOOLS

The selection of schools for the work was neither systematic nor strictly random. We selected schools together with district authorities, in two phases. In the early formative years we worked with 21 schools, chosen on the basis of three criteria: 1) they were considered low functioning schools; 2) they were considered rural schools; and 3) they were located in areas in the Eastern Cape that held some symbolic importance to Madiba himself (Qunu, Mqanduli and Mbizana).⁷ A few of these schools were on a list of schools that were reported to have had received a donation in the name of Mandela. As it turned out only one of these schools had actually received a significant investment of infrastructure. In 2009, we invited these 21 schools to apply to work with us intensively in the foundation phase. In the end 10 schools, known as Cohort A, signed up, and from then on consistently took part in the activities of the collective.⁸ The 2007 systemic evaluation literacy and mathematics results of the schools that stayed in the collective were compared to those that did not. There was no statistically significant difference between the two groups of schools in terms of learner performance.

In 2012, the collective was expanded to include an additional cohort of four schools, known as Cohort B. These schools were selected differently. Together with the Mbizana District Office, we selected an additional three schools, in direct proximity to the Cohort A schools. Two of these schools had expressed an interest in joining the collective. The third had not been selected from the initial 21 schools but had independently tried out the materials and activities of the collective (refer to Table 2, B-1). It was therefore decided to include it. The final Cohort B school

7 There was debate in the early days about whether the NMI should privilege working only with schools that had received a donation of some sort through the work of Mandela. This was rejected for two reasons. First, these schools were scattered around the province, thus not conducive to building natural communities of practice. Second, the Board of Trustees advocated the principle that Mandela's legacy in education was for all children, rather than relegated to a few schools.

8 Fourteen schools were initially accepted. Two of these schools fell out because the work was too demanding. One school decided to drop out when its classroom block was blown over a cliff by a summer storm, and was not rebuilt. A fourth school was suspended from the collective in the third year because its stated medium of instruction was English, a medium which fell outside the intervention design and provisioning.

was selected to be in closer proximity to East London, with the idea of conducting more intensive field testing there.

Taken together, the MCC Collective involves 15 schools, presented in Table 2. On average, 72 teachers took part each year (excluding teachers who came of their own will and who were not formally part of the collective.) Approximately 2,500 foundation phase learners were involved in the intervention each year (see Table 2).

Table 2: Selection Scope

NUMBER OF MCC TEACHERS	72
Average Total MCC Learners (Grade R, 1, 2 and 3) Annually	2,516

Table 3: Intervention Schools: Learner Numbers

SCHOOL	CLUSTER	ENTER	GRADE R	GRADE 1	GRADE 2	GRADE 3	TOTAL
A-1	Mqanduli	2009	40	23	35	35	133
A-2	Mqanduli	2009	18	25	28	29	100
A-3	Mbizana	2009	20	30	35	35	120
A-4	Mqanduli	2009	46	50	46	45	187
A-5	Mqanduli	2009	40	39	40	32	151
A-6	Mbizana	2009	78	81	69	72	300
A-7	Mbizana	2009	55	66	84	68	273
A-8	Mqanduli	2009	20	20	22	20	82
A-9	Qunu	2009	35	44	30	26	135
A-10	Qunu	2009	37	52	44	39	172
B-1	Mqanduli	2012	27	24	30	30	111
B-2	Mbizana	2012	45	65	60	57	227
B-3	Mbizana	2012	33	46	40	32	151
B-4	Mbizana	2012	42	58	58	58	216
B-5	Amathole	2012	44	44	45	25	158
TOTAL			580	667	666	603	2,516

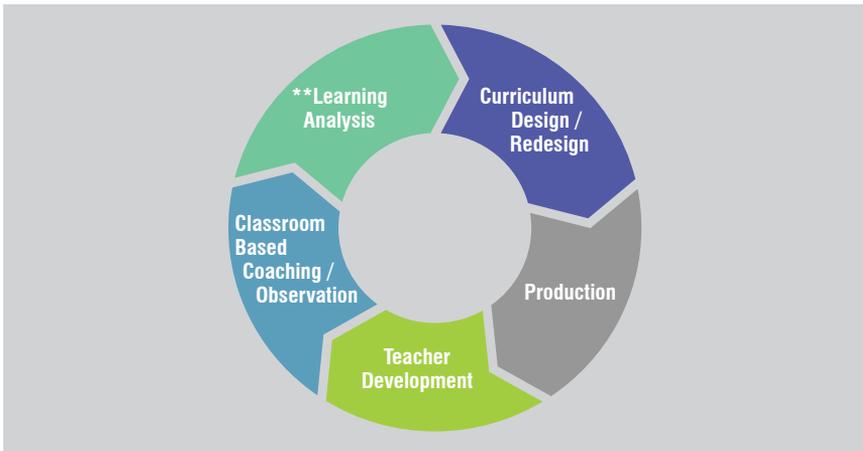
3. DESIGN CYCLES

At the centre of educational design research are iterative cycles of design, testing and reflective analysis. The design of this study combines instructional tools and teacher development and support activities.

The question for each design cycle was how to develop tools that best supported teaching and learning, and how to enhance teachers' capabilities to use the tools in their classrooms.

The study was organised into (school) term based learning cycles. As presented in Figure 5, each cycle consisted of four elements: material design and development, teacher development and support, classroom-based support and observation, and analysis:

Figure 5: MCC Education Design: Term Based Cycle



- **Materials design and development:** Before each school term, a detailed set of teaching and learning tools were developed for each Grade, for each term, and for all participating classrooms. In the following year, the term based materials were redesigned, responding to the experience of classroom-based testing. In the end, there were three instructional toolkits: isiXhosa HL literacy, English FAL, and mathematics.
- **Teacher development and support:** It was understood from the outset that materials could not teach on their own. It was accepted that some form of

teacher development and support would be required to both orient teachers to the curricular toolkit and deepen and extend their knowledge and practice. Teacher development work was undertaken during each term cycle. This usually took the form of two day workshops where teachers came to a central venue for a range of developmental and reflective activities.

- **Classroom-based support and observation:** A near-peer instructional coach spent approximately one day per teacher per term working with teachers in their classrooms. The first goal was to support teachers to deepen and expand their instructional practice through demonstration, co-teaching, observation and other forms of instructional coaching. The second goal was to enhance field-testing of the curriculum itself, learning how the curricular toolkit and the underlying design principles might be altered or refined to better meet the needs of classrooms.
- **Data collection, analysis and reflection:** Throughout each term cycle the curriculum and teacher support were reviewed and analysed and lessons drawn for redesign. This took two forms. First, a range of data was collected from classrooms and teachers in an attempt to analyse patterns of teaching and learning practice across time. Second, a series of reflective discussions were undertaken with teachers to identify lessons learned. The lessons were fed into subsequent cycles or redesign.

4. DATA AND ANALYSIS

4.1 Introduction

Data analysis is presented in three sections. The first is an ongoing, largely qualitative analysis attempting to better understand instructional practice, and the factors that (re)produce and change them. This analysis was undertaken by researchers and practicing teachers, through a range of informal interactions, complemented by some structured sessions to document emerging insights. The second analysis is process oriented, focusing on tools. The data takes the form of iterative process notes of the researcher team, attempting to keep track of process decisions and their rationale across the design process. The final set of analysis is quantitative analysis of learner performance data in literacy and mathematics.

4.2 Analysis 1: Instructional Practice

There were three methods for examining the relationship between tools and instructional practice: observation, iterative engagements between teachers and researchers, and periodic reviews of learner work. As a baseline activity, a study was undertaken which involved visiting schools, interviewing key stakeholders and observing some classroom time, supported by a structured evaluation tool, and examination of a sample of learner work. Through the course of the work, instructional coaches and others in the research team undertook more in-depth day on day observations of classroom practice, noting observations in reflective written reports and in regular oral reports. Beyond observation data, data was drawn from interactions between researchers, instructional coaches and practicing teachers in the course of field testing successive iterations of instructional tools in classrooms. Before commencing with the intervention, focus group discussions were conducted with teachers, to establish an understanding of their concerns and ways of speaking about teaching and learning in their classrooms. Across the term based cycles, there were written questionnaires, rapid assessment surveys, as well as structured discussions to reflect on the curricular tools in relation to classroom practice. From time to time, a sample of learner work was examined in order to gain a sense of teaching and learning pacing and substantive progress.

4.3 Analysis 2: Process Design

The second focus of analysis was process oriented. Education design research focuses on process, and underlying design principles. Through iterative cycles of intervention, a design team attempts to learn about what successive approximations of design principles illuminate about their target settings and problems. Across the study, a series of process notes attempted to keep track of process decisions and rationale behind the decisions – the ongoing heuristics of decision making and process redesign.

4.4 Analysis 3: Learner Performance

The limitation of most intervention studies has been a lack of ability to demonstrate impact at the level of learner performance (Fleisch, 2008). Ultimately, the study held itself accountable to improved learner educational performance in home language literacy and mathematics. In 2007, a baseline assessment of learner

performance in home language literacy and mathematics was undertaken throughout Cohort A schools, using a Grade 3 Systemic Evaluation instrument developed by the National Department of Education.⁹ Each assessment consisted of 54 items, including multiple choice, fill in, and full sentence / problem work (scored 0 to 4). The initial baseline instrument (Grade 3 Systemic Evaluation) was re-administered in mathematics in 2014 and in isiXhosa literacy in 2015.¹⁰ The same literacy and numeracy instrument was administered under the same conditions. The tools were administered by trained fieldworkers, managed by a senior researcher. Teachers were allowed to be present during the test administration, but were not allowed to take part in the process in any way. Scripts were brought back to the office and stored in a secure facility. Scripts were sent to Joint Education Trust (JET) for marking and capturing, to increase the validity of the dataset.¹¹ 91% of enrolled learners took part in the assessment in 2014, and 90% in 2015. Given that this activity was undertaken at the end of the year this represents good participation rates.¹²

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- 9 By 2007, the Department of Education had developed two assessment instruments for Grade 3 literacy and mathematics, a national instrument and a parallel provincial instrument, containing some shared items and some different ones developed to measure the same skills. The national instrument was used strictly for assessments at the national level undertaken by the DBE and not released for other applications. The parallel assessment could be used for provincial assessment activities and made available for slightly wider discretionary purposes. (For example they were used by the QIDS-UP project of the DBE which was initiated around the same time as the MCC.) (Source: personal communication, Carla Pereira, Joint Education Trust.) During this time, the NMI approached the Eastern Cape Provincial Department of Education for permission to use the assessment instruments. Approval was given to the NMI to utilise the tool (Systemic Evaluation Foundation Phase Grade 3 Provincial and District Assessment.) The NMI was trained by the department in the protocols of administration, and requirements for confidentiality.
- 10 The initial study design planned for the Systemic Evaluation to be reapplied starting from 2011. However, in 2011 the national Department of Basic Education administered its first annual national assessment (ANA.) Concerned about testing overload, the study shifted strategy, hoping to compare the baseline results with ANA results over time. In the end, the ANA results were not comparable across years (Fleisch and Schoer, 2014), nor comparable with systemic evaluation results. As such, the research team decided to re-administer the initial baseline instrument in 2014 and 2015.
- 11 The team recognises the support of Roelien Herholdt and Carla Pereira for their assistance with marking and capturing the scripts.
- 12 10% of learners were absent on the day of the assessment in both 2014 and 2015. In 2014, teachers insisted that 2 learners with serious learning difficulties be exempt from participation.
- 13 Data analysis was carried out using SAS. (SAS Institute Inc., SAS Software, version 9.3 for Windows, Cary, NC, USA: SAS Institute Inc. (2002-2010)). We recognise the support of Dr. Petra Gaylard, Data Management and Statistical Analysis (DBSA) for ongoing assistance with the statistical analyses.
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With the support of an external statistician, we undertook a basic statistical analysis focused on descriptive statistics and a statistical comparison of groups.¹³ Of the 15 schools in the MCC in 2014/15, 8 had baseline results from 2007. For these schools, the analysis sought to compare the results from 2007 and results from 2014/15, school by school and as a group, helping to understand progress and limitations. The analysis also sought to compare the first cohort with the cohort who entered the collective later, under slightly different conditions. Finally, it sought to analyse results by individual school, to contribute to a more detailed understanding about the relationship between schools, contexts and performance.

Between-group comparisons were carried out using a Linear Mixed Model, with the score as the dependent variable. The year of the assessment, gender and age were used as independent variables, district and number of learners per grade were used as co-variates, and the school was used as a random variable. The comparisons used a 5% significance level. The language of the child was not included in the model, as only two children in the entire dataset were not isiXhosa home language speakers.

4.5 Summary: Process Map

Figure 5 summarises the basic process map for the study. In 2007 we undertook a baseline assessment of schools. As discussed above, the exploratory work informing the study design took place between 2007 and 2009. By the end of 2009, work had focused on renovating and renewing classrooms (iilima) in a cohort of schools (Cohort A).

The work of the Magic Classroom Collective began in 2010. As discussed below, in the initial period, the intention was to build supplementary tools. By 2013, the design principles had shifted toward building full curricular toolkits. This report focuses on the six-year span from 2010 to 2015.

Figure 5: MCC Process Map

			MAGIC CLASSROOM COLLECTIVE					
2007	2008	2009	2010	2011	2012	2013	2014	2015
Preliminary / Exploratory Work			Supplementary Tools		Transitional	Full Curricular Toolkit		
Systemic Evaluation Baseline	Miss Brian Year	Cohort A (observation and classroom setup)			+ Cohort B (no classroom renovations)		Systemic Evaluation Math	Systemic Evaluation Literacy

5. QUALITY OF RESEARCH DESIGN

5.1 Validity, Trustworthiness and Generalizability

Education design research focuses on theory generation in the context of educational process design. It aims to elucidate generative design principles upon which successful interventions can be built, and to contribute practical, methodological and theoretical insights toward creating learning ecologies that can improve educational outcomes in specific settings (Kelly, 2007).

The validity and trustworthiness of educational design research lies in the application of a set of iterative reflective principles, and a range of qualitative and quantitative tools to track process design. The intervention rigorously applied these principles to strengthen the credibility of the findings. Researchers, instructional coaches and practitioners worked together in intensive and iterative design cycles. Serious effort was made to make explicit theoretical assumptions underpinning this work, as well as to detail steps undertaken to implement the intervention. Data is analysed in a relational way, that is, on its own and in connection with other data and the intervention as a whole. Every attempt has been made to be reflexive, including being explicit about assumptions and self-critical about mistakes made in the course of the intervention. The credibility of the work lies its long term nature, the intensive ongoing engagements, the interaction between practical and theoretical insights, and the inclusion of a wide range of quantitative and qualitative analysis to shape and guide the analysis.

The validity and reliability of the systemic evaluation data was discussed above. Permission was secured to use the Systemic Evaluation instrument designed by the Department of Basic Education, benefitting from the validity and reliability testing of external designers from the Joint Education Trust. The same grade 3 HL literacy and mathematics assessment was administered under the same conditions during the baseline and the evaluation phase. Scripts were marked, captured and analysed externally to increase validity of the dataset.

5.2 Ethical Considerations

The informed consent of the school governing bodies, teachers and parents/caregivers was secured. Test scores, samples of writing, questionnaire and interview data of individual participants were handled in strict confidence and

anonymised, except in special cases where the consent of participants has been secured to make public personally identifying data.

5.3 Limitations

According to Hoadley (2016) and the wider ReSEP team (van der Berg et. al., 2016) a limitation of research in the sector is the lack of random control trials to confirm causal intervention relationships at scale. This intervention shares this limitation. It is not an experimental design, nor is it designed to control for confounding variables in order to prove causation.

The study must be understood within the very real limitations of the team, the capacity within the field, and constraints of time. The research team did not fully anticipate the intensity of what would be required when it initially embarked upon the study. The research team was small, consisting of two to three senior educationists¹⁴, one to three classroom-based coaches (depending upon the year), and a handful of junior developmental posts. The limitations of the team combine with limited capacity in the field. For a range of historical reasons, there is limited educational expertise at the interface of African languages, literacy and learning. The team had to build capacity through the course of the work, rather than draw on existing capacity in the area. The work was tightly time bound, with instructional tools designed and delivered for the beginning of each school term.

The limitations of time and capacity impacted the intervention in a number of ways. The time for structured analysis, redesign and redevelopment of each tool in a given period reflected the combined limitations of time and capacity. There are a number of targeted studies that would have contributed to stronger gains in this period. This remains work for the coming period. There are some sets of data that would have been useful to analyse that we did not collect. Some of the data we have collected remains either under-analysed or unanalysed. Finally, the unit of data analysis, especially for quantitative work, remained at the level of groups of schools. In the next period, the goal is to establish more detailed classroom datasets, and to shift the unit analysis to individual classrooms, teachers, and children.

14 The senior researcher capacity represented one Nguni linguist and literacy specialist, one educationist without access to isiXhosa, and one isiXhosa-English bi-literacy specialist. The latter subsequently left part way to complete full-time doctoral studies. All of the senior researchers were under pressure to complete doctoral work, which also diverted energies from the intervention during this period.

Baseline Findings

1. INTRODUCTION

The baseline study consisted of three primary activities. First, we undertook school and classroom observations to better understand instructional practice. Second, we undertook a number of discussions with teachers, individually and in groups, to better understand their assumptions, expectations, and their ideas about literacy and mathematics. Finally, we administered a systemic evaluation of Grade 3 literacy and mathematics to better understand patterns of learner performance.

2. INSTRUCTIONAL PRACTICE

The baseline understanding and appraisal of instructional practice was drawn primarily from observation data. The patterns of instructional practice were consistent with those observed during the Miss Brian Year, with patterns of practice described in classroom-based research in poor and rural schools across South Africa, and largely consistent with patterns across the developing world (Hoadley, 2016).

Observation suggested that there was little time spent in classrooms. There were high levels of teacher absenteeism, ascribed to departmental activities, union activities, funerals, pay days and illness (van der Berg and Louw, 2008). When teachers were present, they often spent a lot of time out of the classroom

for school meetings and duties related to functions such as the school nutrition programme.

Even on days when teachers were in their classrooms, there was little evidence of structured instructional time. The patterns corroborated those documented in the Educator Workload Study (cited in Hoadley, 2016), which made an attempt to quantify academically productive classroom time. The study concluded that time spent on instructional activity ranged from a low of 6% to a high of 56% of total school time. We did not attempt to quantify the time during the baseline, but our observations suggest that these schools were in the low range.

There was little systematic structure for instructional days. Consistent with the work of Ensor et al (2002), there was markedly little specialisation of time. There was little regular partitioning of the school days into consistent units allocated to curriculum content areas, teaching routines, or time for play or other activities. One full school day was at best organised around one or two instructional activities, with children having the entire day to work on very few tasks. While each classroom and school had a formal time table, there was no evidence that it had instructional effect. There was little rotation between content areas at designated intervals during the day.

The pace of instruction was extraordinarily slow, with low academic expectations. Teachers consciously slowed down pacing to cater to what they called 'slow children', justifying the pace on the basis of inclusion. Most teachers expressed a sense of care for their children, explaining their slow classroom pace as respectful of the 'slow children'. They indicated that the majority of their learners were 'slow'. Informed by a supposedly child friendly discourse, they insisted that all of their children have their own talents, but most were not oriented toward academics. As summarised by Ensor et al (2009), the combination of time use, pacing and low semantic density translates into low cognitive demand.

Classrooms were tense and teachers overwhelmed. With few instructional rituals, teachers were preoccupied with issues of basic cleanliness, order and discipline, and barely concealed high levels of corporal punishment. Teachers spoke loudly in demanding tones, with few opportunities (emotive or practical) for dialogic engagement with children.

There were few texts in the classroom and little print on the walls, beyond old health posters that had been there across some years. To the extent that there

were books (dated workbooks and textbooks) in the school, they were either piled in a corner of a classroom or a principal's office. Very few learner readers, let alone story books or informational texts, could be found.

In terms of literacy practice, there was little evidence of literacy work beyond whole-class, choral activities and extensive copying from the board. While there was some evidence of phonics work, it was neither systematic nor comprehensive, and was often not linked to reading connected texts. There was no evidence of daily reading aloud to children. Writing was limited to copying words and sentences from the board.

In terms of mathematics, teachers focused on the math content with the least language requirements. Mathematics instruction was limited to board based 'sums', with little systematic progression across the school year or between grades. While the critique of some research in foundation phase math is that there is an overreliance on concrete apparatus (such as counting beads and blocks) at this level (Ensor et al, 2009; Schollar, 2008), in the case of these classrooms there was too little use of concrete apparatus. As a result, knowledge of numbers was primarily memorised. The memorisation focused on forward counting, with the illusion of number sense falling apart when children attempted to count backwards, even at low number ranges.

