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The Grade R Mathematics and Language Improvement Programme

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Introduction

In this issue of JET Exchanges, we share information about the Grade R Mathematics and Language Improvement Programme (MLIP) in which JET is a partner, describing the context in which the programme is being implemented before providing details on the programme itself.

Foundational mathematics and literacy skills are premier issues in South African classrooms, both for learners as well as educators. South Africa has invested in several reading and mathematics interventions in the past years; however, setbacks like the COVID-19 pandemic rolled back progress that had been made. According to a background report by Spaull for the 2030 Reading Panel,

> *If learning loss estimates are correct and SA does manage to get back onto the pre-pandemic improvement trajectory, it will still take 86 years from 2023 up to 2108 until all Grade 4 children can read for meaning in SA (Spaull, 2023, 8).*

Currently, 65% of learners lack the skills needed to progress in language and mathematics (Gauteng Education Development Trust, 2021, 7). Considering the challenging landscape for advancing effective mathematics and literacy interventions, the Grade R MLIP has led efforts toward improving outcomes in these areas for all schools in Gauteng Province offering Grade R from 2022 through 2024.

CALL TO ACTION

To empower more Grade R teachers, Foundation Phase department heads and subject advisors to deliver better pre-school education, reach out to Nathalie Vereen at nathalie@jet.org.za and join our resource mobilisation efforts. Let's ensure quality ECD education for all!

Context

Literacy

Literacy plays a fundamental role in schooling from an early age. The 2030 Reading Panel evaluated literacy research and emphasised the important conclusion that 'Children who do not "learn to read" in Grade 1 and Grade 2 will not "read to learn" in Grades 2 and onwards" (Spaull, 2023, 2). These essential years in the Foundation Phase scaffold learning for subsequent years of schooling as well as for lifelong learning. Research has also found that more years of schooling lead to robust outcomes such as advancing economic potential, improving health and reducing crime (Hanushek & Woessmann, 2007, cited in Shiohira, 2019, 7). Given educators' integral role in ensuring learners' success during these early years, it is essential that teachers have a firm grasp of the pedagogy and methodology for teaching early literacy.

The United States National Reading Panel report outlines five principles of effective literacy instruction that teachers must implement in their classrooms, including phonemic awareness/phonological awareness, phonics, vocabulary, comprehension and fluency (National Reading Panel, 2000). In *Consolidating Research and Comparing Practice: What Funders Need to Know for Meaningful Engagement with Literacy In South Africa*, Kelly Shiohira (2019, 8) elaborates on these principles for literacy instruction. Shiohira explains that oral language development in South Africa includes phonological awareness (at the level of word, syllable, onset-rime and phoneme), where learners are taught to understand and adapt language orally. Shiohira (2019) goes on to describe the principle of phonics, which links written letters and spoken sounds, having the power to enhance reading fluency. Furthermore, learners process receptive vocabulary (words heard and read in context) and productive vocabulary (words said and written in context); these methods also increase comprehension as learners are beginning to read (Shiohira, 2019, 8). These themes presented by the National Reading Panel and Shiohira shape some of the basic principles on which South African teachers might develop their pedagogical approaches to teaching literacy to learners in the Foundation Phase.

Mathematics

Mathematics teaching and learning has a strong association with language. In the book *Early Grade Mathematics in South Africa* (Venkat & Robinson, 2022), Feza, Ramollo and Chiphambo (2022), in the chapter titled 'Early grade mathematics in African languages: Emerging research', provide evidence concerning the value of learners learning and practicing mathematics in their home language, noting that learning in the school's language of learning and teaching (LoLT) can, in the same way as learning in a foreign language, disrupt brain function and memory and the pathways needed to master mathematical concepts (Feza et al., 2022, 171). This highlights the value of creating interdisciplinary connections between language and mathematics.

