

National Learner Support Community of Practice
Highlights of the Main Maths and Science Learner Support
Community of Practice Meeting

22 August 2017, RMB



Setting the scene

In this session, the Maths and Science Community of Practice (CoP) continued to map what is currently being done and what can be done to support effective learning and teaching in mathematics in South Africa. CoP members considered how we might increase the number of learners who are prepared to successfully take maths forward into grade 10 and beyond.

The meeting featured a presentation by Dr Lynn Bowie on the work of OLICO, an organisation which runs after-school programmes in Diepsloot. Dr Lynn provided a sense of OLICO's journey over the past five years as its moved toward a tailored blend of tutoring and technology that fosters mathematical sense-making for learners. Her presentation also included the lessons OLICO has learnt in the process.

OLICO's work in maths education reflects many of BRIDGE's values and exemplifies the significant contribution that can be made by small organisations through collaboration and the open sharing of information and resources.



Overview of presentation

OLICO's early work teaching computer literacy to adults highlighted the significant academic hurdles young people face in accessing employment and pursuing further studies. As a result, the project (in partnership with IkamvaYouth) branched into tutoring high school learners.



“Maths is meant to make sense but to the vast majority of our children it just doesn't – it is a series of jumbled rules, half-memorised facts and things you are meant to perform in class that you are not sure of.” (Dr Lynn Bowie, OLICO)

OLICO sees its core challenge as finding ways to “reinstate sense-making in maths” by helping learners understand key maths concepts and develop the crucial core fluencies. Part of the challenge is the impossibility of re-teaching every concept that learners may have missed, and the need to concentrate on those key mathematical concepts that are essential to continuing productively with maths. Language – which affects all school subjects, but maths in particular – is another challenge. As is presenting maths as a graspable subject, and giving learners the courage and patience to grapple with difficult problems until they can make sense of them. Building this mindset is especially difficult as it is contrary to 21st century expectations to perform tasks quickly and with ease.

The quest to address this core challenge gave rise to OLICO’s tutor-supported online programme for grades 7 – 9 learners. The programme develops number sense and fluency, bridges gaps in learning, and creates a pathway into maths from grades 10 – 12 and beyond.

“We have made open source and collaborative work fundamental to how we do things.” (Dr Lynn Bowie, OLICO)

The online component of the programme consists of tutorial videos on key concepts and a variety of questions and activities for practise and drill. The online platform gives immediate feedback to learners and guides tutors by highlighting areas that require additional intervention. Tutors can monitor learner progress, provide one-on-one support to those who need it and hold regular group tutorials (which include discussion of key concepts, peer interaction and written work). A literacy programme runs in parallel with the maths programme to encourage reading for enjoyment and to develop learners’ reading and writing skills, as well as their understanding of maths terminology.

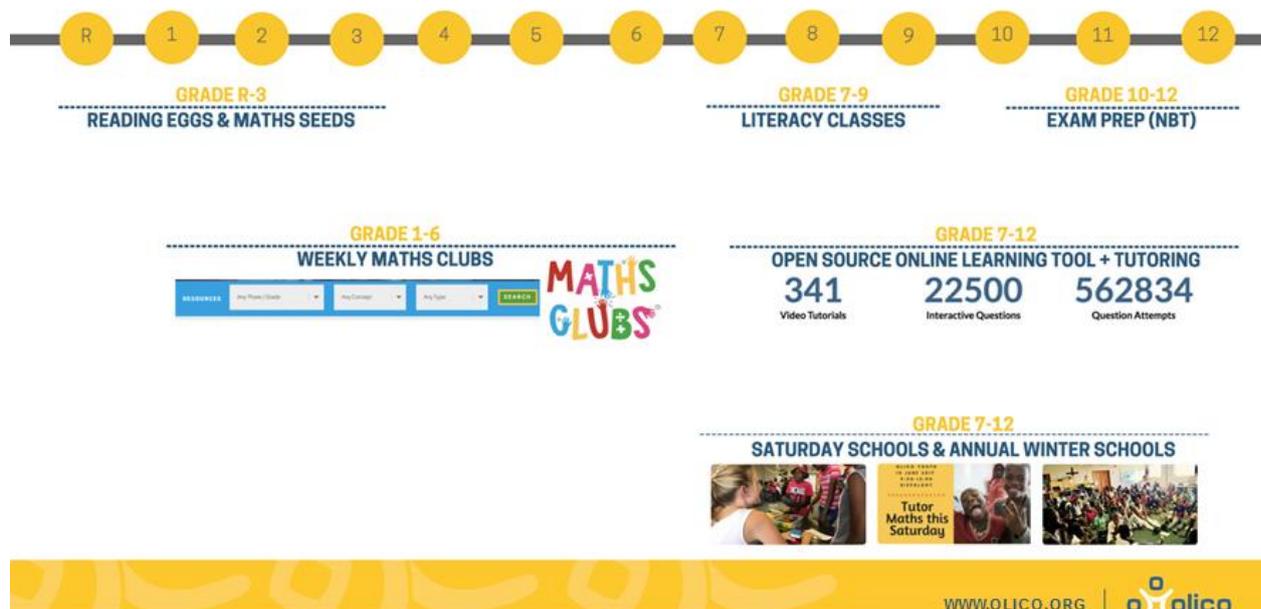
Assistance at grade 10 – 12 level includes tutorial videos and exam practice, which is sourced from schools. There is also an extensive National Benchmark Test (NBT) practice course.