There was almost no evidence of differentiation for learning. Whether classrooms were set up in rows or groups, teaching took place primarily through a whole-class format. Teachers relied on a small group of learners to field teacher questions which helped make classrooms look more effective than they actually were. The majority of children were silent; much of the time it was clear that they were not following the logic of any given activity.

We undertook a rapid review of learner work, contained in counter books and flip files. Combining literacy and mathematics, children did not complete more than one page per week, with most completing much less. The activities demonstrated little structure or organisation, and reflected pervasive copying activity. Literacy work was limited to working with words and short sentences. Mathematics was limited to working on counting and basic addition and subtraction, with little evidence of structured progression. There was little evidence of feedback to learners, with much work being unmarked.

3. TEACHER PERSPECTIVES AND PRACTICES

As another baseline activity, a range of discussions were had with teachers to better understand their assumptions, expectations and perspectives. A couple of things stood out.

During this period we observed and undertook a number of preliminary teacher development activities (Ramadiro and Porteus, 2011). Most had little experience or ability to speak about their own instructional practice. The majority of teachers enacted themselves passively (some friendly, others more openly disengaged), evaluating activities only positively. But when they returned to their classrooms, there was little evidence that their instructional practice had shifted.

When teachers did speak about their classrooms, their concerns focused on the behaviour of children (and a concern about basic values and discipline), and their deep dissatisfaction with educational authorities (both provincial and national). As a whole, they were alienated from parents, perceiving them as not caring about their children's education.

In unguarded moments, teachers admitted to doubting whether any of the ideas presented in teacher workshops were practical in *their* context. They opined, 'perhaps this or that idea works with *your* children [in middle class schools], but something is wrong with *these* children'. Thus teachers took the view that much teacher development work was not relevant to the dynamics of their classrooms. They did not question whether the ideas were workable for 'normal' children (implicitly internalising a middle class child as the 'norm'), but could not see them as workable in their own context. They questioned the capacity of 'their' children to learn, reflecting internalised low expectations for children in these classrooms. Over time, this tension between the empty rituals of teacher development activities alongside chronic failure of classrooms appeared to have undermined their basic trust in the teaching and learning nexus between themselves and their children. The discourse exposed a deep-seated, barely noticed, teacher internal landscape that had concluded, 'none of this really works with *these* children'.

However, the majority of teachers spoke a lot about their care and concern for children in their classrooms. They interpreted post-apartheid learner-centred and inclusive education to mean, among other things, slowing down classrooms in order to accommodate 'slow children'. They thought it 'unrealistic' to expect most children to learn to read and write by the end of the foundation phase. When first

exposed to the systemic evaluation tests, which required Grade 3 learners to read independently, they thought the test was unrealistic and unfair to their children.

Teachers struggled to see how different parts of foundation phase literacy curriculum came together. They were largely unable to differentiate and identify connections between *spoken language* and *literacy* development. They made no clear and principled distinctions between pedagogical strategies appropriate to developing language and literacy in a child's home language (isiXhosa) and a relatively unfamiliar additional language (English). They showed little ability to distinguish literacy expectations from one grade to the next. There was not a clear delineation in expectation, for example, between a grade 1 and grade 2 learner. Across grades, they were uncertain about whether independent reading is in fact a legitimate goal of the foundation phase.

4. LEARNER PERFORMANCE

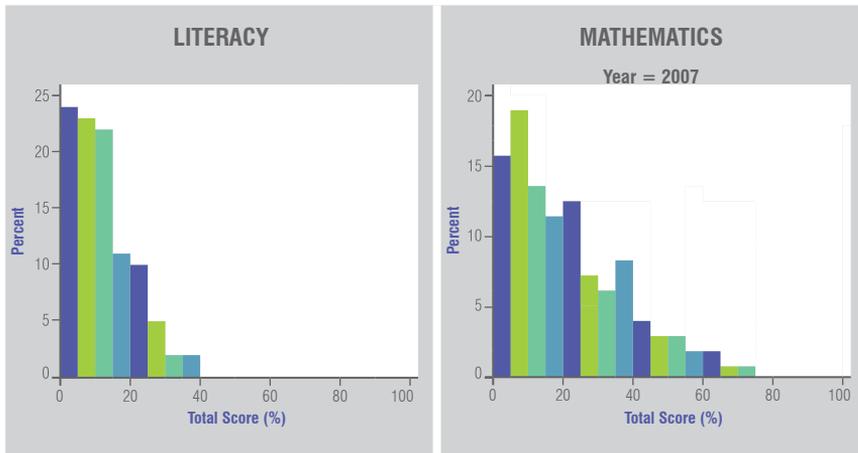
The results of the Systemic Evaluation of Grade 3 learners isiXhosa home language literacy and isiXhosa mathematics are presented below. Even given the description of pedagogical practice presented above, the results were striking. The mean score in mathematics was 19%, with 35% of children scoring under 10%, and less than 2% of children scoring above 60%. The results in literacy were even more dismal. The mean score was 11.7%, with 50% scoring under 10% and 97% scoring under 30%. The results suggest that children were largely guessing their way through the assessment, with little if any ability to read independently. In math, children scored slightly higher on non-language based, visual oriented questions that lend themselves more to guessing (geometric patterns, shapes, and basic measurement), and scored less than 2% on language based problems.

The results suggest that the use of a learner's home language as a medium of instruction, while necessary, is not a sufficient condition for academic success. Other essential conditions are the following: availability of appropriate and adequate materials, extensive teacher subject knowledge, and pedagogical knowledge and skills to teach in under-resourced, often crowded, mixed-ability classrooms.

Table 4: Summary of Results: 2007 Baseline Systemic Evaluation

	LITERACY	MATHEMATICS
Mean	11.7%	19%
Median	11.1%	17%
% of Learners within Lowest Performing Level (0 to 30%)	97%	80%
% of Learners in Top Performing Levels (>60%)	0%	<2%

Figure 6: Summary of Results: Baseline Systemic Evaluation



Process Findings

1. INTRODUCTION

Educational design research focuses attention on *process design*, with the goal of ‘advancing our knowledge about the characteristics of these interventions and the processes of designing and developing them’ (Plomp, 2007:13.) A primary goal of the research process, in this case, was to advance our knowledge of existing instructional practice, and of what is required to shift instructional practice. It was assumed that shifting instructional practice would rely upon the development of effective instructional tools combined with effective teacher development and support activities. We did not presuppose the full nature of what would constitute an effective instructional toolkit, nor what would constitute effective teacher development activities. These questions lay at the heart of each design cycle. This section presents process findings: an overview of emerging design principles and the rationale for process decisions.

2. COMMON PROCESS FINDINGS

2.1 Introduction

At the heart of the MCC is the work of developing an instructional toolkit for Grade R, 1, 2 and 3, calibrated and field tested within the context of rural children and their teachers. Calibration means that the materials place the isiXhosa speaking child (and teacher) at the centre, holding theoretical assumptions accountable to their linguistic and sociocultural context. Field testing ensures that ideas, tools

and practices undergo the rigorous test of real classrooms. For each term cycle, tools are designed, developed, produced and distributed. Teachers are brought together to orient them to the tools, ideas and practices, and are provided with some classroom support. Teachers, instructional coaches and researchers analyse their use in the classroom, extracting lessons for redesign.

There are a range of important objectives in the foundation phase, many of them invaluable not only to a child’s future but to the future of a democratic dispensation. From early in the intervention, we elevated literacy above the larger pool of important teaching and learning goals. In particular, we prioritised the goal of independent reading and writing. In order to strengthen basic mathematics, we quickly extended the starting point to include reading and writing in the math classroom. Traditionally, a focus on the 3-R’s is associated with retreat from the broader social and educational goals of primary education. In the case of this intervention, a focus on reading, writing and basic mathematics is not about a retreat from these larger and vitally important goals, but about forging a path toward them.

Figure 7: Summary of Toolkit Development

PHASE 1	PHASE 2	PHASE 3
2009/10 to 2012	2012 to 2015	2015 to 2017
Instructional Supplementation	Complete Instructional Toolkit	Complete Instructional Toolkit

Figure 7 presents the three overlapping phases of design work. In the first phase of work, from the end of 2009 to early 2012, the focus of the development of the instructional toolkit was to supplement extant materials. The process findings for literacy and mathematics were similar at this point and therefore are discussed together. The second two phases focused on building a self-contained and coherent instructional toolkit. The process findings for literacy and mathematics are discussed separately below.

2.2 First Phase: Design Principles

The intentions of the design team in this phase were explicitly not to develop a complete instructional toolkit. The design team focused on supplementation

as an initial goal for two reasons, one strategic and one practical. At the outset, teachers expressed change fatigue, and felt weakened rather than strengthened by the wave of curricular reform. The immediate goal was to attempt to build upon what teachers were already doing, through supplementary curricular tools. The backdrop to this period was curricular policy known as the revised National Curriculum Statements (rNCS) which put at the centre teacher autonomy, and only broadly articulated annual learning outcomes (Macdonald, 2008).

Early in this phase, we gathered instructional materials in use by teachers. These were largely commercially produced materials. New materials development took the form of learner workbooks, designed for homework supplementation and/or classroom-based lesson extension work. The materials were developed in isiXhosa, specifically designed for isiXhosa learners. They were designed not for curriculum coverage, but to support development of key concepts and skills. The design assumption was that teachers would maintain their teaching repertoire, we would share the best published materials already used by other teachers, and new materials would support and extend (rather than replace) existing instructional practice. While aware of the limitations of prevailing practice, we believed that the practice in place was enough to support modest extensions. There are four process findings from this period:

First, teachers had even fewer teaching and learning materials than initial observation suggested. Their 'teaching files' consisted of an assortment of hand-outs from a variety of workshops they had attended, which from time to time they photocopied for the class. These did not constitute a set of materials that could be brought together with any kind of coherence to contribute to pacing and progression.

The second process lesson concerned the way the 'supplementary materials' were used. While developed as supplementary, they were quickly used as a primary and exclusive teaching tool in most classrooms, reaching beyond their intended design. This is probably because these materials were the first set of coherent materials developed in isiXhosa for isiXhosa home language learners which they had had access to. This was a startling finding. While it is notoriously difficult to find ways to directly impact instructional practice, these materials were relatively quickly embraced by teachers.

The third process lesson concerned the day to day teaching structure.

Through observation and classroom support the design team began to conclude that a primary binding constraint for instructional practice was basic *instructional structure*—the rituals, rhythms and organisational systems that help a teacher establish a classroom’s daily, weekly and annual base-step. Instructional base-step is used to refer to the basic rhythm, pacing and practices that keep teaching and learning moving forward in a structured and productive way. The biggest challenge for teachers was not so much any lesson in isolation (even though this was certainly a challenge). The more basic challenge was in stringing together lessons into meaningful learning days, which establish meaningful learning weeks, which hold together conceptually across a learning term and year. The design team became persuaded of the generative potential of a *strong instructional structure*. Well-meaning work focusing on creative pedagogies or once-off lesson plans appeared to miss the mark. An emerging design principle was to focus on the rituals, rhythms and routines that help a teacher find her daily, weekly and annual base-step. As such, the design team were persuaded of the need for a more complete instructional toolkit. Teachers were quicker to reach this conclusion; from early on teachers requested that we work together to create a more complete instructional toolkit to guide and support day to day instructional practice.

The fourth process lesson related to the goals of instructional differentiation. The initial concept paper framing our research intentions focused simultaneously on three principles of teaching: bilingualism, interactivity and differentiation (Ramadiro, 2009). Early aspirations focused on differentiated instruction early in the change process, assuming that successful modest differentiation could make the teaching process more meaningful. Instructional differentiation is both a philosophy and teaching art that acknowledges that different children learn in different ways and at different paces. In more resourced contexts, teachers differentiate instruction through a combination of assessment, content, pedagogy and classroom structure, focusing instruction on smaller groups of children, or even an individual child (Tomlinson, 2014). In this context, we sought simply for teachers to make some productive use of differentiated activities, allowing instructional practice to focus on smaller groups of children.

However, in this early phase of field testing, we were forced to modify this early design principle. The conditions required for even modest differentiation were not

available. Differentiation rests on a classroom culture of high performance, shared between children and teachers across time. The experience suggested that the design principles underlying available strategies and tools for differentiated instruction (assessment activities, instructional tools, and pedagogical practice) are not accountable to the needs and demands of poor and working class large classrooms where too many teachers struggle to use time and lesson schedules systematically and effectively. Pushing for early differentiated practice further alienated teachers. Design expectations shifted. The initial design goal focused on building instructional momentum, acknowledging that teachers would teach largely to a whole class. The second goal, over time, was to build upon instructional momentum with tools that would harness teachers' ability to see, think about, and work with children in more differentiated ways.

Summary Box 1: Design Principles, Phase 1

1. Teachers did not have access to a broad or systematic set of instructional materials to draw upon. The available materials did not constitute a programme for a systematic teaching year.
2. Teachers did not feel supported by curricular policy privileging notions of teacher autonomy over and above access to tools and instructional structure.
3. Supplementary materials were adopted as primary teaching materials. Teachers called for a more comprehensive instructional toolkit rather than instructional supplementation.
4. The most fundamental binding constraint to expand teachers' instructional practice was the lack of instructional structure – the ability to structure and manage teaching and learning for progression across a day, week, term and year. The lack of instructional structure (the lack of an instructional “base-step”) was a more fundamental constraint than weaknesses in any specific pedagogical skill or content knowledge.
5. The conditions for differentiated instruction were not in place. Early design goals shifted away from early differentiated practice, toward a longer term process of building instructional momentum combined with modest workable tools for early differentiation.

2.3 Structured Learner Workbooks

From as early as 2011, the design goals began to shift away from instructional supplementation toward building a core instructional toolkit. In the early period

we decided on structured learner workbooks (one for mathematics and one for home language literacy) as the backbone of the toolkit. The choice of learner workbooks over lesson plans reflects both their potential for generating a base-step and observations about how they functioned in the classroom context. This design decision differentiates the intervention from a wider body of work in South Africa (GPLMS, national district support strategies, e.g., Fleisch, 2012) that establish lesson plans (rather than learner workbooks) as the primary tool to shift instructional practice.

Early in the intervention, we experimented with the co-development of lesson plans, and allocated training time to teachers' working together to write lesson plans. Lesson plans have the potential to impact instructional practice. The act of writing a lesson plan can build a teacher's capacity to envision, plan and enact a thoughtful lesson. They can assist with pacing and conceptual progression. The development of common lesson plans allows teachers to share ideas and practices, and especially more experienced teachers to share ideas with less experienced ones. The potential of lesson plans to serve these functions lies in the relationship between the teacher and the tool, what socio-cultural theorists call the motive. The productivity of individual lesson plans assumes both that teachers have access to a broad enough set of experiences and tools to critically choose and structure lessons themselves, and that teachers relate to *writing* as a *thinking* tool. The productivity of shared / pre-written lesson plans assumes that teachers view lesson plans as authentic (applicable in reality.) It assumes that teachers are motivated to read documents day on day and that they are able to read rapidly, not only for meaning but also to enact a complex range of activities (envisioning, note taking, highlighting, extracting main ideas, making modifications) while they do so. Moreover, lesson plans assume that teachers already approach their days in a structured way, and to the extent that they do not, it is a simple matter to establish this basic structure.

These conditions are not in place in our set of schools. Teachers enact lesson planning mechanically, motivated primarily by district compliance. We observed little evidence of 'planning-in-action' at the level of the classroom. Teachers' relationship with reading was narrow and fragile. The majority of teachers are ambivalent, reluctant readers at best, with few self-generative reading traditions in their lives.

Despite some initial reservations¹⁵, we observed that structured learner workbooks function differently. They behaved as a backbone for teaching, expanding practice for both the weakest (and least motivated) and the strongest (and more motivated) teachers. In the context of classrooms that had little conceptual progression they created a material basis upon which to rebuild a base-step of teaching and learning.

As we observed teachers engaging with structured learner workbooks, and attempted to understand why teachers overwhelmingly reacted positively to them, we came to believe that their value resides in the function, materiality and location of the tool. Lesson plans are primarily a metacognitive tool, attempting to improve instructional preparation, located outside of class time. Learner workbooks reside materially at the interface of a teacher and children. Their materiality holds teachers and children together into a learning moment, structured by some notion of progression over time. The workbooks were a way of bringing international best practice into the classroom, through careful study of representation (how to best represent a concept or learning activity on a page), pacing and conceptual progression.

Workbooks play an important role in teacher development strategies. Given the relative shortage of training time, available time can focus on creating a relationship with a tool, while the tool continues to assist a teacher to master content and instructional practice over time.

The workbooks were used in different ways by different teachers. In classrooms with stronger teachers, workbooks allowed them to take advantage of representation, activities, pacing and conceptual progression. It appeared to allow them to focus their professional resources more fully on the activity of teaching – the careful mediation between new concepts, instructional tools and learners. The more motivated teacher could focus attention on preparation, instructional practice and reviewing and assessing learner work more systematically.

Teachers who were not motivated enough to read associated guides / lesson plans or do more detailed planning would still look at the learner workbook page

15 Structured learner workbooks are not popular among many educationists, who privilege the creative capacities of teachers and children, sensing workbooks to be overly prescriptive and didactic. While we share some of their reservations, these workbooks have been created in close collaboration with teachers, revised many times, and are an essential tool in this particular context and at this point in the intervention.

just before (or even during) the lesson. In this moment, teachers often established their sense of what is required. When designed carefully, pages can be used for this purpose — to support the weaker teacher to get a quick grip on the material, and to signal key teaching moments for the day. The teacher and children still benefit from the representation, progression and pacing, even if in a limited way.

A smaller group made up the least motivated teachers. In these classrooms, workbooks again functioned differently. When these teachers ‘fall onto’ the workbooks, at least some agency is handed to children. Even if a teacher does not prepare, children start looking at the pages, drawing the teacher and child forward into a new day. Because the material is designed with reasonable pacing and progression, there is some learning that can be achieved by children exploring the books on their own, with minimal support from teachers. While the workbooks are designed as teaching tools, they have some functionality when teachers are not, in essence, ‘present’. For these teachers, the question remained whether or not the experience could serve to regenerate motive. Could the scaffolding of learner workbooks expand teacher motive over time? Early results suggested that this is a possibility. For each group of teachers (motivated or not), the experience of the initial learner workbooks (for supplementation) was relatively quickly absorbed, and appeared to increase teachers interest and participation in the collective

There is an active debate in the education community internationally, focused on what are termed ‘scripted materials’. The concern is that in the end, an international move toward highly scripted materials may contribute to decreasing teachers’ professional autonomy, and in the end unravel the agency, art and science of the professional teacher. It is important to highlight this debate and its vital concerns. It is also important to locate the current strategy in context. The materials, in this context, are less scripted than *structured*. The strong structure is a means toward building teacher autonomy and agency, which first and foremost relies on experiences of success.

Placing the learner workbook at the centre of the instructional toolkit meant that the design stakes here are high. The principles for the design of learner workbooks emerging from the first phase of work are summarised in the box below.

Summary Box 2: Design Principles, Learner Workbooks as Instructional Spine

1. Structured learner workbooks have more generative potential to improve instructional practice than lesson plans in this context and at this point in the intervention.
2. The goal of learner workbooks is not supplemental, nor limited to extending learning per se. Their most important function is to scaffold teachers' instructional practice. They are a teaching tool over and above a learning tool.
3. Learner workbooks must hold for a less motivated teacher, and expand instructional practice for an increasingly motivated teacher.
4. Recognising that children learn at different paces, they must do several things, sometimes complementary and at other times contradictory. They must be inspired by curricular aspirations and structure, but be accountable to a pacing and progression that does not leave the majority of children behind, and provide structured opportunities for children left behind to catch up.
5. Learner workbooks must draw upon available theory. Each page must reflect the best use of representation for conceptual and skill development. At the same time, they must answer to a careful understanding of children's and teacher's socio-linguistic contexts. As they draw upon wider theory, they respond to the opportunities and constraints of local instructional practice.

2.4 Transitions

Two important changes occurred in the 2011/2012 period. In this period, the revised Curriculum Assessment Policy Statement (CAPS) (DBE, 2011) and the DBE learner workbooks were introduced in the primary phase. By and large, both changes resonated with the design principles emerging from the work of the MCC at the time.