The study goes on to explain how a global study found a correlation between mathematics and language in conjunction with income. In one example from the United States, researchers found that pre-school English language learners from low-income households often fell behind their counterparts who spoke English at home (Feza et al., 172). This furthers the argument in favour of learning foundational mathematics skills in a LoLT that matches a learner's home language. When the LoLT is not a learner's home language, it can be one factor accounting for poor performance (Feza et al., 2022, 174).

An additional pedagogical best practice mentioned by Feza et al. focuses on the importance of translation or versioning in mathematics lessons. With reference to translating between English and isiXhosa, researchers cited an example where one word in one language may have two meanings in another, for example, 'ngaphezulu' could mean both 'more' and 'above' — when quantified, the word means 'more', otherwise it means 'above' (Feza et al., 178). Learning appropriate comparison words in mathematics thus depends greatly on teachers' abilities to present information in two languages and achieve the same meaningful learning outcomes (Feza et al., 2022, p. 179).

Teaching practices in the South African context

Literacy

The Progress in International Reading Literacy Study (PIRLS) 2021 provides a comparative overview of international reading levels. The 2021 report indicates that South African learners in Grade 4 had a mean achievement score of 288 on the test, placing South African learners in Grade 4 below the lowest benchmark, which requires scores between 400 and 474. The Low International Benchmark (400-474) says that leaners 'can read to locate and retrieve explicit information' (PIRLS, 2023, 6). Furthermore, 81% of learners did not reach the Low International Benchmark, meaning that they '[could not] read to locate and retrieve explicit information'; nevertheless, one in five learners ranked in the Low International Benchmark, while 1% of learners reached the Advanced International Benchmark (PIRLS, 2023, 7). At a time when reading abilities determine success in long-term learning outcomes, this is a pivotal age group for which educators must master pedagogy and teaching approaches.

Many literacy projects have been implemented over the years in South Africa in an effort to address poor literacy performance, and a key challenge they face in delivering positive long-term outcomes lies in training. Some larger-scale projects that use a training-of-trainers model rely on subject advisors to train teachers; however, subject advisors are not always experts in literacy pedagogy and are often unable to perform at higher than 50% proficiency on literacy teaching tests (Spaull, 2023, 2). Even the range in knowledge and capacity among teachers can make it difficult to deliver results for literacy outcomes. Based on previous PIRLS trends and potential trajectories, the 2030 Reading Panel has outlined needs for 'significant reform' and 'system overhaul'. As suggested by the panel, getting up to 90% of Grade 4 learners reading for meaning by 2031 requires 'system overhaul', including teacher recruitment, training, certification, support and evaluation. Spaull notes that without retraining Foundation Phase teachers for continuity and growth within their own teaching practice as well as a lack of new teacher recruits who have been trained to teach reading may both contribute to the status quo in a system that is working toward achieving greater outcomes (Spaull, 2023, 7).

Mathematics

Learning deficits are not a new challenge confronting mathematics teaching. Curriculum 2005 (C2005) was an attempt to redress equity gaps caused by the apartheid education model (van Deventer, 2009, 127). Hamsa Venkat and Ingrid Sapire (2022) cite findings from 2000-2010 of slowed progress in mathematics gains among learners. They note that C2005 was largely inaccessible, where teachers had

little background knowledge to support proper instruction, especially emerging from a system that did not allow for flexibility (Venkat & Sapire, 2022, 3). Nick Taylor points to similar findings in his paper *'Anything but Knowledge': The Case of the Undisciplined Curriculum* (2001), arguing, 'the stronger the learner centred element of a curriculum, and the lower the socio-economic status of its recipients, the less likely it is to achieve its goal of social equity' within a constructivist framework (Taylor, 2001, 2). This legacy of inadequate mathematics interventions drives the need for more robust curricula.