All the materials used in OLICO’s after-care programmes are open source, free to use and freely available. OLICO has also entered into partnerships with schools interested in using the material, which in some cases has involved customising the resources.

OLICO has also been motivated to support the development of number sense in children in grades 1 – 6. This led to the creation of maths clubs. The clubs, which were developed by Professor Mellony Graven and Dr Debbie Stott of Rhodes University, focus on energising children around maths, developing their core number sense through play and presenting maths as a subject they can make sense of.

OLICO is now supporting other organisations who are interested in running clubs, and monitoring the effectiveness of these interventions. Amongst those interested are teachers in the Diepsloot area who have been enthused and reinvigorated by the training. OLICO is also working with other organisations and individuals to extend the collection of games, activities and materials offered in the clubs, and populate an online open source repository

THE OLICO TOUCHPOINTS



Assessment is a strong feature of all of OLICO's interventions. All those attending the centre are pre- tested to guide the focus of the intervention. Written assessments and discussion are also used to diagnose mistakes, provide feedback and verify understanding.

Through its research and data collection, OLICO has confirmed the benefits of its programme for learners across grades 7 – 9. However, a significant drop in school maths results is still observed as learners move into grade 9 and begin algebra and formal geometry.

OLICO aims to continue sourcing and developing materials and technology, particularly for their open source online programme for grades 7 – 9, and to implement and test them in the real world to be sure of their usefulness. The organisation hopes to attract 20000 users to its programme, and has plans to create an offline version for those without internet access. OLICO hopes to continue to partner with NGOs and schools to provide training and extend the reach of the grade 7 – 9 online programme and maths clubs. There has also been some interest from provincial education departments to provide training for teachers. This would have to be provided in partnership with organisations that are already working with teachers.

OLICO would welcome any opportunity to work collaboratively with NGOs and/or the BRIDGE community to identify the key mathematical concepts that learners have to master in grades 7, 8 and 9 in order to progress in maths. Despite working hard at this, OLICO believes they have not yet fully resolved this issue, and are hoping that shared learning across different projects will provide a better sense of where to focus their energies for the best results.



After the presentation, participants raised various questions for discussion. A selection of those questions and responses are included below:

i) *Has OLICO found any particular method or strategy to be especially successful?*

Lynn noted that ‘gamification’, by which she meant finding ways to make maths fun, has been OLICO’s most successful strategy. An example of this is the ‘times table challenge’ – learners were so excited and enthusiastic about this that they spent extra time at the centre and completed 5000 questions in a few weeks.

ii) *How do you measure the impact of maths clubs on learners’ maths results?*

OLICO assesses children when they start the programme and again at the end of the year using the Early Grade Mathematics Assessment. Their partnerships with schools only began in early 2017, so the organisation hasn’t had a chance to assess impact in those spaces yet. However, OLICO is grappling to produce a monitoring and evaluation framework that could show the impact on school results as it is difficult to get reliable school assessment data. Determining what to test is also a challenge as is identifying a robust test to use. It is important for NGOs in this space to work together to find robust ways of monitoring the impact of interventions on school performance.

iii) *Is what OLICO does in line with the GDE’s Annual Teaching Plan (ATP)?*

This is complicated as ATPs are different in different provinces. OLICO centres concentrate on key concepts in each grade, but these are not strongly aligned with the ATP. However, topics can be selected from OLICO’s material and sequenced to align fully with ATPs – schools electing to do this will need to charter the pathway for their learners.

Dr Bowie pointed out that OLICO is keen to partner with organisation where there is common purpose and synergy. OLICO has been able to redesign whole sections of its programmes to suit schools that want to use them.

To access the presentation given by Professor Graven on maths clubs, click [here](http://bit.ly/2x3Lctb). <http://bit.ly/2x3Lctb>.