- **CAPS**

CAPS was introduced to teachers in the Eastern Cape through district level training workshops in late 2011 and 2012. CAPS provided the first detailed integrated curriculum and assessment statement for each subject for each grade, broken into learning goals for each school term. It was a policy response to the lack of instructional structure discussed above. CAPS was never meant to be an instructional toolkit – and therefore did not duplicate nor negate the intervention. The intervention took both an affirmative and critical view of CAPS. The MCC embraced CAPS to the extent that it attempted to provide more explicit curricular and assessment structure, focusing teachers' attention on literacy and mathematics instruction, and providing a stronger

sense of pacing and conceptual progression. Given that the teachers in MCC were accountable to CAPS goals, the intervention looked to CAPS for guidance, while adopting a critical stance by maintaining accountability to MCC teachers and learners through field testing. In essence the intervention sought to ask, to what extent is CAPS workable in the educational and social and linguistic context of MCC learners and teachers? Where must we deviate from CAPS to better serve teaching and learning in these classrooms? The emerging answers were different for literacy and mathematics, and are discussed below.

- DBE Learner Workbooks

From 2012, each learner in the foundation phase was given a workbook for each of home language literacy, English as an additional language, mathematics and life skills. The MCC was interested in the potential importance of this investment into learner workbooks. Were these workbooks the answer? For a moment the MCC considered whether to terminate the design of new materials, and rather place the DBE workbooks at the centre of the intervention. In the first year, we continued tentatively with the work of the MCC, while observing how the DBE workbooks worked in classrooms. In the end we concluded that the DBE workbooks were designed from a different set of design principles. By the end of 2012, the design team resolved to continue to work on developing a different set of workbooks. Affirming the importance of the investment into learner workbooks, the collective hoped to develop learner workbooks more responsive to the rural and poor context, to share the experience, results and design principles. From 2013, the design team set out to build a detailed instructional toolkit. The design decisions and lessons emerging for literacy and mathematics are discussed separately below.

3. ISIXHOSA HOME LANGUAGE LITERACY

3.1 Introduction and Initial Design Principles

At the heart of the MCC is the development of an instructional toolkit for isiXhosa literacy in the foundation phase. As discussed across this paper, literacy in the social linguistic context of these schools is predicated on effective early literacy instruction in a child's home language. This section focuses on home-language literacy development, with the goal of supporting isiXhosa speaking children

to learn to read and write independently in isiXhosa by Grade 3. The three broad design phases are summarised in Figure 9. This section summarises the experiences and design principles emerging across these phases.

The initial design principles for home language literacy development are summarised in Box 3. They speak to a balanced approach to home language literacy development, presented schematically in Figure 8. To the extent that different approaches to literacy are regarded as complementary rather than competing, we know that children from text-poor homes require both skills (systematic phonics) and immersion in literate activities (accessible experiences of reading and writing for real reasons.) The question is how to do these things effectively and simultaneously in large classrooms? Moreover, in the burdened context of a teaching day, exactly what and how much of each element represents balance? Across this discussion, we focus attention on the design team's evolving understanding of balance and imbalance.

Summary Box 3: Initial Design Principles, Home Language Literacy

1. When children begin school, they are still learning their home language. A fundamental task of school is to immerse children in home-language activities that extend their speaking and listening skills.
2. Children need to develop a sophisticated awareness of the phonological system of their primary language as part of learning to read an alphabetic script.
3. Children need explicit, systematic and enjoyable phonics instruction which takes place briefly but regularly, as part of a broader literacy programme.
4. Children need many opportunities to try out and apply in context their newly-acquired phonological awareness and knowledge of phonics. Therefore, immersion in meaningful reading and writing experiences from the first days of schooling is vital.
5. Children learn to read by reading. In order to read extensively, children need regular access to materials of a high quality, in a variety of genres, which are of interest to them and within and just above their current reading abilities.
6. Children do acquire vocabulary, fluency and comprehension in the normal course of reading. However, it is necessary to teach vocabulary, fluency and comprehension strategies in order to ensure independent reading at grade level.
7. School based experiences with literacy must engender a positive emotional relationship with text. If children's experience with text is stressed, uncomfortable, or frustrating, they are unlikely to break through, even if other elements of good literacy teaching are present.

Figure 8: *Balanced Literacy Teaching*

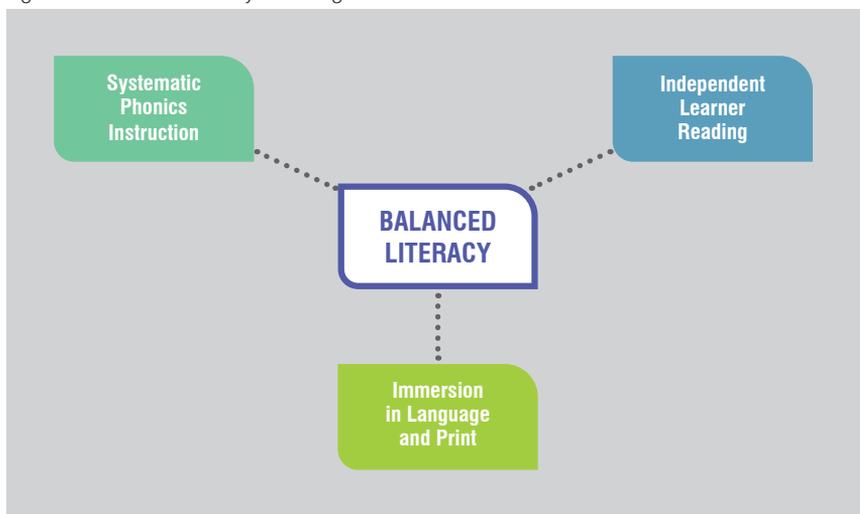


Figure 9: *Summary of Home Language Literacy Toolkit Development*

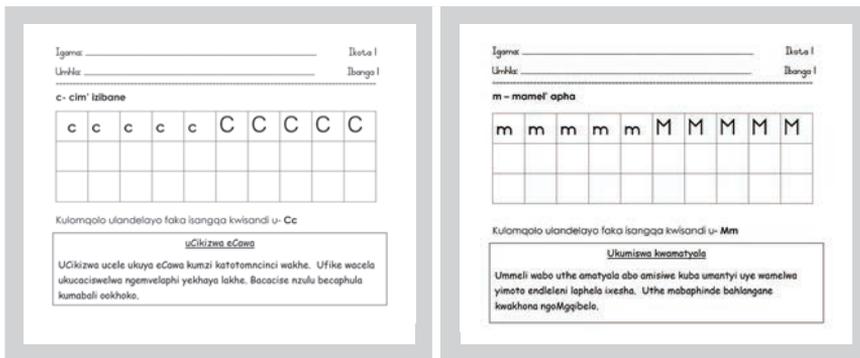
PHASE 1	PHASE 2	PHASE 3
2010 to 2012	2012 to 2015	2015 to 2017
Supplementation: Learner Workbook & Independent Reading	Primary & Complete Toolkit: Learner Workbook Independent Reading Teacher Storybook Programme (Phonics Research)	Primary & Complete Toolkit: Integrated Workbook Phonics Pocketbook (Phonics Research)

3.2 Design Phase 1

The early phase of design work in home language literacy has been summarised above. In the initial period, the design team focused on developing homework workbooks to supplement home-language instruction. By the end of 2012, the work extended to build a more comprehensive set of workbooks to scaffold day to day instructional practice. The primary goal was to package a balanced literacy programme in a workbook. The aim was to provide learners with grade level literacy practice, integrating language development and phonics skills with modest reading for comprehension and independent writing activities.

At this point, phonics skills were developed through a series of carefully written short sentences and passages. It was neither a phonics programme in the dominant, inductive sense, focusing on the smallest unit of sound-letter correspondence outside of meaningful context. Nor was it a whole language programme, addressing phonics largely as they occur in texts of interest. It sought to find the intermediary ground, building small passages with some meaning, which focused on specific 'decoding' skills (Figure 11).

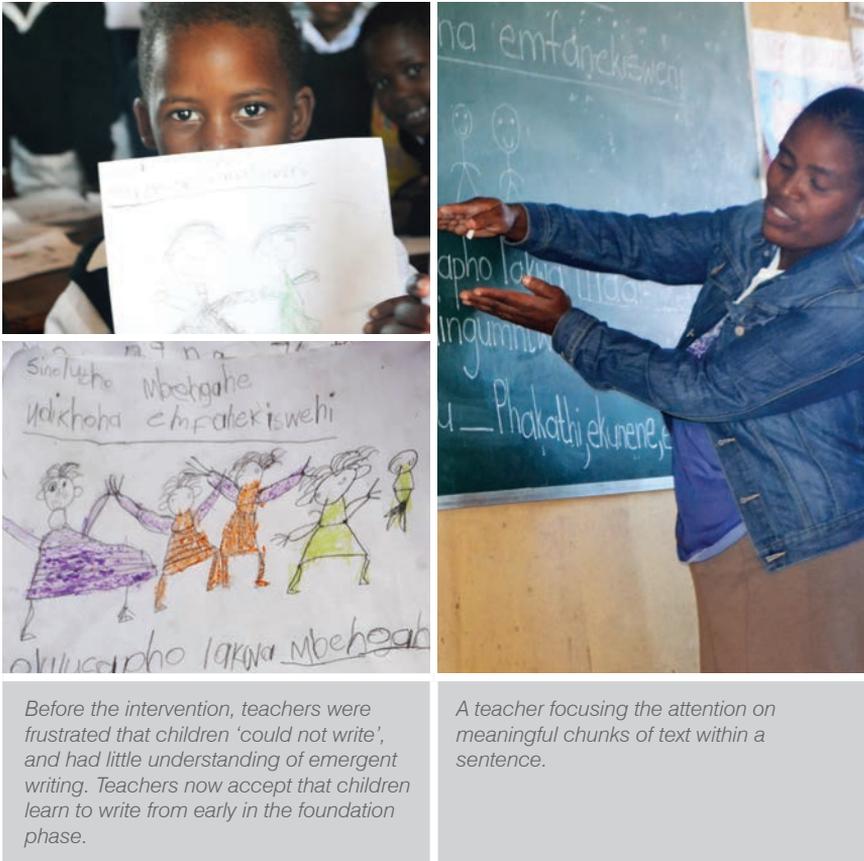
Figure 10: Illustrative Excerpts: isiXhosa Literacy Workbooks



Grade 1 Term 1. Simple examples of an approach to phonics that is explicit and systematic, and yet tightly tied to meaning. On these pages, children work with consonants, both as isolated sounds, and embedded into text. Sentences have been constructed that provide a good context for a child to play with the sounds in the context of a meaningful chunk of text.

The writing component of the workbooks focused on the mechanics of writing that support the development of reading. This involved emphasis on letter formation, conventions of writing such as word spacing, directionality, spelling, punctuation and capitalisation, and basic composition skills such as grammar, word choice, and how to grow sentences and paragraphs.

Figure 11: Emergent Writing



Before the intervention, teachers were frustrated that children 'could not write', and had little understanding of emergent writing. Teachers now accept that children learn to write from early in the foundation phase.

A teacher focusing the attention on meaningful chunks of text within a sentence.

During this period, the design team also undertook a review of available instructional materials, focusing on isiXhosa phonics and independent reading. The available literature was limited.

Teachers supporting an English speaking child to read independently have access to a range of instructional tools, often grounded in established theory, empirical data, and professional practice (CIERA, 2003; National Reading Panel, 2000). They have access to a range of assessment toolkits, and a wide range of basal readers / levelled texts available to support independent reading (e.g., Leslie and Caldwell, 2011). When used well, these tools assist teachers to support children to read from the early weeks of Grade 1, framing a new world for teachers

and children from early on. Such materials provide structure to children's emergent reading practices, enabling them to gain confidence earlier, especially if they have little access to print inside and outside of school.

While some of these materials and tools exist in isiXhosa, most of them are not grounded in principled theory, data, and a study of teacher's professional practice. There has been exceedingly little investment into the interface of African languages, pedagogy, and literacy (e.g., de Vos, van der Merwe and van der Mescht, 2014). There is little data on isiXhosa reading development, either relating to the development of phonics skills or how these skills work with isiXhosa lexico-grammar and readers' own familiarity with different genres of written material and their background knowledge. There are no normed assessment protocols to assess reading development. There are no tested design principles for basal / graded readers for African languages in general or isiXhosa in particular. There are few sets of levelled readers. Amongst the known sets, there are well known limitations, including small numbers of readers within sets (SAIDE, 2011). The problem runs deeper than these technical shortfalls. Given the dearth of research in this area, there is scant empirical basis for notions of 'grade' and 'level'. Without this data, the few attempts at developing levelled readers have had to rely on small scale data, professional judgement, guesswork, and mostly on spurious analogy with English language reading development. On the latter, the assumption is that what makes an English sound / word / sentence / paragraph simple (or increasingly complex) applies to isiXhosa, even though it is obvious that isiXhosa is structurally different.

In this early intervention period (2010 to 2012), we reviewed readers available from publishers (not just limited to basal readers), and bought a starter pack of books for each classroom. We undertook some basic training with teachers on how to support independent reading in the classroom. The books did not constitute satisfactory sets of graded readers, but at least established a wider set of readers in each class.

Unlike the workbooks, which were taken up rapidly, it is less clear how quickly these expanded reading resources translated into activity. The teacher response was uneven, with some teachers using the books often, others less so. Most teachers did not use them systematically.

An important lesson of this period was the lack of available suitable material for two key elements of a balanced reading programme: tools and materials

to support phonics development in large classrooms and levelled reading materials to support fluency development and reading for understanding. These components of a balanced reading programme rely on a better grasp of language and reading development in isiXhosa, as discussed below.

Summary Box 4: Emerging Design Principles, Home-Language Literacy

1. A learner workbook establishes an effective structural backbone for home language literacy progression in this instructional context.
2. An effective workbook must include an explicit approach to phonics skills development in the home language.
3. There is a need for classroom-based qualitative and quantitative longitudinal studies that investigate the development of phonics skills in African languages. Such studies will help refine our notions about how children learn to read in these languages, and inform pedagogy and materials development.
4. Researchers, teacher educators, curriculum specialists and publishers need to work together more systematically to develop criteria for the production of levelled/graded readers in African languages in the foundation phase.
5. There is an urgent need to focus on producing expository or informational texts in African languages in the foundation phase. To date most available materials in this phase are narrative texts. African language speaking children are at a disadvantage relative to their Afrikaans and English speaking peers by the end of grade 3, partly because the former have little access to informational texts, reducing the range of vocabulary, text structures, and topics they are exposed to. This further impacts whether they are prepared to make the language and learning transitions currently expected in Grade 4.
6. Research into writing development in African languages in the foundation phase is even more underdeveloped than research into reading. In particular, there is a need for research into writing activities that support the acquisition of the alphabetic system and composition skills.

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- 16 There are quality isiXhosa children's books that are no longer in print due low demand. Some of these would be important to bring back into print if we could establish the partnerships needed to do so.
 - 17 We value the intellectual leadership of Xolisa Guzula in regard to the development of the Teacher Storybook Programme.
 - 18 We express appreciation to the work of Biblioneef, who assisted in the review and procurement of quality isiXhosa literature. We acknowledge our valuable partnership with Puku in the promotion of African language children's literature. We acknowledge the contributions from the Alpha Trust Foundation to the development of this programme.
-

3.3 Design Phase 2

Moving into 2013, the literacy programme consisted of a learner workbook, combined with a rudimentary independent reading programme. The independent reading programme remained preliminary and less than fully structured, given the non-availability of readers meeting criteria described in Box 4 above. From 2013, a new aspect of the home language literacy programme was introduced, that became known as the Teacher Storybook Programme (TSP). The design was initially inspired by four purposes: to expose children to quality literature (giving them the experience of being consumed by the magic of a book); establish a routine of reading aloud to children (as an opportunity for children to listen to and discuss with their teachers texts beyond their current reading experience); establish an early morning ritual of reading aloud to mark the beginning of a new teaching day; and to establish a relationship between teachers, reading and quality children’s literature, nurturing teacher’s own experiences of reading for enjoyment.

The initial design was relatively simple. The design team reviewed isiXhosa children’s literature that was currently in print.^{16 17} One book was selected per week (10 books per term) for each Grade – 40 books per grade, per year. These books provided a material basis for opening each school day by reading a story.¹⁸

The programme, however, quickly grew beyond these early design intentions, and became, in the end, a large whole-language reading programme. Each book became the basis for a whole language lesson, structured across a teaching week, used systematically for reading aloud, paired reading, sentence work (including sentence strips), listening (including listening to audio books), phonics development, vocabulary extension, art, and writing.

Table 5: Weekly Structure of the Teacher Storybook Programme

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
Comprehension Strategies	Vocabulary	Writing	Phonics and Word Identification	Art and Language Use
visualisations, questioning, predicting, making connections	identification of key words, synonyms, antonyms	letters, summaries, new stories, book reviews	Phonological awareness, phonics, grammar	applications with art, music, games, re-telling, summarising

Figure 12: Teacher Storybook Programme, Grade R



This soft spoken teacher teaches Grade R in Mbizana. In this lesson she starts by talking about the author and the illustrator. She then asks children to guess what they think the story is about. Two children raise their hands. She gently asks a few of the quieter children to share their ideas. Skillfully she brings most of the children into the conversation, going back to the children who have more to say after the quieter children have had a chance. Her skills are demonstrated by the many children who are ready to share their ideas with her. By the time she moves forward, many children have had an opportunity to share their ideas, and all of them are interested to see if their predictions come true.

Taken together, the home language literacy programme comprised a total of three tools – the literacy workbook, the independent reading programme, and the teacher storybook programme. In reality these programmes competed for limited time each day. CAPS prescribes a learning week of 23 hours for Grade R to 2, and 25 hours in Grade 3. 10 hours each week are dedicated to literacy, inclusive of both home language literacy and English (FAL). Roughly 75% of this time is dedicated to home language development. Even in fully functional schools, this represents at most 1.5 hours per day of home language literacy work. Schools are far from functional. In the end the question facing bi-literacy development is not so much, what is possible, but rather, what is possible in the time available?

Observations across this period are complex. On the surface, the TSP appeared to be an especially successful element of the programme. Evident both through classroom observation and teachers' own reflections, the TSP appeared to impact teachers' practice, discourse, and identity. The tool appeared

to contribute toward shifting teachers' relationship with children's literature, their relationship with reading with children, and their ability to use connected texts to teach phonics and grammar. Their classrooms looked and felt different, focused on whole language activity. Perhaps most importantly, for a number of teachers it appears to have loosened their tight grip on simple replication of previous practice. They moved away from primarily board based word work, and began to enact literacy for real reasons, often for the first time. Most teachers found that reading aloud was a workable ritual to open school days; some teachers found it workable to end school days. In terms of discourse, teachers' reflections and conversations turned toward instructional practice, focused on children, teaching and reading. In terms of identity, teachers spoke of feeling like 'a teacher', and they spoke of enjoying their classrooms for the first time. These are invaluable gains.

However, there was a downside. The toolkit had multiple parts. For teachers with little experience with curricular structure, it was difficult to manage. In the end, teachers were increasingly drawn to the TSP, which consumed the greater part of literacy instruction day on day. Systematic phonics instruction and independent reading support, structured by the other two tools, was increasingly crowded out, disrupting the initial design principles. As emphasised by early design principles, programmes that push phonics to the margins are not likely to create independent readers in text-poor classroom and home contexts. By 2015 the design team was concerned that the attraction to the TSP had inadvertently crowded out the other elements, especially systematic phonics and early independent reading instruction.

An internal review of the programme pointed to another concern. The TSP was initially designed for teachers to read out loud, providing an opportunity for children to engage in text beyond their independent reading level. This level of text should challenge children intellectually, help them to learn new words and more complex language structures, make them think about new things, explore new questions, consider complex characters, and move into 'chapter books' with more plot. The books that were initially selected for the TSP did not all meet these design principles. Many books were in essence too simple to play this role, books better suited for shared reading or independent reading in these grades, rather than reading aloud.

Combined with our concern about the lack of research on isiXhosa literacy development in general, and phonics in particular, the design team concluded that while teachers experienced their classrooms as reading friendly, we were unlikely to be building independent literacy skills, at grade level, for all children. It was not that the TSP did not prove its value; it simply took too much time in the context of a balanced toolkit. The 2015 literacy results confirmed the complex conversation here (See Section 8.2 below.) Teachers had made important gains in their classrooms. They were not yet creating independent literacy at scale in Grade 3. Box 5 summarises the design principles emerging from this phase.

