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LEARNING TO TEACH READING AND MATHEMATICS AND INFLUENCES ON PRACTICE IN KENYA

Country Report
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Learning to Teach Reading and Mathematics and Influences on Practice: A Study of Teacher Education in Kenya

Prepared for
The William and Flora Hewlett Foundation

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List of Acronyms and Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
APHRC	African Population and Health Research Centre
ASALs	Arid and Semi-Arid areas
BED	Bachelor of Education
CPD	Continuing Professional Development
DICECE	District Centre for Early Childhood Education
DFID	Department for International Development
DQAS	Directorate of Quality Assurance and Standards
ECDE	Early Childhood Development and Education
EFA	Education for All
FGDs	Focused Group Discussions
EGR	Early Grade Reading
FGD	Focus Group Discussion
FPE	Free Primary Education
GER	Gross Enrolment Ration
HIV	Human Immunodeficiency Virus
ICT	Information Communication and Technology
JICA	Japanese International Corporation Agency
INSET	In-service Education and Training
ITE	Initial Teacher Education
KANU	Kenya National Union
KCSE	Kenya Certificate of Secondary Education
KESI	Kenya Education Staff Institute
KESSP	Kenya Education Sector Support Program
KIE	Kenya Institute of Education
KISE	Kenya Institute of Special Education
KJSE	Kenya Junior Secondary Education
KNEC	Kenya National Examinations Council
KNUT	Kenya National Union of Teachers
KRT	Key Resource Teacher
KTTC	Kenya Technical Training College
MDGs	Millennium Development Goals
MoE	Ministry of Education
MOEST	Ministry of Education, Science, and Technology
NACECE	National Centre for Early Childhood Education
NARC	National Rainbow Coalition
NASMLA	National Assessment System for Monitoring Learning Achievement
NGO	Non-government Organisation
NQTs	Newly Qualified Teachers
P1	Primary 1
P2	Primary 2
P3	Primary 3
P4	Primary 4
PCK	Pedagogical Content Knowledge
PTA	Parents Teachers Association
PTE	Primary Teacher Education
PTTCs	Primary Teacher Training Colleges
QASO	Quality Assurance and Standards Officer
RTL	Reading to Learn
RoK	Republic of Kenya
SACMEQ	Southern and Eastern Africa Monitoring Educational Quality
SbTD	School-based Teacher Development

SMASSE	Strengthening of Teaching of Mathematics and Science in Secondary Education
SNE	Special Needs Education
SSA	Sub-Sahara Africa
TE	Teacher Education
TAC	Teacher Advisory Centre
TPA	Teacher Preparation in Africa
TLMs	Teaching-learning Materials
UPE	Universal Primary Education
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USAID	United States Agency for International Development

1.

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Executive Summary

Since 1990 and more especially since 2000, the goal of *Education for All* by 2015 has galvanized many countries in sub-Sahara Africa (SSA) into confronting their historically low rates of enrolment. They have been remarkably successful in attracting many more children into schools (UNESCO 2008). However filling the classrooms is not enough; education for all, if it is to have positive social and economic consequences, must involve children learning at least the basic minimum competences of literacy and numeracy that will enable them to benefit from and contribute to their society's future.

In Kenya, following the introduction of the free primary education programme in 2003, enrollment increased by over 1 million pupils or by 17.6 per cent. However, information from recent learning assessment studies suggests that this exponential increase in enrollment has not been matched by increase in learning. The 2010 UWEZO assessment reported that nearly half of Standard 4 learners could not read a Standard 2 level story and that a third of the children in Standard 2 could not read even a word while only a third could read a paragrah of their level (UWEZO 2010). The UWEZO assessment report also indicates that only half of the children in Standard 1-8 aged 6-16 years have acquired the highest numeracy competency expected of Standard 2 learners. Similarly, the Kenya National Examinations Council's (KNEC) assessement of Standard 3 learners in numeracy and literacy reported poor learning achievement. The report indicates that achievement in both reading (297.58) and numeracy (295.6) was below the standardized mean of 300 (KNEC 2010).

It is generally accepted that an adequate supply of well trained teachers is critical to improvements in education. On attaining independence in 1963, Kenya set out to expand primary teacher training. The expansion efforts seem to have paid off as, although the percentage of untrained teachers was high (ranging between 21 per cent in 1970 and 37 per cent in 1976 [Kang'ali, 1995]), the situation has changed and virtually all primary school teachers in public schools are now trained. Unfortunately, the same cannot be said about the quality of teachers. Research examining teacher quality confirms the logical conclusion that poor quality of students' learning correlates strongly with poor quality of teachers' teaching. Effective student learning and achievement is hampered by weaknesses in teachers' pedagogical content knowledge (PCK) and classroom practice (Pontefract & Hardman 2005; Akyeampong, Pryor & Ampiah 2006, Moon et al. 2005; Byamugisha & Ssenabulya, 2005 and other SAQMEC country reports) both of which are developed through effective initial teacher education and continuing professional development (CPD) programmes for teachers.

The current study was set up to fill the gap in knowledge about how the initial and continuing education of teachers impacts on the practice of teachers in Kenya. Because of the extreme importance of early reading and mathematics for future progress, it focuses on the preparation that teachers who teach in the lower primary grades receive and what support is available through CPD and other routes to teach these subjects. A central issue is whether the process of learning to teach reading and mathematics at lower primary level (standards 1-3) draws attention to, and emphasizes the kind of teaching known to be important for developing lower primary school children's abilities to read and understand basic mathematical concepts.

In particular, the research has addressed the following research questions:

1. **How do pre-service teacher education programs prepare trainee teachers to teach reading and mathematics in the early grades?**
   a. What assumptions about learning to teach reading and mathematics can be deduced from the structure and content of the primary teacher training curriculum, and from school textbooks?
   b. How does the teacher education curriculum and their implicit and explicit theoretical base relate to the curriculum for early years in language and mathematics in schools?
2. **How do trainee teachers develop their understanding of teaching reading and mathematics to early grade students?**

a. How do these relate to college courses and experience during a structured practicum?

3. How do newly qualified teachers teach reading and mathematics in their first few years of teaching?

a. How does this practice relate to what has been taught and learnt in pre-service training?

b. What support do they draw on in developing their practice?

c. What is the nature of the gap between what the research literature says about teaching reading and basic mathematics in early primary schooling, and what beginning teachers actually do in their classrooms?

4. What are the characteristics of professional development programs with a mathematics and/or reading focus that have been implemented over the past three years?

a. Which teachers have they been designed for, and how were these teachers selected?

5. How do the graduates of professional development programs teach reading and mathematics to early grade students?

a. What changes in teacher practice can be linked to their participation in professional development programs?

6. Which teaching competencies and skills should be incorporated into the curriculum of primary teacher education programs and which should become the preferred focus of teachers' professional development activities?

7. How cost effective are major pre-service and CPD programs with mathematics and reading focus?

a. What is the relationship between the cost per trainee and extent to which teachers develop their understanding and adopt desired practices?

8. How can professional knowledge and skills in teaching reading and mathematics be effectively transferred and shared within and among primary teacher training programs and beginning teachers?

In addressing these issues we conceptualize competence in terms of knowledge, understanding and practice. Good practice in teaching is a complex process which requires a great deal of different knowledge - content knowledge, that is, knowing about the subject matter to be taught, pedagogic knowledge that is knowing how to engage with learners and to manage a classroom and, pedagogical content knowledge, which involves knowing how to represent and formulate the subject matter, in this case of early reading and mathematics, that make it comprehensible to students. The study has therefore investigated the different kinds of knowledge that teachers at various stages of preparation have and their understandings of how this can be applied to construct classroom practice.

Data generation for the study started with a critical analysis of teacher education policy and curriculum documents to establish what competences relevant to the teaching of reading and mathematics the primary teacher education (PTE) programme (and where available, CPD programmes) seek to instill in trainee and CPD teachers.

Subsequently, qualitative and quantitative data were collected in primary teacher training colleges (PTTCs) and in primary schools. The PTTC research sites comprised four primary teacher training colleges – three public and one private. Two colleges were drawn from the Coast Province and the other two from Central Province. Teacher educators were observed and videoed teaching lessons on lower primary mathematics and reading methods to final year teacher trainees. The teacher educators were then interviewed while focus group discussions were conducted with groups of 6-8 trainees drawn from classes where lesson observation had been conducted. All accessible final year trainees in the four colleges were also asked to fill a questionnaire.

School level data was collected from 33 schools (16 from Central Province and 17 from the Coast Province). Videoed observations of lessons in reading and mathematics in lower primary classes by newly qualified teachers (NQTs) and experienced teachers who had been on CPD were followed by forensic interviews calculated to give a greater understanding of what teachers actually know and can do. Head teachers in all sample schools were also interviewed on the issue of NQT support and management especially as related to teaching reading and mathematics. In addition a slightly adapted version of the questionnaire used for trainees was given to NQTs.

The key findings of the study include:

1) There has been no serious effort to interrogate the concept of quality teachers and how the curriculum and structure of PTE can be changed to enhance the quality of training the trainees receive and therefore the quality of teachers and teaching in the country. Rather, raising teacher grades and entry requirements for the PTE programme have been the two main teacher quality improvement strategies adopted.
2) The PTE curriculum design and implementation is not in consonance with the progressive teacher as a reflective practitioner teacher education model suggested in various ways in the teacher education policy statements, goals and objectives.
3) The PTE formal and co-curriculum is overloaded leaving little time for focus on development of the knowledge, understandings and skills that trainee teachers will need to help primary school learners learn.
4) The PTE curriculum lays heavy emphasis on subject content and acquisition of theoretical knowledge about teaching reading and mathematics rather than on understandings and skills for teaching.
5) There are gaps between the PTE and the primary school reading and mathematics curricula.
6) There are no training or induction programmes for PTTC teacher educators. They are therefore ill prepared to offer quality training for primary school teachers as they have virtually no professional knowledge about primary schools or about teaching those who will teach young children.
7) In their teaching, teacher educators focus more on theoretical knowledge about teaching - how to structure reading and mathematics lessons, teaching-learning activities and the use of teaching learning materials - and less on understanding and pedagogical knowledge.
8) The trainees mistake the theoretical knowledge about teaching they have acquired for teaching competence and leave the colleges confident about their ability to teach reading and mathematics
9) NQTs draw heavily on the theoretical knowledge about teaching they acquired in college in their teaching and when they are not successful in helping children learn, they blame the children.
10) There seems to be a theoretical recognition of the importance of CPD, however, little has been done to institutionalize and improve the quality of CPD programmes in Kenya.
11) There has been little CPD focus on key curriculum areas such as early reading and mathematics despite the importance of these subjects.
12) The nationally implemented school-based teacher development (SbTD) CPD programme that introduced the concept of reflective teaching in Kenya seems to have had positive impacts on the teaching of some of the teachers trained.

Based on the findings of the study, the following are recommended:

1. There is an urgent need for teacher quality and teacher education policy dialogue with a view to the development of a comprehensive research-based policy on teacher education generally and on teacher education for teachers of reading and mathematics in the lower primary.
2. The teacher education curriculum and practice should be reviewed and to focus on teacher education models that have been shown to produce effective teachers generally and effective reading and mathematics teachers for the lower primary in particular. The curriculum should focus on equipping trainees with content knowledge, pedagogical knowledge and pedagogical content knowledge.
3. The teacher education reading and mathematics curricula for lower primary should be reviewed to enhance the link with the lower primary school reading and mathematics curriculum.
4. The teacher education curriculum for reading in the lower primary curriculum should be strengthened to include particular emphasis on the phonics approach which has been shown to be effective in helping struggling readers decode print and thereby become independent readers.
5. It is critically important that Kenya institutionalizes CPD as a strategy for improving the quality of education. In this regard, it is necessary that further critical analysis of the CPD programmes discussed in this report – SbTD, EGR, RTL and SMASSE – is carried out to inform a government driven and sustained reading and mathematics CPD programme for lower primary teachers.

Chapter 1: Background and Introduction

Education for All (EFA) and Educational Quality: The significance of Teacher Education

Since 1990 and more especially since 2000, the goal of *Education for All* by 2015 has galvanized many countries in sub-Sahara Africa (SSA) into confronting their historically low rates of enrolment. They have been remarkably successful in attracting many more children into schools (UNESCO 2008). However filling the classrooms is not enough; education for all, if it is to have positive social and economic consequences, must involve children learning at least the basic minimum competences of literacy and numeracy that will enable them to benefit from and contribute to their society's future. Unfortunately, much evidence suggests that many who attend school are not learning very much. UNESCO (2008:2) reports a 'relatively low and unequal learning achievement in language and mathematics' in many countries especially in sub-Sahara Africa (SSA). These poor results are seen throughout basic schooling, but it is becoming increasingly clear that the first years of schooling are especially important. Children's early experiences with learning shape their attitudes and commitment to education and so, more than at any other stage, what happens in the early grades, determines their educational future. Unless they make sufficient progress at this stage they are liable either to cease coming to school entirely, relapsing into illiteracy and innumeracy, or to become the 'silently excluded' who are not able to access the increasingly demanding work of the later grades (Liddell and Rae 2001; Lewin 2009; UNESCO 2010; Glick and Sahn 2010). This is particularly true in reading and mathematics which underpin understanding across the school curriculum.

Research examining teacher quality confirms the logical conclusion that poor quality of students' learning correlates strongly with poor quality of teachers' teaching. Effective student learning and achievement is hampered by weaknesses in teachers' pedagogical content knowledge (PCK) and classroom practice (Pontefract & Hardman 2005; Akyeampong, Pryor & Ampiah 2006, Moon et al. 2005; Byamugisha & Ssenabulya, 2005 and other SAQMEC country reports). Teacher education has been identified as both part of the problem and the solution. Increase in pupil enrolment has meant a huge demand for more teachers and the priority has been to find ways of increasing the numbers appointed either by recruiting more trainees onto established courses, by creating new routes into teaching or by a combination of both strategies (UNESCO 2005). Policy and plans often assume that initial teacher education (ITE) and continuing professional development (CPD) make a difference to teachers' pedagogic knowledge and skill which in turn will be reflected in enhanced student learning outcomes (Dembélé and Lefoka, 2007). However, in many countries in SSA there is little systematic insight into the content and process of knowledge and skill acquisition by ITE students and newly qualified teachers (NQTs), and even less evidence that relates inputs to outcomes in terms of improved pedagogy and greater learning achievement in mathematics and reading. Not enough is known about how teachers working in different educational environments and contexts adopt and adapt the knowledge and skills they have acquired through formal training to address the particular learning needs of young students in their actual schools.

Commitment to improving the quality of primary education in sub-Sahara Africa has focused primarily on infrastructure (e.g. classrooms, equipment, learning materials) and the supply of adequate numbers of teachers, and less on how teacher training and CPD can promote teachers that meet the learning needs of students in real classrooms (Moon 2007; Bernard, Tiyab, & Vianou, 2004). While there is evidence that both pre-service and on-the-job training of teachers at primary school are the key ways in which teachers learn to teach (Darling-Hammond, Wise & Klein 1999: Lewin & Stuart 2002), research indicates that induction support for the NQTs[1] can be negligible, with a 'washout' effect occurring as a result (Lewin and Stuart, 2003). Socialization into existing

[1] In the project, we use the term 'trainee' to denote those still undergoing initial training and 'newly qualified teacher' (NQT) for those in the first four years of service. 'Students' refers to those whom they are teaching in the primary/elementary schools.

school practices may quickly overwhelm the effects of training, especially in systems where seniority creates status hierarchies that promote conformity to established practices by NQTs (Westbrook et al. 2009).

The Teacher Preparation and Continuing Professional Development Project ('TPA Project'), funded by the William and Flora Hewlett Foundation, was set up to fill the gap in knowledge about how the initial and continuing education of teachers impacts on the practice of teachers through studies in six African countries. This paper reports on the research that has been carried out in Kenya. Because of the extreme importance of early reading and mathematics for future progress, it focuses on the preparation that teachers who teach in the lower primary grades receive and what support is available through CPD and other routes to teach these subjects. A central issue is whether the process of learning to teach reading and mathematics at lower primary level[2] draws attention to, and emphasizes the kind of teaching known to be important for developing lower primary school children's abilities to read and understand basic mathematical concepts. The research has built up a comprehensive picture of initial training and CPD related to reading and mathematics in the early years of primary school. It has sought to identify factors that contribute to successful practice and that lead to increased student learning outcomes, as well as specific barriers and constraints that impede teacher practice and student progression in basic numeracy and literacy. The findings are used to suggest feasible ways in which teacher preparation in Kenya might be improved.

