



Improving English and mathematics in Tanzanian government primary schools

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Village Education Project Kilimanjaro (VEPK) has worked with and in Tanzanian government primary schools for twenty years. The early years of the project allowed VEPK to see that improving school buildings and facilities was not enough to improve results: what was needed was a programme of teacher development. For a few years various teacher development sessions were held on an ad-hoc basis, while for the past nine years VEPK has been working on what it calls a Whole School Development Programme.

The aim of the Whole School Development Programme (WSDP) is to improve the quality and teaching of English and mathematics in Tanzanian government primary schools through a cost-effective and sustainable model of in-service teacher development. Discussions were entered into with local education authorities and permission was granted for an initial seven year project to explore ways to improve the teaching and learning of English and mathematics in four schools. For reasons outside this paper, the project schools were changed part way through. This allowed the WSD model which had been developed with the initial four schools to be implemented together with the introduction of the mathematics programme which had recently started to take form. In 2014, the English programme, which had been under development over the same years, was finally initiated in an extended programme of pilot schools.

Underpinning the English and mathematics projects is the WSDP which ensures support from the teacher, head teachers, ward education officer, district education officer and inspectors. Head teachers received training in the importance of team work, delegation and communication skills. The ward education officer supports the head teachers through visits and meetings. Regular meetings are held as required to discuss challenges and find ways around existing bureaucratic procedures to allow best practice to develop. The local Teacher Training College for primary school teachers is also included in discussions and exploring ways to develop the programme.

The WSDP takes a multi-pronged approach to understanding the primary school system in Tanzania. It has approached the issue of poor education from an action research and problem solving perspective, unpicking assumptions in order to ascertain the underlying issue and find a solution. The favoured theoretical approaches include Jerome Bruner's Discovery Theory and Jay McTighe's Backward Design, both of which are based on Cognitive theory. Underpinning both these theories are the ideas of Lev Vygotsky and Jean Piaget. These theories also underpin the two main strands of the WSDP, namely the teaching of English and mathematics. Each of these will be looked at in turn.

English Project

Having explored and researched the issues surrounding the teaching of English in Tanzania for fifteen years, the conclusion reached is that there is a need for a single course in all primary schools which teaches the structure of the language, and from which teachers can learn on the job. This conclusion is based on the following findings.

English was taught well in the 1960s and primary pupils understood and enjoyed the subject. Most Tanzanians over the age of 58 have good English which they learnt at school and can still recall some of the stories they read whilst learning English (Allen, 2009). The programme they followed was for two years after which time they had sufficient knowledge of the structure of the language to cope with all subjects in English at Middle School (from Standard V). In 2013, according to the Uwezo report, only 35 per cent of children (aged 10-16) tested were able to pass the English test at Level 2 Curriculum. In addition, teachers do not have sufficient confidence or ability to teach English well (Allen, 2008). As noted by Cullen (1994, pp.163-4) "in most parts of the world where exposure to English is limited, and where English is not the medium of instruction but a compulsory foreign language on the school curriculum, the main concern of English teachers in primary and secondary schools is precisely this: the need to improve their own command of the language so that they can use it more fluently, and above all, more confidently, in the classroom". He continues (p.165), "A poor or rusty command of English undermines the teacher's confidence in the classroom, affects his or her self-esteem and professional status, ...and makes it difficult for him or her to follow even fairly straightforward ...teaching procedures such as asking questions on a text (cf. Doff 1987), let alone fulfil the pedagogical requirements of new, more communicative curricula. Low levels in English among the teaching force are thus not just a concern among the teachers themselves but should also be a concern of those involved in planning both pre-service and in-service teacher training programmes".

To address these issues and to support the teachers of English in the government primary schools who number over 40,000 and who operate across the vast landmass of Tanzania and across the different physical and cultural environments in a cost effective and sustainable manner, VEPK has been trialling the New Original English Course (NOEC). This course has five books which are used between Standards III to VII. The course has the advantage of returning to introduce English as a foreign language in Year III of primary school. Returning to teaching English as a foreign language was recently alluded to by the President (Lugongo, 2015) in an announcement referring to a raft of proposed changes to the delivery of primary and secondary education. In other countries where English is taught as a foreign language, it is generally introduced in the third year. Where it is introduced in the first two years of school it "consists of oral communication practice and understanding, repeating and applying what one has heard" (Finnish National Board of Education, 2015). The NOEC follows the traditional route of introducing the additional language in year three (Norwegian Ministry of Education and Research, 2004).

Many of Tanzania's primary pupils enter primary school without Swahili as their first language, and so they need time to learn Swahili, to learn to read and to write, and to settle in to school routines and discipline.