Summary Box 5: Phase 2 Design Principles, Home Language Literacy

1. The systematic use of quality home language children's literature in the classroom appears to be generative in re-establishing a relationship between teachers, children and reading.
2. The ritual of systematically reading to children at the beginning and ending of each day appears to be accessible, and appears to make a positive contribution to providing initial structure to a teaching and learning day.
3. Children in working class schools require balanced reading instruction, combining systematic language skills with reading and writing for real reasons. A programme that marginalises systematic and explicit phonics, and a structured independent reading programme is not sufficient to build independent readers and writers at scale.
4. The weakness of a tool with too many independent components is that it relegates instructional balance to day to day pressures, habits and preferences.
5. An effective balanced literacy programme will have some kind of backbone that explicitly supports teachers to achieve instructional balance.
6. Materials for reading aloud must be selected carefully to ensure that they expand children's language, imagination and knowledge.
7. While it is necessary to do some phonics work in the context of connected texts, in large classrooms and in communities where there is little access to print, this cannot substitute for targeted, brief but regular, fun, explicit and systematic phonics instruction conducted daily.
8. In the next phase of work, the most important learning for the field resides in a closer examination of the relative strength of different elements within a toolkit, contributing in the end toward a better appreciation and explication of balance in this instructional and social context.

3.4 CAPS and DBE Workbooks:

As discussed above, there were two important developments in the 2011/12 period. In this period: the revised Curriculum Assessment Policy Statement (CAPS) and the DBE learner workbooks were introduced in the primary phase.

CAPS was introduced to teachers in the Eastern Cape through district level training workshops in late 2011 and 2012. CAPS provided the first detailed integrated curriculum and assessment statement for each subject for each grade, broken into learning goals for each school term.

An early review of CAPS in the area of isiXhosa home language literacy raised some red flags. There were three early concerns about CAPS that have crystallised over time. First, CAPS does not provide an adequate guide for the expectations for language and literacy development for African languages. The limitations are particularly important in the area of phonics, writing development and reading comprehension. The second concern focuses on the links between grades, with wide curriculum expectations gap between grades, and especially between Grade R and 1, and between Grades 1 and 2. The final concern is about breadth, depth and balance. Home language literacy expectations do not appear to help with structuring a balanced approach to reading and writing instruction. All aspects of balanced literacy instruction are not covered in sufficient breadth and depth. It appears that CAPS attempts to cover a wide range of literacy skills, but does not adequately assist teachers to structure the depth of skills, nor the instructional balance between skills, consistent with grade level expectations. As such, while the design team used CAPS as a general guide, it also remained accountable to the limits of conceptual progression demonstrated in classrooms.

The DBE Workbook for home language literacy and mathematics was introduced in 2011. In crowded, text-poor rural classrooms the introduction of the DBE workbooks was important for several reasons. In classrooms with fragile cultures of teaching and learning, the DBE workbooks helped to concretise CAPS for many teachers and provided a basis upon which conversations about teaching and learning could be held between many actors. Subject advisors and teacher development practitioners had a material tool around which to begin various kinds of in-service initiatives. Strong teachers began to have conversations about the place of worksheets in CAPS, the concepts and skills which it aimed to develop, and how to teach and assess them. Even if only indicative, the workbooks began

to clarify some of the concepts and skills learners were expected to master in each grade.

For most classrooms, this was the first time that all children had their own individual copy of a bound and multi-page set of materials. (This was true only two or three years after workbooks were first introduced, when delivery of workbooks to schools became increasingly reliable). Each child having their own copy of printed materials was important for rural schools, where secure access to print for every child had always been a struggle. The worksheets in general are visually appealing, colourful and engaging, and contain a range of key activities including drawing, colouring, cutting, reading and writing, and present a range of topics for classroom discussion. The workbook provides examples to teachers of quality instructional worksheets.

However, the design team observed a number of problems with the DBE workbooks, mostly embedded in their purpose and design. The workbooks were not designed to structure teacher's day to day instructional practice. They are a collection of good examples, rather than a structured teaching programme. However, while the workbook is designed as supplementary (like the first phase of MCC materials), teachers neither understood that it was designed for supplementation nor used it effectively for supplementation.

In terms of home language literacy for isiXhosa, the workbooks on their own do not scaffold a balanced approach to literacy instruction. They do not provide a structured approach to balanced reading and writing instruction. Not all aspects of balanced literacy instruction are covered in sufficient quantity or depth. The workbooks provide examples of practice, seemingly with a tacit assumption that intensive practice for conceptual and skill development and consolidation will occur elsewhere in the teaching day. The workbooks share the design flaws of CAPS. They attempt to keep up with CAPS, and in so doing cover too much too fast, without reasonable scaffolding for conceptual development page by page. A teacher who relies only or largely on the workbook as a teaching tool is unlikely to achieve grade level expectations for literacy, because much of what is needed to reach these goals is not covered.

The generic nature of the home language workbooks, demonstrated for instance by the fact that they deal poorly with isiXhosa phonics development, probably reflects a development team and process dominated by English-

speaking materials developers and their sensibilities. The structure and content choices of the workbooks suggest that they are versioned copies of English workbooks, rather than originally created within the linguistic and literacy logic of an African language.

The lack of teacher support materials further challenges their instructional value. Recognising that only a few teachers read extended support materials, the provision of an instructional guide could have assisted district officials and other lead teachers tasked with training others to understand their pedagogical role more accurately. A teacher guide could make explicit to teachers the pedagogical assumptions underlying each worksheet. This is not about scripting classroom interaction, but about making visible to teachers pedagogical assumptions woven into worksheet design. The teacher guides, in particular, could directly address the question of how the effectiveness of the workbooks could be maximised in large and under-resourced classrooms. Such a guide could encourage subject advisors and other teacher trainers to examine the workbook and work through the implications of using the tool in large classrooms. This would help ensure that workbooks are not simply used in mechanical ways, or as a mere learner 'activity book', reinforcing patterns of rote learning.

Summary Box 3: Analysis of CAPS and DBE Workbooks: isiXhosa Home Language Literacy

1. CAPS for isiXhosa home language literacy does not provide an adequate guide to achieving the expectations for balanced language and literacy development. This is especially the case regarding phonics and writing development.
2. A review of CAPS for isiXhosa home language in the foundation phase is required. The review should focus on providing clearer guidance about expectations for phonics, reading fluency, reading comprehension, and writing. Special emphasis should be placed on the curricular expectations between grades.
3. A workbook on its own may not be adequate for teaching, especially basic systematic phonics. A home language literacy workbook may have to focus on a smaller range of areas where workbooks are effective, such as teaching vocabulary, reading comprehension, emergent writing and independent writing development. The challenge to an integrated toolkit with more than one part will be to find an effective instructional spine to structure and balance the elements of the toolkit.
4. Given the continued prevalence of whole-class and rote teaching and learning strategies in many classrooms, it is essential that workbooks are accompanied by a teacher guide designed to make explicit pedagogical implications.

5. While there is some overlap between English and African languages on some dimensions of literacy, early literacy materials in African languages cannot be produced primarily through the lens of English, that is, through versioning largely in the form of translation. The materials should be produced through the linguistic, orthographic, and sociolinguistic and pragmatic logics of these languages. This has implications for how materials development teams are constituted and led.

3.5 Design Phase 3

From 2015, the design team was convinced that the development of a systematic phonics programme and associated structured reading materials was contingent upon a better understanding of isiXhosa children's reading development.¹⁹ From 2015, focus was placed on building this dataset. The goal was to generate data to inform the initial design principles of subsequent isiXhosa literacy materials development.

In 2015, a set of reading assessments was developed to assess alphabet knowledge, phonics (in isolation and in connected texts), reading fluency and comprehension, as well as school attendance data. A group of trained junior researchers carefully administered these assessments with children. At the end of the fourth term of 2015, data was gathered covering a total of 257 learners from Grade R to Grade 4 in an Mbizana school. The school was chosen due to its relative functionality. During the end of fourth term of 2016, similar data was collected in a school in Mqanduli.

The full results will be presented upon completion of the analysis. The data is designed to provide us with a better understanding of the state of reading in isiXhosa and across different varieties of isiXhosa. Some preliminary results, based on a subset of the data, already confirm some of the concerns raised above. Table 6 presents a preliminary summary of some of the data.

19 Phonics and structured readers in English, for example, reflect a detailed research base designed to understand reading progression. This data provides insight into how children learn to read in English (home language speakers and additional language speakers), the strategies they use to develop their reading, and the common struggles they have. It is known that children rely heavily on onsets and rimes in the early period of reading in English. It is known which vowels and vowel clusters are easier (and more difficult) for children to read. It is known that there are some sounds that are particularly difficult to distinguish. It is known which consonant clusters, vowel arrangements, word lengths give children the most trouble. This type of understanding does not exist for isiXhosa, and curriculum writers are left to make more or less educated guesses.

Table 6: Alphabet and Phonics Tasks: Median % Correct, Across Grades

	OVERALL	GRADE R	GRADE 1	GRADE 2	GRADE 3	GRADE 4
Sequential Alphabet Uppercase	84,6	19,2	96,2	100,0	73,1	92,3
Sequential Alphabet Lowercase	92,3	30,8	96,2	100,0	57,7	90,4
Random Alphabet Uppercase	65,4	7,7	96,2	96,2	42,3	96,2
Random Alphabet Lowercase	80,8	11,5	92,3	96,2	61,5	96,2
Word List 1	52,5		22,5	55,0	62,5	74,4
Word List 2	45,0		1,3	46,9	65,0	73,1
Word List 3	36,0		0,0	51,2	48,8	79,9

Regarding alphabet knowledge, the median percentage correct score on a task of reading the alphabet in its conventional sequence for grade R learners was 19.2% for the upper case and 30.8% for the lower case. Thus by the end of Grade R most learners do not know the alphabet in sequence. This is even more apparent when alphabet knowledge is assessed through a task that requires grade R learners to identify the alphabet out of sequence, with median percentage correct scores dropping significantly to 7.7% for the uppercase and 11.5% for the lowercase. These results are of serious concern given that research suggests strong alphabet knowledge by the end of grade R is predictive of early reading success (e.g., Piasta and Wagner, 2010). The median percentage score correct for grades 1 and 2, for both the sequential and random alphabetic identification task, are high but not perfect. Also, what these scores do not show is that while readers were able to identify letters of the alphabet, many took a long time to do so. In other words, letter knowledge was not automatic. Grade 3 did better than the table would suggest. Many learners in grade 3 moved in and out of reading the letters in isiXhosa and English and hence the low score for isiXhosa. There are a couple of probable reasons why many grade 3 readers moved in and out of isiXhosa. The most proximate one is the nature of the task, that is, letters in isolation as pure symbols providing no contextual clues indicating the language in which they

should be decoded. The lack of perfect scores in grade 4 is also explained by readers in this grade moving in and out isiXhosa.

The phonics task consisted of three word lists, each with about 40 words. Word list 1 was the easiest and word list 3 the most difficult. When all three lists are combined, they incorporate all isiXhosa phonic patterns. The purpose of the task was to assess which phonics patterns readers can use in the context of word identification. Overall, median percentage scores increase grade by grade - from grade 1 to 4. On the whole, readers across grades struggled with word identification. The table suggests that by the end of grade 1, readers identify between 0% and 22.5% of isiXhosa phonic patterns correctly; between 46.9% and 55% in grade 2; between 48% and 65% in grade 3; and between 73.1% and 79.9% in grade 4. Across the grades, most readers did not use phonics efficiently, with reading often characterised by false starts, long pauses, repetitions, slow and disfluent reading. In this school, readers have not mastered isiXhosa phonics. Even into grade 4, many learners have not consolidated their knowledge of isiXhosa phonics.

The value of the dataset is less evaluative, and more interpretive. It begins to provide an understanding of children's reading development across grades. In the context of a reasonably organised school, it is designed to contribute to our understanding of the sounds and contexts of sounds that home language learners experience the most ease and the most difficulty with. It will deepen our understanding of errors and common substitution patterns. And it will help us explore the relationship between phonics development and early reading. In the end, its value lies in its contribution to better design principles guiding the redevelopment of the isiXhosa phonics and independent reading programme.

The initial findings translated into an instructional innovation that will be tested in 2016 and 2017. The initial findings guided the development of an isiXhosa phonics pocketbook. It is designed for use both inside and outside of the classrooms, by teachers and by peers. It will be distributed to all MCC schools, and piloted intensively in three schools. Moreover, during this period, the home language literacy toolkit will be streamlined into a more user friendly tool, with a structured backbone.

Summary Box 7: Final Design Principles, Home Language Literacy

1. Initially, teachers had an extremely low level of knowledge or pedagogical experience oriented toward teaching reading and writing through a child's home language, ultimately believing that teaching independent reading was not possible in the foundation phase.
2. The initial teaching 'leap' required into effective literacy teaching is the ability to structure and utilise a teaching day. Even as teachers learn more about literacy instruction, their ability to translate knowledge and ideas into instructional practice is largely reflected their ability to structure and organise instructional time across a day.
3. A structured and balanced toolkit combining whole language activities with language skills expanded teachers' pedagogical practice in regard to home language literacy.
4. The complexity of balanced reading instructional design is not the simple combination of elements, but the balance between instructional elements, in the context of a burdened teaching day. In the end, the question facing bi-literacy development is not so much, what is possible, but rather, what is possible in the time available?
5. Little is known about instructional balance to support isiXhosa independent reading in poor urban and rural schools. More refined design principles must emerge from further research and exploratory work.
6. The development of a systematic phonics programme, and associated structured readers, is somewhat contingent on studying a dataset which explores reading development and progression amongst home language learners in isiXhosa.
7. Even in classrooms that benefit from some stability and structure of instructional time, the time constraints on home language literacy development are severe. Supporting the majority of children to meet current curricular goals is likely to require finding more instructional time, both inside and outside of classroom time.

4. ENGLISH AS A FIRST ADDITIONAL LANGUAGE (FAL): LANGUAGE ACQUISITION AND LITERACY DEVELOPMENT

4.1 Introduction and Initial Design Principles

The MCC aimed to develop an instructional toolkit that supports isiXhosa speaking children to learn to read and write independently in isiXhosa by Grade 3 *and* to contribute to building enough language and literacy skills in English to help

learners transition to use English as a language of teaching and learning from Grade 4, as provided for in CAPS.

On this point, CAPS should be understood as a negation of language education policy (RSA, 1997) which provides for additive bilingual education, that is, the use of a child's home language as a language of teaching and learning for as long as possible, while adding on other important languages in the earliest possible grades. In the case of isiXhosa and English bilingualism, for isiXhosa home language children this means the use of isiXhosa as a language of teaching and learning *for as long as possible* and early introduction of English as an additional language. The international consensus is that, depending on school and broader sociolinguistic context, children require about 6 to 8 years of *good teaching* in the home language in order to make a successful transition to learning in a second language as the only primary language of instruction (Cummins, 2000). In other words, while the English FAL programme can contribute to fostering rapid, deep and high levels of English language skills among children, given that English is not commonly used in the communities, homes and schools in which our FAL classrooms are located, their English skills will not be adequately developed by the end of grade 3 for children to be ready to learn through English-only in grade 4. The realistic goal of the MCC's English first additional language (FAL) programme is to support English language and literacy acquisition to help make the transition to learning and teaching through English in grade 4 less painful.

The previous section described the experience and design principles in home language literacy development. It spoke to the delicate balance between the elements of a balanced literacy programme. This section summarises the experience and emerging design principles for English as FAL. It focuses on a different balancing act: the balance between home language literacy development and English literacy development, again in the context of a burdened instructional day. Out of 10 hours per week allocated to literacy work, CAPS allocates roughly 2.5 hours to developing English as an additional language. Assuming a classroom operates effectively, this translates into roughly 30 minutes per day. The initial design principles guiding development in English as an additional language are presented below.

Summary Box 8: Initial Design Principles, English Language Literacy

1.	While there is overlap between Cummins' (2008; 2003; 2000) theoretical constructs of basic interpersonal communicative language skills (BICS) and Cognitive and Academic Language Proficiency (CALP), it remains both theoretically and practically useful to maintain a distinction between these constructs if we are to formulate pedagogically realistic goals for additional language learning in the foundation phase.
2.	A realistic goal of English language learning in poor rural and urban foundation phase classrooms, where in particular teachers struggle with English and children have little access to English inside and outside the school, a realistic goal for English language learning in the foundation phase is acquisition of (modest) BICS. The implication is that in most cases it would be inappropriate to use English as medium of learning in grade 4.
3.	A principled distinction must be made between processes and contexts of learning and use of home language and additional language literacy. Again, while there is overlap in strategies for teaching literacy in alphabetic scripts, such as English and isiXhosa, the two languages require very different approaches, because in the former we are primarily concerned with language acquisition and in the latter with literacy acquisition. While in both cases literacy is a tool and object of learning, teaching and learning goals and processes ought to be different.
4.	Long term English literacy proficiency in this context is contingent on solid home language literacy development (Baker, 2006; Cummins, 2000; Taylor and von Fintel, 2014).
5.	A focus on English is counterproductive to the extent that it disrupts quality home language instruction.
6.	Children learn a new language a little at a time. Small regular lessons are more effective than longer more sporadic lessons. English instruction is highly contingent upon a teachers' ability to structure and use instructional time.
7.	Children must be systematically introduced to English as early as possible. Early instruction must focus on early language acquisition and orientation (phonemic and phonological awareness). Given the current curricular expectations, enough language proficiency must be consolidated by early Grade 2, as a basis to moving into English literacy development.
8.	Effective additional language instruction requires that the home language is drawn upon in a principled way to support language and literacy acquisition.

4.2 MCC Design Experience

As discussed in the baseline findings, teachers reported that they were teaching English. However, before the MCC there was little evidence of English instruction,

let alone systematic English language instruction and literacy development in the foundation phase.

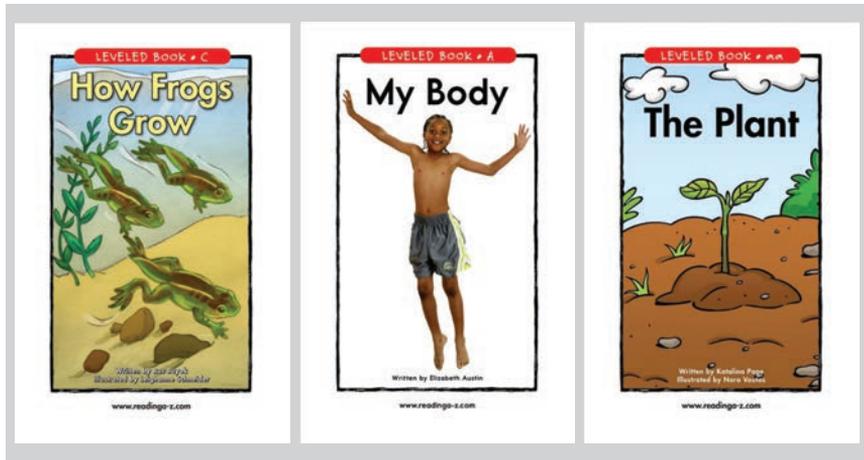
In this period, we attempted to develop and introduce an English as an additional language toolkit, at the same time as introducing the isiXhosa literacy programme. The toolkit was not structured by a learner workbook, but rather took the form of an assortment of written, audio and visual materials making up an instructional toolkit, requiring greater levels of instructional organisation.

The Grade R toolkit focused primarily on providing learners with aural language input and development of phonological awareness in English as a basis for literacy in subsequent grades. The toolkit consisted of posters and recordings of nursery rhymes and songs. The programme was relatively simple and manageable, designed to require little instructional time. The toolkit was relatively well received. Given that nursery rhymes and songs had become an increasingly important tool for teachers to structure classroom days, the toolkit fit well within the overarching goal of structured and curriculum-rich instructional days. The toolkit will be redesigned based on lessons emerging from this experience.

From Grade 1, the toolkit became more complex, with higher instructional and organisational demands. The toolkit for Grade 1 to 3 focused on aural and oral language development as well as literacy development. Year on year, the toolkit builds progressively on listening, extends learners' aural and oral language base, and builds phonics and word identification skills, vocabulary and comprehension, and writing. The toolkit progressively focuses attention on books. A set of levelled readers is provided for each grade. The design team drew upon a set of levelled readers written by US teachers²⁰, planning to develop a local set of readers once we better understand design requirements. By Grade 3, book selection shifts from narrative to more informational texts in order to prepare children to 'read to learn'. They focus on science, history and art. A written guide provides a common set of activities for each book, combining reading to children, summarising, paired reading, audio recordings, listening and comprehension work, and writing. In the first phase, a toolkit was designed that was intended to be completed in half of the year. The toolkit was introduced to Grade R in 2010, to Grade 1 in 2011, and to Grade 2 and 3 in 2012. Examples of items from the toolkit are presented below.

20 The initial books are drawn from Reading A to Z (<https://www.readinga-z.com>).

Figure 13: Exemplars from the English FAL Toolkit



Teachers struggled with the materials. It became increasingly clear how little experience teachers had with teaching English on a daily basis. Moreover, to the extent that they had taught English, teaching centred on a narrow set of drills, with little spoken and written English. While the FAL materials developed did not move fast enough to prepare children for the language transition at Grade 4, teachers experienced the materials as a huge stretch of their skills.