In particular, the research has addressed the following research questions:

1. **How do pre-service teacher education programs prepare trainee teachers to teach reading and mathematics in the early grades?**
   a. What assumptions about learning to teach reading and mathematics can be deduced from the structure and content of the primary teacher training curriculum, and from school textbooks?
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2. **How do trainee teachers develop their understanding of teaching reading and mathematics to early grade students?**
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   a. How does this practice relate to what has been taught and learnt in pre-service training?
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4. **What are the characteristics of professional development programs with a mathematics and/or reading focus that have been implemented over the past three years?**
   a. Which teachers have they been designed for, and how were these teachers selected?
5. **How do the graduates of professional development programs teach reading and mathematics to early grade students?**
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7. **How cost effective are major pre-service and CPD programs with mathematics and reading focus?**
   a. What is the relationship between the cost per trainee and extent to which teachers develop their understanding and adopt desired practices?
8. **How can professional knowledge and skills in teaching reading and mathematics be effectively transferred and shared within and among primary teacher training programs and beginning teachers?**

[2] Standards 1-3 in Kenya

In addressing these issues we conceptualize competence in terms of knowledge, understanding and practice. Practice is central to good teaching but successful teachers would concur with the great body of research into teaching that good practice cannot just depend on the unreflected application of techniques. It is a complex process which requires a great deal of different knowledge. Content knowledge, that is, knowing about the subject matter to be taught, is obviously important, but teaching also requires pedagogic knowledge that is knowing how to engage with learners and to manage a classroom. However as Shulman (1987) first pointed out, in order for these two kinds of knowledge to guide actual practice, a third category, pedagogical content knowledge, is crucial; this involves knowing how to represent and formulate the subject matter, in this case of early reading and mathematics, that make it comprehensible to students. The project has therefore investigated the different kinds of knowledge that teachers at various stages of preparation have and their understandings of how this can be applied to construct classroom practice.

1.1. Is Teacher Education the Root of Problems Behind Poor Quality Learning in Kenyan Children?

In Kenya, the government's focus on basic education goes back to independence in 1963 when the Kenya African National Union (KANU), the then ruling political party, declared that the government would provide universal primary education (UPE) (RoK, 1965). Consequently, the Government abolished direct payment of primary school fees from Standards I to IV in 1974, thereafter in Standards V to VII by 1980 and to Standard VIII in 1985 when the 8-4-4 system of education was introduced and the duration of primary education was extended from 7 to 8 years[3]. However, user fees found their way back into education with the introduction of cost sharing policies in the 1980s owing to the structural adjustment policies of the IMF and the World Bank and cost sharing was formally declared official government policy following the recommendations of the Presidential Working Party on Education and Training for the Next Decade and Beyond[4] (RoK, 1988). Nevertheless, following the Education for All conferences in Jomtien, Thailand in 1990 and in Dakar in 2000 where the EFA goals articulated in Jomtien were reiterated, the re-emphasis of the EFA goal in the millennium development goals (MGDs) also of 2000 as well as the coming to power in 2002 of the National Rainbow Coalition (NARC) government, which had promised free primary education in its campaigns, the government once again declared free primary education (FPE) in January 2003[5]. The immediate impact of the FPE programme was a massive increase in enrolment in public primary schools where enrollment increased by over 1 million pupils or by 17.6 per cent. The GER rose from 88.2 per cent (87.3 per cent for girls and 88.9 per cent for boys) in 2002 to 102.8 per cent (87.5 per cent for girls and 105.0 per cent for boys) in 2003 (Ministry of Education, 2005). In 2007, the GER stood at 107 per cent (girls 104.4 per cent and boys 110.7 per cent) (Ministry of Education, 2008).

All the same, analysts have shown that the upsurge in enrollment immediately following each declaration of free education was soon followed by a drop, and argued that this is because of the poor quality of education provided. With Kenya on its way to attaining the second EFA goal - basic education for all by 2015, and concerns about the quality of education provided being raised, researchers and education analysts have sought to provide empirical data on literacy and numeracy quality indicators. Data from such studies is a serious indictment of the quality of education in primary schools in Kenya.

Earlier in 1998, Kenya participated in the regional Southern and Eastern Africa Monitoring Educational Quality (SACMEQ) assessment of literacy of Standard 6 pupils[6]. In the assessment, Standard 6 pupils were tested in

[3] Under the 8:4:4 education reform, the structure of education was changed from 7:4:2:3 (seven years primary, four years secondary 'O' level, two years secondary "A" level and a minimum of three years university education) to 8:4:4 (eight years primary, four years secondary and a minimum of 4 years university education). Curriculum reforms of the 8:4:4-education system involved broadening the curriculum and introducing a vocational skills orientation in the curriculum.

[4] Popularly known as the Kamunge Report after the Chairman of the Presidential Working Party

[5] The right to education has been enshrined in the newly promulgated constitution (Republic of Kenya, 2010) and the Children's Act declared free and compulsory basic education for all children (Republic of Kenya (2001).

[6] The other countries that participated were Malawi, Mauritius, Namibia, Zambia, Zanzibar and Zimbabwe.

reading in English. The finding was that while 64.8 per cent of Standard 6 pupils had reached the minimum level of mastery on the reading test, only 23 per cent had attained the English reading mastery level deemed desirable for successful learning in Standard 7 (UNESCO IIEP, 2001). The findings suggest that 12.2 per cent had not even reached the minimum reading mastery level. These findings have been corroborated by two recent assessments.

The first study to be released was the *Are Our Children Learning?'* learning assessment study by UWEZO, a civil society organization that assessed children between 6 and 16 years in reading and mathematics in their homes. The UWEZO study reported that only half of children aged between 6 and 16 years could read a Standard 2 level story in English. Further, the report indicates that nearly half of Standard 4 learners could not read a class 2 level story and that in Standard 2, only a third can read a paragrah of their level while another third cannot even read a word. With regard to mathematics, the report indicates that only half of the children in Standard 1-8 aged 6-16 years have acquired the highest numeracy competency expected of Standard 2 learners (UWEZO, 2010).

The second learning assessment study '*Monitoring of Learning Achievement for Class 3 in Literacy and Numeracy in Kenya'* conducted by the National Assessment System for Monitoring Learning Achievement (NASMLA) a semi-autonomous section in the Kenya National Examinations Council (KNEC) was also released last year 2010 (KNEC, 2010). The report indicates that reading achievement stood at a mean score of 297.58 (with girls doing better than boys) which was below the standardized mean of 300. An analysis of competecny level attainment revealed that less than half of the pupils (47.7 per cent) attained the desirable levels 3 and 4 of literacy[7]. With regard to numeracy, the report indicates that the mean score stood at 295.6 which was slightly lower than the standardazed mean of 300 and that boys did better than girls. The report further indicates that slightly more than half (51.7 per cent) of the pupils tested attained the desirable levels 3 and 4[8].

These reports point to the need of investigations into the teaching and learning of reading and mathematics in Kenya. The centrality of the role of the teacher in the teaching and learning process is widely acknowledged and the search for the solution to the poor quality of education generally and achievement in early reading and mathematics has started to focus on the teacher.

On the other hand, some recent research has sought explanations of the poor quality of learning in primary schools. A recent study by the African Population and Health Research Centre (APHRC) assessed primary school teachers in mathematics subject knowledge. The report indicates that primary teachers scored poorly in the mathematics they teach and recommended that greater emphasis be paid on strengthening teachers mathematics subject knowledge (APHRC, 2010). While we agree with the APHRC researchers that mathematics subject knowledge is important for all teachers, we hypothesize that lower primary teachers' ability to represent and formulate mathematical concepts and processes in ways that help learners undersatand mathematics is of greater importance. Such abilities can largely be aquired through teacher education. This study, therefore, focused on understanding the kind of knowledge, understandings and pedagogical knowledge that receive emphasis in the ITE programme in Kenya.

[7] Level 3 is described as basic reading and refers to a learner who – *uses correct punctuation in simple sentences. Infers meaning from short passages, and interprets meaning by matching words and phrases and identifies the main theme of a picture*. Level 4 is described as reading for meaning and refers to a learner who – *links and interprets information located in various parts of a short passage; understands and interprets meaning of a picture and writes short sentences to describe the theme.*

[8] Level three refer to a learner who – *translates information presented in a sentence into one arithmetic operation. Interprets place value of whole numbers up to thousands and interprets simple common everyday units of measurement such as days, weeks, litres, metres and shillings.* Level four refer to a learner who – *translates information presented in sentences into simple arithmetic operations and uses multiple arithmetic operations (in the correct order) on whole numbers.*

1.3 Initial Teacher Education in Kenya

1.3.1 Historical Background with a Focus on Primary Teacher Education (PTE)[9]

Currently, primary school teachers in Kenya are trained in 21 public Primary Teacher Training Colleges (PTTCs) and many but small private colleges in a 2-year residential PTE programme. In 2007, enrolment in the public PTTCs stood at 18,406 (50.53 per cent male and 49.46 female). Enrolment in private colleges was 3,945 (45.65 males and 45.63 female). All the PTTCs are mixed sex institutions.

As in many other sub-Saharan African countries, PTE (and by implication teacher education generally) was introduced to Kenya in the early years of the twentieth century by Christian missionaries who introduced Christianity and western education in Africa. The first teacher education centre in Kenya was opened in Mombasa in the coast region. However, few teachers were trained in the pre-independence era with the result that at independence in 1963, only 31.7 per cent of the primary school teachers were trained. On attainment of independence, the critical role played by teachers in the expansion and improvement of education quality was recognized by the first post-independence education commission, the "Kenya Education Commission" which made the observation that, *"the provision of a well-educated, keen, competent, respected and contented teaching force is by far the most important contribution that the Government can make to the schools of Kenya"* (Republic of Kenya [RoK], 1964, p. 107). The committee identified both quantity and quality of teachers as key challenges as Kenya sought to work towards the attainment of UPE at a time when barely 60 per cent of the eligible children were in school (RoK, 1964). The issue of teacher supply was addressed through the expansion of PTE in two ways - increasing the number of PTTCs and the introduction of an in-service teacher training programme for the untrained teachers in the schools.

The PTE expansion efforts have paid off as, although the percentage of untrained teachers was high (ranging between 21 per cent in 1970 and 37 per cent in 1976 [Kang'ali, 1995]), the situation has changed and virtually all primary school teachers in public schools are now trained[10].

With regard to the quality of teachers, although virtually all post-independence education commission reports, and reports of such other bodies, as well as policy statements on education have had something to say about the quality of teachers and teacher training, the rhetoric has not been matched with action and interventions to improve the quality of teachers through teacher education.

Recommended and/or implemented changes in teacher education policy seem to have been informed by the thinking that knowing a subject is what is needed to teach the subject. Thus, policy changes have revolved around raising the teacher grades through raising the academic requirement for entrants into PTTCs. Initially, PTTCs trained primary school completers (and in some cases even non-completers) as Primary 3 (P3)[11] or Primary 4 (P4) grade teachers. Subsequently, from 1994, training at P3 grade was phased out[12], and P2 became the lowest grade for which teachers were trained. The lowest academic requirement became the now discontinued Kenya Junior Secondary Education (KJSE) examination certificate[13]. Subsequently, P2 training was abolished and a grade D plus[14] in the end of secondary education examination[15] - the Kenya Certificate of

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[9] Primary Teacher Education in Kenya refers to the training of teachers for the first 8 years of school which constitute primary education. However, the 1999 education commission expanded the scope of basic education to include pre-primary, primary and secondary education. All the same, in the management structure of the Ministry of Education, the Directorate of Basic Education covers only ECDE and primary education.

[10] The few untrained teachers in the public schools are employed at school level by the Parent Teacher Associations (PTAs) to ameliorate the shortage of teachers. This is because although there are many unemployed graduates of PTTCs, there is a shortage of teachers in the schools as government stopped employing teachers in 1997 and only resumed last year (2010) when 60,000 primary and secondary school teachers were employed.

[11] Primary 1 (P1) is the highest grade and Primary 4 (P4) is the lowest.

[12] Training of P4 teachers had previously been stopped

[13] The KJSE was done after two years of secondary education.

[14] The highest KCSE grade is A while the lowest is E.

Secondary Examination (KCSE) - became the minimum requirement for P1 teacher trainees. The entry requirement was later raised from the D plus to a mean grade of C plain following the recommendations of the 1999 Presidential Working Party on Education (RoK 1999). In 2004, following the recommendations of the same commission, the requirement is that an applicant must also have obtained a minimum of D plain in mathematics and C minus in English. This policy change was informed by the realization of the importance of literacy and numeracy development in the primary school. Further, since English is the language of instruction from Standard 4 onwards[16], it was felt that teachers needed to be competent in the language.

Consequently, there is a sense of achievement in government documents with regard to improvement in the quality of trained teachers, judged by the percentage of teachers in each of the 4 grades. At independence, the percentage of teachers at each of the four grades P1, P2, P3 and P4 was 5.3, 9.4, 44.0 and 9.6 per cent respectively (RoK, 1965). As Table 1 shows, the situation is now significantly different.

Table 1: Distribution of Primary School Teachers by Qualification 2003-2007

Qualifications	2003		2004		2005		2006		2007	
	No.	%	No.	%	No.	%	No.	%	No.	%
Graduate	254	0.1	925	0.5	890	0.5	1,020	0.6	1,083	0.6
Approved*	16,760	9.5	49,100	27.8	47,202	27.8	40,874	25.2	43,422	25.2
SI/Dip**	4,512	2.6	4,338	2.5	6,786	4.0	7,209	4.4	14,646	8.5
P1	129,785	74	99,549	56.4	95,701	56.4	93,275	57.6	99,090	57.6
P2	24,298	13.8	15,775	8.9	15,165	8.9	11,418	7.0	12,130	7.0
P3	3,972	2.3	1,865	1.1	1,793	1.1	1,698	1.0	1,804	1.0
Total trained	176,316	98.7	176,381	99.0	169,564	99.1	162,072	99.4	172,175	99.4
Total Untrained	2,306	1.3	1,803	1.0	1,469	0.9	921	0.6	978	0.6
Grand Total	**178,622**	**100**	**178,184**	**100**	**171,033**	**100**	**162,993**	**100**	**173,153**	**100**

Source: Ministry of Education Science and Technology (2008) Statistical Book

NB

* Approved graduate teachers are teachers who attain status equivalent to that of university graduates through promotion rather than through university studies

** S1 or Secondary 1 teachers are 'O' level certificate holders trained to teach two subjects in secondary schools in the 1960s and early 1970s who were redeployed to the primary school sector following availability of BED trained teachers. Diploma teachers in primary schools are either 'A' level (and later 'O' level) certificate holders trained to teach at the secondary school level but redeployed to the primary sector, or P1 teachers who have graduated from diploma level in-service training and education (INSET) programmes for ECDE or SNE

The increase in the number of university graduate teachers can be attributed to the launching of part time Bachelor of Education degree programs in the public and private universities. Many P1 teachers have taken advantage of these opportunities to enroll for and complete their degree programs. The downside to this development is that university training of the P1 teachers does not add to their competence in teaching at the primary level as their training in the universities is for teaching two secondary education subjects. Further, once they attain university degree qualification, the teachers consider themselves overqualified for primary school teaching and therefore feel that teaching in primary school lowers their status.

[15] The examination has changed names over the years but it is currently known as the Kenya certificate of Secondary Education (KCSE)

[16] Discussions with PTTC principals revealed that these subject requirements have not been implemented owing to political interference.

Currently, the government has accepted proposals that the PTE programme be raised from a certificate to a diploma programme. The argument is that in the 21st century, Kenya requires higher quality teachers. It is also noted that a good proportion of students in PTTCs attained C plus grade, which is the minimum required KCSE examination grade for entry into universities. Such students only enrolled for the PTE certificate course because they lacked the resources to privately pay for university education like their financially better off peers[17], therefore, offering such students only certificate level training is considered unfair.

Unfortunately, raising teacher grades has not been accompanied with activities directed at raising the quality of teacher training. Indeed, there has been no serious effort to interrogate the concept of quality teachers and how the curriculum and structure of PTE can be changed to enhance the quality of training the trainees receive and therefore the quality of teachers in the country. For example, there has been no specific commission on teacher quality and training and the structure and curriculum of PTE has remained very much the same over the years. The two-year PTE programme is based on the concurrent design model comprising of studies of all the primary school subjects, professional / education studies and practical teaching experience through teaching practice.

The closest Kenya has come to addressing the issue of quality teacher education has been three teacher education conferences organized by the Ministry of Education. The first was held in pre-independent Kenya in 1956, while the second and third after independence in 1968 and 1994 respectively. The third conference focused on quality and had the theme *'The Teacher for Quality Education for this Decade and Beyond'*. The conference report indicates that the objective of the conference was to review past and present policies and practices in TE in Kenya and the keynote speaker urged participants to focus deliberations on the quest for developing and obtaining good quality teachers (Ministry of Education, 1995). The impact these conferences have had on teacher education in Kenya is not clear.

With regard to reading and mathematics, the areas of interest in this study, the only discernable related policy change seems to be the yet to be implemented requirement that PTE entrants have obtained a minimum of D plain in mathematics and C minus in English in the KCSE examination. This is despite caution in teacher education research literature that effective teaching requires more than knowledge of the subject matter to be taught.

Although policy discourse on quality education does allude to the importance of literacy and numeracy development in lower primary, discourse on teacher quality and teacher education in Kenya has not paid much attention to how PTE curriculum, practices, and structure could change to encompass progressive ideas, new knowledge, and practices. Such new knowledge include the realization that good teaching is the result of teachers drawing from content, pedagogic, and pedagogic content knowledge that inform the TPA research project.

All the same, there has been expansion in the teacher education programmes in Kenya with the result that Kenya now has an elaborate teacher education system. Teacher education programmes other than PTE are focusing on producing teachers for ECDE, secondary schools, SNE, and technical education and training.