Kimberley Porteus, in the book *Early Grade Mathematics in South Africa* (Venkat & Robinson (eds), 2022), points to findings from 2007-2009, listing some of the additional challenges in rural South African classrooms that place barriers on advancing learners' progress in mathematics. Two major challenges may lie in both time and preparation. Time includes the degree to which teachers are dedicated to their work. In this case, absent teachers without substitutes or having too few lessons focused on mathematics (as little as one or two lessons focused on mathematics per week) both limit learners from advancing in their mathematical skills (Porteus, 2022, 102).

Teachers working in rural schools also experience pedagogical challenges. While policy steers teachers toward teaching mathematics in learners' home languages, most teachers are not equipped to do so (Porteus, 2022, 103). This inadequacy on the part of teachers hampers deeper conversations in the mathematics classroom and perhaps elucidation on the part of the learners. Learners may begin doing mathematical tasks in a rote manner, rather than exploring critical thinking skills and making connections in context, where mathematical concepts provide a framework for understanding the world through an interdisciplinary lens.

COVID-19 pandemic set-backs

While the COVID-19 pandemic interrupted formal schooling around the world, now more than three years since the initial lockdown, staggering statistics bring to light the current deficits and the path needed toward academic recovery. In 2016, reports estimated that 36% of Grade 4 learners would effectively read for meaning by 2031. In 2022, the projected estimated percentage for that same goal was reduced by 9% to only 27% of learners reading for meaning by the end of Grade 4 by 2031 (Spaull, 2023, 7). The pandemic set back improvements in learning outcomes and raised questions about the interventions that learners need.

As reported in *PIRLS 2021 International Results,* parents shared their perceptions of how the COVID-19 pandemic affected their children's learning outcomes (Mullis et al, 2023). Parents surveyed in 57 countries confirmed that 86% of learners stayed home from school after the onset of the pandemic, and among parents with children who stayed home from school, 67% noted that their children's learning was adversely affected (22% indicated 'a lot' and 45% indicated 'somewhat') (Mullis et al., 2023, 11). Meanwhile, 19% of parents did not feel that their children's learning was adversely affected (Mullis et al., 2023, 11). Time away from a formal school setting in the 2020-2021 school year ultimately impacted longitudinal learning gains for school systems within many countries

In South Africa, time away from school in 2020 set learning achievements back to 2015 levels. The learning outcomes regressed more for learners in low-resourced schools than learners in higher-resourced schools. Additionally, an evaluation of Grade 2 and Grade 4 learners in South Africa estimated losses of up to 60-80% of the year that should have been spent in classrooms (Reddy, 2022). These statistics explain both underlying variables correlated with the COVID-19 pandemic as well as the urgency for effective mathematics and literacy interventions.

Grade R Mathematics and Language Improvement Programme

Background

The Gauteng Department of Education (GDE) Education Road Map 2019-2024 outlines five strategic goals, with the first goal targeting Early Childhood Development. This goal aims to universalise Grade R, and the Grade R MLIP complements that goal with a focus on improving teaching and learning in mathematics and home languages in Grade R, as its name suggests. Ultimately, the programme aims to successfully move learners from Grade R to Grade 1, with learners' preparation in Grade R being such that it can carry them successfully through the Foundation Phase. To accomplish the goal outlined by the GDE, 90% of learners must achieve at least 50% proficiency in both literacy and numeracy by the end of Grade 1, in alignment with the National Development Plan.

The Grade R MLIP works toward achieving the proficiency goal through play-based learning, storytelling, improved assessments and an emphasis on emergent reading. Overall, it is envisaged that emphasising quality pre-school education (also known as early childhood development or ECD) will lead to a range of positive outcomes, including in long-term cognitive development, as well as social and academic benefits. Research has shown that investing in ECD can mitigate the impacts of poverty that often lead to low educational achievement (Ferguson, Bovaird & Mueller, 2007, 703). Additionally, the programme works toward improving assessment practices in Grade R and improving learners' readiness for formal school.