The design team watched the balance between home language literacy instruction and English instruction. The toolkit attempted to move into English literacy (reading and writing) from Grade 1. The balance between home language literacy teaching and English FAL was not hard-wired into the materials themselves, but rather relied on the teachers' pedagogical knowledge and organisation of an instructional day. It appeared that some teachers taught English FAL at the expense of home language literacy, while others found little space for English FAL.

The design team identified what appeared to be design flaws in the English FAL programme. It had too many parts and was therefore difficult for some teachers to manage. The challenges to design principles reached further. The lack of comfort with the toolkit raised more questions than it answered. There were a wide range of possible reasons for the discomfort, ranging from the lack of teacher experience to over-ambitious curricular aspirations.

Across time, the design team reviewed the expectations of curriculum for English as a first additional language (FAL) across the foundation phase. The limitations of CAPS are starkest for African language speaking children in the area of expectations for English as FAL. The curricular expectations during this phase are not calibrated to the reality that many additional language learners of English have little access to English inside and outside of school and that many teachers of English as additional language in such schools struggle with English themselves and use ineffective strategies to support language acquisition (e.g., Nel and Muller, 2010). The effect of this is that there is a big gap between curriculum expectations for English language acquisition and what can be achieved in these classrooms. This is manifest in the fact that while children learn some English, probably a lot of English given the context, what they are able to learn by the end of grade 3 is not adequate to prepare them to learn through this language at the beginning of grade 4.

Unrealistic curricular aspirations do not, on their own, explain the low levels of teaching. There were several questions facing the redesign of the English FAL instructional toolkit. In reference to teachers, how much of the difficulty with the toolkit was a simple reflection of teachers' weak instructional practice? In reference to learners, how much of the difficulty was a simple reflection of pacing and unsound curricular expectations of CAPS for English as an additional language in these communities? What was the dialectic between home language learning and English FAL during these years? That is, at what point does an overemphasis on English FAL become detrimental to the goals of home language reading and writing development? Rather than redesign the materials the design team decided to leave them largely intact, attempting to better understand how they were working, and the design principles which were emerging. A thorough evaluation of the English FAL experience has not been completed. Rather than suggesting clear design principles, the work raises a number of propositions and questions for the work going forward, as presented below.

Summary Box 9: Emerging Design Hypotheses and Principles, English Language Literacy

1.	In the linguistic context of poor urban and rural schools in South Africa, it is important to combine home language literacy instruction with English FAL from as early as possible.
2.	English FAL curriculum and instructional strategies must be developed in balance with home language literacy curriculum and instructional strategies. The teaching of home language and FAL may benefit from a common backbone, to better scaffold instructional balance.
3.	Long term reading and writing skills are highly contingent on home language literacy development.
4.	Learners are not yet building strong home language reading and writing capacities by the end of Grade 3. In this instructional context, even highly effective teachers are unlikely to be able to consolidate reading and writing capacities in English by the end of Grade 3.
5.	If meaningful literacy development is premised on a certain amount of language proficiency, English language proficiency is not established by the end of Grade 1. Learners would benefit from much more time for English aural and oral language learning.
6.	While workbooks have a role in teaching and learning an additional language, language acquisition requires a much wider range of resources.
7.	Placing high expectations on English reading and writing in Grade 2 and 3 brings with it severe instructional risks:
7.1.	The first risk is that it inadvertently undermines (weakens / crowds-out) home language reading and writing development. If some consolidation of home language literacy is the basis for additional language literacy, we risk turning attention away from building these foundations, at the moment when they are most fragile.
7.2.	The second risk, given the rudimentary nature of learners' English language, is that children treat reading and writing mechanically, as linguistic non-sense.
7.3.	The final risk involves effects on teachers. If teachers cannot come close to meeting this instructional goal, it inadvertently deepens teachers' sense of alienation from the curriculum.
8.	A curriculum with high expectations for aural and oral language proficiency and modest expectations for early reading and writing in English would support teachers in focusing their instructional resources on accessible high value goals.
9.	In order to improve foundation phase literacy results, the sudden transition to English as the language of teaching and learning from Grade 4 must be replaced by a more gradual instructional transition. The space provided by language policy for a more evidence-based transition establishes the basis for a review of language and literacy curricular goals, and the relationship of language and learning into the intermediate phase.

10. CAPS English FAL curricula are unrealistic for learners who live in communities and schools where little English is used and where teachers struggle with this language. Curricular expectations need to be aligned with the language in education policy which provides for additive bi/multilingualism, that is, use of the home language as long as possible and high quality teaching of English as long as possible before this language is used as the sole or main LOLT.

5. MATHEMATICS

5.1 Introduction

The way teachers approached mathematics before the intervention was summarised in the discussion of the baseline earlier. Mathematics teaching revolved around narrow board based arithmetic exercises. Expectations were limited. There was little evidence of concrete strategies beyond the use of finger counting, with little pacing and progression. This section presents the design process in reference to building the teaching and learning toolkit for mathematics. Three overlapping design phases are discussed below, as summarised in Figure 14.

Figure 14: Summary of Mathematics Toolkit Development

PHASE 1	PHASE 2	PHASE 3
2010 to 2012	2012 to 2015	2015 to 2017
Learner Workbook Supplementation	Learner Workbook Primary and Complete	Learner Workbook Primary and Complete
Pre CAPS	CAPS	“Post CAPS”
Teacher Guides	Teacher Guides	Summary Lesson Plans
Homework through Supplementation	Homework through DBE Workbook	Homework Redesign

5.2 Design Phase 1

The first phase of work focused on instructional supplementation, as discussed above. In mathematics, supplementary materials focused on select concepts in each grade, allowing for repetition and practice. The materials were developed by lead teachers, many of whom showed a sense of alienation from mathematics by

circling around a few concepts, with limited confidence in conceptual progression and pacing. As discussed, teachers responded strongly to the materials, and used them as primary instructional materials to support their day to day teaching. Teachers called for a more complete set of materials, to anchor and structure their daily teaching. The choice of a learner workbook as an instructional spine was discussed above. The design principles for mathematics from this phase are summarised below.

Summary Box 10: Emerging Design Principles, Phase 1, Mathematics

1. Early mathematics instruction relies on an accurate and comfortable use of the home language. This includes but is not limited to: 1) an accurate consistent mathematics lexicon and discourse; 2) the spontaneous use of language; and 3) use of the home language structure and nuance to support conceptual / instructional clarity. As such, mathematics materials must be written through, rather than translated into the language of teaching and learning.
2. An instructional toolkit calibrated for this context must have a strong backbone, establishing basic pace and conceptual progression. A structured learner workbook provides for this strong instructional spine.
3. An effective workbook must be calibrated to the educational context of working class schools, supporting children's conceptual progression in mathematics, in manageable progressive steps.
4. An effective toolkit must provide some scaffolding for weaker (and less motivated) teachers and establish a productive stretch for more motivated teachers. It must be generative as teachers' practice extends.

5.3 Design Phase 2

From 2012, the design expanded to become an increasingly complete instructional toolkit, guided by the emerging design principles. The toolkit in this period included a structured learner workbook, teacher support guides, and a set of resources (including posters, charts, counters, etc.). The learner workbook established the spine of the programme, framing pacing and conceptual progression across learning days, weeks and years.

The design team shifted and expanded. In the first phase, the curriculum was designed by lead teachers, based at the NMI, all of whom spoke isiXhosa as a home language. The strength of the materials was that they resonated

with teachers, with little mediation. The weakness of the materials was that they lacked the pacing and conceptual progression to meet curricular goals. The task of building a full curricular toolkit on time, term by term, meant the design team required more capacity. As such, the design team extended to include math curriculum developers who did not speak isiXhosa, defying an initial design principle. The design team attempted to mediate this transgression by investing large amounts of time and energy into the transformation (rather than just translation) of materials written in English into isiXhosa, jointly working to better understand this interface.

As discussed, a revised national curriculum (CAPS) was introduced in this period and an early review of CAPS for literacy raised red flags. The design team's initial analysis of CAPS in mathematics was mostly positive. CAPS responded to the need for a more structured curriculum, with grade and term level pacing, with an articulation of both conceptual areas and number ranges for teaching across the foundation phase. While affirming the basic trajectory of CAPS, several early questions emerged at the interface of expectations, learning contexts, and instructional time. The design team was concerned about the breadth of concepts, and the span of number range per grade. Were the expectations (both the breadth of content and the number range) achievable in working class schools, or were they based on middle class school experiences and assumptions? What are the implications of a broad conceptual range, and relatively high number range for these instructional contexts? Was this kind of stretch productive or unproductive for teaching and learning in these contexts?

With these questions in mind, the starting point in this second phase was still to work with CAPS as a guide to the greatest extent possible. With teachers held accountable to CAPS, materials were developed to be 'CAPS compliant'. While the design team did not hold itself strictly accountable to term by term pacing, it did attempt to meet the annual expectations of CAPS across each grade. The learner workbooks were developed, evaluated and re-designed every year during this period. Redesign involved maximising the instructional representation on each page, responding to teachers' analysis, and improving pacing and progression, both within and between grades. For each term based workbook, teachers were provided with a teacher guide, with more detailed information about how to use the materials in classrooms. During this period, teachers were encouraged to use

the DBE workbooks for homework and supplementation. The design team began by focusing on Grades R and 1, and by 2014 was building a complete set of tools for Grade R through 3.

Across this period, the design team deepened its understanding of the depth and nature of teachers' alienation from mathematics and mathematics teaching. Most teachers gave few systematic lessons in mathematics, often limited to one per week. Teachers had received ambivalent signs from the system about the importance of structured instructional inputs. Teachers had little understanding of the relationships between math concepts. Supporting the work of Naidoo and Venkat (2013:31) on teachers' a-historicity, 'each time a new example enters the scene, the past appears to vanish'. Teachers did not have a clear sense of how simple operations, for example, build upon each other. As such, both teachers and learners approached each math activity in functional terms. The shared question that framed their activity was, 'What should be done here?' rather than 'What is going on here?' As such, learners approach math by looking to the teacher to understand 'what she wants' rather than looking to the material to explore its patterns and representations. There was little emphasis on method, with an overemphasis on contingent form. Teachers invariably used heavy and dry language, passing down a sense of stress mixed with tedium. Handing down their relationship with math to learners, teachers were not oriented to encourage the activity of mathematics (looking, seeing, drawing pictures, and checking). The simple provision of teaching and learning resources, on their own, held limited pedagogical meaning (Venkat and Askew, 2012). The design principles emerging for the development of the learner workbook spine are summarised below.

Summary Box 11: Design Principles for Learner Workbook, Mathematics

The Learner Workbook was the most important tool for the development of teachers' content knowledge and instructional practice, especially for weaker, less motivated teachers. To maximise the impact of a learner workbook in this instructional context, several complex design principles were used. The workbook was designed to:

1. Support learner's conceptual progression in mathematics, in manageable progressive steps.
2. Structure and extend teachers' content knowledge and instructional practice.
3. Provide instructional scaffolding for sensible days, weeks, and terms of teaching.

4. Organise material to assist teachers to build upon and within instructional concepts within a week. (The instructional week is an important unit of planning.)
5. Maximise the quality of instructional representation (representation-rich).
6. Model a new way of relating to and speaking about math, providing a model for a more positive, inquisitive instructional voice.
7. Take advantage of home language resources to teach and learn mathematics, and support accurate language use in mathematics by teachers in the classroom.
8. Promote the activity of mathematical thinking, and support teachers' ability to recognise and affirm the activity and behaviours that deepen mathematical thinking.
9. Provide scaffolding for assessment and instructional feedback.
10. Provide explicit structure for the use of math teaching and learning resources, closely linking resources to relevant math activities.

The experience of producing written material to support teachers was contradictory. In general, teachers were reluctant readers, having had few experiences of reading for enjoyment or to effectively inform professional practice. Their relationship with reading was fragile and largely non-generative. The majority of teachers did not regularly refer to teacher guides outside of training. The only tools teachers appeared to spend extensive time studying were the learner workbook pages.

Weak teachers were the least likely to read or systematically refer to written support materials. As such, they leaned particularly hard on the workbooks. An over-reliance on the workbooks meant that teachers neglected other steps of mathematical instruction, such as mental math. Most teachers indicated a desire for more support in putting together lessons around the workbook, but there was little evidence that this could be achieved through the provision of more written material.

The materials presented in isiXhosa were used differently from those presented in English. For Grade R and 1 teachers, who invariably spoke English with less confidence, isiXhosa materials were more accessible. For Grade 2 and 3 teachers, who had primarily studied through English for their professional degrees, isiXhosa materials encouraged teachers to work with their mathematical knowledge through the language of instruction. Reading the materials invariably led to discussions

and debates, expanding and clarifying how to think and talk about mathematics in isiXhosa in their classrooms.

Over time, as some teachers gained momentum, lead teachers emerging and their professional interest increasing, there was more evidence of teachers using the teacher guides for reference. Even so, reading endurance is limited. One of the most important audiences for the teacher guides were the instructional coaches, who referred to them continually in their work with teachers in their classrooms.

The experience suggested two contradictory design principles. For the majority of less motivated teachers, written materials are unlikely to be used. The weakest teachers use the learner workbooks to orient themselves to the teaching day. To the greatest extent possible, therefore, *learner* workbooks must be designed to speak to *teachers*. On the other hand, once a teacher is more motivated, written instructional support can be more productive. To the extent that teacher support materials work, they provide the building blocks for structuring a daily lesson.

As discussed above, DBE mathematics workbooks were in their primary phase in 2011. They took the form of two semester workbooks, just over 250 pages across the year. At face value, they represent an exciting set of materials, with high quality representation and use of colour. As discussed above, given the lack of structured materials in the system, they represent a massive national investment into the system. For the first time, most learners in the system had their own set of learning materials. The early experience of the MCC strongly affirmed the importance of learner workbooks for instructional scaffolding in contexts with little history of instructional successes. The fundamental question was whether this set of workbooks represented the best contribution to the system.

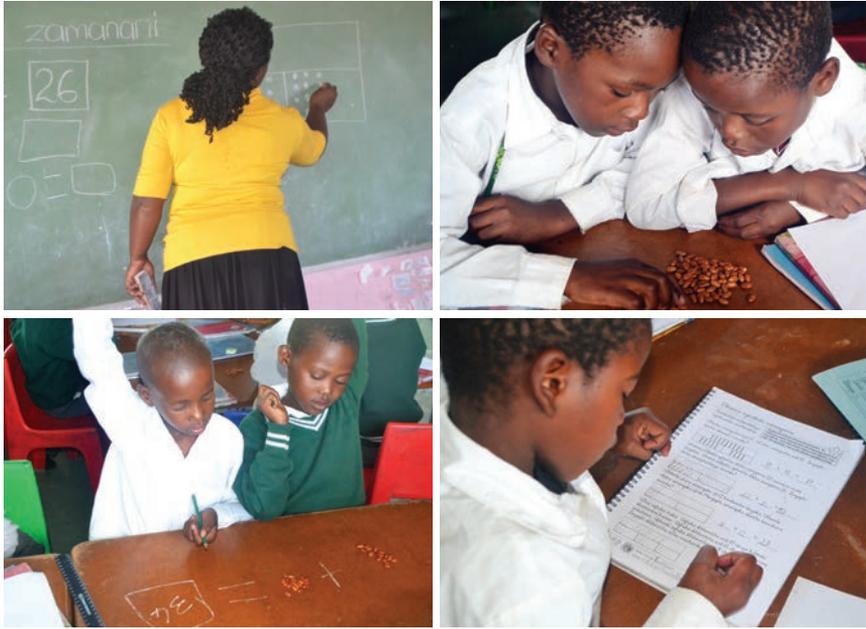
While affirming the investment into a structured workbook, in the end the design team concluded that the design principles underlying the DBE workbooks did not maximise their impact. The limitations of the workbooks were derived from a review of the materials themselves, and how they were used in classrooms. From 2012 to 2015, teachers were advised to use the MCC books to structure their teaching days, and use the DBE workbooks for homework and additional supplementation. A few teachers felt pressure from district authorities to use the DBE workbooks to structure their teaching days. In a review of progression in 2016, distinct patterns stood out. Approximately 5% of teachers used neither MCC nor DBE workbooks, with little evidence of learner work completed. 85% of

the teachers used the MCC workbooks, and had established some day to day teaching rhythm on the basis of the books. 10% of teachers visited during 2016 demonstrated an instructional balance between the use of the MCC and DBE Workbooks, primarily using DBE for homework and supplementation. There was little evidence of the DBE workbook establishing curricular momentum on its own. When teachers attempted to use the DBE workbook apart from the MCC workbooks, they used each page as an isolated activity sheet, gaining little conceptual momentum or insight from a number of related activities. The use of the DBE workbooks appeared to propagate patterns of a-historicity. The design principles emerging from this phase of work are the following:

Summary Box 12: Design Principles, Mathematics

1. The DBE Workbooks were not designed to support structured, day to day pacing and progression.
2. Quality teacher support materials in the language of instruction are important for two reasons. They are accessible to teachers with weak English literacy. They serve to establish and deepen a teachers' instructional discourse.
3. The majority of teachers have a fragile relationship to reading.
4. The assumption of most teacher development work is that teachers will read in order to improve their practice. The relationship is in practice bi-directional. Starting to become a more effective teacher (and seeing some success in the classroom) may be a precondition for rebuilding a culture of reading amongst teachers.
5. Weak teachers do not use written support material to inform or extend their teaching practice. To the extent that they prepare, they study the learner workbook. The learner workbook must be designed as much as possible to guide these teachers.
6. Expanding teachers' reading culture is fundamental to the task of teacher development in the long term. When teachers build some confidence in teaching, their reading practices may expand. Written support materials assist more motivated teachers rather than less motivated teachers. Even if written materials are targeted at more motivated teachers, they must be user friendly, relatively concise and focused on the structure of daily practice.

Figure 15: Teaching Mathematics, Grade 3



This lesson focuses on word problems. The teacher begins with mental math. She moves to the board and models a method, focusing on reading the problem, and studying key words. She models the problem by drawing a part-part-whole diagram on the board. She asks learners to represent several problems using counters (magic beans!). Learners were given chalk to use on their desks to draw the part-part-whole diagrams. By the time they turn to their math workbooks, the method is established. When strong learners finish, they made their way to the reading carpet for independent reading, giving her more time with students who need more instruction.

5.4 Transitions and Phase 3

From the end of 2015 to the end of 2016 the design team undertook a more intensive review of the mathematics toolkit. This included a review by experienced curriculum writers in foundation phase mathematics, a review by lead teachers, and a rapid assessment of learner work. At the heart of this review was the question of the viability of CAPS, the role of the DBE workbook as a homework book, and ever present questions of pacing and progression.

While the design team brought together a range of experiences, the task of finalising the materials was exceedingly complex. The tension inherent in the

development of the learner workbooks lay in the detail. The most significant challenge was a question of pacing and progression. By 2015, the workbooks were structured into 10 *imithamo*²¹ per term, or 38 across the year. In Grade R, each *umthamo* was 8 pages. In Grades 1 to 3, each *umthamo* was 10 pages. Most teachers did not complete the full set of *imithamo* in a year. The design team have maintained this density (approximately 2 pages a day), recognising that the pace remains a stretch for most teachers. Curricular progression questions cannot be resolved simply by adding more material.

The design principles focused attention on meaningful conceptual consolidation across an instructional week. Confronting the a-historicity of teaching practice, the material sought to focus teachers' and children's attention on one concept or a set of closely related concepts, building upon them within one week, as opposed to moving across concepts within one week.

After several years of experimenting with progression and pacing, the design team concluded that the curricular expectations established in CAPS seemed to have important limitations. The most important relate to implications for conceptual breadth (and associated number ranges). In the end, the wide breadth of curricular expectations provided too little time for conceptual consolidation, leaving children with little automaticity, relying on rudimentary strategies for working with numbers.

In the years where the design team was committed to meeting CAPS goals, there was a conceptual jump on almost every page. The space available was almost completely taken up by conceptual representation (small conceptual expansions on each page) leaving little space for mathematical fundamentals – gaining automaticity in mathematical basics upon which to draw from in the future. At the beginning of each year, there was little space available for sufficient review of material from the previous year. There are two problems with this. First, even for learners who participate in productive classrooms day on day, there is too little space for review, consolidation and practice within and between years. Second, the pacing has no room to mediate the instructional context, in which children miss a considerable number of learning days due to absence, lack of effective teaching and the contingencies of learner attention spans day by day.

21 *Imithamo* is an isiXhosa word meaning a mouthful – the amount one can chew in one bite without choking, adopted from the work of the Distance Education Programme, UFH (2000).