1.3.2 Other Teacher Education Programmes in Kenya

Teacher Education for ECDE

Government involvement in the training of ECDE teachers started in 1985 when the MOE started a two-year in-service programme for untrained pre-primary teachers (RoK, 1988). At the time, the majority of the teacher trainees were primary school leavers. To-date, ECDE teachers are trained at certificate and diploma levels through in-service programmes offered in District Centres for Early Childhood Education (DICECE) and in private institutions. Training of trainers and curriculum for ECDE are undertaken at the National Centre for Early

[17] In Kenya, although the minimum university entry grade is set at C plus, entry into public universities on government partial sponsorship through loans and scholarships and bursaries goes to those with the highest grades. Other qualified candidates can enter the universities but on self sponsored basis.

Childhood Education (NACECE) at the Kenya Institute of Education (KIE). ECDE training focuses on children age 0-8 years.

Although there is no linkage between ECDE and PTE training programmes, head teachers of the mostly private but also public primary schools visited for the current research indicated that they preferred to assign ECDE trained teachers to lower primary classes than PTE trained teachers. They argued that ECDE teachers manage to get children to read and do basic mathematics faster than PTE teachers and that this could be attributed to the fact that unlike the PTE training, the ECDE training focuses specifically on younger learners. Consequently, it is better placed to equip trainees with lower primary methodology. These observations are significant because entry requirement for ECDE training is much lower than that of PTE and the training is undertaken on part-time basis unlike PTE which is full time and residential.

Teacher Education for Secondary Schools

On attainment of independence in 1963, the education system was under pressure to train large numbers of indigenous secondary school teachers to replace the expatriate teaching force that was dominant in this sub-sector, as well as to take up positions in the expanding secondary school system. Several diploma teachers' colleges were established to train both arts and science teachers. At the same time, the University College, Nairobi[18], started training graduate teachers through the Bachelor of Education as well as a 1-year post-graduate diploma in education programmes. Currently, there are only two public diploma teachers colleges training science and mathematics teachers only and therefore the bulk of secondary school teachers are trained in faculties of education in public and private universities. In 2007, the then three diploma colleges had a total enrolment of 1,882 teacher trainees of whom 857 or 45.5 per cent were female.

Teacher Education for Special Needs Education (SNE) Learners

Prior to 1985, SNE teachers recruited from among already trained primary school teachers were trained in special schools and in regular primary teacher training colleges. However, in 1985 the Kenya Institute of Special Education (KISE) was established to train SNE teachers and perform other functions related to SNE. KISE offers a two-year diploma in SNE to holders of a Primary 1 (P1) teachers' certificate. At the same time, the institute offers a three-month in-service course for teachers in SNE schools. Trainee teachers with special learning needs themselves are trained in Machakos TTC – one of the primary TTCs.

Teacher Education for Technical Education

Technical education teachers are trained at the Kenya Technical Training College (KTTC) which was established in 1978. The college offers a one-year diploma to technical education diploma holders who are trained to teach technical training institutions.

Summary

Six key points emerge from the foregoing discussion of availability and quality of teachers and teacher education in Kenya:

1. Kenya has virtually wiped out untrained primary teachers from the public education sector, but has a shortage of teachers in the schools and a host of unemployed PTTC graduates owing to budgetary constraints.
2. Teacher education in Kenya is fairly developed with programmes for all levels of education – ECDE, primary and secondary as well as programmes for SNE and technical institutions.
3. Although the history of primary education and teacher education is imbued with discourse on teacher quality, the rhetoric on improving the quality of teachers has not been matched with action with the result that primary teacher education programmes have remained virtually unchanged since attainment of independence in 1963.

[18] Now University of Nairobi

4. Teacher education policies have not focused attention on ensuring that primary school teacher trainees acquire the knowledge, pedagogical skills and pedagogical content knowledge that they will need to help lower primary school students learn to read and understand basic mathematics – the two areas that are considered critical for further learning and for living.
5. Raising teacher grade and entry requirements for the PTE programme have been the two main teacher quality improvement strategies implemented. However, these strategies are misinformed as teacher education research points to reform in teacher education that demonstrates that helping students learn is a complex endeavour which requires a combination of knowledge and skills on the part of the teacher – knowledge about the subject, pedagogic knowledge, and pedagogic content knowledge (PCK).
6. According to the primary school head teachers, the ECDE teacher training programme produces better teachers for reading and mathematics in the lower primary than the PTE programme.

1.3.3 Continuing Professional Development (CPD)

The need for continuing teacher training and development was recognized as a major need at independence in 1963 when the Kenya Government inherited over 8,000 untrained primary school teachers (Lovegrove, 1968). As a result, among the recommendations by the first post-independence education commission – the Kenya Education Commission of 1964 - was the in-service training of both the untrained and trained teachers (RoK, 1964). However, the number of untrained teachers in the primary schools increased to 35,000 by 1976 owing to the hiring of untrained teachers to meet the expanded needs of free primary education for classes 1 to 4 introduced in 1974. Consequently, the second post-independence education commission – the National Commission on Educational Objectives and Policies of 1976 – emphasised the need to reduce and if possible eliminate the large numbers of untrained teachers (RoK, 1976). To achieve this, a two year-distance education in-service training programme for serving untrained teachers was established. The distance-education programme combined distance teaching with residential training during school holidays and weekends (RoK, 1988). In addition, pre-service teacher training was expanded with the result that by 2007, only 978 (0.56 per cent) of the 173,153 primary school teachers in government employment were untrained.

Government pronouncements in policy documents have continued to underline the importance of CPD for trained teachers. For example, Sessional Paper No. 1 of 2005 (RoK, 2005) has emphasised the need for a dynamic, responsive and well-coordinated system of in-service training as a pre-requisite for the success of the free primary education (FPE) initiative and the achievement of Education for All (EFA) goals. However, key players in education in Kenya agree that little has been achieved in this area. For example, the Kenya National Union of Teachers' (KNUT) assessment is that, *'There is an amorphous design of in-service teacher training'* (Bunyi, 2003 p. 91). The MOE seems to concur. The Sessional Paper No. 1 of 2005 acknowledges the fact that there has been little INSET with the result that few teachers have had opportunities to participate in INSET activities. Indeed, most of the INSET going on in the country is provided by a variety of local and international NGOs, and development partners with or without the collaboration of the MOE.

Over the years, there have been attempts to institutionalise CPD. One such effort is the establishment of the inspectorate division now the Directorate of Quality Assurance and Standards[19] in the MOE. Established over 40 or so years ago, the directorate has an elaborate infrastructure with quality assurance and standards officers (QASOs) at national, provincial, district and zonal levels[20] and a policy of one inspector for every 30 schools. The Directorate has two key functions: (i) monitoring curriculum delivery in schools to ensure effectiveness, and (ii) providing advisory services to schools on how best to improve their teaching (MOE, 2005). Unfortunately, the inspectorate officers and now the QASOs have a history of focusing almost exclusively on the first function. According to Sifuna (n.d.) in the missionary colonial education era, the school inspectors focused on "… *policing the teachers instead of guiding and counselling them" (*p. 25). Indeed, harassment of teachers by supervisors and inspectors of schools was one of the reasons that led to the formation of KNUT in 1957 (http:hivaidsclearinghouse.unesco.org**)**. Available literature suggests that QASOs have not sufficiently shaken off

[19] Other directorates of the MOE are the directorate of: basic education, technical education and training, higher education, and policy and planning.

[20] Recently, the Permanent Secretary in the MOE announced that the Ministry will post QASOs to public schools to ensure high quality education (*Daily Nation,* Tuesday, October 7, 2008).

their old reputation of being associated with the "policing" function and many teachers view their visits to schools as faultfinding missions Olembo (1992) cited in Mutua (2007). Consequently, QASOs have not had much impact on changing practice at classroom and school levels. According to Mutua (2007), supervision missions in schools usually focus on teachers' lesson plans, schemes of work and records of work with little focus on actual teaching and learning. All the same, QASOs face considerable budgetary and competence related impediments in carrying out their responsibilities. Owing to limited budgetary allocations, QASOs have huge transport problems and rarely visit schools, especially those in remote areas (Ngome, 2006). On the other hand, there has been no pre-appointment training for QASOs and there is little on the job training as newly appointed QASOs only receive a two weeks' training at the Kenya Education Staff Institute (KESI). Previously, successful school primary head teachers were recruited as school inspectors. However, currently, required qualifications for QASOs include degree level training or equivalent with at least three years teaching experience[21]. Further, the promotion system has not been open and transparent which has led to incompetent people being appointed QASOs. Such officers lack the skills to do the work effectively which in turn causes them to lack respect of those they inspect (Elimu Yetu Coalition, 2003).

Another effort in the institutionalisation of CPD was the establishment of Teacher Advisory Centres (TACs) and the hiring of TAC teacher educators appointed from experienced primary school teachers and stationed at the district and zonal education offices to assist schools and teachers on various aspects of teaching and learning[22]. Teacher support-related duties and responsibilities for TAC teacher educators include organizing and coordinating seminars, workshops, and refresher courses for teachers on curriculum changes and pedagogy; and inducting new teachers.

However, for various reasons, more often than not, TAC teacher educators do not carry out these teacher professional growth related functions. The reasons include shortage of education field officers which leads to TAC teacher educators being assigned management duties at the expense of teacher development work, inadequate financial resources for INSET training workshops and transport as well as poor physical infrastructure including roads, in many areas. In addition, TAC teacher educators lack appropriate competence since they do not receive adequate INSET attention themselves.

In the latest effort, the MOE has identified INSET for primary teachers as one of the 23 investment programmes in the Kenya Education Sector Support Program (KESSP) 2005-2010 (MOE, 2005). This was done because it was found necessary to co-ordinate in-service programmes provided by the MOE itself, through donor support and/or implemented projects, NGOs, and religious organizations so as to ensure proper utilization of resources and avoid duplication in teacher capacity development for effectiveness (MOE, 2005).

All the same, a few on-going and/or recently concluded INSET programmes on reading and mathematics, have introduced new perspectives, knowledge and practices in the teaching of these subjects in Kenya. The programmes include School-based Teacher Development (SbTD), Early Grade Reading (EGR), Reading to Learn (RTL) and the Strengthening of Teaching Mathematics and Science in Secondary Education (SMASSE) for primary school teachers.

The SbTD programme

The SbTD programme introduced the reflective model of teacher education in Kenya. Implemented on a national scale, the SbTD programme was launched in 2001 through the collaboration of the MOE and the Department for International Development (DFID). The aim of the first phase of the programme was to strengthen the teaching of mathematics, English and Science in the primary schools generally. The programme used the cascade model of training with training of trainers at national, provincial, and district levels. The district level trainers trained the TAC teacher educators who in turn trained the teachers. The idea was to train one teacher for each of the

[21] This means that most QASOs will not have primary school training and/or experience since only secondary school teachers are trained at degree level.

[22] Currently, there are 1,052 TAC teacher educators in the country

subjects from every school in the country. The trained teachers were referred to as the Key Resource Teachers (KRTs) for their respective subject.

By the end of Phase One of the programme in 2004, 50,000 teachers had been trained - a KRT for each subject (English, mathematics and science) per school. The programme adopted a distance learning model which means that the teachers undertook their studies for the programme while they were still teaching their classes. The advantage of this approach was that teachers could immediately put into practice what they were learning in the safety of their own classrooms. Four distance learning modules were developed comprising of a core module – Principles of Primary Practice (MOE, 2001a) - and modules for English, mathematics and science. The KRTs were expected to train the other teachers in their schools working through the relevant subject panels. However, the extent to which this actually happened is doubtful. Many of the KRTs we talked to indicated that they had done little in the way of training other teachers in their schools. Further, in many schools we visited, the head teachers did not seem to be clear as to which teachers had received KRT training especially in cases where the head teacher joined the school after the completion of Phase One of the programme in 2004. In cases where KRT teachers had been transferred and had thus been replaced, the head teachers did not seem to know whether or not the new teachers had received KRT training while in their previous schools.

Developing reading skills

The SbTD programme did not focus specifically on lower primary. However, analysis of Unit 2 - Developing the Fluent Reader - of the English module (MOE, 2001b), reveals that the module focuses on segments of the lower primary reading curriculum found in the syllabus. The reading curriculum seems to have a heavy emphasis on developing the CPD teachers' understanding of reading and PCK. This is achieved through interactive exercises and activities. The first question in the Unit is '*In your own words, how would you define reading?'* Another question is *'What are some of the problems readers may have?'* In the module, the teacher is constantly being invited to think about various reading-related issues. For example, following a reading for comprehension activity, the teacher is invited *to think of how to help the children who seem not to be reading with comprehension.* Insights into the practice of SbTD CPD reading teachers are presented in Chapter 3.

Developing mathematics skills

The SbTD mathematics curriculum which is available in the mathematics module entitled *'Teaching and Learning Mathematics in the Primary Classroom'* (MOE, 2001c). The module adopts a progressive approach to mathematics teaching as is evident from even the titles of the nine units of the module, These are: (i) How children learn mathematics, (ii) mathematics is all around us, (iii) Language and mathematics, (iv) Planning for mathematics, (v) organizing resources in mathematics, (vi) gender issues in mathematics (Vii) Developing mathematics thinking, (viii) assessment, monitoring and evaluation in mathematics, and (ix) Developing mathematics in your school. The emphasis is on developing the CPD teachers' understandings of mathematics content knowledge, teaching/learning methods, and development and use of teaching/learning resources. The focus is also on PCK. This is evident throughout the module. For example, the purpose of Unit 1 which is the introductory unit is stated as '*to help you teach mathematics more effectively. It* (the unit) *will also help you to be able to* ***prepare activities that lead children to understand*** *and master concepts in mathematics'.* The objectives also suggest understanding. The two objectives of Unit 1, for example are that the CPD teacher should be able to (a) *discuss* how children learn mathematics and (b) explain the nature of mathematical concepts.

The PCK focus is clear in the reflective questions posed and the activities assigned. In Unit 1, for example, one of the questions posed is *What do you think are the needs of children in mathematics at lower primary level?'* The follow up activity to this question is: '*think of ways in which you can meet these needs and list them down'.*

EGR

The innovativeness of the short lived (less than a year) EGR intervention in Kenya was its exemplification of the phonics approach to teaching early reading which is something that the PTE and the school curriculum recommend but don't delve into. The intervention was implemented starting February 2008 on an experimental

basis in 20 primary schools in Malindi District of the Coast Province. The intervention was implemented by the Aga Khan Foundation and Research Triangle Institute (RTL) International and was funded by USAID. Twenty control schools were also selected for monitoring of impact purposes. Standard 1 and 2 teachers were trained over five days on how to use ready-made highly structured English and Kiswahili reading lessons that focused on phonological awareness (pre-reading skills, including listening and sound sensitivity), alphabetic principle (relationship of print to sound), which skills that research shows enhance acquisition of reading skills (Crouch, Korda and Mumo, 2009). The teachers were expected to teach three reading lessons a week in Standard 2. Interestingly, a post-intervention assessment showed substantial improvements in reading scores in both the experimental and control schools. Perhaps due to this lack of differentiation between experimental and control schools with regard to improvements, the programme was abandoned.

From the little information on the EGR intervention gathered by the current researchers, mainly from EGR trained teachers and a TAC teacher educator who had participated in the programme, it seemed that the EGR teachers were only required to teach pre-prepared lesson-by-lesson, week-by-week, lesson plans. The EGR approach did not seem to concern itself with CPD teachers' understanding of reading or the approaches in use.

RTL

The RTL intervention focuses on training lower primary teachers in reading and mathematics. The intervention is being implemented on a pilot basis in 64 schools in the educationally marginalized Kwale and Kinango districts of Coast Province by the Aga Khan Foundation in collaboration with the MOE. According to the RTL Project Director in the Coast Province, the RTL approach to reading and mathematics in lower primary has been tried in Afghanistan and found to improve outcomes. The intervention is fairly new as actual work in schools started only in September last year (2010).

The RTL reading programme adopts the scaffolding approach developed by David Ross of Sydney University in Australia who came up with a eight step procedure for teaching reading. The scaffolding approach is derived from Vygosky's theory of proximal development. The difference between the RTL approach and the methods for teaching reading taught in the PTTCs, is that instead of starting from the sound as in the phonics approach or from the word as in the look and say approach, the RTL approach starts from the whole text in the form of a story, and moves to the sentence, the word and finally the sound. The scaffolding approach as implemented in the RTL intervention uses six of the eight steps.

At the start of the intervention, teachers were trained for three days for reading and three days for mathematics. RTL teachers write the stories they use in class themselves. Therefore, a key focus of the training is on how to write the stories and how to use the stories in teaching. TAC teacher educators and RTL project workers provide professional support to the teachers in their schools.

The RTL intervention is very new and so the African Population and Health Research Centre (APHR) that has been contracted to conduct external evaluation has yet to provide evaluation information on the intervention. However, the teachers observed and interviewed were very enthusiastic about the approach and felt that it enabled them to help the children learn to read faster.

SMASSE for Primary School Teachers

SMASSE for primary school teachers is a very new CPD programme focusing on improving the teaching of mathematics and science in the primary schools generally. SMASSE for primary school teachers is a national intervention implemented by the MOE in collaboration with the Japanese International Cooperation Agency (JICA). The programme started in April 2010 with the training of trainers drawn from PTTC science and mathematics teacher educators. The actual training of teachers started with the training of Standard 6 mathematics and science teachers in the August 2010 school holidays.