The programme aims to build capacity among Grade R department heads and school management teams, enhancing their skills in monitoring and providing support for Grade R teachers and practitioners in order to improve their curriculum delivery with pedagogical skills. The programme also provides access to relevant materials for mathematics and home languages to enable Grade R teachers and practitioners to provide learners with appropriate instruction and prepare them for schooling beyond Grade R. Throughout the programme, Foundation Phase subject advisors support Grade R educators in curriculum implementation and pedagogical practices.

Programme development

Early stages of programme development began in 2016 under the direction of the GDE and the Gauteng Education Development Trust (GEDT). In 2018, the GEDT commissioned JET Education Services (JET)[1] to prepare an overview of continuing professional development and training needs of Grade R teachers and practitioners, as well as current training options in South Africa, with particular focus on the Gauteng province. The research by JET concluded that the Western Cape Education Department (WCED) had initiated the only fully evaluated Grade R intervention through Stellar Home Language, implemented by Wordworks[2]. With some necessary changes, the GEDT adopted the contents, materials, training, and general design of the intervention, as outlined in the report. The GEDT then presented a proposal to the GDE and both the GEDT and GDE agreed to design an intervention, in consultation with the United States Agency for International Development (USAID) and Zenex Foundation.

After discussions among the GDE, GEDT, JET and the Funder Group, the organisations agreed on the programme's implementation phases. The Funder Group, made up of USAID, the GEDT and Zenex Foundation, serve as project funders. The Design and Working Group (DWG), consisting of representatives from the GDE, JET, Wordworks and the School Development Unit (SDU)[3] of the University of Cape Town, developed a project design document. Additionally, subcommittees from the DWG organised to develop materials for both mathematics and home languages. Concurrently, the Project Steering Committee (PSC) was also formed, consisting of key members from the GDE, GEDT, USAID, and Zenex Foundation as well as JET. JET would serve as the project management office and secretariat of the PSC. Technical partners would include Wordworks, specialising in the teaching of home languages, the SDU with a speciality in mathematics teaching, and Kelello Consulting, serving as the external evaluator. Partners in all structures have participated actively since the programme's inception. Additional substructures include working groups for learners with special needs as well as monitoring and evaluation.

Programme implementation

Programme implementation with Grade R teachers began in 2022, first focusing on home language training. The programme was designed as an in-person training model; however, the COVID-19 pandemic impacted the original project design and forced all stakeholders to utilise hybrid training models. From the start, GDE subject advisors conducted internal monitoring through school visits and monthly workshops. External evaluation, managed by Kelello Consulting, focused on testing Grade R learners, observing classroom lessons, interviewing stakeholders and administering pre- and post-tests for teachers. Implementing

1 JET Education Services: https://www.jet.org.za/clearinghouse/projects/grade-r-maths-and-language-improvement-project
2 Wordworks: https://www.wordworks.org.za/
3 School Development Unit (SDU): https://humanities.uct.ac.za/schools-development/about-sdu/sdu

the mathematics curriculum in 2023 has followed the same training style as for the home language curriculum. Work in 2023 has also incorporated time to develop materials for Grade R learners with special needs.

Programme implementation has included five distinct outputs:

- Materials development in eleven languages for both home languages and mathematics;
- Quarterly training-of-trainers, coupled with provision of the printed materials for each term;
- Quarterly information sessions for the Foundation Phase department heads;
- Monthly training of Grade R teachers from public ordinary schools, also coupled with provision of the materials for each term to eventually use with learners;
- Ongoing internal monitoring conducted by the GDE and external evaluation team.

The programme targets a total of 4 500 teachers and practitioners and is currently in the third of three phrases; teachers have already received training on home language teaching, while training on mathematics teaching is currently in progress.