The NOEC is a course, not merely a set of books or textbooks. The overall aim is to prepare pupils for detailed comprehension work and written work as this will fulfil the needs of their education after primary school. In summary, there is always an extensive oral introduction of every topic (Singleton, 1989, Hawkins, 1984, Vilke, 1988), the exercises are varied to allow for different learning styles and build up word and phrase recognition which is vital for future comprehension work (Tabors, 1997). The stories included are of interest and are firmly set in an East African context. The stories build up over the course and at the end comprise about 750 words. The paragraphs are numbered for ease of

comprehension work. The structure of the course addresses the five “strengths” of language learning as identified by Stevick (nd). These are:

1. Relevance – of the content to the pupil’s own language needs
 2. Completeness – inclusion of all the language necessary to the stated aims of the course
 3. Authenticity – the material should be both linguistically and culturally authentic
 4. Satisfaction – the pupil should leave each lesson feeling he has benefited more than simply progressed
 5. Immediacy – the pupil can use the material in a lesson straight away.
- These “strengths” add to the motivation of pupils to learn an additional language as noted by Corder (1967).

The NOEC of 2014 is based on the original NOEC introduced and used in Tanzania from the late 1950s through to 1970. An assessment of the earlier NOEC noted that it “was an excellent series of books. The content for the pupils was of meaning and interest drawing on their environment and people and things to whom and to which they could relate. Each lesson used language items from previous lessons so that language learning was continuous and not segmented. The exercises were many and various. There was built-in group and pair work and lots of action suggested for the pupils to be able to demonstrate their understanding” (Allen, 2009). In summary, the NOEC, then and now, takes into account the physical, psychological, emotional and motivational development of a child (Piaget 1961, Glover and Bruning, 1987, Gardner, 1993).

The earlier NOEC had a “unique feature”, *The Teachers’ Notes and Handbooks*, “which gave comprehensive guidelines on grammar rules, pronunciation, how to teach and teaching aids.” The 2014 NOEC builds on this by giving all the explanations and instructions in Swahili (the teachers’ native language). This replicates the practice concerning teachers’ handbooks for teaching a foreign language in Europe, America and Canada.

In each Teacher’s Notes there is a mini-dictionary, and a full pronunciation guide. For Book One and Two (for Standard III and IV) the Teacher’s Handbooks contain teaching techniques and methods as well as special notes on difficult grammar topics. The teacher is guided every inch of the way. The teacher learns on the job and cannot go wrong if they follow the book as the structure of the language is taught in a systematic way with endless revision and cumulative learning. The vocabulary in the books is based on the most frequently used words in the English language (Allen, 2009).

The books are there and have been tried and tested (Allen, 2008 & 2009), but more important is the testing of the 2014 NOEC which VEPK is currently piloting in some schools. The results after the first year of implementation are already noticeable. Teachers are more confident, pupils are enjoying lessons and participating in their learning (Samson, 2015).

An additional innovation VEPK has introduced is the *Jiandae*. This is a two year course of Language Awareness for Standard I and II. It aligns with the early introduction of an additional language in countries such as Norway and Finland. The focus is on oral and aural development, gaining knowledge of the environment, Tanzania and other countries and people, and developing thinking skills. This too, is being piloted, with similar results to the NOEC.

The reception of the NOEC and the quality improvement already noticed in the short time the pilot has been running, requires further attention. It is known that the Tanzanian Government needs to reconsider the English syllabus and the textbooks in use for the teaching and learning of English in its primary schools in order to address the decline (DfID, UWEZO 2013). The NOEC allows Swahili to be used in the classroom, not to translate but to explain and give instruction which assists in learning the foreign language. There is no overnight cure for improving education and a solution which is country-wide is needed. Any new programme or initiative will take at least seven years to have an initial impact on the calibre of pupils finishing Standard VII and at least 14 years to have an embedded impact affecting the standard of education as a whole. The NOEC meets these requirements in a cost effective and sustainable manner.

Mathematics project

As with the English and Whole School Development research undertaken by VEPK, that for mathematics has started with the reality of the situation in the school and classroom in order to break through the commonly perceived causes of low quality education.