SMASSE for primary school teachers has therefore, so far, not focused on teaching in the lower primary – the area of interest in the PTA project.

Summary

The foregoing discussion of CPD activities in Kenya has highlighted several things about the status of CPD in Kenya generally and about CPD for lower primary mathematics and reading in particular. Notable key messages are:

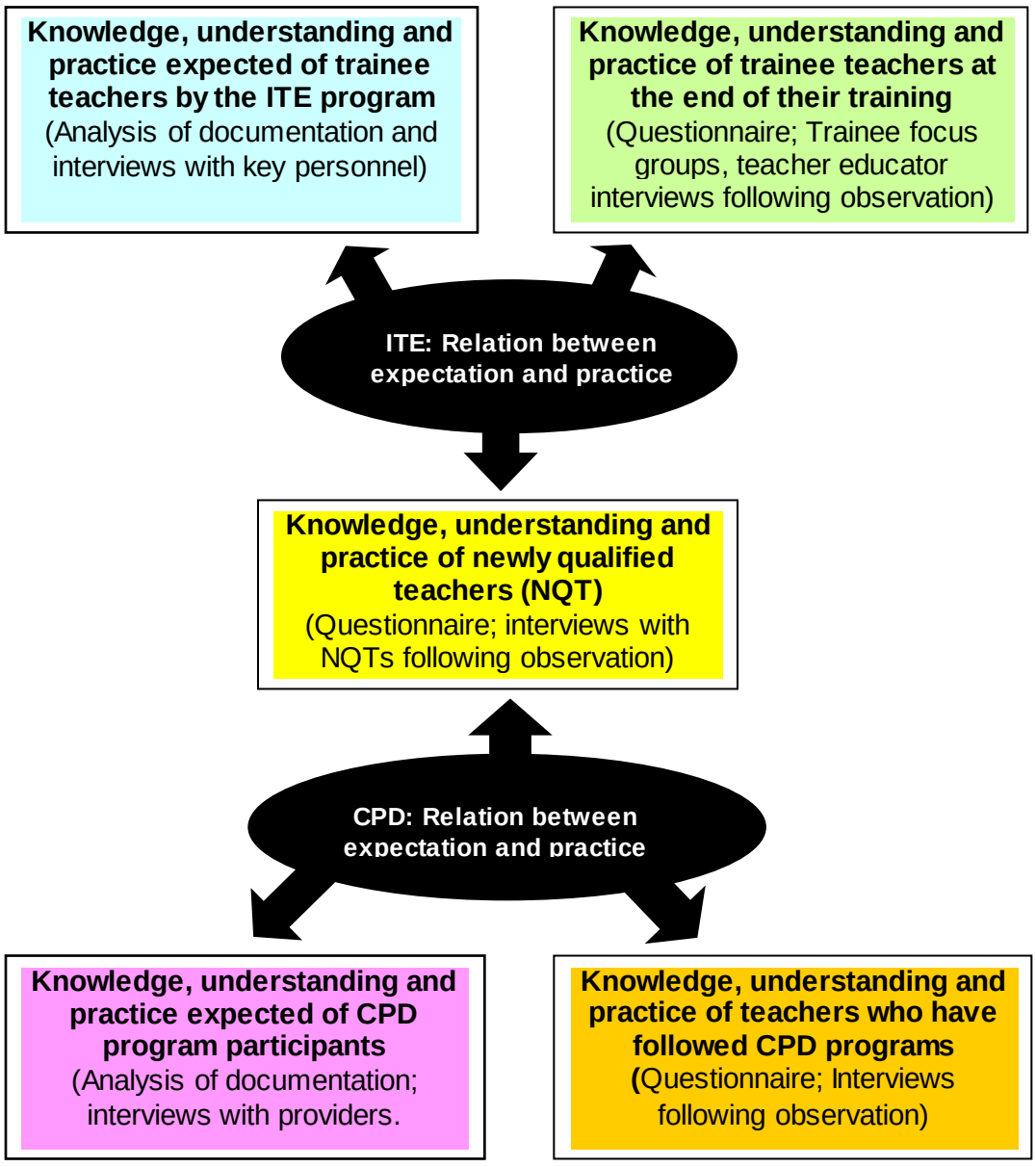
1. There seems to be a theoretical recognition of the importance of CPD, however, little has been done. For example, although Kenya has an elaborate CPD infrastructure, CPD has not been institutionalized.
2. Although there is an elaborate national infrastructure for CPD comprising of QASOs and TAC teacher educators, budgetary and competence impediments hinder delivery of effective CPD.
3. There has been little CPD focus on key curriculum areas. For example, few CPD programmes focus on early reading and mathematics despite the importance of these subjects in the development of literacy and numeracy skills which are seen as an important function of primary education.
4. The SbTD CPD programme seems to pay attention to the promotion of teacher competences that the TPA project considers essential for sustained effective teaching (through development of content knowledge, pedagogical knowledge and PCK).
5. The small EGR and RTL CPD programmes which focus on early reading and mathematics have introduced innovative approaches to the teaching of reading and mathematics.

1.4 Research Design and Methodology

1.4.1 Data Sets and Methods

The research hinges on establishing the different knowledge, understanding and practices that are expected of teachers during their preparation and then comparing them with those that they actually exhibit at different points in their training and career. The points of comparison are summarized in Figure 1.

Figure 1: COMPARISONS AND TENSIONS



An initial line of enquiry was to establish what competences relevant to the teaching of reading and mathematics that the program of initial teacher education seeks to instill in trainee teachers. This was accomplished from an analysis of documentation including the analysis of program aims/objectives, and expected standards as well as from interviews with the providers (blue rectangle in Figure 1).

The second set of data (green rectangle in figure 1) sought to build up a picture of the knowledge, understanding and practice of actual trainee teachers at the end of their training. Both quantitative and qualitative data were used to develop this. Qualitative data derived from focus groups and interviews following observation of teaching on the ITE program. Direct inference about the training from observation is problematic and possible only through frequent and lengthy observation a scale outside the means of the project. The project therefore used observed sessions of mathematics and reading training as preliminary data for focus group discussions with a sample of trainees in each college, selected as far as possible to include a range of achievement, a balance of gender and ethnic background, in consultation with their teacher educators. Moderation of the discussion was designed to consider the extent to which what was observed reflected the training as a whole, using the video and shared experience of the session to probe pedagogic content knowledge and understandings of teaching practice. A similar approach was followed in interviews with the trainers whose sessions had been observed.

The quantitative data derived from a questionnaire, developed from one that had been used successfully in other work (Akyeampong, 2003b) to trainee teachers towards the end of their course (see Appendix A). It was administered to a sample of trainees in four contrasting teacher training colleges. Two of the colleges (both public) were drawn from Central Province while the other two (one public and the other private) were drawn from the Coast Province. The Coast Province was sampled for focus because a large section of the province falls within the educationally marginalized Arid and Semi-Arid areas (ASALs) of Kenya where education indicators are very low. Further, the EGR and the RTL CPD programs – two of the three CPDs with a focus on mathematics and reading that the study focused on are implemented only in the Coast Province.

In Kenya, the questionnaire was piloted in a PTTC in the Eastern Province. The questionnaire demanded relatively closed responses, and as well as straightforward questions included a series of scenarios that are likely to be encountered in teaching in early grades. Respondents were then required to select responses to the scenarios which describe the most appropriate approach to teaching a particular concept or skill in reading and mathematics. These responses then gave access to trainees' pedagogical content knowledge and likely pedagogical practice in reading and mathematics.

The task of understanding how initial training is put into operation involved collecting a data set on the knowledge, understanding and practice of newly qualified teachers (yellow rectangle in figure 1). A sample of schools was selected where teachers in the first four years of their career were working. A total of 33 schools were sampled – 16 (seven urban and nine rural) from Central Province and 17 (six urban and 11 rural) from the Coast Province. Videoed observations of lessons in reading and mathematics by the NQTs were followed by forensic interviews asking questions around details of practice, sequencing of tasks, and use of resources, progression within the lesson and onwards towards the next, and use of language of instruction as against English, mother tongue or local lingua franca. Again this form of interview was calculated to give a greater understanding of what teachers actually know and can do than direct inference from observation. Interviews were informed by evidence of the educational attainment of students from exercise books, records of assessment and where possible brief interviews with students. Head teachers in all sample schools were also interviewed on the issue of NQT support and management especially as related to teaching reading and mathematics. In addition a slightly adapted version of the questionnaire used for trainees was given to NQTs.

The research design called for a similar approach to continuing professional development programs. An initial survey of what is available in Kenya was mounted (pink rectangle). Only three CPD programmes with a focus on reading and mathematics were found. The nationally implemented school-based teacher development (SbTD) programme which focuses on both reading and mathematics, and the small Early Grade Reading and Reading to Learn programmes, both of which focus only on reading. This gave an account of what the programs were intending to achieve. As a point of comparison the project collected data on the knowledge, understandings and practice of teachers who had recently followed the CPD programs (orange rectangle in figure 1). This followed exactly the same procedure of observation, interview and questionnaire as for the NQTs.

One more type of the data, those related to cost effectiveness were also collected. The approach to this is described in detail in Chapter 5.

1.4.2 Summary of Data Collected

The project therefore collected overall a large set of data both qualitative and quantitative as outlined in Table 2.

Table 2: Summary of Data Collected

Data set	
National Profiles of ITE programs:	
• Policy and curriculum documents, syllabi.	
• Interviews with providers	
• Assessment and certification criteria, content etc.	
ITE in action	teacher training colleges – two urban, two rural [4]
• Questionnaire with trainee teachers	All available trainees near end of their course (1,299)
• Trainee focus groups	A total of 19 FGDs of 6-8 trainees (11 for reading and 8 for mathematics)
• College schemes of work	All relevant schemes for mathematics and English language
• Teacher educator interviews	8 mathematics and 11 English [19]
• Observations of college teaching	8 observations mathematics and 11 English (19)
NQTs in action	33 schools (rural, peri-urban, urban) 16 in Central and 17 and 17 in Coast Province
• Questionnaire NQTs	137 from schools in Central and Coast provinces and Nairobi City
• Observations and forensic interviews	34 NQTs – from schools in Central and Coast provinces and Nairobi City
• Interviews with head teachers and other teacher colleagues	33 - 1 per school
Profiles of CPD programs	Ministry of education and other providers
• Policy and curriculum documents, syllabi	SbTD Core, English and Mathematics modules
• Interviews with providers	6 providers
CPD graduates in action	
• Questionnaire with CPD graduates	23 teachers
• Observations and forensic interviews	23 teachers
• Interviews with head teachers and other teacher colleagues	33 - one per school

1.4.4 Data Analysis

Analysis of the different data sets represented by the colored rectangles in figure 1 enabled the project to address the research questions. It did this by building up a detailed description of the knowledge, understandings and practices of teachers during the different phases of preparation and using these as a basis for comparing what is occurring in the field with what is intended. For the qualitative data interviews and focus groups were transcribed and imported into the Nvivo 8 qualitative data analysis software among with other appropriate texts such as summaries of observations. Data were coded and sorted into using a system of hierarchical categories, most centrally those of knowledge, understanding and practice. This enabled patterns to be identified and queries to be run.

Quantitative data were analyzed using STATA software. This enabled the project to work with a large data set and to provide relevant tables and graphs. It was then possible to make relevant interpretations from descriptive statistical methods with some use of inferential statistics such as the calculation of Pearson's Chi^2 to test for independence.

1.5. Outline of the Report

In addition to the foregoing chapter that has provided the context of the research with regard to the historical background and the structure of TE in Kenya, as well as the conceptual and methodological backgrounds of the research, the report has five other chapters. Chapter 2 focuses on the intended PTE curriculum generally and the lower primary reading and mathematics curricula in particular as found in key policy and curriculum documents such as education commission reports, syllabuses and text books. Chapters 3 and 4 (respectively) focus on the lower primary reading and mathematics curricula as practiced in actual teaching of methods lessons in PTTC classrooms while Chapter 5 provides a cost and efficiency analysis of training reading and mathematics teachers in Kenya. Chapter 6 provides a summary of the key findings of the research and articulates the policy and practice TE issues that require urgent attention for improvements in the quality of education in Kenya.

Chapter 2: The PTE and School Curriculum: Continuities and Gaps

This chapter focuses on the planned PTE, and school reading and mathematics curriculum as found in policy documents, syllabuses, pupils' textbooks and teachers' guides. A critical analysis of the entire PTE curriculum will be presented first.

2.1 The PTE Curriculum

In Kenya, the PTE curriculum is centrally developed at the Kenya Institute of Education (KIE)[23] . The PTE curriculum comprises of a two-volume syllabus. Volume 1 contains the syllabuses for English, Kiswahili, physical education, social studies, creative arts, art and craft, music and information communication and technology (ICT) while Volume 2 contains the syllabuses for mathematics, science, agriculture, home science, professional studies, Christian religious education, and Islamic religious education.

2.1.1 The philosophical / Theoretical Underpinnings / Orientations of the PTE Curriculum

The philosophical orientation of the PTE curriculum can be discerned from national statements of purpose and direction for education and teacher training as well as from the design of the PTE curriculum. These include the national goals of education, policy statements on teacher education (TE), the objectives of the PTE programme, the objectives of the professional studies component of the PTE curriculum, as well as the design of the curriculum.

National goals of education

In Kenya, curricula documents such as syllabuses open with a statement of the eight national goals of education. The goals provide a very broad philosophical base for education in Kenya and it is expected that all curricula will be imbued with this broad philosophy. The eight national goals of education state that in Kenya, education should promote: (1) nationalism, patriotism and national unity; (2) the social, economic, technological and industrial needs of national development; (3) individual development; (4) sound moral and religious values; (5) social equality and responsibility; (6) respect for and development of Kenya's rich and varied cultures; (7) international consciousness and positive attitudes towards other nations; and (8) positive attitudes towards good health and environmental protection. These national goals of education place very high expectations on all levels and types of education including TE. Whether or not these national goals receive attention in PTTCs will depend on the structure and content of the PTE programme and what goes on in the actual teaching and learning of reading and mathematics among other PTE subjects.

National policy statements on PTE

A reflective TE model is discernable in policy statements on TE. Although Kenya has not developed a comprehensive TE policy, statements in some national level policy documents such as national education commission reports and the current national policy on education – the Sessional Paper No. 1 of 2005 - provide indications as to the direction such a policy would take. For example, explaining the kind of educated person Kenya needs, the 1964 education commission stated, *'Kenya needs grown men and women capable of independent and constructive thinking and it is very much the business of the schools to see that it gets them'* (RoK, 1964 p. 116). The report went on to say that therefore, at the teachers' college, '*the students must themselves experience the processes of exploration, of trial and error, of consolidation and application of knowledge which will later become the basis of their teaching'* (RoK, 1964 p. 116). The report emphasized the need to have teachers with a higher standard of teaching skill and of insight into the needs of children.

[23] KIE is responsible for all school and college curriculum except for university education

In reference to the PTE curriculum, the Sessional Paper No. 1 of 2005 (RoK, 2005 p. 74) states, *'The curriculum for this level should also place more emphasis on child-centred approaches in teaching so as to enhance both quality learning achievements and motivation'.* The emphasis on '*independent and constructive thinking'* in the graduates of the education system and the need for trainee teachers to experience the processes of '*exploration, of trial and error, of consolidation and application of knowledge'* in their training and to adopt the same later in their teaching is further evidence that a reflective practitioner TE model is envisaged. Indeed, this points to a constructivist view of learning to teach through research and problem solving.

The qualitative research in the PTTC sought to investigate whether or not the practice in PTTCs is in consonance with the stated or implied philosophy of TE. The study findings on this are discussed in Chapters 3 and 4 on Learning to Teach Reading and Learning to Teach Mathematics respectively.

The objectives of PTE

The objectives of PTE and those of the professional studies component of the curriculum make reference to developing professionalism and child-centred teaching in teacher trainees; predispositions and skills that are in consonance with a reflective practitioner TE model. The relevant objectives of PTE syllabus are:

1. To develop basic theoretical and practical knowledge about the teaching profession, so that teachers' attitudes and abilities can be turned towards professional commitment and competence;
2. Bearing in mind the child as the centre of education, teacher education should prepare teachers who can:
   Provide suitable learning opportunities
   a) Develop the individual child's potential abilities to the maximum through a variety of creative learning experiences
   b) Develop the child's ability in critical and imaginative thinking in problem solving and self expression
3. To create a national consciousness for educational excellence in every teacher; and
4. To develop an awareness and appreciation of innovation in the fields of education and an ability to utilize them.

The manner in which these objectives are stated using verbs such as 'develop' and 'create' suggests a constructivist view of learning. All the same, these objectives are quite general and sophisticated and interpreting and applying them in practice could prove to be difficult. Further, there is no mention of reading and mathematics in the general objectives of PTE despite the fact that discourse on primary education in Kenya emphasizes the important role of primary education in the development of a literate and numerate society.