We have found the sharing of ideas at BRIDGE CoP meetings to be very rich. A lot of the ideas that we have incorporated in our work have come through the sharing that happens in the BRIDGE community.” (Dr Lynn Bowie, OLICO)

“Speaking as a funder working on behalf of our trustees in an area where there are so many different programmes, it has been exciting to hear that the OLICO programme can be adapted for schools and other NGOs, so these organisations can partner with OLICO without having to change everything they do. It has also been pleasing to hear the emphasis on key concepts and on monitoring and evaluation, and that OLICO’s approach does not encroach on the teaching role.”

Participating CoP Member

@CoP

Discussion

CoP members formed small groups to discuss what might be done in the senior phase (and earlier) that would lead to an improvement in Grade 9 maths learner performance, which would in turn help learners gain sufficient confidence to opt to take the subject in the FET band.

Some of the responses have been captured in the table below:

- ❖ Professionalise teaching and give teachers better support – involve teachers in decision-making, recognise the challenges that they face, and develop their confidence by giving them the tools they need to teach effectively, together with practical guidance on appropriate teaching methods.
- ❖ Give teachers who teach maths in primary school specialist training – currently those who become good maths teachers do it by developing themselves. Teachers don’t teach what they are not comfortable with, and many teachers’ expertise fall short of the requirements of the job.
- ❖ Re-design the curriculum to focus on developing skills and thinking, and to give learners the time and opportunity to grapple with ideas and solve problems. This approach is better than what is often a shallow delivery of concepts, and an overloading of the curriculum that requires teachers to quickly skim across content.
- ❖ Create a more coherent curriculum by standardising the approaches of schools and provinces, standardising resources, focussing on the teaching of concepts and avoiding the repetitiveness of the CAPS curriculum. Currently, the overall purpose is lost because the curriculum is fragmented.
- ❖ School leaders have a responsibility to address Human Resource (HR) issues that impact on the teaching of maths. Principals are responsible for driving the curriculum and in order to do this they need to understand HR and curriculum policies, their roles and responsibilities as principal, and how to use the policies and their position to the betterment of their learners. Although the pool of teachers trained in maths is small, it is critical that schools select teachers with maths skills when they take in new grade 4 teachers. Principals do have some leeway in terms of teacher selection and should make sure that at least some of their grade 4 teachers have maths skills, and that these

teachers assist others who do not have the same level of expertise. Principals also have a responsibility to identify young people who display an affinity with maths and an interest in teaching, and get them trained. Then principals ought to use their networks to find and place those learners in training.

- ❖ Change people's negative mind-sets regarding maths – this would involve changing the narrative about how difficult maths is and how clever you have to be to do it. We need to provide a nurturing environment that enables teachers and learners to overcome their hatred and fear of maths, and help them become less emotional about maths so they are not embarrassed by their mistakes. Instead, learners and teachers must be shown that making mistakes is part of developing problem-solving ability which crucial to studying maths.
- ❖ Focus on key concepts and competencies. Key concepts should be applied in all grades (not made a focus of any particular grade), and should be constantly refreshed, even if they have been taught before in lower grades. Learners should be given more freedom to understand methods and concepts, and to move from the concrete to the abstract.
- ❖ Make maths more visual and concrete by moving away from worksheets and towards project based learning that links to everyday experiences and life lessons. e.g estimate the time needed to cross the road before a car drives by.
- ❖ Provide opportunities for peer learning amongst teachers, for example: forums to discuss the key concepts, or teachers at the individual school level coming together to discuss solutions that have worked, etc.
- ❖ Recruit and develop specialist maths and science teachers by creating new degrees and re-structuring training to include internships, mentoring, induction programmes and in-service training. Include a process of re-alignment for people who have previously studied maths and science, who are not teachers but are looking to change careers, and retrain them.
- ❖ Identify master teachers and share these good teachers among several schools. Look at ways of reconceptualising their situation, for e.g. by relieving them of administrative work to concentrate on teaching, or making perks conditional on working collaboratively with other teachers.
- ❖ Create specialist maths and science schools that share resources with other schools on a regular basis through mobile classrooms and labs, and through other interventions driven by expert teachers.
- ❖ Address the negative impact of language on maths. Mathematical terminology is important for understanding concepts and has to be used consistently. If maths is taught in English from Grade R, will home languages suffer? Is teaching in a learner's mother tongue the answer?
- ❖ Encourage parental involvement and community support for maths – principals can increase their impact by collaborating with neighbouring schools to do this.
- ❖ Create a favourable environment for the grade 3 to 4 transition to help learners cope with the conceptual and procedural changes so that they don't fall behind at this critical stage.

- ❖ Network and collaborate with feeder schools and teacher communities of practice to share and build good practices. Schools are encouraged to approach neighbouring schools to ask for help with maths.

List of Participants

First name:	Surname:	Organisation:
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