Numerous studies have been undertaken comparing private and government schools in Tanzania in order to ascertain what the differences are, mostly looking at textbooks, class size, teacher motivation, language of instruction and facilities available (Desai, Qorro & Brock-Utne (eds), 2009, IPA, 2015). What has been noticeable from these various studies is the assumption that the curriculum or syllabus is fit for purpose (Qorro, 2010, Michael, 2013). Using McTighe's Backward Design approach, VEPK has identified that one of the main issues in teaching mathematics lies in the design of the syllabus. This has a knock-on effect as the textbooks are designed around the syllabus as are the assessments. Using the ideas from Backward Design, Piaget (1961), Bruner and Vygotsky as well as the premise that mathematics should be a practical part of everyday life, VEPK has developed strategies for use in the classroom which assist the teacher and the pupil by making learning fun, relevant and which ultimately meets the aims and objectives of the syllabus and curriculum.

For early years learning, that is Pre-Primary, Standard I and Standard II, strategies and ideas have been adapted to the Tanzanian situation from the Montessori programme (Montessori, 2015). These have been grounded in the development theory of Piaget (1962), Glover and Bruning (1987), Gardner's multiple intelligence (1993) and Vygotsky's scaffolding. The emphasis is on ensuring an understanding of the concrete (using real objects) before moving onto abstract ideas (supported by Scruggs & Wong, 2012). Setting a strong foundation in the early years is crucial to the success in later years. To support the teachers with teaching mathematics in a concrete way, VEPK produced three handbooks for teachers, namely *www.hisabati I, II and III*. These have been used in the pilot schools for four years and an analysis of the 2013 and 2014 Standard IV national mathematics papers indicates that the approach is having a positive impact (Samson, 2015). This is despite the syllabus having gaps and inconsistent development steps.

For developing and improving mathematics in the higher standards, the work of Ian Lowe, Charles Lovett and Doug Williams is drawn upon. In addition to their work in Australia, Lowe works with schools in Malawi and Williams in Kenya. They therefore have an intimate knowledge of how mathematics differs in East Africa from that in Australia. Drawing on their experiences in both continents they have found ways to support pupils in Africa to understand the concepts behind mathematics so that those pupils can transfer their knowledge and solve problems rather than follow a process to get to a solution.

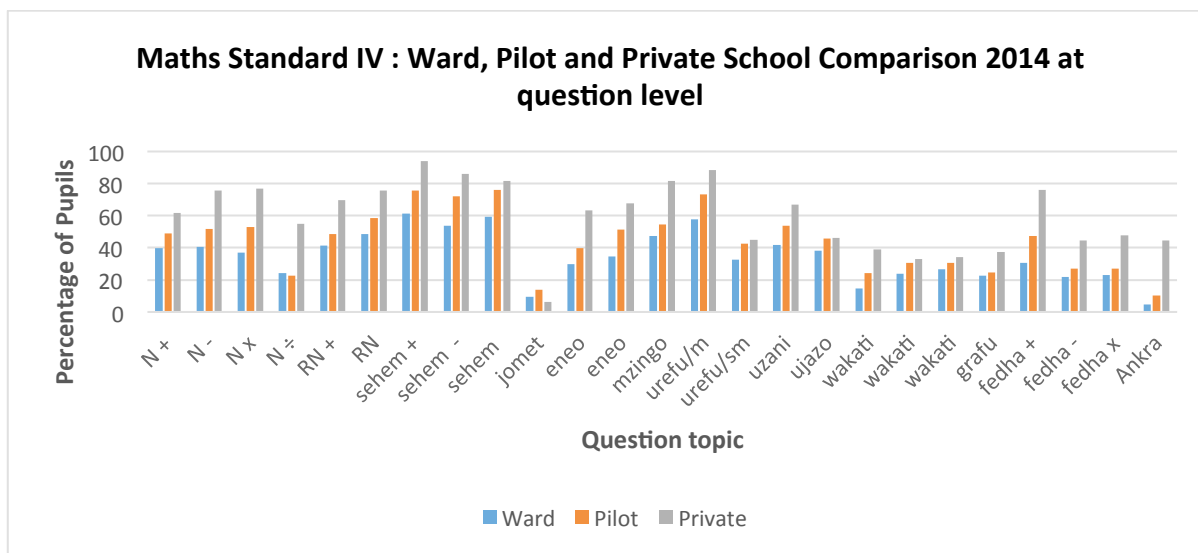
Using prior experience from a private school in Tanzania following the government syllabus, the mathematics syllabus was analysed according to theme or topic and how it was developed across

the Standards. This exercise highlighted gaps and inconsistencies in the curriculum which helped explain why teachers were struggling to teach certain concepts and had difficulty understanding these themselves. Because the textbooks follow the syllabus as noted by Qorro (2010), these gaps and inconsistencies were not identified in Qorro's study as her criteria for assessing the teaching of mathematics was based on the premise that the syllabus was fit for purpose. The teachers were unable to identify the fundamental problems within the textbooks as their knowledge of mathematics was not sufficiently developed to do so. The VEPK Mathematics project has included the teachers as part of the interrogation of the mathematics syllabus by confirming through focus groups and discussions what is taught in each Standard or not. This has led teachers to trust the support VEPK is providing as they are aware that VEPK has a clear understanding of the curriculum and syllabus as well as the reality facing them on a daily basis. Finding ways to address the gaps and inconsistencies has become a partnership between the VEPK mathematics development adviser and the mathematics teachers in the schools.