The PTE syllabus articulates 11 objectives for the professional studies component of the curriculum. Some of the objectives that point to a reflective practitioner TE model spell out that graduates of the programme should be able to: (i) perform teaching duties with professional competence and commitment, (ii) develop an awareness for innovations in the field of education and utilize them appropriately, (iii) develop a rational approach to problem solving through inquiry and research, (iv) provide suitable opportunities for children with diverse learning needs, (v) develop the individual child's potential abilities to their maximum through a variety of creative learning experiences, and (vi) develop the child's ability in critical and imaginative thinking, problem solving and self-expression. Some of these objectives are very general and some could be open to many interpretations for example the first objective about performing teaching duties with professional competence and commitment. However some of the objectives do suggest a reflective TE model. The third objective's focus on inquiry and research as problem solving strategies, for example, does cohere with the reflective practitioner TE model. However, not all the objectives are aligned to the reflective practitioner model of TE. The first objective *'to develop basic theoretical and practical knowledge about the teaching profession'* belies a knowledge orientation. Chapters 3 and 4 focus on analyzing the extent to which the foregoing TE philosophy is applied with respect to teaching reading and mathematics in the lower primary.

All the same, while the reflective practitioner TE model is suggested in various ways in the TE policy statements, goals and objectives, it does not seem to be the case in the PTE curriculum design. Developing reflective

practice requires to be learned practically. However, very little time is allocated to practical experience in the form of teaching practice (TP) in the curriculum. The PTE curriculum has three components: content subjects comprising nine teaching subjects which combine subject content knowledge and teaching methods; professional studies (referred to as professional education); and teaching practice. While students study the teaching subjects and professional studies throughout their two years (except when they are on teaching practice), teaching practice takes a total of only nine weeks. This, points to less emphasis being put on practical teaching experiences which is not in line with the reflective practitioner TE model suggested in other PTE and PTE-related documents.

However, some aspects of reflective practice can be developed at college level, for example, if teacher educators offer trainees the opportunities to draw on TP experiences and reflect on their experiences, or if trainees have opportunities to discuss and review episodes simulated or acted in the college classroom. Chapters 3 and 4 of this report analyse whether this is indeed the case with regard to the teaching of how to teach reading and mathematics in lower primary.

From the foregoing analysis of the philosophical and theoretical underpinnings of the TE curriculum in Kenya, and the view of knowledge of teaching and how it is acquired discernable from the PTE curriculum, it seems that there is a discontinuity between the two. While the reflective model of TE is suggested in various ways in the policy statements on TE, practical experience, which is in consonance with the reflective model of TE receives little emphasis in the PTE curriculum design.

2.2. The TTC and School Reading and Mathematics Curriculum as Intended

2.2.1 The PTE Reading Curriculum as Intended

It is important to note that there is no subject called reading in the PTE timetable. Rather, reading is taught as a topic in a language curriculum in both the PTE and the primary school curriculum. On the other hand, there are three PTE reading curricula in Kenya based on the three languages in which learners are introduced to reading in the first three years of primary school – the mother tongues, Kiswahili and English[24]. The current study focused only on reading in English, however, where issues pertaining to mother tongue and the use of Kiswahili are relevant in the data, these are discussed and their significance in relation to the study objectives noted.

The content to be covered in the PTE reading curriculum is contained in the 2004 PTE syllabus for English and is also reflected in the PTE textbooks. In Kenya, while the syllabuses presents only an overview of the content of the curriculum, the textbooks are expected to interpret and elaborate on the content stipulated in the syllabus. An important criterion on which textbooks are judged worthy of inclusion in the recommended list of text books popularly known as the 'Orange Book' is the extent to which they have correctly interpreted the syllabus[25]. On the other hand, PTE external examinations administered centrally by the Kenya National Examinations Council (KNEC) are a pointer to what is given emphasis in teaching. This is because the PTE examination results determine whether a trainee is awarded a certificate or not[26]. Consequently, teaching in the PTTCs tends to put more emphasis on areas of the syllabus that are expected to contribute more of the PTE examination questions.

The PTE syllabus has 7 sections (A – G) with reading captured in only one section - Section C which focuses on methods of teaching reading, entitled: "Teaching English in Primary Schools". The section is further split into four: (i) the English syllabus, (ii) specific methods in lower primary, (iii) specific methods in upper primary, and (iv)

[24] According to the language policy, the mother tongue is the language of instruction in the first three years of primary school in linguistically homogeneous environments while English and Kiswahili are taught as subjects. In linguistically heterogeneous environments, English or Kiswahili is to be chosen as language of instruction. From Standard 4 onwards, English becomes the language of instruction everywhere.

[25] Schools are not allowed to spend government teaching/learning resources funds on books that are not in the Orange Book

[26] To be awarded the PTE certificate, a trainee must pass in all eight examinable subjects and teaching practice.

schemes of work, lesson plans and progress records. The teaching methods for reading in the lower primary (look and say and phonic method) are taught as two of the sub-topics under 'specific methods for lower primary'. The other sub-topics covered under teaching reading in the lower primary are pre-reading skills, reading readiness, informal activities for introducing reading, word attack skills, the sequence of activities for reading lessons, using supplementary materials and individual reading progress. On the whole, it can be observed that there is inadequate focus on reading in the English PTE syllabus. As Commeyras and Inyega (2007) have noted, the PTE English curriculum is too general and wide to provide guidance for teaching reading pedagogy effectively. For example, the curriculum includes the study of literature, aspects of drama and library science skills all of which take away time and focus from reading development which should be at the centre of primary education generally but lower primary in particular.

PTE textbooks are a fairly new product in the book market in Kenya. All the 3 PTE textbooks i.e. *PTE Revision Series English,* Distinction English and *Mastering PTE English* were first published in the year 2008[27]. This means that trainees have not been benefiting from reading materials on teaching methodology for reading. PTTCs on the other hand, don't seem to have been concerned about this gap. This can be deduced from the fact that some PTTCs do not have these textbooks on the list of books and other resources that trainees are expected to purchase.

The few PTE textbooks in the market closely follow the PTE syllabus both in the structure and content. Indeed, the nine sub-topics covered in the syllabus are also the major sub-titles used in the books. In one of the books that has objectives for each sub-topic (Mastering PTE English), the objectives are exactly the same as those in the syllabus. In taking the reading methodology further, the textbooks delineate the procedures/steps to be followed in teaching reading. One book (Mastering PTE English) outlines 'The Sequence of Activities for Reading Lessons' generally while another book (Distinction English for Primary Teacher Education Year 1 and 2) outlines 'Lesson Procedures for "Look and Say" Method'; 'The Pure Phonic Teaching Procedure' ; and 'The Mixed Phonic Teaching Procedure'. With regard to assessment, the textbooks focus more on assessing acquisition of theoretical knowledge. The questions and exercises in the textbooks generally focus on theoretical knowledge. Two examples taken from Mastering PTE English demonstrate this (i) *Distinguish the look-and-say method from the phonic method,* and (ii) *Describe three advantages and three disadvantages of each method.*

The final PTE examination examines teaching methods for reading in Paper 2. KNEC and college level examination questions tend to focus on theoretical knowledge. Two questions in the 2010 mock examination[28] of one PTTC: (i) *State two pre-reading skills,* and (ii) *Using appropriate examples, describe the procedure of teaching reading in upper primary.* Teaching in the colleges is, to a good extent, driven by the needs of the KNEC examination. According to the teacher educators interviewed in this study, ensuring that trainees pass the final examination is all important. Consequently, it is safe to hypothesis that much of the teaching in the PTTC will focus on theoretical knowledge which is not in sync with the constructivist and reflective models promise in other sections of the syllabus.

The following sub-section presents a critical analysis of the intended PTE lower primary reading curriculum as documented in the syllabus and the text books, as well as can be discerned from the end of course examination, to explicate the knowledge, understanding, practice and professional content knowledge underpinning the reading curriculum. The analysis is also intended to provide some indication of how the Kenyan curriculum defines and operationalizes learning to teach reading, and what that means for how reading is presented in the PTTC reading methodology lessons.

The intended knowledge base of reading in the Kenya PTE curriculum

At a general level, the syllabus puts more emphasis on acquiring knowledge about reading rather than on its pedagogy. For example, in terms of time allocation, teaching methods for lower and upper primary are allocated 70 hours (35 hours each) or only 27.6 per cent of the 254 hours available for English. This allotted time has not

[27] Previously, many reading teacher educators depended on the 1986 *Draft Teaching Guide for English Teacher educators* prepared by KIE.

[28] Mock examinations are proto-types of the KNEC examinations.

been broken down further; hence it is difficult to estimate how much time is recommended to be spent on the reading programme. The assessment that there is less emphasis on pedagogy can also be supported by the fact that only one of the five general objectives of English that states that the teacher trainee should be able to '*teach at the primary school level, the basic English language skills of listening, speaking,* ***reading*** *and writing effectively'* focuses on pedagogy. This focus on acquiring knowledge rather than skills for teaching suggests that the curriculum developers perhaps believe that once knowledge about a skill is acquired, it becomes transferable in the classroom context. However, there is a difference between knowing about something and knowing how to do something. The former appears to be an emphasis of the Kenya PTE reading curriculum.

The types of intended knowledge

An analysis of the sections on teaching reading in the lower primary in the various PTE curriculum documents – the 2004 syllabus and 3 PTE textbooks: *Distinction English, Mastering PTE English and PTE Revision Series: English* – reveals that the heavy emphasis on knowledge evident in the time allocation and in the general objectives of the English curriculum is also to be found in the section on teaching reading in the lower primary. In this section, it is evident that the teacher trainees are expected to acquire several types of knowledge related to teaching reading. The types of knowledge include knowledge about: (i) the primary school curriculum, (ii) skills related to developing the reading skill (iii) methods for teaching reading, (vi) the structure of the reading lesson, (v) activities and class organization for teaching reading, (vi) preparation and/or use of teaching-learning materials, (vii) reading problems, and (viii) assessing reading.

Knowledge about the primary school curriculum

The knowledge of the primary school curriculum that trainee teachers are expected to acquire can be deduced from the objectives of the relevant topics. Many of these objectives are stated in behavioural terms and they emphasize knowing about and not knowing how to. The objectives relevant to reading state that the learner should be able to:

- ***state*** *the role of and ...the primary school syllabus'* and '***name*** *the components of the approved course materials and explain their organization*
- ***name*** *the components of the approved course materials ...*
- ***describe*** *pre-reading .... skills*
- ***describe*** *approaches to the teaching of reading ...*

Knowledge about skills related to developing the reading skill

Both the PTE syllabus and textbooks identify reading related skills such as pre-reading skills and word attack skills. However, rather than put the emphasis on developing the trainees' practical abilities to help lower primary learners develop these skills, more emphasis is put on the knowledge about the skills. For example, in the PTE textbook *Distinction English,* the topic 'pre-reading skills' is presented in the form of a table with three columns. In the first column with the title 'skill area', four pre-reading skills are identified; in the second column with the title 'abilities' the various abilities associated with each skill are identified and; in the third column with the title 'examples of activities to practice the skills', examples of skills that can be used to develop the particular skill are identified.

The tendency for the PTE curriculum to put more emphasis on knowledge rather than on the practical aspects about teaching reading applies across the entire lower primary reading curriculum. In fact, even the presentation of the teaching methods for reading focuses on the teacher trainee acquiring theoretical knowledge on specific methods and not on knowledge based on the practical use of the methods. For example, on the "Look and Say method" it is stated that trainees will acquire knowledge of (i) the purpose of look and say, (ii) the value and limitations of the method, and (iii) look and say activities. For phonics as a method, the following is stipulated as what trainees are expected to acquire: (i) the principles of the phonic method, (ii) the advantages and disadvantages of the phonics method, (iii) phonic skills assumed to be covered in Mother Tongue Reading and (iv) additional sound/letter relationships to be taught in English.

From the foregoing, two things can be noted. Firstly, there is a heavier emphasis on theoretical knowledge of teaching reading in the PTE reading curriculum and less on practical knowledge. The danger with this is that trainees may confuse this knowledge with ability to teach reading and thus develop a false confidence in their ability to teach reading in the lower primary. Secondly, there is a gap between one of the general objectives for English which rightly states, that the trainees should **be able to teach the reading skill** at the lower primary level, and the heavily knowledge oriented content of the curriculum.

Intended understandings

The PTE syllabus is rather thin on specific kinds of understandings that teacher trainees are expected to develop and the context in which they are to be acquired. This can be deduced from the definitions of *reading* and / or the delineations of the purpose of reading from in the PTE textbooks in Box 1 and 2.

Box 1: Understanding reading

Reading is the act of getting meaning from print or other symbols. When we read, we decode the sounds we hear or the symbols we see. The reading activity is only complete when the reader obtains meaning from sounds or symbols. The reading process involves decoding, thought and socialisation. English for Primary Teacher Education

Box 2: Understanding the purposes of reading

The main purpose for reading in the lower primary is to develop and practise reading skills needed for studying in the higher levels of learning. Other purposes for reading include recognition of letter sounds, recognition of words by looking at them, attaching meaning to spoken and written words etc.

Distinction English for PTE Teacher Education Year 1 and 2

The few indications of the kinds of intended understandings there are in the syllabus and the text books appear to be theoretically oriented. For example, the specific objectives for the section on The English Syllabus and Approved Course Books indicate that the learner should be able to: (i) *state the role of and **interpret** the primary English syllabus*, and (ii) *name the components of the approved course materials and **explain** their organization.* In the sub-section on schemes of work, lesson plans and progress records, one of the specific objectives states that the trainee should be able to '***explain** the importance of the scheme of work and the lesson plan'.* All the same, these objectives suggest a perspective on understanding based on what the trainees are expected to know theoretically.

On the other hand, PTE text books specifically use the word 'understanding' to convey some idea of what teacher trainees are expected to grasp as a result of what they study. For example, the books point out that trainees are expected to develop understanding of reading, the purposes of reading, pre-reading skills, look and say method and phonic method. Yet again, understanding is to be developed without much on problematizing the application of knowledge in practice. Also, this assumes quite a superficial understanding of what it is trainees are expected to understand.

From the foregoing analysis of the PTE reading curriculum and other materials, several things are worth noting:

i. There is inadequate focus on reading in the English PTE syllabus.
ii. The time available for teaching English is not put to the best use with regard to the trainees later teaching needs. For example, the PTE English curriculum includes the study of literary texts at the expence of reading methodology.
iii. There are inadequate resources on methods for teaching reading for both the trainees and the teacher educators.
iv. There is a heavy emphasis on theoretical knowledge about teaching rather than on pedagogical knowledge in the syllabus, textbooks and examination questions.
v. There is a gap between one of the general objectives for English which rightly states, that the trainees should be able to teach the reading skill at the lower primary level, and the heavily knowledge oriented content of the curriculum.
vi. There is inadequate focus on the kinds of understandings that trainees are expected to develop and the contexts in which they are to develop them.

2.2.2 The PTE Mathematics Curriculum as Intended

An Overview of the curriculum

The PTE mathematics curriculum is found in Volume Two of the 2004 PTE syllabus. It is also found in the few available PTE mathematics textbooks such as Distinction Mathematics for Primary Teacher Education Year 1.

The Structure of the PTE Mathematics Curriculum

The PTE syllabus divides the mathematics programme into two: Year 1 and Year 2. In the first year, in which mathematics is allocated 157 hours of the 224 hours (about 70 per cent) available for mathematics in the entire PTE programme, emphasis is laid on teaching and learning methods while in the second year, in which mathematics is given 67 hours (about 30 per cent), emphasis is on mathematics subject knowledge. This suggests a fairly heavy emphasis on mathematics subject knowledge which, according to the introduction to the syllabus, is aimed at broadening the understanding of mathematics and increasing opportunities for further studies for the teacher trainees. The relatively heavy emphasis on mathematics content knowledge is indicative of an academic orientation in the PTE mathematics curriculum. It is also in line with the disproved thinking that academic knowledge of mathematics is a criterion of good primary school mathematics teacher which seems to inform policy on TE in Kenya discussed in Chapter 1. Conversely, all the PTTC principals and teacher educators interviewed in the course of the current study indicated that the two years available for the PTE programme are grossly inadequate. It would seem that the time available for training primary school teachers is not utilized to meet the greatest needs of those being prepared to help lower (and upper) primary school students learn mathematics.

The content of the syllabus is split into 17 and nine topics for the first and second years respectively. Year One topics methodological skills and preparation for teaching (which includes teaching/learning resources, schemes of work, lesson plan and class organization) are allocated five and 16 hours respectively or 3 per cent and 10 per cent of the 157 hours available. This further goes to suggest the colleges may not have enough time to engage in the kind of learning activities that require sustained reflective practice to develop deep understanding of the structures of learning and teaching mathematics at the primary school level.

The mathematics syllabus does not differentiate between lower and upper primary segments. This is surprising because educational policies do differentiate between lower and upper primary. The language of instruction policy referred to previously, for example, has implications on the teaching of mathematics and on how lower primary mathematics teachers should be trained. The failure to divide the syllabus into lower and upper primary segments could be the reason why such policy issues are not addressed.

The decision on what is appropriate content and teaching and learning methods for lower and for upper primary in the PTTCs seems to have been left entirely to the mathematics teacher educators. It seems reasonable to argue that this suggests that the teacher educators should be well trained primary mathematics educators and that the primary school mathematics syllabus and textbooks constitute core resources in the PTE programme. Discussion of the qualitative data on the teaching of mathematics in the PTTCs in Chapter 4 of this report demonstrates that this is not the case.