Research in foundation phase mathematics shares a concern about an over-reliance on concrete strategies for solving problems without a transition to the symbolic system of mathematics (Ensor et. al, 2009; Venkat, 2013.) The discussion is often presented as an 'over-reliance' on concrete counting methods, which could be misunderstood to suggest that there is currently too *much* use of concrete counting methods in the foundation phase. Our experience challenges this as a starting point for these schools. At the beginning of the intervention, there was too little use of concrete counting methods, especially in Grade R and Grade 1, the starting point for a child's sense of numbers. While teachers claimed to be working with counters, for example, there was little evidence of their systematic use in the classroom. Moreover, when teachers supported concrete counting (most often oral counting), they focused almost exclusively on counting forward, rather than allowing children to sense the cardinal relationships between numbers (both forward and backward, and moving through numbers non-sequentially).

Rather than too much concrete counting per se, the design team observed relatively limited concrete counting combined with far too little space to consolidate concepts beyond counting methods. The number four remains (1-2-3-4) rather than finally becoming 4. A child may see that 3 flowers + 2 flowers is 1-2-3-4-5 flowers, but she is not given enough time at the interface of (3+2) to automatically link it with 5. This appears to be less about an over-reliance on concrete counting mechanisms, than about the lack of curricular space and instructional routine for consolidation and practice.

The final concerns about the CAPS curriculum relate to language use across the primary phase. As discussed previously, curriculum policy does not take advantage of language in education policy (RSA, 1997) and makes a radical jump to English as the LOLT in Grade 4. There are few guidelines about how this is going to happen in mathematics. In the MCC the design team focused attention on mathematical lexicon and conceptual development in children's home language. Given the limitations of English FAL, it is highly unlikely that the mathematics lexicon will be consolidated through this language. The practice of shifting the language of teaching and learning in mathematics to English in Grade 4, as opposed to a more gradual transition, is likely to further undermine mathematical progression.

In the end, the design team identified six interrelated weaknesses with CAPS as a system of instructional scaffolding.

Summary Box 13: Limitations, CAPS Mathematics, Foundation Phase

CAPS may inadvertently undermine the consolidation of mathematical foundations through the following limitations:

1. The wide range of concepts competing for instructional time.
2. The lack of elevation of foundational concepts over less foundational ones.
3. The lack of distinction between sub-steps in the development of basic skills about mathematical operations.
4. Too little scaffolding for low number repetition and practice.
5. Relatively high number ranges.
6. A lack of space and emphasis on visual literacy and problem solving opportunities.

The abrupt transition to English as LOLT in Grade 4 is likely to further undermine curricular progression in mathematics.

The design team identified three opportunities to gain instructional time for consolidation: a redesigned learner workbook, mental math, and a revised approach to homework supplementation. There were design shifts in each of these domains. From 2017, the learner workbooks were redesigned to create more space for consolidation and practice. First, concepts were prioritised, elevating the concepts that are most fundamental for grasping basic number sense and moving from concrete to more symbolic relationship with the number system (counting, comparing, ordering, place value, problem solving, breaking down and building up, addition, subtraction, and the fundamentals of multiplication and sharing). Curricular goals that are valuable over time, but are less essential to the foundations of early mathematical thinking were progressively de-elevated (time, measurement, money, fractions). Within more complex concepts, the design team focused attention on simpler sub-concepts (half), and at times eliminated more complex sub-concepts (sixth, non-unitary fractions). A detailed framework was established for progression in counting, addition, subtraction, multiplication and division, making explicit the finer grain pacing of development required to build foundational competence in each grade. The design team focused on a slightly lower number range for operations, focusing attention on higher numbers, with an emphasis on the structure of the number system and place value. The design team placed more emphasis on the transition between grades, providing more

space for review and repetition between grades.

The second design shift related to teacher support materials. The design team moved away from more narrative teacher guides to more structured summary lesson plans. In the discussion above, the choice of learner workbooks above lesson plans as an instructional backbone was discussed. This design principle was retained. Lesson plans were not explored as a method of primary instructional scaffolding. It was recognised that lesson plans would likely not to be used by the weakest teachers. Lesson plans were written for the instructional coaches, and the more motivated teachers who were emerging. As teachers' transformed practice generated some success, some of the teachers became more motivated to seek out instructional guidance. The lesson guides were written to respond to this emerging cohort of teachers.

The complexity of lesson plans resides in the balance of content, detail and length. Initially the design team attempted to write detailed teacher support guides. Attempting to support day to day teaching, the guides were invariably long, often written through English, difficult to translate, requiring a high tolerance for reading. With learner workbooks shifting year on year, associated teacher support materials had to be rewritten as well. Massive energy was expended, all the while with the suspicion that the very teachers who required the most support were unlikely to read them.

From 2015 to 2017, responding to the design principles above, the design team began to experiment with writing lesson plans. Over time, the goal was to minimise the length, and somehow maximise the guidance around instructional structure and pacing. For all teachers, even if they did not read them in any detail, the purpose of the lesson plans was to locate workbooks within a daily lesson structure. For teachers who were gaining interest and momentum, it was hoped that the materials would provide a relatively user-friendly lesson structure to scaffold preparation and pacing. The lesson plans answer to a simple lesson strategy, providing summary pacing for mental math, review, concept teaching, workbook pages, and vocabulary review.

The final shift in design in this period relates to homework. The way that educational experiences are extended (or not) in the home environment is another gulf between middle class and poor and working class schools, with little or no established tradition for home-based work in working class schools. In a working

class school, a homework tool must take advantage of parents' (and other caregivers') available resources to establish early rituals of home-based learning success. The DBE workbook was not well designed to stimulate homework practices in text-poor communities. The DBE workbooks present a series of language-rich and image-rich exemplars requiring high levels of interpretation, with few patterns established across pages. Over time, the design team did not observe any teachers who were using the DBE workbooks effectively for homework supplementation. The lack of success was a source of frustration for teachers, reaffirming their sense that parents did not care about their children's schooling. The design team's conclusion was different, namely that the design principles of the DBE Workbooks were not aligned to the context of working class parents. The design team accepted that establishing effective and self-generative homework practices for the majority of children in text-poor communities is extraordinarily difficult. In this context, parents should experience a win simply by systematically ensuring that children engage in regular home-based work on school days. As such, homework must not demand high levels of interpretation, and must fall well within instructional pacing. By the time children have work to do at home, they should have demonstrated some confidence in the classroom context. As such, home-based work represents an opportunity for repetition, practice and consolidation of fundamental skills.

From 2017, the design team introduced a homework tool providing one A5 page of homework per school day, focused on non-word-based calculations. A parent's responsibility is to ensure that a child attempts the homework each night, and signs off upon completion. In this early design, parents are not held responsible for checking or engaging further with the work. Design principles for mathematics homework are presented below.

Summary Box 14: Design Principles, Mathematics - Homework

1. There are weak traditions of homework in most poor and working class schools. Teachers are not oriented toward working with parents to build this practice.
2. In general, parents in these schools do not or are unable to undertake homework support, for a range of (historical) reasons.
3. Language based and interpretive-rich material is unlikely to generate homework practices in text-poor communities.

4. Building homework cultures will take time and support. A mathematics homework tool is likely to be generative to the extent that it is less based on word problems and focuses on revision and review of context-reduced calculations.

6. LIFE SKILLS

There has been little mention of the Life Skills learning area across this report, perhaps suggesting that it is not a priority concern to the design team. On the contrary, Life Skills in the foundation phase encompasses vital basic knowledge and skills about citizenship, and also introduces fundamental concepts of general science and social science. The decision of the design team to focus on literacy and mathematics (and not on Life Skills) reflected three considerations: the limited capacity of the MCC design team, teacher ability to absorb more ideas, and instructional time. In the end, the limitations of instructional time was the crucial consideration. Given the high demands of literacy and mathematics in this context, and the already burdened instructional day, several questions frame an approach to life orientation. How much of the life skills curriculum could be covered through activities oriented towards literacy and mathematics? For example, how could a new set of quality information books in home language contribute to the Life Skills curriculum, starting from Grade 3? How can life skills be used to structure and animate the instructional day? How should curricular expectations (and instructional practice) be modified to ensure that it does not disrupt a teachers' early focus on literacy and mathematics? In the next phase of work, the design team hopes to focus more attention on these questions.

7. TEACHER DEVELOPMENT AND SUPPORT

At the heart of the work of transforming schools is working effectively with teachers. A full discussion of the teacher development and support strategies, and the design principles emerging, are beyond the scope of the current paper. The design principles emerging are summarised below.

Teacher development and support were woven into each design-cycle. They took the form of centralised workshops, smaller communities of practice, and classroom-based support and demonstration. Each teacher participated in an intensive 2-day workshop each term, tightly focused on a review of the

previous term's materials, the introduction of the next term's materials, extending knowledge related to instructional materials, and modelling how to participate in a community of practice. A 'substitute teacher', usually an interested parent, was paid a modest stipend to cover for the teacher during these two days of lost classroom time.

Teachers were invited to participate in once-a-term gatherings that were called 'clusters'. This is the level of engagement where, in theory, teachers have an opportunity to experience professional collaboration across schools, and participate in more meaningful peer to peer support. The experience at this level was mixed. The rural context means that distances between schools is vast, and transport resources are limited. While the sessions themselves were highly productive, they were in the end difficult to organise without encroaching on teaching time. Further experimentation around options to build more local communities of practice amongst teachers remains an aim of future work.

The final element of teacher support was classroom-based coaching. An NMI instructional coach spent approximately one week in a school per term, approximately one day per teacher per term. The coach draws upon six primary strategies – planning and preparation with teachers, demonstration, co-teaching, observation, co-review of learner work, and formative reflection (both with individual teachers and the foundation phase team.)

The experience led to concrete design principles, a deeper understanding of the context, and of the binding constraints. The design principles emerging are summarised below.

Summary Box 15: Design Principles, Teacher Development and Support

1. **Language Use:** Teacher development activity must be conducted in the languages of the classroom, in this case isiXhosa and English. The use of the home language in teacher development activities maximises teachers' understanding of the material and assists teachers to develop consistent, precise and fluent discourses for instructional practice.
2. **Tool Driven:** Given the relative lack of time for formal professional development, instructional tools must be placed at the centre. Moreover, tools must be imbued with developmental potential. Training can focus on creating a relationship with a tool, while the tool continues to assist a teacher to master content and instructional practice over time.
3. **Knowledge Generation:** While teacher development must take advantage of what is known (about teaching and learning in general), the methodology of teacher development must acknowledge the current limits of expertise. Approaching teachers as the ultimate authority for 'what works', establishes the ground for a knowledge project that begins to better integrate theory and practice.
4. **Near Peer:** The legitimacy of knowledge (from training to curricular aesthetics) resides in the combination of resonance with a local context, and enough experience to assist a near-peer.
5. **Substitutes:** Teacher professional development that takes teachers out of class must invest in mechanisms to minimise disruption of classroom teaching and learning.

The overarching experience of the MCC identifies two interrelated binding constraints that ultimately will frame the success of teacher development work, or any other intervention to shift the system in the future. These binding constraints will not be resolved at this level of design principles per se. The first constraint is the history of collapse of the legitimacy, culture, and interpersonal relationships of school based professional support (Ramadiro, 2016b). To become a proficient teacher takes several years after receiving a formal teaching qualification. An increasingly recognised constraint in the system is the quality of pre-service programmes for teaching. However, even if a teacher participates in an effective pre-service programme, much of how a teacher teaches, apart from how they themselves were taught, is fundamentally shaped by the quality of on the job training (including supervision, coaching and mentorship) they receive in the early years in the profession. It is only on the job that new teachers learn in a concrete way what it means to keep expectations high for every child, how to collaborate

with other teachers in their phase, how to do classroom and school level administration, how to partner with parents around their children, and how to teach day in and day out in large and under-resourced classrooms with children with diverse needs, interests and strengths without losing patience, motivation or hope. The kind of knowledge needed to run successful classrooms is context dependent and context-sensitive and is best role-modelled by other teachers working in a similar setting. On-the-job training can be described as a form of enculturation. That is, it is about helping a novice become a member of a culture by having him/her observe, assimilate and talk things through with established and successful members of a culture (Daniels, 2001; Wenger, 1998; Wertsch, 2007). Much of the 'training', if this is indeed the right word for it, occurs informally in the course of doing work rather than in specially organised workshops. Enculturation into a high performance culture has largely collapsed in many poor and working class schools. New teachers sink or swim on their own.

One binding constraint is an illegitimate system of authority. The breakdown can be traced to apartheid and the struggles against it. Apartheid era education officials often treated Black teachers with disrespect, suspicion and in an authoritarian manner. For instance, some of the people employed to oversee Black Education at this time were often authoritarian and arbitrary in their treatment of principals, PTAs and the Black community in general. A culture of disrespect, fear, and suspicion permeated the entire Bantu Education system (Nkomo, 1990). In turn, principals, deputy principals, and Heads of Departments (HoDs) treated those below them with disrespect. Ordinary teachers treated learners in an authoritarian manner and their parents with disdain. Whatever semblance of school functionality this culture informed, it could not be sustained because it was fundamentally unjust. Indeed, in the 1980s, teacher unions denounced, resisted and overthrew it. For whatever reasons, teacher unions, government, universities and civil society more generally, have failed to replace this school culture with a high performance, democratic and humane culture. Instead, a kind of vacuum developed in many schools, resulting in a collapse of teacher motive. The vacuum was filled by school dysfunction exemplified by teacher absenteeism and foot-dragging and a lack of respect for experience and seniority. In such schools, the mechanisms for older or more experienced teachers to pass on their wisdom, experiences and practices to younger or novice teachers are broken. As a result,

despite years of education reform and intervention work, many of these schools look and feel as if they are always starting from scratch. The schools have little ability to learn from themselves, to absorb new knowledge and strategies, and to adapt and pass on progressively refined educational expertise to a new generation of their colleagues. Even when these schools are functional at one point in time, they struggle to create and recreate themselves as high performance school cultures. Unless we can re-establish a legitimate and authentic culture of support within schools, much of our innovative educational intervention work will not be absorbed and when it is, the effect of the absorption will be short-lived.

Classroom-based coaching, if indeed it is possible, becomes extraordinarily sensitive. With few teachers ever experiencing humane professional support, many teachers remain closed down to classroom-based support for long periods of time. The 'opening' for coaching relies on the moments when a coach is able to authentically assist a teacher with the details of her/his professional practice and challenges: how to teach a certain area, how to organise a classroom or administrative systems, how to think about a child who is left behind. The opening relies on building a new ground for legitimacy based on experience and expertise, not one that relies heavily on seniority, job titles, or formal qualifications.

The second interrelated binding constraint is the lack of instructional expertise in the system, and especially expertise focused on reading and writing in African language contexts. The main basis of legitimate authority will rely on experienced teachers who have high levels of instructional expertise (especially in reference to the use of two languages to develop reading, writing and math), and have developed a humane pedagogy for working with other teachers. Taken together, the collapse of a culture of professional support and the lack of instructional expertise in the system have contributed to a system whereby school based authorities (for example principals and Head of Department posts) are not always appointed on the basis of instructional expertise. The implications are multifaceted. One of the far reaching implications is the inability (both in policy and practice) for school level authorities to hold indolent and truant teachers to account.

Some educationists argue that our attention should focus mostly on the last point and provide school based authorities with more power to discipline and dismiss teachers. While this may be a small part of the solution, it is unlikely to work as a main strategy. If the binding constraint reaches to the lack of a culture

of professional support at the school level, the source of the solution is likely to lie in the development of authentic instructional expertise, accountable to the social and linguistic context of the majority of teachers and children. This will require a multifaceted strategy of development over time. Some early suggestions about such a strategy are presented at the end of this paper.

Learner Performance Findings

1. INTRODUCTION

How far have we come? To what extent have these interventions, and the design principles behind them had a demonstrable impact on learner performance? The baseline findings were described above. The performance of the collective is ultimately held accountable to literacy and mathematics results, as measured by a Systemic Evaluation designed for Grade 3 learners. The minimal goal was to achieve 2.5% annual gains in both literacy and mathematics, with an ultimate goal of a sustainable 70%. This section highlights the gains that have been made, and the limitations emerging, drawing upon learner performance data.

In 2007, the Grade 3 assessment was administered to Cohort A schools in both literacy and mathematics. In 2014, the assessment was re-administered in mathematics and in 2015, the assessment was re-administered in literacy. The statistical analysis focused on descriptive statistics as well as comparing differences between key groups of schools. The 2007 results were compared to the 2014/15 results for the schools that participated in the baseline, and these results were compared to the entire cohort. The initial cohort of schools (Cohort A) was compared with schools that began later (Cohort B.)

2. LITERACY

A comparison of the results of the baseline and the 2015 Grade 3 home-literacy assessment are presented below. Table 7 summarises the results. Figure 16 compares the average scores of learners from 2007 and 2015, and presents the

same data organised by DBE performance levels. Figure 16 compares the cohort of schools working in the collective from the beginning (Cohort A) with schools that joined in 2012 (Cohort B).

The mean score of Grade 3 learners in 2007 was 11.7%. 97% of children were performing between 0 and 30%, the lowest DBE performance band. There was little evidence of independent reading. In 2015, the mean score was 33.2%. The difference in means is 21.5%, with a high degree of statistical significance ($p < 0.0001$.)

Calculating an annual growth rate depends upon which year is considered to be the beginning of the intervention. If the entire 8-year span from 2007 to 2015 is included, this represents a 2.7% annual growth rate. The work of the MCC only began systematically in 2010. If the gains are spread across these 5 years, it represents 5.4% annual growth rate. The design team began to build complete curricular tools (as opposed to supplemental tools) in 2013; much of the growth is likely to have occurred in this period. If growth is allocated to this period, it represents a 10.7% annual growth rate. (The comparison of Cohort A and Cohort B supports the hypothesis that much of the change was concentrated in this period.) In either scenario, they are significant gains.

The patterns of the shifts are significant. In 2007, close to 50% of learners scored in the lowest decile (between 0 and 10%). In 2015, less than 5% remained in this decile. In 2007, 97% of children scored at the lowest performance level (0 to 30%.) In 2015, this had decreased to 44%.

In the baseline period there were no learners scoring above 40%. In 2015, one third of learners were scoring in this range, with 11% scoring above 60%. While the majority were still not reading independently, there was evidence of the emergence of independent reading.

Table 7: Summary of Results: isiXhosa Literacy

2007 BASELINE PERFORMANCE: GRADE 3 HOME LANGUAGE LITERACY	
Mean	11.7%
Median	11.1%
% of Learners within Lowest Performing Level (0 to 30%)	97%
% of Learners in Top Performing Levels (>60%)	0%

2015 PERFORMANCE: GRADE 3 HOME LANGUAGE LITERACY	
Mean	33.2%
Median	32.4%
% of Learners within Lowest Performing Level (0 to 30%)	44.3%
% of Learners within Top Performing Levels (>60%)	11.1%

Figure 16: Average Learners Score, Grade 3 Systemic Evaluation, isiXhosa Literacy: 2007 to 2015

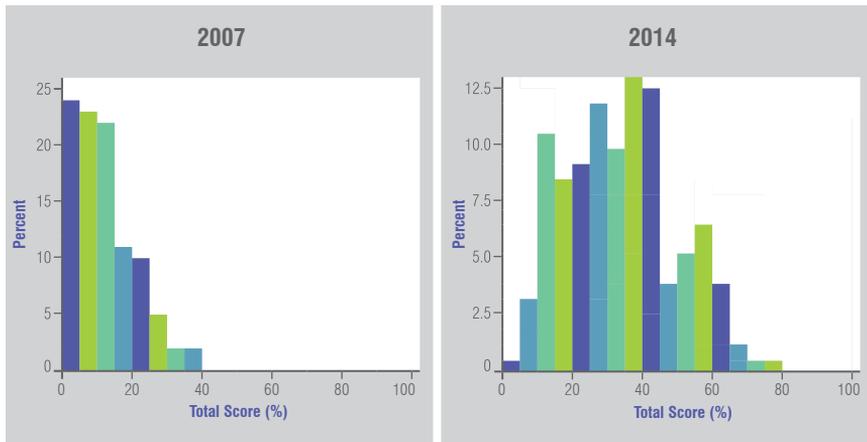


Figure 17: Average Learners Score, Grade 3 Systemic Evaluation, isiXhosa Literacy: 2007 to 2015, by DBE Performance Levels

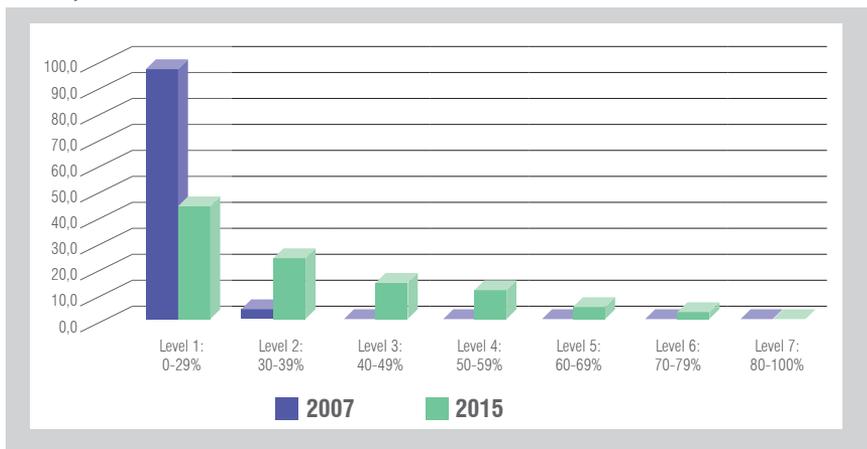


Figure 18 presents the data for the entire Magic Classroom Collective (Cohort A and B.) Table 8 compares Cohort A with Cohort B. The average mean for the entire collective was 35.8%, 2.6% higher than the comparison cohort. The 1.1% difference in means between the entire Cohort A (35.4%)²² and Cohort B (36.5%) was not statistically significant ($p=0.94$.)