Understanding of the structure of the syllabus and the importance of pupils having a concrete understanding of mathematics has enabled teachers to identify where pupils need additional input on new topics to ensure a solid foundation. This is particularly important when topics are introduced in higher Standards without links to prior knowledge, for example: fluency in addition, subtraction, multiplication and division are the basis for all mathematics, such as algebra, fractions, area, perimeter and volume; an understanding of inverse operations is essential for fractions to be understood; knowledge of inverse operations is also necessary for working with integers and algebra; fluency in addition, subtraction, multiplication and division and inverse operations are the core of the work covered in the www.hisabati Pre Primary, Standard 1 and 2 books.

The main focus of the VEPK Mathematics Project over the past two years has been to analyse the Standard IV national examination papers for mathematics at question level for all the schools in the education wards where the pilot projects are being conducted. The use of the government set tests rather than additional externally set tests enables a wider range of learners to be compared, is cost effective and relates directly to the syllabus. The analysis of the papers also provides an insight into how the questions are set by the relevant body which has enabled further areas for development to be identified as well as challenges with the marking process. Had the tests been set externally, none of these aspects would have been identified. Where issues are outside the scope or remit of VEPK, they are fed through to the relevant academic officer for feeding back into the system through the relevant channels.

Further analysis of the results of the examination alongside the syllabus has enabled teachers to understand why they and their pupils are struggling with problem solving questions, algebra and areas of geometry for example. This is irrespective of whether pupils attend private or government schools. As can be seen in the graph below, the dips are the same for all schools.



What was disconcerting about the 2014 results was the drop in the number of pupils answering questions 1-4 correctly as these are generally basic addition, subtraction, multiplication and division questions. However, analysis of the question paper to see how the questions differed from previous years indicated that the challenge of getting teachers and pupils to understand the importance of place value is still an issue. This can be seen below in how Question 1 was set out in 2013 and 2014 respectively.

2013: 7999
2001

2014: $9 + 117 + 2018 =$

At least one pupil showed his working out as $9117 + 2018 =$ clearly indicating that there is a lack of understanding of place value.

Later questions in the 2014 examination paper which had concrete type aspects to them were answered correctly for example:

Q14) $m30 + m45 =$

Q22) Tsh cents
 2680 30
130 90

However, most pupils regarded Q22 (2014) as having two different parts and so did not carry the cents over to shillings.

These findings from the two years of examination papers demonstrate that having a concrete understanding of mathematical concepts is important but so is understanding the principles and logic behind mathematical equations. Without this, pupils follow rote processes which do not enable them to problem solve.

The VEPK Mathematics project has demonstrated the importance of starting with the reality “on the ground” to identify the issues rather than the “big picture”. Helping teachers understand how mathematics builds on concepts and relates to the concrete (reality and everyday life) is crucial to improving the quality of teaching and learning. A consequence of this approach has been the recognition by teachers of the importance of team work and sharing instead of putting the

responsibility for pupil achievement onto the Standard VII teacher. The foundation set by the Pre-Primary teacher is as important, if not more, to the pupil's success as is the Standard VII teacher's input to hone the basic skills in order to develop problem solving skills.

Conclusions

Scruggs and Wong (2012) conclude in their chapter on *Theoretical support for reconstructive elaborations* that why successful strategies for teaching pupils with learning difficulties "are so beneficial" is that "they incorporate the work from psychology on elaboration learning (Jensen & Rohwer, 1963), meaningfulness and learning (Glover & Bruning, 1987), concreteness and learning (Paivio, 1971) and effective encoding of information (Underwood and Schultz, 1960)". These theories and approaches are applicable to the three strands of VEPK's Whole School Development Programme and in particular, can be identified in the English and Mathematics Projects. This in itself addresses an aspect not covered in this paper but alluded to, namely that no special attention has been given to learners with learning difficulties in the pilot schools or design of the programme. The state of education in Tanzanian government schools is so dire that most pupils can be said to have at least one learning difficulty. More significantly though, the activities and grounding of the concepts in the concrete and everyday life means that best pedagogical practice is employed which meets the main requirements of all learners including those with basic learning difficulties.

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