On the other hand, the PTE textbook available to the researchers – Distinction Mathematics for Primary Teacher Education Year 1 - although closely following the syllabus both in structure and content does explain the concepts and / or operations covered in the various topics as well as the methodology / teaching and learning activities to be adopted; and the teaching/learning resources to be used. For example, the concept of place value is explained and then the two stages of teaching place value using sticks are described. The section ends with reference to other teaching aids for place value – place value tins, place value pockets, and place value charts. It can therefore be concluded that the textbook has a constructivist orientation and focuses on developing trainees' understanding and practice.

In the following sub-section, the intended lower primary mathematics curriculum is critically analysed to reveal the knowledge, understanding that are embedded in the curriculum. The analysis will also provide some insights into how the Kenya curriculum perceives and operationalizes learning to teach mathematics and the implications this has on how mathematics is taught in PTTC mathematics methods lessons.

The Intended Knowledge Base of Mathematics in the PTE Curriculum

Analysis of the mathematics syllabus and the mathematics textbooks reveals several knowledge types that the trainee is expected to acquire. These include knowledge of: (i) the primary school mathematics curriculum, (ii) mathematics content knowledge, (iii) approaches for teaching different topics of the curriculum, (iii) locally available materials for teaching mathematics, and (v) learner-centred methods

Knowledge of the primary school mathematics curriculum

The PTE mathematics curriculum has not put much emphasis on trainees developing adequate knowledge of the primary curriculum. The first of the nine general objectives of the PTE mathematics course stipulates that the trainees should be able to *display knowledge of the primary school mathematics curriculum.* However, the topic by topic enumeration of the content does not include the study of the primary school syllabus as one of the areas to be covered. The only mention of the primary school syllabus is in the context of preparation of schemes of work where interpreting the primary school syllabus is listed as one of the things to do in the process of making a scheme of work. The implication is that the trainees are likely to acquire inadequate knowledge on what mathematics they are expected to teach and how they are to teach it.

Mathematics content knowledge

The PTE mathematics syllabus lays emphasis on superficial theoretical knowledge of primary mathematics. This can be deduced from the way the specific objectives for many of the topics covered in the syllabus are stated using the active verb 'identify'. For example, for the topic 'Numeration Systems', the specific objective states that '*the learner should be able to* ***identify*** *and use the systems of recording numbers – Tally, Hindu Arabic and Roman*'. Similarly, for the topic '*Classification of Whole Numbers'*, the specific objective stipulates only that the learner *should be able to identify different classes of whole numbers*. The focus on mathematics content knowledge resonates with the discussion in Chapter One about how teacher quality is associated with academic qualifications. This is contrary to current thinking on teacher quality which lays emphasis on practical pedagogical knowledge and PCK.

Teaching and learning methods / Pedagogy

The PTE mathematics curriculum seems to lay considerable emphasis on teaching methods. For example, in the introduction, the syllabus points out that the PTE mathematics course aims at: *producing a mathematics teacher* ***equipped with methods and skills for use in primary school*****.** However, a careful scrutiny of the syllabus reveals that the emphasis on teaching methods is superficial. For example, only two of the nine identified general objectives for the syllabus focus on practical teaching. The two are that the trainee should be able to: (i) *identify appropriate teaching approaches for the relevant content,* and (ii) *vary teaching approaches according to the opportunities that may arise during the lesson.* The focus on mere identification of teaching methods / approaches is most evident in the specific objectives for each topic which overwhelmingly focus on trainees ability to '*identify'.*

Further, teaching methods / approaches are presented as activities that should be carried out while teaching different concepts and /or operations; and as procedures referred to in the syllabus as *development stages* for teaching different concepts and / or operations. For example, for the topic 'Addition and Substraction', the specific objectives include ability to identify (i) *activities that show addition as putting together*, and (ii) *development stages of teaching addition*. The objectives pay little attention to understanding and practice of the activities. The syllabus does not indicate how knowing the activities and the development stages will be translated into trainees' abilities to meaningfully engage primary school learners in the activities in ways that will lead to effective learning of mathematics.

In addition, the heavy emphasis on activities and stages or steps of teaching concepts and operations could lead to the trainees' fixation with activities and steps with the consequence that trainees develop the perception that teaching mathematics involves merely the teacher going through set steps and getting learners to do things. This has the potential of leading the trainees to believe that once they have gone through the set steps for teaching a given concept or mathematical operation, and engaged learners in activities, their job is done. Since the procedures and activities can be easily learnt even by memorization, once they have learnt them, the trainees could develop misplaced confidence in their own abilities to teach mathematics.

PTE textbook Distinction Mathematics is helpful to trainees in various ways (i) it provides details on how the various activities are to be conducted, (ii) after each topic; the book has a section on common errors and, (iii) at the end of each unit, there are exercises. However, the book comes short of providing opportunities for trainees to develop PCK. For example, the common errors section provides trainees with theoretical rather than experiential knowledge of possible errors. Further, the exercises mostly require trainees to describe how they would teach various concepts and / or operations. The following two exercises for the topic 'Addition' illustrate this: (i) *you intend to teach your class addition such as 38 + 16 using abacus. Describe how you would do this*. (ii) *Describe how you would use a number line to show your class 3 x 2 =2 x 3*.

In addition to the inclusion of teaching approaches in the various units of Distinction Mathematics, Unit 5 focuses specifically on methodological skills. The unit content is essentially descriptions and exemplifications of various learner-centred methods including discovery, role play, demonstration, and discussion. Again, the section is heavily inclined towards theoretical knowledge of learner-centred methods.

From the foregoing discussion, it seems that there is a constructivist and reflective orientation underpinning the approach to learning to teach mathematics especially in the textbook. However, this orientation requires adequate time and an approach to teacher training which engages with practical issues about teaching and learning mathematics. This appears to be inconsistent with the structure of time allocation in PTE curriculum, which as the previous section shows is heavily skewed in terms of time on subject content knowledge.

Teaching / Learning Materials and Resources

Appropriate use of teaching learning resources is considered particularly important in teaching young children mathematics because of the abstract nature of mathematic concepts. Further, it is argued that young children learn more effectively through activities in which they manipulate objects.

The PTE mathematics curriculum places considerable emphasis on teaching learning resources. This is evident in the syllabus and in the textbook Distinction Mathematics. In the syllabus, one of the nine general objectives is that *the learner should be able to identify and use appropriate and locally available teaching / learning resources.* The syllabus also has a topic on teaching /learning resources with two specific objectives indicating that the learner should be able to (i) *prepare teaching/learning materials,* and (ii) *use teaching/learning resources.* In addition, at the end of the description of the 2-year syllabus, there is a list of suggested teaching/learning resources. However, the syllabus is not clear on how the trainee will develop the understanding of how the teaching resources enhance learning or the practical knowledge required to use teaching resources to aid learning at different levels of primary school.

The textbook Distinction English, on the other hand, integrates use of teaching resources in the presentation on various activities for teaching different concepts and / or mathematical operations. In addition, there is a topic on Teaching / Learning resources in Unit 6 PREPARATION FOR TEACHING where categories of teaching resources – improvised materials, readymade materials, body parts, reference materials and resources persons – are briefly described and the resources in each category listed. All the same, like the syllabus, the book does not clarify exactly how the use of resources enhances pupils' learning or how the resources are to be used to develop students' mathematical knowledge.

Conclusion

In conclusion, three concerns emerge from the foregoing critical analysis of the PTE mathematics curriculum:

1. There seems to be an emphasis on mathematics content knowledge although the PTE programme has serious time limitations.

2. The curriculum fails to differentiate lower and upper primary segments of primary education yet those who teach in PTTCs are mostly trained to teach secondary mathematics and thus their knowledge and experience is closer to upper than lower primary. The implication is that training of teachers for lower primary mathematics is likely to suffer more.

3. Although the available textbook – Distinction Mathematics – does seem to somewhat lean towards a constructivist approach, on the whole, the syllabus and the textbook lay more emphasis on theoretical knowledge of teaching / learning methods and the preparation and use of teaching / learning resources.

The above shortcomings of the PTE mathematics curriculum can have serious implications on how trainees are trained to teach mathematics on a day by day, lesson by lesson basis in the PTTCs.

2.2.3. The School Reading Curriculum as Intended

The lower primary reading curriculum for English is found in the 2002 Primary Education Syllabus Volume One (KIE, 2002) in which the reading primary syllabus comprises part of the syllabus for English. The syllabus takes a thematic approach. Themes for Standard 1 include: greetings and requests, home, classroom. Themes for Standard 2 include greetings and polite language, environment and travel while themes for Standard 3 include school and school activities; health and hygiene; and sports. The lower primary reading curriculum is also found in the English textbooks - both the pupils' books and the teachers' guides.

The above curriculum materials were critically analysis to understand the lower primary curriculum as planned by the curriculum developers both in terms of what reading is and the knowledge, understandings that should go with it in the classroom context. The scrutiny has provided strong indications as to how the teachers and learners are expected to interact and act in the teaching/learning classroom environment.

What is reading knowledge?

Unlike the PTE syllabus, the Primary Education Syllabus for English has adopted a thematic approach. Themes for Standard 1 include: greetings and requests, home and classroom. Themes for Standard 2 include greetings

and polite language, environment and travel while themes for Standard 3 include school and school activities; health and hygiene; and sports.

In the syllabus, what is expected of reading lessons is articulated in the general objective that addresses reading and which can be taken as an operational definition of reading.

> What is reading?
>
> *The learner should acquire reading skills to be able to read and understand instructions, to read for information and for pleasure, and to develop vocabulary and sentence structures* (K.I.E., 2002).

This general objective for reading has significant implications on what reading entails, the content of reading lessons and how reading lessons should be conducted. The teacher for reading should help learners not only to know how to read but also to be able to read with understanding, to get information from what they read and to derive enjoyment from their reading. Further, the definition suggests that it expected that the reading teacher will create opportunities for children to read for pleasure and/or the teacher her/himself will read stories to their learners.

The expectations on the reading teacher in the school curriculum seem to be different from that suggested in the PTE curriculum and materials. In the PTE curriculum and materials, the expectation seems to be that the teacher will require only theoretical knowledge. The gap between the two could mean that trainee teachers graduate with inadequate competence to effectively teach reading in lower primary.

On the other hand, the details of what the lower primary should focus on can be gleaned from the specific objectives.

Table 3: Specific objectives for Reading in the Lower Primary

Standard 1	Standard 2	Standard 3
i. Recognise the letters of the alphabet ii. Read names of objects in the classroom iii. Match numbers and objects iv. Sentences/texts correctly v. Match names to pictures of animals vi. Match words/sentences with pictures vii. Read words/sentences/text viii. Read short passages	i. Read simple sentences/passages and answer questions ii. Read short passages iii. Read and write simple sentences iv. Read and answer oral/written questions v. Read short passages and answer questions	I. Read and follow instructions II. Read passages/poems III. Read short stories and retell them IV. Read for pleasure

The specific objectives seem to be more oriented to the look and say method of teaching reading which is also emphasized in the PTE syllabus.

Pedagogical knowledge and skills expected of teachers

At the end of the lower primary English syllabus, the Primary Education Syllabus there is a list of the learning experiences for the various skills – listening, speaking, reading and writing. The learning experiences for reading indicate the activities the student should engage in. For examples, the first activity on the list is: r*eading words/sentences/short paragraphs.* These seem to be in the same trend with recommended activities in the PTE syllabus and not very helpful to the teacher given the realities of classrooms in Kenya with diverse learners and limited teaching/learning materials.

The introduction to the English syllabus highlights various aspects of the syllabus among which are three related to pedagogical knowledge. These are classroom talk, reflective teaching and collaborative learning. The implication is that the teacher should have competence in these areas yet these are not covered in the syllabus and materials. Their mention here therefore amounts to mere rhetoric.

Gaps and Policy Issues

The foregoing analysis of PTE and the lower primary reading curriculum has revealed the following:

Gaps

1. The primary school reading curriculum adopts a thematic approach while the PTE curriculum adopts a topic by topic approach;
2. The PTE curriculum has a very narrow and theoretical definition of reading while the primary curriculum has an operational definition with implications on the knowledge and pedagogical skills the teacher should have.
3. While the PTE curriculum focuses chiefly on early reading or decoding, the lower primary reading curriculum focuses more on understanding as learners read fairly long comprehension passages

Continuities

1. The focus on activities that students should engage in found in the PTE curriculum are also in the primary curriculum

2.2.4. The School Mathematics Curriculum as Intended

The primary mathematics curriculum is found in the 2002 Primary Education Syllabus Volume Two (MOE, 2002); and in the primary school mathematics textbooks – the pupils' books and the teachers' books - of which there are several in the market.

The primary school mathematics curriculum delineates the mathematics concepts, operations and skills that the PTE trainees are expected to teach on graduation. The implication is that these are the concepts, operations and skills that the PTTCs should have prepared the trainees to help primary school learners understand and perform.

The structure of the primary mathematics curriculum

The primary mathematics syllabus is organized by class – Standards 1 to 8 – and thus, unlike in the PTE syllabus which is organized by topic, it is easy to locate the lower primary curriculum as it is represented by the Standards 1 to 3 contents of the syllabus. Further, the syllabus takes a cyclic curriculum design where the same content appearing in Standard one reappears in each successive standard but at a more difficult level. For example, the syllabus for every standard, 1- 3 opens with the topic 'Numbers' but the content gets more difficult each time. The topics covered in Standards 1-3 are shown in Table 4.

Table4: Topics Covered in the Lower Primary

Unit	Std 1	Std 2	Std 3
1	Numbers	Numbers	Numbers
1.1	Pre- numbers	Whole numbers	Whole numbers
2.0	Whole numbers	Operations	Fractions
3	Operations	Measurement	Operations
4	Measurement	Geometry	Fractions
5	Geometry		Measurement
6			Mass
7			Capacity
8			Money
9			Time
10			Geometry

The introduction to the syllabus indicate that it is expected that concepts and skills will be developed practically and emphasizes that teachers should make and use locally available materials.

On the other hand, the teachers' guides such as Primary Mathematics Teacher's Book to be used with the relevant pupils' Primary Mathematics book do provide detailed help on how to conduct mathematics lessons to the teachers. The teacher's guide to Primary Mathematics pupils' book is divided into units just like the pupil's book. Each unit has a section on objectives which are taken from the syllabus for primary mathematics, background notes and the Lesson. The lessons are page by page reproductions of the Pupil's Book. For example, Standard 1 Lesson 1 is on Pupils' Book page 1. The teacher's guide identifies the mathematics words to be covered in the lesson, teaching materials to be used, suggested time and activities.

As in the PTE textbooks, the activities comprise of step by step instructions on what the teacher should do including suggestions on questions the teacher can ask at different points in the lesson. Indeed, the bulk of the content for each lesson is on activities. While the ready-made activities are helpful, in a sense, they reinforce the focus on activities without teachers' developing an adequate understanding of how they can help learners grasp the relevant concepts that is evident in the PTE curriculum.

Conclusion

The critical analysis of the PTE and the primary mathematics syllabuses reveals that there is a gap between the two. While the PTE syllabus focuses more on developing a theoretical knowledge of practical approaches to teaching mathematics and of making and using teaching / learning resources, the primary mathematics has a high expectation that mathematical concepts and skills will be developed practically using teacher made and locally available TLMs.

Chapter 3: Learning to Teach Reading

Background

Researchers at the Centre of Education in the US have drawn attention to the complexity of learning to read particularly for those doing so in a second language and emphasized the importance of trainee teachers acquiring a solid theoretical foundation of reading and the range of pedagogical approaches to reading. They suggest that these understandings and skills are to be acquired through the trainees practical engagement in real classrooms and reflection (Centre for Education, 2010). On the other hand, research on teaching has revealed that good teaching is the result of the teacher integrating different types of knowledge to create teaching scenarios that make what they teach comprehensible to their students. According to Shulman (1987) the ingredients of knowledge that combined result in good teaching are: knowledge about the subject matter (content knowledge), knowledge of how to engage with learners and manage classrooms (pedagogical knowledge) and knowledge of how to represent and formulate content knowledge in ways that make it understandable to the students (pedagogical content knowledge). In this chapter, we explore the knowledge about reading, the pedagogical knowledge and practice that lower primary trainee teachers in Kenya acquire from their training and the extent to which these change over time in their teaching career.

3.1. The identity, Knowledge, Understandings and Practice of Reading Teacher Educators

We believe that teacher trainees knowledge and understanding of teaching reading in the lower primary is to a good extent informed by teacher educators' own knowledge, understandings and practices. We therefore observed eight (six female and two male) teacher educators teach lessons on methodology for teaching reading in lower primary in four PTTCs and subsequently interviewed them.