The programme versioned, printed and distributed 4 824 sets of *home language* materials in 10 languages for Terms 1 through 4 in 2022 in the Gauteng province. As of Term 2 in 2023, the programme has also versioned, printed and distributed 4 824 sets of *mathematics* materials in 10 languages for both Terms 1 and 2, as well as 4 824 mathematics kits for Terms 1 and 2. Kits for Terms 3 and 4 are currently being distributed. Materials are aligned with the Curriculum Assessment Policy Statement (CAPS), contextualised for the Gauteng province and quality assured by the GDE. While materials in siSwati were not originally printed and distributed in Gauteng, they have been versioned for this eleventh official language and are available as open-source materials through Creative Commons. Meanwhile, capacity building efforts have involved 190 GDE subject advisors in quarterly training-of-trainer sessions (they also received materials); a monthly training for 4 524 Grade R teachers in home language and mathematics content; and quarterly information sessions for Foundation Phase department heads (home language sessions in 2022 and mathematics in 2023).

Programme sustainability

The programme strives for sustainability. Having the technical expertise and capital of both a human resources team as well as subject advisors and Foundation Phase department heads to train Grade R teachers has been instrumental in driving and implementing a provincial-wide project. Since all materials are open-source, the only additional costs include printing of training materials and training for their use. Given that the GDE has been involved from the programme's inception to the present ensures stakeholder buy-in to carry the programme forward and take full ownership by 2025. Fortunately, budget allocations allow for programme extensions in 2024 and 2025. Programming in 2024 will focus on home languages, allowing for ECD facilities to receive training and for other teachers to catch up. In 2025, the extension will focus on mathematics for the same groups as 2024, in addition to accommodating the programme to better suit learners with special needs.

Programme Lessons

Given the long-term investment in the programme and the involvement of strategic partners such as the GEDT and the GDE since 2016, as well as the high degree of engagement, financial and otherwise, by multiple stakeholders, including the Funder Group, the work comes with valuable take-aways. Project implementers have learned the value in clarifying roles. Defining roles included defining programme governance with a signed stakeholder agreement in place and determining who would be responsible for presenting key deliverables such as materials development, training and evaluation reports. The PSC would provide strategic oversight of the work of the DWG. Additionally, the programme needed a clear direction for assessing progress, which would be done by an external evaluator. Given the era in which the project was planned and implemented, especially with regard to the global pandemic, flexibility remained a key priority for project design.

Timelines inevitably evolve throughout the course of a project and require a high degree of flexibility. Adapting materials to fit 11 languages for online training shifted the start date by a full year. Additionally, training required rehearsals or 'dry-runs' and online support sessions for more effective implementation. Accommodating for these varied challenges enhanced the adaptability of the programme, but also required effective problem-solving skills on the part of the programme implementers. Cost increases are inherent in project design, and this programme is not an exception, given the additional material costs related to a modified training plan.

The GDE's ownership of the project has created the momentum to both drive and implement this project versus solely being pushed by the Funder Group. The GDE has contributed funding, quality assured materials and participated in all programme structures, including the DWG, subcommittees and PSC. Nevertheless, an independent evaluation is key to provide an external perspective of the overall programme and provide recommendations to improve both the design and interventions. External evaluators developed and marked pre- and post-tests for teachers in collaboration with technical advisors and the GDE. Furthermore, careful use of technical and language expertise throughout the programme's design and implementation strengthened the evidence-based approaches for all stakeholders.

Conclusion

While the South African education system will require additional interventions to successfully prepare its learners, the Grade R MLIP aims to tackle some of the leading issues that face ECD. It prepares learners for formal schooling in a play-based, storytelling environment, giving them a head-start in their home language. The project gives schools the opportunity to utilise well-designed and translated materials and classroom kits to encourage learning at an early age. The literacy intervention serves as a key programme to prepare emerging readers to read for meaning. Additionally, the newly initiated mathematics programme aims to incorporate learning mathematics in the context of home language.

The project is set to conclude its evaluation in 2024 and continue interventions aligned with the GDE, intent on maximising sustainability for Grade R teaching and learning outcomes.

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