It is noteworthy that Cohort B is doing at least as well as Cohort A in less time. There were three differences between the two cohorts: i) Cohort A started in 2009/2010, while Cohort B started in 2012; ii) they enjoyed different selection methods; and iii) Cohort A received a set of initial investments that Cohort B did not receive. The results raise a series of interesting questions and possibilities.

It is likely that the sampling method for Cohort B accounts for some of the difference. Some Cohort B schools had demonstrated an interest in participating. The simple ability to express interest is likely to reflect a stronger school. This is supported by our initial analysis of ANA data. ANA data suggests that by 2012, Cohort B schools were as strong as Cohort A schools. Whether or not this advantage from 2012 onwards represents differences in selection, the impact of DBE workbooks, or other differences is difficult to untangle.

The results may also suggest that the impact of the intervention was higher in the phase of work 2012 to 2015 than in the phase of work 2009 to 2012. That is, the phase of work which focused on a full curricular toolkit demonstrated a stronger impact than the phase of work focused only on supplementation.

Both Cohort A and Cohort B received the teaching and learning tools associated with the toolkits. Schools in Cohort A participated in a preliminary phase of work whereby classrooms were renovated and painted, and basic classroom furniture (chairs, desks, cubby holes) was provided. At face value, the results suggest that the initial classroom investments did not have an important impact, with Cohort B performing better than Cohort A. The experience with Cohort A suggested that the initial provisioning played a role in both the physical world of teaching and learning, as well as in the internal world of teachers, interrupting the deep patterns of neglect that framed their relationship with teaching. The physical resources provided for Cohort A classrooms may have been meaningful even to

22 Note that the scores presented above (2007 vs. 2015) reflected 8 of the 10 schools in Cohort A. Two schools in Cohort A did not participate in the baseline.

Cohort B classrooms, their energies at least partially motivated by the possibility of getting similar resources. The relationship between these variables requires further study.

Figure 18: Summary of Results:
MCC Total (A+B)

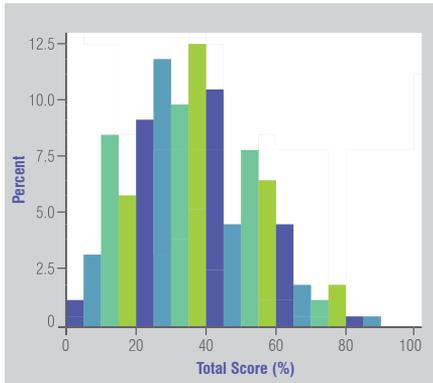


Table 8: Comparison of Cohorts: A vs. B

%	COHORT A	COHORT B	MCC TOTAL
MEAN	35.4	36.5	35.8
MEDIAN	33.3	35.2	35.2
SD	16.1	17.0	16.4
< 30%	40.2	39.9	40.1
> 50%	20	26.8	22,3
> 60%	8,4	8,6	8,4

3. MATHEMATICS

The results from the Grade 3 mathematics systemic evaluation are presented below. Table 9 and Figure 19 summarise the results. Figure 18 and 19 compare the results from 2007 with the results from 2014. Table 10 compares the cohort of schools working in the collective from the beginning (Cohort A) with schools that joined in 2012 (Cohort B).

In 2007, the mean score of learners was 19%, and the median score was 17%. In 2014, the mean and median were 56.0%. The difference in means is 36.9%, with high degrees of statistical significance ($p < 0.0001$.)

Again, calculating an annual growth rate depends upon which year is considered to be the beginning of the intervention. Spread across the entire 7-year span between 2007 and 2014, this represents a 5.3% annual growth rate. Given that the work of the MCC started systematically in 2010, if the growth is spread across these 4 years, it represents 9.2% annual growth rate. Given that the design team only started to build full year curricular tools (as opposed to supplemental tools) from late 2012, much of the growth is likely to have occurred in this 3 year period, which would represent a 12,3% growth in this period. Either way, these are meaningful performance gains.

While almost 60% of children scored between 0 and 20% in 2007, these extremely low level performers had all but disappeared by 2014. When organised by DBE performance levels, just shy of 80% of learners were in the lowest performing level (0 to 30%) in 2007. Only 10% of learners remained in the lowest level in 2014. These patterns suggest that the intervention is effective for the most struggling learners.

Prior to the intervention, there were essentially no children scoring 60% or above (Level 5 or above.) After the intervention, 44% of learners were scoring in this range (48% of the entire MCC collective.) For the first time, a group of stronger learners is emerging in these classrooms. The intervention also appears to be working for the stronger learners.

The average mean for the entire collective was 57.0%. The 2.4% difference in means between the entire Cohort A (57.9%)²³ and Cohort B (55.5%) was not statistically significant ($p=0.94$.)

Table 11 presents performance by mathematical concept area. The 52 questions were distributed across 14 concept areas; each 'concept' reflects 3 to 4 questions, a limited basis for an analysis of conceptual proficiency. With this limitation in mind, the following observations can be made. Across concepts there was a dramatic increase of performance; the difference in means was highly significant for each concept area. The 14 concepts were organised into five rough groups: number sense, addition/subtraction; word problems; supplementary; and multiplication and sharing. The term 'supplementary concepts' refers to more applied concepts that are less fundamental to building a basic foundational number sense. These concepts are important, providing a strong bridge for children to apply and relate mathematics to the world. However, they are not fundamental per se for the development of a basic sense of numbers. In theory, a child could make up some of this learning in the intermediate phase, assuming that she has a strong number sense moving out of foundation phase.

This organisation of concepts speaks to the concern about conceptual crowding that was discussed above. While the gains are significant, they are arguably distributed broadly rather than strategically. While there are significant gains in number sense, the mean in this conceptual area remains at 65%. The gains are not fully translating into gains of addition and subtraction, which reaches

23 The scores presented above (2007 vs. 2015) reflected 8 of the 10 schools in Cohort A.

only 46%. While there is no absolute hierarchy to mathematical learning, if children have not consolidated an understanding of the way numbers work, and of addition and subtraction, progression in the intermediate phase is particularly difficult. There is no simple equation between gains across areas. Even so, the patterns support the question about whether the breadth of mathematical concepts (and especially supplementary concepts) may distribute gains too thinly. It may be that the elevation of fewer more fundamental concepts, rather than an even spread of many concepts, may lead to more long term gains in mathematical progression. 'Word-problems' was left as a category of its own. Word-problems reflect both mathematical method and independent reading ability. The low proficiency in word-problems focuses attention once more on language and literacy, in particular on independent reading, but also underlines the fact that a successful mathematical toolkit will focus explicit attention on mathematical discourse acquisition.

Table 9: Summary of Results: Mathematics

2007 BASELINE PERFORMANCE: GRADE 3 MATHEMATICS	
Mean	19%
Median	17%
% of Learners within Lowest Performing Level (0 to 30%)	80%
% of Learners in Top Performing Levels (>60%)	<2%
2014 PERFORMANCE: GRADE 3 MATHEMATICS	
Mean	56%
Median	56%
% of Learners within Lowest Performing Level (0 to 30%)	10%
% of Learners within Top Performing Levels (>60%)	44%

Figure 19: Average Learners Score, Grade 3 Mathematics, Systemic Evaluation: 2007 to 2014

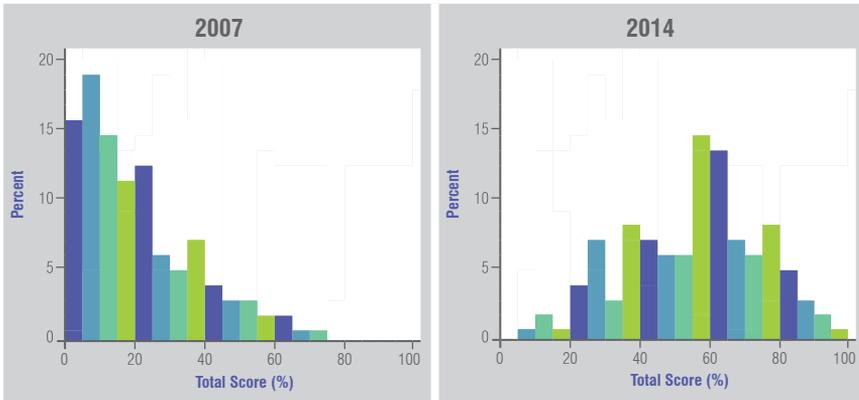


Figure 20: Average Learners Score, Grade 3 Systemic Evaluation, Mathematics: 2007 to 2015, by DBE Performance Levels

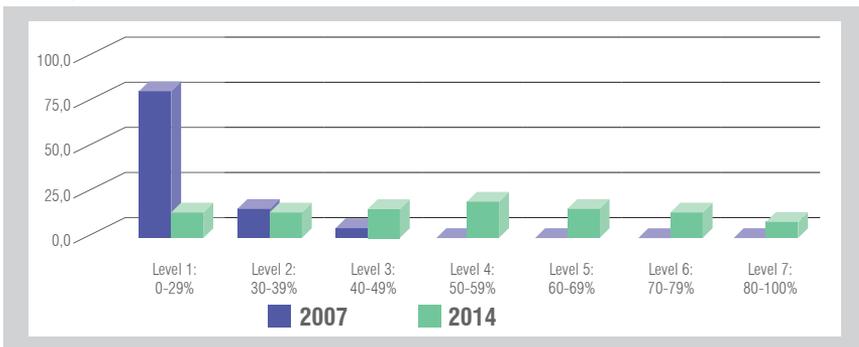


Figure 21: Summary of Results: MCC Total (A+B)

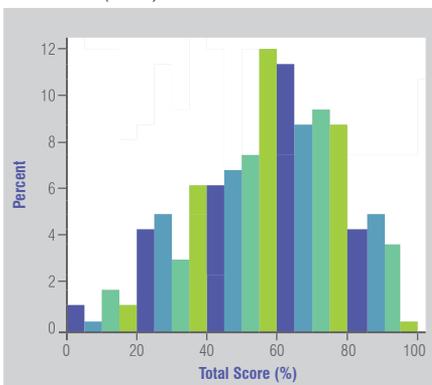


Table 10: Comparison of Cohorts: A vs. B

%	COHORT A	COHORT B	MCC TOTAL
MEAN	57.9	55.5	57.0
MEDIAN	59.3	57.4	59.3
SD	19.4	22.3	20.5
<30%	10,7	17,1	13.0
>50%	66,3	46,3	65.9
>60%	48,8	28,6	47.9

Table 11: Grade 3 Systemic Evaluation: Comparison of 2007 to 2014 by Mathematical Concept Area (%)

CONCEPT	2007	2014	VARIANCE	CONCEPT	2007	2015	VARIANCE
A. Number Sense	22	65	42	D. Supplementary	14	57	43
Counting	22	69	47	Time	7	34	27
Order	23	64	42	Measurement	30	85	55
Patterns	22	60	38	Money	10	51	41
B. Add / Subtract	15	46	31	Data	2	47	45
Addition	10	45	35	E. Multiplication/Share	19	52	33
Subtraction	19	47	28	Multiplication	21	47	26
C. Word Problems	2	20	18	Sharing	14	40	26
				Fractions	22	68	47

$p < 0.0001$ for all comparisons in this table

4. IMPLICATIONS FOR DIFFERENTIATION

The beginning of this report reviewed the devastating trends of schooling nationally, whereby learner performance in more than 60% of schools is basically flat. That is, despite differences between children, classrooms and socio-economic contexts at home, children are, statistically speaking, destined to perform poorly. The results from the 2007 baseline are consistent with this state of affairs, with 97% of children scoring below 30% in literacy, and 80% scoring below 30% in mathematics. The results from the 2007 assessment are striking in their homogeneity. The starting point of these classrooms is that they are almost completely *undifferentiated*.

By 2014 and 2015, the results look different. Rather than all learners clustered below 20%, learning performance is becoming more distributed, into a bell curve of sorts. The lowest performers (between 0 and 20%) have all but disappeared. There is an emergence of strong learners, with 11% of children scoring over 60% in literacy, and 44% of children scoring over 60% in mathematics. These are becoming more 'normal' classrooms, with a much wider range of learner performance – some weaker, some stronger.

As discussed above, the early design intention was to emphasise instructional differentiation from early in the intervention. In the early stages, the design team pulled back from this intention, recognising that true instructional differentiation

was beyond teachers' immediate reach. Recognising that teachers were struggling to establish their instructional base-step, a rapid emphasis on deeply differentiated practice was not available. As such, during this period, in both literacy and mathematics, the instructional toolkit focused on regaining instructional structure and momentum, and assumed teachers would primarily continue to work with the entire classroom as a unit, with most children engaging in the same or similar activities at any one time. Focus was concentrated on increasing the pace of teaching and learning interactions (written, verbal, with teacher, with peer), and the linguistic relevance of these interactions (building upon home language resources, introducing English resources.) Over time, the design team attempted to expand teachers' ability to see and think about children in differentiated ways, and take advantage of modest differentiated moments in their teaching, but did not introduce fully differentiated instruction.

The comparison of the data from 2007 to 2014 is significant in several ways. First, it suggests that the development of a set of relatively non-differentiated curricular tools to scaffold teachers to regain their relationship with teaching may be appropriate in the early phases of development. While differentiation benefits especially struggling and especially fast-moving learners, the intervention in this phase benefited both ends of the learning spectrum. Both children who scored at the low end and at the high end benefited. Given the slow pacing and unclear progression in classrooms, the first step for turning classrooms around is to increase the pace and make intelligible progression in learning interactions, ensuring interactions are meaningful by taking advantage of children's home languages, among other strategies.

The results also suggest that classrooms are now more complex. Children are no longer homogenous; there are weaker and stronger learners, as there are in any functional classroom. In the initial phase of development, it was more possible to teach to an 'average' child, ignoring the variety of skills and abilities in the classroom. That is more difficult now. The challenge in the next phase will be to continue to strengthen the base-step – the pacing and progression of day to day teaching - while at the same time raising the bar and turning teachers' attention to modest workable tools of differentiation to enhance instruction.

Implications for Policy and Practice

1. PRIORITISATION OF BINDING CONSTRAINTS

The work of the ReSEP team (van der Berg et al, 2016; Spaul et al, 2016) brought together experienced educationists to analyse the foundation phase system, reflecting an extensive review of literature and national data sets in the sector. They suggest that the root cause of low educational outcomes combine a lack of capacity with a lack of accountability. Accepting that resources and energies are limited, they suggest the need for systemic prioritisation. One report (van der Berg, et al., 2016) adopts an approach that focuses on the prioritisation of binding constraints -- the problems behind the problem that, if addressed, could begin to generate better outcomes in the system as a whole. They identify four binding constraints in the system: a) weak institutional functionality (pointing to the differences in provincial authorities); b) undue union influence; c) weak teacher content knowledge and pedagogical skill; and d) wasted learning time and insufficient opportunity to learn. They conclude by suggesting the most important investment into the system at scale must be made into the goal of learning to read, and identify priority system-wide interventions and a roadmap toward achieving this goal. As we draw out the lessons and implications from the experience of the Magic Classroom Collective, we have followed their approach. We first focus on the prioritisation of binding constraints, and then turn to an analysis of priority interventions and investments for system change. The emerging analysis affirms much of the ReSEP analysis. However, there are important differences of emphasis and understanding, pointing to a somewhat different route forward.

The first binding constraint emerging from the work of the MCC, is the alienation of the knowledge project serving education itself. By 'knowledge project' we refer to the instincts, assumptions and methods that shape the traditions of educational research, curriculum development, teacher training and development and policy work. The knowledge project serving education stands at a distance from the social and linguistic context of working class children and their teachers. There are two interrelated weaknesses. First, current educational expertise does not work through the languages of the majority of children and teachers. Second, current educational expertise is not sufficiently embedded within the day to day instructional practice of poor and under-resourced schools. The agenda for building an embedded expertise, accountable to classroom practice, will require a range of strategies over time, as discussed below. This speaks to the capacity of national educational expertise, and its accountability to the social and linguistic context of children and teachers.

The second binding constraint is weak institutional functionality at the level of provincial and national systems. This binding constraint speaks to the capacity of educational systems, and their accountability to the classroom. The experience of the MCC focuses priority on weaknesses that impact teacher learner ratios and basic instructional resourcing. The national post provisioning model (DoE, 2002) prescribes that the teacher learner ratio for the foundation phase should be no more than 1:35. The overall teacher learner ratio in the MCC schools was over 1:40. Forty per cent of schools had more than 45 learners per teacher. These ratios are exacerbated by other weaknesses. Teachers are frequently moved between phases and schools, and such movements are made on the basis of dated learner data. After 5 years of the MCC, only 45% of the initial teachers remained in the phase or school. Between 10% and 15% of teachers were new in the collective in any one year. There was a great deal of shifting between phases, where in essence, teacher training had to start all over again. When teachers are moved or take extended (authorised) leave, there are no mechanisms to replace them, leaving full classrooms without teachers for months, and at times years. There are no systems of substitution when teachers are taken out of the classroom for departmental activities or when they are ill. These inefficiencies normalise the loss of classroom time.

Beyond personnel allocation, this constraint also speaks to the availability of

minimal teaching and learning resources. It speaks to the non-personnel recurrent expenditure: its scale, its distribution, and the way it is converted (or not) into teaching and learning resources in rural and poor schools. Given the complexity of early literacy and mathematical instruction, there is no question that solid teaching resources, imbued with pedagogical meaning for teachers, contribute to the quality of instructional practice. The lack of basic resources (from pencils, to crayons, to counters, to more specialised bilingual readers) remains a binding constraint for most classrooms.

The third binding constraint is the lack of a legitimate basis of authority for professional support and mentoring, for example, district and university based. The lack of legitimacy reaches back to dehumanising systems of authority under apartheid, exacerbated by the lack of valid instructional expertise in this period. This constraint is intertwined with the first constraint. Given the alienation of the knowledge project, teachers have few experiences of instructional support where they experience improved results *in practice*. As such, there is no basis in praxis to re-establish legitimacy. Rebuilding the legitimacy of school-based (and wider) systems of authority for professional development depends upon building expertise in tight embrace with instructional practice. In order to invest in teacher professional development (at different levels of the system), there must be simultaneous investments into the development of the legitimate expertise to support teachers in their classrooms. The praxis of this level of expertise must be accountable to the demonstration of workable classroom-based solutions. This speaks to the development of an embedded layer of expertise in the system, capable of producing and reproducing quality teachers over time, who can function or perhaps even thrive in these kinds of schools.

The final constraint is defined as the *combination* of weak teacher practice (content knowledge and pedagogical skill) and an insufficient opportunity to learn, also documented in the work of the ReSEP team. While functioning somewhat independently, they are closely related. In terms of teacher practice, this includes building content knowledge, and especially an accurate understanding of bilingual reading, writing and mathematics instruction, building upon the language resources of children. It includes pedagogical content knowledge, with an emphasis on pacing and conceptual development, increasing the quality and quantity of learning interactions (with teacher, between learners, and with

meaningful text.) This element is based upon strong instructional structure, with related organisational systems. It speaks directly to the capacity of teachers, and their accountability to the children in their classrooms.

A comparison of the prioritisation of binding constraints of the ReSEP team and the MCC experience are summarised in Table 12 below. The table also locates the constraints in terms of accountability. There are important overlaps. The most significant difference in these prioritisations is the role of existing educational expertise. In the ReSEP prioritisation, there is less concern about the validity of current educational expertise. The suggestion is that the interventions required can be built without serious questioning of the current instincts, dispositions or assumptions on which educational expertise is grounded. The experience of the MCC suggests something different. It suggests that as we intervene in the system, we must find much stronger theory and methods for holding the work accountable to the linguistic and instructional contexts of poor and working class schools. This set of priorities requires a reframing of recommendations for policy and practice in important ways.