All but one of the teacher educators were trained to teach English language and one other secondary school subject and four of them had in fact started their teaching careers in secondary schools. Three of the teacher educators joined PTE immediately on graduating from the universities with BED (Secondary) degrees. Only one of the teacher educators had prior training and experience of primary education having trained and worked as a primary school teacher before enrolling for the BED (Secondary) degree[29] before being deployed to PTE. Clearly, reading teacher educators' knowledge base was secondary English. On the other hand, none of the colleges we worked in had an induction programme for new teacher educators and there were no opportunities to attend CPDs that would enhance their understanding and practice. Consequently, newly recruited teacher educators experienced a wide knowledge gap between what they knew about teaching in secondary school and what they were required to teach in PTTCs. This is how they described their experiences to us:

> *When you first come to this college, it's a shock. In fact, for the first one year you don't know what you are doing. You go to class and teach your lesson but as you walk out you are asking yourself, did I teach the right thing?* (A teacher educator from a PTTC in Central Province)

> *when I came here, there was no induction into what goes on, so I just went and taught grammar just the way I had been teaching it in secondary school… it was only when we were setting the exam that I realized that I had been doing the wrong thing* (A teacher educator from a PTTC in the Coast Province)

[29] Universities do not offer primary education degrees

We probed the teacher educators to learn how then, they learnt how to teach reading and found that they had mostly developed their expertise from learning on the job, through reading, trying different approaches and from colleagues they found teaching reading as the following excerpts illustrate:

> *I trained myself through reading* (a teacher educator from a PTTC in the Coast Province)
>
> *I learnt from my colleagues who were here before me because we constantly discussed what we were supposed to do but it takes a long time.* (a teacher educator from a teacher training college, Central Province)

We wondered what knowledge and understandings about teaching reading can be acquired casually from colleagues who themselves had suffered the same fate on entering PTE and in colleges with critical shortage of books on reading and reading pedagogy. We hypothesized that the teacher educators' knowledge base for teaching those who will teach reading in the lower primary could be shallow. In our intensive interviews, we asked questions that would shed light on teacher educators' knowledge and understandings of learning to teach reading.

3.1.1 Teacher Educators' Knowledge and Understandings of Learning to Teach Reading

We thought that teacher educators understanding of what reading in the lower primary means would inform their knowledge and understanding about learning to teach reading. Therefore, in the interviews, we asked them what reading in Standard 1 is. They offered us different definitions and explanations that revealed that they understood reading to mean decoding and getting word level meanings as is evident from the excerpts below:

> *Reading is that ability to look at a word, make it out, understand what the word means and comprehend - to look at a word, understand it and therefore comprehend it - that is what it is* (A teacher educator from the Coast Province)
>
> *I can say maybe it includes sounds of words. It is mostly sounds. I think now joining those sounds to make words. (A teacher educator from the Coast Province)*
>
> *For me, reading in Class 1 is the ability to recognize words and recognize their meaning (A teacher educator from Central Province*)

We concluded that teacher educators understanding of early reading was limiting compared to meanings of reading found in the literature on reading. The National Reading Panel in the USA for example, identifies early reading components as phonemic awareness, phonics, fluency, vocabulary and text comprehension (Chabott, 2006). Teacher educators limiting understanding of reading was evident in the lessons they taught which did not go beyond word level reading. This leaves trainees ill prepared to teach reading skills such as fluency and text level understanding which seem to be the focus in the primary textbooks.

We critically analysed what teacher educators did in the reading methodology lessons we observed as well as what they told us in the interviews to get insights into what they thought learning to teach reading is. We concluded that teacher educators thought that learning to teach reading is learning to conduct the look and say reading method activities using various TLMs. In most of the lessons we observed, the look and say was the method of choice. Teacher educators used look and say activities such as matching words with the corresponding object, identification of words on a flash card and playing games such as the fishing game. One teacher educator demonstrated how to recognize a word by its shape by drawing a box around the word following the letter shapes. Otherwise, the teacher educators did not explain what it is that the lower primary students should see in the word although a few mentioned looking at the shape of the word.

A few teacher educators did seem aware of the phonics method of teaching reading and its importance for the trainees in helping lower primary students learn to read. One teacher educator put it this way:

> *The thing that will really help them* (lower primary students) *to read is if they know the sounds of English or the sound of whatever language, sound of the letters in that language that they are reading; that will help them to know how to read, so you* (the teacher of reading) *have to start with the sounds. Let them know the sounds* (Teacher educator from the Coast Province).

However, we did not see any lesson on the phonics method. Teacher educators only made reference to it before moving on to the look and say activities. We deduced that teacher educators had inadequate knowledge and understanding of the phonics method. Given that reading experts recommend either a combination of phonics and sight word teaching or look and say (Bentolila and Germain, 2005) or place emphasis on phonics especially for struggling readers, (Slavin, Davis and Madden, 2009) we concluded that trainees were not being adequately prepared to teach reading in lower primary.

We probed teacher educators on alternative methods for helping students who were experiencing reading difficulties. After observing a lesson in which the teacher educator used simulation to teach reading using a game and some 'students' were not able to read some of the words, we asked the teacher educator what is to be done in such a case. He explained that words used in the game should have been taught before and continued thus:

> *if a learner is not able to use any of the skills learnt to read the word that is a very serious case because that means he has forgotten the shape of the letters, he has forgotten the length of the words. You just teach; they will understand as they continue reading* (Teacher educator from Central Province)

When we probed further on what he would advise trainees to do in such cases, his response was,

> *At this time we say if it is a learner in class two and is totally unable to read a word meant for his level, it means there is something that did not happen in standard one so this learner needs to be taken back to acquire the skills of class one during a remedial lesson* (Teacher educator from Central Province)

The literature on reading for English as a second language learners indicates that teachers should have a good understanding of how oral and reading skills in the first language transfer to English and how to facilitate that transfer (Centre for Education, 2010). We thought this is critically important knowledge and understanding in Kenya since English is the second or even third language for a majority of lower primary students. We found that the teacher educators had some awareness of language related difficulties faced by some learners and even tried to address the issue. A teacher educator explained what she was doing thus:

> *The lesson was actually for them to know the best ways to teach that child that has just come to class 1 how to read. I was actually focusing on the child who is in rural areas that maybe has not gotten the opportunity to go for ECDE and so comes to class 1 without any knowledge of reading and they don't even know English or even Kiswahili. They just use their mother tongue. I was trying to give them that experience on how they can help this child to know reading (Teacher educator from Coast Province)*

The lesson had focused mostly on simulating the teacher teaching reading using the look and say method and getting the 'students' to repeat words over and over again. The teacher educator explained that lower primary teachers of reading:

> *Need to understand that reading requires a lot of imitation and repetition and therefore they should emphasise on the words they teach. They should drill the learners to understand a word before they introduce sentences* (Teacher educator from the coast Province)

While drilling might have a place in language teaching, research has shown that in lower primary English as a second language classes in Africa, it often deteriorates into mindless chanting (Bunyi, 2001).

In fact, we found that some teacher educators' held negative views about the role of Kenyan languages in learning to read in English. In identifying causes of reading difficulties, mother tongue interference was usually mentioned. This suggests that the teacher educators had a subtractive view about the mother tongues contribution to learning to read in English and actively discouraged code-switching despite the currently held view that knowledge of the mother tongue is beneficial in learning to read in a second language (Cummins, 1981). We concluded that trainees' adoption of their educators' views would lead to reading lessons in which students who only had knowledge of the mother tongues find their linguistic resources unvalued and develop poor self-esteem and thus fail to learn as Opuku-Amanikwas (2004) demonstrates.

3.1.2. Teacher Educators' Practice

According to the US Centre for Education (2010), successful reading teacher educators model the pedagogic strategies they are teaching their trainees to use and provide opportunities for extensive and guided practice with students in classrooms among other things. We observed reading methodology lessons in the PTTCs keenly to gain insight into teacher educators' practices and assess how they strengthened the trainees' ability to teach reading in the lower primary.

Largely, teacher educators used a combination of methods – demonstration of how to teach reading, whole class teaching using question and answer as well as lecture strategies. A few teacher educators simulated early reading lessons with the trainees acting as lower primary school students. In addition, teacher educators combined teaching of methods and teaching the reading lessons' procedures. For example, a teacher educator explained his objective in a lesson we had observed thus:

> *I wanted them to get the procedures of teaching reading. I wanted them to be familiar with the methods of teaching and the steps they should be following when teaching reading* (Teacher educator from the Coast Province)

In one such lesson, the teacher educator taught a reading lesson in Standard 2 in which she combined lecture, demonstration and question and answer activities as she taught what she said were the four stages in a reading lesson - oral preparation, word recognition, guided reading and checking understanding. In the discussions we had in the interviews, it emerged that teacher educators considered their methods as being learner-centred. A teacher educator explained what they do just before teaching practice thus:

> *We do a lot of interactions and questioning. You call someone to the front and tell him, "Do this the way you would do it in the classroom situation." We have a lot of reading sessions before teaching practice whereby you talk; they talk and dramatize something that you see they are not doing well. You do it yourself and then they will see what you are doing*. (A teacher educator from the Coast Province)

However, from the lesson observations, it appeared that the teacher educators' view of learner-centredness was shallow as trainees were not engaged in serious discussions about what they were learning and neither were they being challenged to think and demonstrate how they would use different methods to respond to particular needs in their classes. Indeed, trainees' participation in the lessons was in answering mostly recall questions, demonstrating what they had either been shown or been told how to do and writing down notes. We concluded that trainees were learning to use set methods and procedures and that they might have difficulties helping different learners in their classes learn to read.

3. 2. Teacher Trainees' Reflections on Learning to Teach Reading

We conducted a total of 11 focus group discussions (FGDs) on mathematics with mixed gender groups of 6 to 8 participants. In the FGDs, we focused on the trainees' understanding of what teaching reading in the lower

primary means, knowledge about the primary school curriculum, their feelings about their preparedness to teach reading in the lower primary and the challenges they expected to encounter when they started teaching.

From the FGDs, it emerged that the trainees had a narrow understandings of what reading in the lower primary is. We received varied responses to our question: What is reading in the lower primary? Some trainees thought that reading had to do with pronouncing words while others said it has to do with word recognition; yet other trainees associated reading with vocabulary building. However, a few did say that reading has something to do with understanding or getting the meaning of words. The meanings we got were not different from what the teacher educators had explained to us. Like their teacher educators no trainee offered a definition that is linked to teaching or learning reading.

Knowledge of the lower primary school reading curriculum

In our discussions with the trainees, it emerged that the lower primary reading curriculum and materials did not constitute a major focus in the lessons in the colleges. The trainees intimated that their knowledge of the primary school reading curriculum was limited. There was a general consensus among them that their interaction with the school curriculum materials was chiefly in preparation for teaching practice. Consequently, one concentrated only on the particular class and topics he/she had been assigned to teach during the three weeks of TP as the as the excerpt below illustrates:

> *Normally the teaching practice is for three weeks, so when we go for three weeks, we don't normally get well acquainted with the syllabus because you only teach in lower primary once, you go to the middle - that is standards four and five - then you go to upper - that is standards six, seven and eight. With three weeks, you will only be given specific topics to cover and you will concentrate only on those three topics and you will not be able to look at other things. Therefore, we are not normally acquainted with the lower primary curriculum so much* (Trainee from a PTTC in Central Province)

In addition to illustrating the trainees' limited knowledge of lower primary reading curriculum, the above excerpt suggests that on the whole, the opportunity to practice what trainees have learnt theoretically in college is very much constrained which in turn means that trainees can actually experience very little in the way of teaching lower primary reading.

Trainees' sense of preparedness to teach reading in the lower primary

The trainees exuded an aura of confidence about their preparedness to teach reading in the lower primary. This overconfidence seemed to emanate from three sources – knowledge about teaching methods for reading in the lower primary, knowledge about the structure of reading lessons and knowledge about the use of TLMs.

The trainees pointed out that they had been trained on how to use both the phonics and look and say methods thus:

> *I have been taught two skills that I can use to teach reading that is the phonics and the look and say. These are two things that will make me help a child out there to come up and grow up basically knowing how to read* (A trainee from a PTCC in the Coast Province).

Despite this confidence regarding the use of the two teaching strategies, other trainees expressed reservations regarding the use of the phonics method, which hints at perhaps the limited exposure to this approach during training.

> *The method I feel comfortable teaching in is the "look and say" because you know sincerely even when you go with those sounds, even you sometimes it will give you a problem. Even though you are a teacher you will have some problems. That is why you find some like me are comfortably using look and say* (Trainee from a PTTC Central Province).

In the above excerpt, the trainee's '*even when you go with those sounds'* refers to trying to use the phonics method in class. The trainee reference to the phonics method as *'those sounds'* suggests that all he knows is that the method has something to do with sounds. In '*even you sometimes it will give you a problem',* the trainee is talking about his colleagues and himself and saying that they will have difficulties using the phonics method even when they have graduated and become teachers. Trainees' lack of confidence in the phonics method suggests their lack of adequate training in the use of the method which was noted in our teacher educator interview data set.

Another source of trainees' confidence in their competence to teach reading in the lower primary was the knowledge they had acquired on how to structure a reading lesson. Our teacher educator data set demonstrated that teacher educators put stress on the structure of reading lessons and the trainees were able to recount the structure to us during the FGDs. A trainee intimated this thus:

> *Okay, as for me from the topic of yesterday, through that topic, I was able to recognize the steps which you follow to make the learners understand because after that topic you can't compare yourself to that person who has not yet even trained because you will be able to introduce that topic very well then the learners will understand everything (*A trainee from a PTTC in Central Province).

What is missing in the above trainees' account of his competence is reflections on how teaching according to the steps for teaching reading will enable lower primary students learn how to read. This suggests that the trainees had learnt techniques to use in reading lessons but had not grasped why the techniques would work.

Finally, the trainees celebrated their knowledge of TLMs. Most of the trainees talked about how they had learnt how to use TLMs in teaching reading in lower primary. They indicated they had learnt strategies such as the use of visual aids and demonstrations. They argued that with the help of demonstrations, they can relate a word that they want to teach with the visual aid, and that way, the learners will be able to relate that visual aid with the word which has either been written on the blackboard or said verbally. However, most trainees seemed to have simplistic faith in the mere use of TLMs. A trainee from a PTTC in the Coast Province stated, *"With the use of teaching aids, the learning is simplified; it's easy to understand*". There is no doubt that TLMs are important especially in primary instruction. What was missing in the trainees' discourse on TLMs is how they ought to be used in ways that are effective in helping learners learn to read considering the learner, environmental and other learner factors. This faith in TLMs is consistent with what we found in the PTE curriculum analyses data set and the teacher educator interview and classroom observation data sets.

Anticipated challenges

In the FGDs, we invited the trainees to reflect on their training and think about the challenges they anticipated they would face in teaching reading in lower primary. It emerged that by and large, the trainees' concerns revolved around issues of language. In the words of a trainee from the Coast Province, *'the major challenge we have is mother tongue influence for the learning, even of the pronunciation of words and articulation of words'.* Here, the trainee was presumably talking about the trainees and lower primary students. A trainee expressed awareness of the challenges they will face in teaching in English, learners who are largely monolingual in their mother tongues thus '*It's a challenge because they are used to speaking mother tongue and to make them understand English is a challenge'.*

3.4. Linking Knowledge to Practice: Insights from NQT Teaching Practices

We observed a total of 15 NQTs (2 male and 13 female) teaching reading in Standards 1-3 in the Coast and Central provinces. Eight of the NQTs taught in rural schools while six taught in urban schools. All the NQTs had

graduated from the PTTCs within the last four years i.e. between 2007 and 2010[30]. The NQTs were subsequently interviewed to gain insights into the knowledge and understandings that informed their practice. We also wanted to find out the extent to which their practice mirrored what they had learnt in their training; and whether or not they had adapted their knowledge and understanding to fit with the environments in which they found themselves teaching reading. From our interviews with the NQTs, we learned that their knowledge, understanding, and practice about teaching reading in the lower primary were mostly derived from their training. Indeed, the head teachers informed us that they did not have induction programmes for the NQTs since they were trained and it was therefore assumed that they were competent.

NQTs' understanding

In the interviews, we tried to get insights into whether practically teaching reading had expanded and / or deepened NQTs' understanding of reading. We found that for most NQTs, their understanding of reading had not changed. They continued to associate reading only with decoding, vocabulary development sentence building and word level understanding as the excerpts below illustrate:

> *It's making a pupil know more words in English (NQT in a school in Coast Province)*
>
> *Reading is to help a child connect one word to another to make a sentence (NQT in a school in Central Province)*
>
> *Reading in class one is the ability to recognize words and record their meaning (NQT in a school in Central Province)*

However, the emphasis in the NQTs lesson objectives was on text level comprehension as one of the NQTs explained:

> *My objective was that they were to read the passage and answer all the questions from the passage and that would tell me that they have understood the meaning of the passage. That was my objective - to check whether they understand the story which is integrated with the new words (NQT from Central Province).*

The NQTs' fixation on definitions of reading learnt in the colleges despite the fact that reading in their practice referred to reading of fairly long stories was indicative of the unreflective approach to practice learnt in their training.

NQT's practice

NQTs generally kept to the highly structured approach to teaching reading that they had learnt in college which was reinforced in the teacher's guides which virtually all of them seemed to depend on. This seemed to suggest that the NQTs were not making instructional decisions on the basis of the learners and the circumstances around them with the implication that they were not yet able to respond to the different reading needs of different learners in their classes.

The structure of reading lessons in the teacher's guides to the various textbooks e.g. New Progressive Primary English, had four stages: vocabulary development, language patterns, reading and comprehension questions. The NQTs continued to describe their methods as look and say and phonics although, in practice, these seemed to apply only to the vocabulary development stage.