Table 12: *Prioritisation of Binding Constraints*

RESEP (VAN DER BERG ET AL, 2016)	ACCOUNTABILITY		MCC	ACCOUNTABILITY	
Source: Review of national literature and data sets.	of...	to...	Source: Longitudinal praxis in classrooms.	of...	to...
Weak Institutional Functionality	Department	Classrooms	Alienated Knowledge Project	Educational expertise	Classrooms
Undue Union Influence	Unions	Classrooms	Weak System Functionality	Department	Classrooms
Weak Teacher Content Knowledge and Pedagogical Skills	Teachers	Children	Lack of Legitimate Authority for Professional Support	Educational expertise	Classrooms
Wasted Learning Time and Insufficient Opportunity to Learn	Teachers	Children	Weak Teacher Practice and Insufficient Opportunity to Learn	Teachers	Children

2. RECOMMENDATIONS FOR POLICY AND PRACTICE

There are no simple solutions to rebuilding sustainable quality primary school education in poor and working class schools in South Africa. When ‘things fall apart’ they do so at many levels, and it is difficult to find one regenerative source.

The process of finding our way forward will take work at many levels, across long periods of time. However, without some shared understanding of the crisis, and the problem behind the problem, we are less able to organise our limited resources for the work ahead of us.

The two most important suggestions that come out of the MCC experience are that the system of education must be held better accountable to the language resources of children, and the instructional contexts of teachers. The value of any investment made into the system will in the end reflect whether or not it is held closely accountable to these two elements. What are the most important implications for policy and practice? Eight priority recommendations emerging from this experience are highlighted, contributing to a roadmap forward.

2.1 Classroom Minimal Standards

Policy provides for basic minimal standards for teaching and learning that are not in place for many rural schools. The simple achievement of stated standards can provide teachers with a better chance in their classrooms. The system must prioritise having no more than 40 learners in a FP classroom, focusing on reaching policy standards of 35 in the medium term. The instabilities of the post provisioning model must be investigated, toward minimising the movement of educators. A substitution system for legitimate time away from the classroom must be created. The system must further prioritise the provision of classrooms with minimum teaching and learning resources. Whether or not there are enough investments into the system, at the moment non-recurrent funds are not translating into adequate classroom-based teaching and learning resources.

2.2 Curriculum (CAPS) Review

The Curriculum Assessment Policy Statement (CAPS) is not held accountable to the language resources of working class children or to the Language in Education Policy (RSA, 1997.) The abrupt language transition currently hard-wired into the system via curriculum provisioning at the beginning of Grade 4, requires careful review. Establishing a more gradual transition to English across the intermediate (and senior) phase of primary schooling would provide African-language speaking children with a more reasonable and attainable literacy and learning trajectory in the foundation phase. A more gradual transition in the intermediate phase,

would frame a review of more attainable home-language literacy and English FAL curricular expectations in the foundation phase.

2.3 Instructional Toolkit

The experience of the MCC suggests that investments into in-service teacher development *on their own* are unlikely to shift instructional practice. The experience suggests that shifts in instructional practice rely first and foremost upon a valid instructional toolkit, providing a strong backbone for day to day instruction. This should be approached as highly structured as opposed to highly scripted. In-service teacher development becomes generative to the extent that it focuses on building teachers' understanding of literacy and mathematics instruction, and builds a relationship between teachers and the instructional toolkit. The experience of the MCC suggests that the current DBE workbooks are not well designed for this purpose. In order to benefit from the massive investments into the workbooks, they should be redesigned as the spine of an instructional toolkit, accountable to the design principles discussed across this paper. The distribution of this instructional toolkit should establish the basis for a national early grade bilingual literacy strategy.

2.4 Architecture for Embedded Research

This text presents a critique of the current ecosystem of educational expertise, suggesting that it neither works through African languages, nor is it embedded in the day to day instructional practice of burdened classrooms. Shifting this into the future will take strong policy scaffolding; a full discussion falls outside the ambit of this paper. A few immediate recommendations stand out. First, the MCC is the first longitudinal education design research architecture bringing senior educationists and practicing teachers into praxis, accountable to learner performance improvements over time. Beyond any technical output, this learning architecture presents a vital opportunity for accountability. It establishes an architecture to both develop and field test educational solutions, and refine the system's understanding and design principles as the system innovates and develops. It is recommended that the DBE allocate dedicated funds to support a small network of intervention study sites (educational design hubs), focused on the major language clusters of poor and working class schools, viz., Nguni, Sesotho,

Tshivenda and Xitsonga. Great care should be taken to include both urban and rural varieties of these languages. Beyond these intensive incubators for design, the experience calls for work on finding a range of ways to decrease the distance between classrooms and educational expertise. This may include providing incentives for University-based teacher educators to spend more systematic time co-teaching in classrooms, and special incentives and recognition for longer term classroom-based research.

2.5 African Languages, Literacy and Learning

Inquiry at the interface of African languages, literacy, learning and instructional practice has been systematically neglected. In order to make real gains in the future, we must make massive investments in building this area, making it productive for the purposes of research, teaching and curricular development. This requires a range of key investments. First, it requires investments into research capacity in early literacy in African languages, including the development of post graduate programmes in this area. In the short term, research and materials production focused on reading and writing development in African languages must be considered a national priority research area. This is likely to require investments bringing together African language scholars with education scholars focusing on bi/multilingualism, language acquisition and literacy. In the longer term, this work will rely on expanding university African languages departments, investments into writing and publishing African language children's books (narrative and informational), production of subject specific, monolingual and bilingual glossaries and dictionaries for use by children and teachers, and a large scale programme to translate key texts used in school into African languages.

2.6 Bilingual Literacy and Instructional Specialists

This recommendation speaks to the development and strategic deployment of instructional specialists at two levels of the system: the school (HODs) and ward/district (instructional coaches). Training of the instructional specialists should be centred on deep understanding of language and literacy acquisition in the relevant African language and English and bi-literacy strategies that exploit similarities and differences between African languages and English at the level of orthography, structure and genres of written language for high levels of bilingualism.

Investments into teacher development (see below), no matter its quality, is unlikely to translate into sustained results without building an embedded layer of expertise in the system to support the growth of instructional practice over time. There are four strategic limitations to the current systems of school and district based support:

The systems of authority (at the school and district levels) have lost legitimacy over long periods of time. The support professionals (e.g., HODs, subject advisors) do not have the instructional confidence and competence through which to rebuild professional authority.

Promotion in the system is often not commensurate with instructional competence. Once promoted, a teacher shifts professional focus away from instructional practice to administration and oversight.

The current investment into subject advisors is grossly inadequate as a basis of scaffolding instructional mentoring and support.

The outcomes from a significant investment into teacher development focused on early literacy depend upon the strength of this level of instructional support. This is likely to require a special partnership between DBE, DHET and specialists in HEIs. It will require more extended opportunities for praxis than are possible through the funding norms for current post graduate degrees and in-service training programmes. This capacity is unlikely to develop outside of a special degree or programme, extended across at least three years, allowing for iterative engagement with theory and practice. As this capacity is developed, it must be strategically deployed in the system, closely supporting HODs and practicing teachers. This is likely to require both a re-organisation of current district personnel, and the expansion of district instructional support posts.

2.7 Teacher Professional Development Strategy: Early Bilingual Literacy

The experience of the MCC supports the call for investments into a massive teacher development initiative focused on early literacy, such as the development of high quality coursework / a programme for both pre-service student teachers and in-service teachers (van der Berg et al, 2016; Spaul et al, 2016). If resources are not mobilised for a massive injection into the capacity of early literacy instruction, we are likely to reproduce and deepen the fault lines of national inequality into the future.

The analysis of the MCC experience, however, suggests that this call needs to be modified in two important ways. The problem should not be framed primarily and narrowly as 'reading' but rather as a challenge of *bilingual literacy*, emphasising the elements of balanced literacy instruction (language acquisition, reading, writing) and the distinctions between teaching literacy in a child's home language and teaching a child to work effectively in a new language (English) in a poor and working class context. Furthermore, a focus on the theory of reading and writing (or even bilingual literacy), on its own is unlikely to impact practice. The experience of the MCC suggests that the constraint to teaching is less grounded in one content area in isolation (important as it is), but rather in how teachers structure and support a complete teaching and learning day. This draws the focus away from the theory of literacy instruction per se, to the relationship between literacy theory and the instructional context of burdened classrooms.

The other way in which the call is modified is that in the end it may be unhelpful to elevate literacy at the expense of mathematics. Given the crisis in mathematics facing the country, it is not difficult to argue that early mathematics is vital to the future of the system. Moreover, gains in literacy are unlikely to be made without providing teachers with a strong instructional base-step, bringing together literacy and mathematics across a teaching day, week and year. Further, a teacher's experience of teaching is unlikely to gain a sense of agency unless they experience some success both in mathematics and literacy. While recognising the importance of focusing national attention on bilingual literacy, this should not take away from the work required in foundational mathematics. The call for emphasising reading (bi-literacy) as a *unifying* goal (Spaull et al, 2016) rather than an exclusive goal may help take advantage of elevating focus, while not moving away from the primary goal promoting instructional balance across a teaching day.

Design principles for new (or revised) initial teacher education and in-service programmes can be drawn from the discussion above. The majority of university based teacher development is conducted through English; an isiXhosa speaking teacher is taught through English to teach isiXhosa speaking children. She leaves the training without the knowledge, discourse or praxis required to build upon children's language resources. The most important design principle, moving forward, is that foundation phase teacher development programmes must be conducted in the language(s) of the classroom, and be rooted in home language

instruction. Materials must be presented in both English, and the relevant home languages, whereby core texts are carefully translated, maximising teachers' understanding of the material and assisting teachers to develop consistent, precise and fluent discourses for instructional practice.

The MCC experience speaks to specific design principles for in-service support programmes, and especially the interrelationship between in-service support and the provision of a structured instructional toolkit. Imbued with instructional development potential, the tools provide a scaffolding to bring the work of professional development into the classroom. Given the relative lack of time for professional development activities, time can be used to focus on creating a relationship with a tool, while the tool continues to assist a teacher to master content and instructional practice over time.

For the design and development of both initial teacher training and in-service programmes, the architecture of the course should be rooted in instructional praxis and draw from best practice, combining on-line resources and face to face engagements.

2.8 Instructional Supplementation or Youth Reading Coaches

One of the conclusions of years of literacy research is that learning to read and write flourishes under specific conditions. Learning to be literate is a social act and is difficult even when children are immersed in enjoyable literacy activities outside of the classroom from a young age. It is all the more difficult in text-poor communities. In these contexts, children require extended individualised time focused on early literacy skills such as phonics, writing, and oral and aural language activities. The experience of the MCC underscores the difficulties of learning literate practices in the classroom context alone. Even if instructional practice were to improve, there is still too little opportunity for individualised immersion in the context of poor and working class schools. In the long term, the system requires additional ways to offer more individualised attention for literacy support.

Literacy outcomes reflect the quantity and quality of reading experiences outside of the classroom, and the nature of the partnership built between teachers and parents around this activity. For the most part, we are not leveraging community resources in this regard.

The system should undertake a cost-benefit analysis of the options to increase opportunities for individualised instruction (both inside and outside of the classroom) in the early stages. The system should consider investing in teaching assistants to provide additional support in poor rural and urban classrooms. Drawn from local communities, and undergoing some training, these auxiliary practitioners could assist with instruction (Spaull et al, 2016).

Another option to be studied is that of investing into an infrastructure of youth workers, trained as school and community based literacy coaches. The role of these young facilitators would be to read to and with children (individually and collectively), animate community literacy activities (such as reading clubs) and support in their encounters with school, combining a number of ideas generated in the field of family and community literacy (e.g., Desmond, 2010). Channelling the interests and resources of unemployed youth, this work-service programme would not only seek to build primary school literacy performance, but also to provide young people themselves with a stronger relationship with literacy as a basis for a pathway into the world of further education and work. With articulation to B. Ed programmes for high performing coaches, this could also help create a different source of future teachers, focused and experienced with bilingual literacy instruction.

3. ROADMAP FOR BI-LITERACY INSTRUCTIONAL DEVELOPMENT

Table 12 below presents the outline of a roadmap which pulls these seven strategies into a rough planning framework. It is partially based on the work of the ReSEP team (van der Berg et al, 2016) and is organised into four planning stages: prioritisation, preparation, implementation, and sustainability. This plan assumes that prioritisation includes a focus on broader institutional limitations, and as such, that classrooms have no more than 40 children and have in place the most basic teaching and learning resources required by curricular policy.

Table 13: Roadmap: Priority Implications for Policy and Practice: Bilingual Literacy and Mathematics

	PRIORITISE	PREPARE	IMPLEMENT	SUSTAIN / ACCOUNT / REGENERATE
1 Curriculum Policy	Review of FP CAPS, with an emphasis on LOLT transitions. Review detailed curricular and assessment implications for Grades R to 9.	<ul style="list-style-type: none"> - Revised FP CAPS goals for home language literacy (African languages), English FAL, and mathematics. - Appropriate assessment tools reflecting new expectations for language transition. - Formulate national plan for the introduction of revised curriculum policies. 	Gradual implementation of new curricular policy based on national plan. Note: National plan to provide lead time for development of instructional toolkits to enable curricular / instructional transitions. ²⁴	Ongoing field testing, through education design hubs, toward five yearly reviews.
2 Instructional Toolkit	Redesign of DBE Workbooks and instructional toolkit for literacy and mathematics.	<ul style="list-style-type: none"> - Instructional Toolkit: FAL and HL Literacy. See design principles. - Instructional Toolkit: Mathematics. See design principles. 	Production and distribution of instructional toolkit (link: in-service support programme)	Ongoing field testing and redesign, through education design hubs.
3 Embedded Research Capacity	The development of research praxis more embedded in classrooms, accountable to the social, linguistic and instructional contexts of poor and working class children and their teachers.	<ul style="list-style-type: none"> - Development of ring- fenced support for education design / intervention research hubs. - Incentive mechanisms for teacher educators to co-teach in classrooms. - Long range strategic plan (DBE & DHET) to scaffold more embedded knowledge project 	<ul style="list-style-type: none"> - Education design hubs: Nguni, Sesotho, Tshivenda, and Xitsonga, encompassing both urban and rural varieties - Strategic plan (DBE & DHET) 	<ul style="list-style-type: none"> - Periodic systemic evaluation of learner performance in design hubs - Periodic working sessions: education design hubs, wider research community and policy makers

24 For example, if it is decided that mathematics in Grade 4 continues to be taught through the medium of a home language, this transition is not introduced into the system until an instructional toolkit is developed for this purpose..

	PRIORITISE	PREPARE	IMPLEMENT	SUSTAIN / ACCOUNT / REGENERATE
4 African Languages, Literacy and Learning	Prioritise development of field: African languages, (bi-)literacy and learning.	Research funding prioritised for: - Literacy development in African languages (HL & FAL) - Research collaborations between African language departments and education faculties.	- Investment into development of African language departments - Large scale translation programmes -Development of informational texts in African languages - Development of subject specific bilingual glossaries and/or dictionaries for schoolchildren	Development of research and post graduate programmes at the interface of African languages, literacy and learning, combining African language and education scholars. Development of African language based university praxis (inside and outside of education)
5 Instructional Specialists	The development of instructional specialists in the area of HL-FAL bilingual literacy and mathematics.	- Collaboration between DHET, DBE and specialists to develop and resource appropriate embedded programme.	Special extended programme to develop early bilingualism, bi-literacy and math instructional specialists, combining extended interactions with theory and practice.	- Deploy HL-FAL bi-literacy specialists across districts. - Develop new posts for instructional coaches at district and ward levels. - Create career paths focused on specialisation in instructional practice.
6 Teacher Development	National Teacher Development Programme: Bilingual Literacy and Mathematics for the Foundation Phase	- Collaborative effort, led by bilingual specialists to design, develop and pilot course and curriculum for initial teacher training programmes. - Collaborative effort, led by bilingual specialists to design, develop and pilot in-service course and curriculum	- Implement initial teacher education course across HEI's offering teacher training programmes. - Implement in-service programme in all districts to all FP teachers.	Two primary evaluation indicators: bilingual learner work & learner performance in literacy and mathematics. Such a programme should regenerate itself year on year. Annual collaborative working group for redesign.
7 Youth Reading Coaches	DHET and DBE collaboration and prioritisation of youth reading coaches programme.	- Collaborative design of youth reading coaches work/service / training programme. - Pilot alternative designs (community education, service, applied service)	- Pilot and evaluate at increasing scale.	- Articulate graduates from programme with access to initial teacher education. - Articulate graduates with further education and training opportunities.

Conclusion

This report started by reviewing the trends of schooling nationally, whereby learner performance in well over 60% of schools is basically flat. As the country emerged from a brutally divided and unequal past in 1994, the public education system was assumed to be one of the most important tools through which to transform the country. Over 20 years after the first democratic election, the patterns of performance at the earliest stages of the system suggest something else: the system of public education largely reproduces the inequalities of the past.

This monograph discusses the experience of a collective of teachers, teacher educators and researchers, working together over time, to better understand and shift the way foundation phase classrooms work in poor, rural, working class schools. The work is founded on the use of the home language of children and teachers to build strong foundations for learning literacy and mathematics in both their home language and English.

The experience of the MCC suggests that there are no simple solutions to shifting the instructional practice of foundation phase classrooms at scale and sustainably. It will take focused investments and hard digging at some scale over time. However, the MCC experience provides a horizon of analysis that is ultimately optimistic. The MCC experience focuses attention on the instructional core of foundation phase classrooms, placing an emphasis on the end goal of bilingual literacy and mathematics. The experience suggests that the infrastructure for national educational development does not place the African language

speaking child at the centre. The work of research, teacher development and support, curriculum, assessment and policy development are not closely aligned to the social and linguistic contexts of our children and their teachers. Children are failing not because teachers are inherently problematic, but because the work has not been done to provide teachers and learners with a good fighting chance at the chalk-face.

The results of the work suggest the basis for a new horizon. With a carefully field-tested structured toolkit and support, a collective of rural foundation phase classrooms with some of the lowest results in the country in literacy and mathematics are starting to function like more normal schools.

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BRIAN RAMADIRO is the Deputy Director of the Nelson Mandela Institute for Education and Rural Development, University of Fort Hare. He researches bi/ multilingualism and literacy and teaches language and literacy in the Faculty of Education. He holds a PhD in applied linguistics from the University of London.

KIMBERLEY PORTEUS is the Executive Director of the Nelson Mandela Institute for Education and Rural Development, University of Fort Hare. Her research interests focus on the transformation of rural foundation phase classrooms, and pedagogical innovations in teacher education. She holds a PhD in education from the University of Fort Hare.

This is an inspiring study of building Magic Classrooms in poor, rural schools in South Africa's Eastern Cape Province. It is ground breaking in at least three major ways. First, it provides a textured account of seven years of a continuing intervention to shift the instructional practices of approximately 70 teachers. School-based research on this scale and depth is rare, not only in South Africa. Second, the intervention is ground breaking in its use of Design Based Research, an approach that has at its core the building of collaborative approaches to investigate, understand and change actual practices. In this case, researchers worked with Foundation Phase teachers and teacher educators in actual classrooms to understand instructional practices and how to shift them. Third, and crucially important, the study presents evidence for the specific approaches it advocates. It can say with confidence, that 'classrooms look, work and perform differently in 2014 and 2015 to how they looked, worked and performed in 2007'. The magic lies in the experience of success for many teachers and students - success in reading, writing and mathematics. For education reformers, this is magic to be savoured.

Pam Christie,
Emeritus Professor of Education, Senior Scholar, CHED,
University of Cape Town

This manuscript details a very innovative and important research project. I am not aware of any other studies that detail language pedagogy and practice in rural South African schools with as much rigor and fine-grained analysis. Not only is the approach structurally sound, it offers new and unique insights into teaching and learning. The research is not only a methodological approach to collect and analyze data, it is also used formatively to enhance and improve the project itself. It is not only descriptive (which characterizes most qualitative case studies) it also addresses and reflects on impact over time while recognizing that the initiative is still a work in progress. It concludes with lessons learned and very useful recommendations - that are built out of a sustained critique and engagement with "what is" versus "what should be". The study will bring much food for thought to policymakers, practitioners, teacher educators, and others working in the service of education provisioning. Language learning and pedagogy has truly been the missing link in South African education policy reform and this study is way in the forefront of understanding and changing practices rooted in contextual and community needs.

Carol Anne Spreen,
PhD, Associate Professor, New York University