The NQTs displayed inadequate understanding of the methods they were using. In the reading stage of the reading lesson, we noticed that the NQTs had the passage read over and over again – by the teacher, by the

[30] It was not possible to find NQTs with fewer years of teaching experience since the government had not hired teachers since 1998. However, the government did hire teachers towards the end of 2010 by which time we had completed classroom observation and interviewing.

teacher with the students reading sentences after the teacher, by groups of students and by individual students. When we probed why all the repeated reading of the same text, most NQTs were unable to explain only saying that it helps students learn to read or that it helps them to understand as the following excerpt illustrates:

> *Reading once they may not comprehend the passage, even twice they may not but the more they read, the more they understand because you realize as they are reading some of them would get lost and because they are children, we realize that they also learn through repetition, keep on asking them to repeat because they learn by repeating (An NQT in a school in Nairobi)*

The idea of children learning to read through repetition was also mentioned by a teacher educator in our interviews. What the NQT was not clear from the above quote is how merely reading a piece of text over and over again translates into understanding.

In our discussions with the NQTs, they talked about the importance of TLMs and particularly concrete objects. In the lessons we observed, the NQTs seemed to go to great lengths to have and use TLMs. However, it seemed to us that the enthusiasm about TLMs was waning among some NQTs. In some of the classrooms we visited, there were no signs of TLMs and when we enquired from the NQTs, some said they had taken them home for safekeeping.

NQTs' PCK

From the interviews and observations, it emerged that most NQTs had the content knowledge for reading at lower primary and were able to apply the methods they had learnt in college. However, most of the NQTs seemed to be at a loss about how to help students with reading difficulties. In our observations, we noted that NQTs did not call on those who could not read to read. When we asked what they do with such students, they told us they call the students back in the afternoon and continue to teach them. We probed about the methods they use in the one-on-one or small group sessions. The NQTs said they did the same things as they had done in the lesson and which had not succeeded in helping the children learn to read.

However, a few NQTs did talk of what they were learning practically as they try to overcome the challenges they face. One such challenge has to do with the large class sizes. This is how one NQT explained what she was doing to help non-readers in her class learn to read despite the large number of children in the class:

> *My strategy is grouping them in pairs. I put one who knows how to read with one who doesn't know. One pupil acts as a teacher to the other. Now they know themselves. I am a teacher of this, I am a teacher of this one, I am a pupil of so and so. Sometimes, I call the two to the front in the afternoon and sometimes I tell the 'teacher' to dictate to the 'pupil'.I tell him/her to dictate five words and you find one dictating and the other writing. Pairing them has helped me a lot. They learn from each other and they are free and I also monitor them. I go monitoring those who are reading and also I motivate those now who are doing teaching the others. I am coming up with my own teachers from that class. Each group has a 'teacher'* (NQT from a School in Nairobi)

Unlike other NQTs who indicated that they mixed readers and non-readers so that the readers can help the non-readers, the above NQT had tried to come up with a strategy on ensuring that this happens.

Another area in which some NQTs were exercising flexibility and making instructional decision on the basis of classroom realities was in the use of codeswitching despite what one NQT described as a stringent rule against it in the PTTCs. She said the following about codeswitching:

> *It is not allowed. When you are having an English lesson, you are not supposed to use Kiswahili at all, at all. Hata ni makosa kubwa sana* (Kiswahili for it is a very big mistake). *In the college, one was penalized for committing such a mistake. You are supposed to teach in English because they want them to get English* (An NQT in a school in Nairobi).

A few NQTs confessed that they code-switch and argued that it was sometimes necessary for the students to understand.

Challenges Faced

We asked the NQTs to identify for us the area of teaching reading they felt wanting in. Most NQTs did not readily own up to facing challenges. We recast the question and asked them to reflect on their training and their teaching of reading in the lower primary and to tell us what needed improvement in the teaching of reading methods in the PTTCs. The NQTs indicated that the teaching of phonics was one area that needed improvement as the following excerpts illustrate:

> *I think they should also emphasize more on the sounds. I somehow can remember being taught the vowels and the sounds but I would not do it very well if I am taken to class 2 or class 1* (NQT from Coast Province)

Another NQT expressed similar sentiments thus:

> *When you have these non-readers, we have to try our level best to help them know the syllables because we are not well prepared in that area. That is the most difficult for me to teach - the syllables and the sounds* (An NQT from Central Province)

However, while confessing their inadequacy, the NQTs showed recognition that the phonics approach is useful in helping early readers become independent readers as the following quote indicates:

> *I can say emphasis* (in PTTCs) *should be put on phonetics so that I can become more effective; how I can teach this phonetics and help the children to read by themselves* (An NQT from the Coast Province)

The above excerpts show that some NQTs had realised the importance of phonics in helping lower primary students to become independent readers and recognised their own limitations in the area.

3.5 Exploring topics teacher trainees and NQTs find difficult to teach

There appears to be significant differences between NQTs and Trainees in three main areas in terms of the areas they find difficult to teach. These are (d) punctuation and capital letters, (e) reading aloud at sufficient speed to make sense of the writing, and (f) recognizing the different parts of a word. The effect size is medium and with the exception of (e), trainees register a slightly higher mean than NQTs. Overall both trainees and NQTs register similar levels of difficulty in teaching main reading areas. One could assume that if NQTs have developed better understanding and skill in teaching these areas either through training or from practice, they should on average; find the topics much easier to teach than trainees who have little experience. Although these findings should be taken as preliminary and requiring more in-depth analysis, nevertheless the results suggest that both trainees and NQTs generally do not find most topics difficult. Linking stories, actions and pictures with writing is considered by both trainees and NQTs are quite easy, in addition to joining sounds together to make syllables. This is not surprising given that much of training is spent on teaching these, and NQTs practices in the schools focus a lot on developing these skills. Teaching letter sounds is also considered quite easy. Finding meaning from a word's place in the sentence is relatively more difficult although the difference between NQTs and trainees is not significant.

Generally the area where both trainees and NQTs find quite difficult (relatively) is, "understanding the overall meaning of a story, poem or other piece of writing. This is not surprising given that this is not given much emphasis at ITE, and yet this is a very important component of reading skill. The overemphasis on letter recognition and joining sounds together to make syllables shows in the high rating that is given by both trainees and NQTs.

Table 5: Reading Topics Trainees and NQTs find easy or difficult to teach in reading

Which of the following reading skills do you find difficult or easy to teach in the first three years of primary school?	Respondent	Mean	Std. Dev	Pearson Chi2	Cramer's V
(a) Finding meaning from a word's place in the sentence	NQTs	3.15	0.96	0.043	0.0886
	Trainees	3.24	1.1		
(b) Joining sounds together to make syllables	NQTs	3.93	0.72	0.096	0.081
	Trainees	4.02	0.84		
(c) Linking stories, actions and pictures with writing.	NQTs	3.98	0.73	0.012	0.1006
	Trainees	3.97	0.95		
(d) Punctuation and capital letters	NQTs	3.63	0.97	0.000	0.1254
	Trainees	3.86	1.08		
(e) Reading aloud at sufficient speed to make sense of the writing.	NQTs	3.65	0.75	0.000	0.1369
	Trainees	3.75	1.03		
(f) Recognizing different parts of a word	NQTs	3.44	0.91	0.000	0.1237
	Trainees	3.16	1.20		
g) Teaching letter sounds	NQTs	4.01	0.73	0.039	0.0898
	Trainees	3.90	0.92		
(h) The way a story is put together	NQTs	3.36	0.94	0.025	0.0939
	Trainees	3.24	1.18		
(i) Understanding the overall meaning of a story, poem or other piece of writing.	NQTs	3.25	1.15	0.329	0.630
	Trainees	3.04	1.26		

3.5.1 Experienced Teachers' Knowledge, Understanding, Practice and PCK

We observed and conducted interviews with experienced teachers who had participated in three CPD programmes – SbTD, EGR and RTL which are described in Chapter 1. The EGR intervention which focused solely on the use of phonics to teach reading in the lower primary was abandoned after the pilot phase. When we went to the field, we found that the implementation of the pilot phase of the RTL programme whose innovativeness is the use of the whole language approach to teaching reading, had just started. Consequently, discussion in this section is based on observations and interviews of SbTD teachers [known as Key Resource Teachers (KRTs)].

The SbTD programme trained teachers for reading and mathematics nationally in early 2000s. Although it focused on the teaching of English generally, the SbTD programme had a strong reading component and a specific focus on teaching reading in the lower primary. In our discussion of the knowledge, understanding, practice and PCK of SbTD KRTs, we will focus on their use of (i) reflective teaching approach, (ii) teaching methods for reading, (iii) group teaching, and (iv) TLMs. However, our KRT sample was very small as we were able to observe and interview only five KRTs teaching reading. Given this very small sample, what we say below should be taken with some caution. All the same, we believe that the knowledge, understanding and practices of the five teachers is indicative of what the SbTD training had tried to achieve and how it had changed the practice of some of the teachers trained.

Reflective teaching approach

The SbTD intervention introduced the reflective teaching approach to Kenya. Although the KRTs did not talk about reflecting on their practice specifically, we could sense aspects of reflection in their practice. A KRT from Central Province told us that the purpose of SbTD was to improve teaching of reading in primary schools and went on to say, *'Sometimes you teach and children do not understand and then maybe you say that it is the children who are not performing when it is you'.* In the words *'when it is you',* the KRT is hinting at the possibility that children's failure to learn could actually be due to the teacher's practice and therefore the need for the teacher to think about what she/he is doing. The KRTs constantly talked about trying different approaches again

suggesting that they evaluated their practice regularly and sought to come up with the best ways of helping lower primary school students learn to read.

Teaching methods

From our observations of lessons and discussions with the KRTs, it emerged that their understanding of reading in the lower primary was broader and deeper than that of the NQTs. While they gave accounts of how they taught sounds, words, sentences and reading for understanding, just like some NQTs, they also talked about what helped children to read fluently, the importance of developing reading speed, and extensive reading for pleasure. Talking about the reading practices of her Standard 2 class, a KRT explained, *'We have a library and so they read. They finish one book and they come for another one. I tell them to tell me the story and they like that'* (KRT from Central Province).

The KRTs seemed to have a good knowledge and understanding of both the look and say and the phonics methods and seemed to use both methods in their teaching. While some KRTs leaned more towards the look and say method, others leaned more towards the phonics method. However, the KRTs seemed to concur that the phonics method is better for helping learners decode print and in helping those who are struggling with reading as the following excerpts reveal:

> *If it's a child who cannot do anything, who has just come, you go back to sounds. That's why they are in groups* (KRT in a school in Nairobi talking about how she helps non-readers who join her class)

> *The group that you are supposed to be in is the one that has very weak children because they need you. They need to know that there is the sound "a", sound "bu" so you go to those sounds* (A KRT in a school in Nairobi).

A KRT explained why the phonics method is more effective in helping children learn to read as follows:

> *Because if… like now if I have not taught the word "cow" and I am using look and say, the child cannot read the word but if I had taught sounds, the child can read; but even if I have taught the word in class by look and say and they memorize, they may not be able to read* (KRT in a school in Central Province).

The view that the phonics method is useful in helping learners to become independent readers is also supported by reading researchers such as Stanovich (1986) and Slavin, (2009).

From our observation and interview data, it was evident that the KRTs used a combination of strategies to help students in their classes learn reading. As already indicated, the KRTs used a combination of the look and say and the phonics methods. They organized the students in groups and spent more time working with phonics with non-readers and they provided ample opportunities for the children to practice reading and got children to read library books. In whole class reading activities, they got the children to touch the words to ensure that all the children had their attention on the words they were reading. In other cases, KRTs had each child read at least a sentence of the text being read to ensure that all the children in the class got a chance to read. A KRT explained her actions of having each child at a time read one sentence of the text they were reading thus:

> *Then the next step was to read sentences because I wanted to make sure that every child in the class knows how to read. If groups are allowed or the whole class reads together, we may not know the pupils who do not know how to read. But reading alone, I have always known the pupils to help* (a KRT in a school in Central Province)

From our interview data, it appears that some KRTs explored all possibilities including seeking the assistance of ECDE teachers to ensure that the children in their classes learn to read. We asked a KRT what she was going to do with non-readers who had recently joined her class. We capture the discussion below:

Interviewer 1: *Now that you know those other people who cannot read very well, what will you do with them so that they can read?*
KRT: *We have agreed with the pre-unit*[31] *teacher to help me.*
Interviewer 1: *To help you?*
KRT: *Yes.*
Interviewer 2: *To show them how to read together with hers?*
KRT: *Yes. So when they* (the pre-unit children) *are reading the sounds, they* (those in the KRT's class who cannot read) *go there in the afternoon.*
Interviewer 1: *So they also go and study phonics as you said and then they develop from there?*
KRT: Yes

The KRTs described the process of getting all the children in their very large classes (over 60 in some cases) to read as being '*very hard'* and '*not easy'*. A KRT described the process that she had gone through from Standard 1 with her Standard 3 class in which virtually all (except the recently admitted) could read fluently as follows:

i. Read the alphabet and the sounds every morning
ii. Getting different groups of children to read sounds of randomly selected alphabetical characters each morning
iii. We then extracted the vowels from the alphabet and read them
iv. We then read the vowels before we came to joining words

She indicated that she had spent a lot of time on sounds in Standard 1.

Our interview data suggests that the KRTs' practice had benefitted from several sources ranging from the initial teacher education ITE programmes, to the SbTD CPD to learning from their own practice. The KRT in the above dialogue and who preferred and used the phonics method effectively told us that she learnt the phonics method in the PTTC from a foreigner teacher educator nun. All the KRTs concurred that they learnt group work methodology from the SbTD programme. We a KRT where how she had learned to break down long passages so as to concentrate on segment by segment. Her response was:

> *I find it just helpful, not necessarily getting it from elsewhere. It all depends. It all depends with what you are teaching and the people you are teaching (a* KRT in a school in Central Province).

The implication here is that as the KRTs searched for the best ways to help children learn to read, they tried different methods. However, the decision on what to do was based on the content of what they are teaching and the environmental factors in the classrooms including the children themselves. The foregoing suggests that the KRTs were drawing on their knowledge of the content and their pedagogical knowledge to make instructional decisions.

The KRTs appeared to have some understanding about the value of utilizing the linguistic resources of their students to facilitate learning reading[32]. One KRT told us that when she was using the phonics method to teach reading in English, she benefited from the fact that the class had learnt about sounds in Kiswahili thus: *we learn Kiswahili as mother tongue here. Now it (Kiswahili) also helped us so much when joining the vowels, like "t" and "ta"*[33].

We observed KRTs use some codeswitching into and out of Kiswahili in teaching reading and in our interviews, we questioned them about it. A KRT responded thus:

[31] The ECDE class located in primary schools
[32] Unlike PTE which prohibited the use of other languages in the teaching of English, the KRTs informed us that the SbTD encouraged the KRTs to use the mother tongues and Kiswahili when in the teacher's judgment, their use enhanced learning.
[33] Kiswahili is a syllabic language and that is why they had found it easy to '*join sounds'*

> *In my own understanding, you cannot stick to one language. You have to explain in Kiswahili. If a child cannot speak that English, let the child speak Kiswahili, then you tell the child you are supposed to say this in English. Otherwise, if you let that child not to talk because it is English time, and tell him that if you cannot speak in English just keep quiet, he will not learn. When they speak in Kiswahili, then you explain, eventually, they will be able to speak in English. Otherwise in this early stage, you cannot stick to English alone. You will be spoiling these children. Imagine how they came. They could not understand that English or even Kiswahili. If I had said no, it's English; I could not have gone where I am now. If there is something they did not understand, I explain in Kiswahili then I tell them in English and I will continue like that. Eventually as they go to class two they will be able now to speak English* (a KRT in a school in Nairobi).

Teaching in groups

It appeared that the KRTs used the group teaching method regularly and well. All the KRTs we observed organized their classes in groups. It appeared that for the KRTs group teaching method served several purposes. The following excerpts illustrate the various purposes:

> *Like today, I had mixed ability but one group was made up of special cases* (i.e. the poor readers). *When they are in mixed ability group, the good ones will help the poor ones when they are working* (a KRT in a school in Central Province)

Here, the teacher is referring to the case when the non-readers are separated from the others so that she can help them while the rest are in mixed ability groups with carefully selected group leaders who are themselves fluent readers and therefore can help others with words they find difficult to read. The group work methodology also helped the KRTs to monitor learning as the following excerpt illustrates:

> *Okay, what you do, you see this group work, this group work help so much because if you go to this group you understand how the group is and you understand the ones who are weak. When you are marking the few questions you have given, it will help you to get the ones who are weak and then after that you will be able to help them (*KRT from Central Province)

Indeed, the KRTs seemed to have fairly good idea about where their students were at in learning to read. When we asked one how many non-readers she had in her class, she responded:

KRT : *Let me say all those who cannot read can read through the sounds but there are two who cannot read "ba, be, bi, bo, bu". Those ones who came recently have not mastered yet. Then there are those who can read just the words but they cannot read a sentence*
Interviewer : *They are about?*
KRT : *Lets say they are about 10* (a KRT in a school in Nairobi)

TLMS

The KRTs seemed confident in their ability to teach reading in the lower primary using various TLMs. They effectively used a variety of TLMS such as flash cards, charts and concrete objects. However, unlike, the NQTs, who seemed to feel compelled to use TLMs in every lesson, the KRTs used TLMs when they felt they would add value to what they were teaching. We asked one KRT who taught reading comprehension in a Standard 3 class why she had not used TLMs in her lesson. Her response was that she found the pictures in the pupils' textbook sufficient for the lesson and explained that she made and used charts but that she used them only when she thought they were necessary.

From our observations and interviews with KRTs, we formed the opinion that a considerable number of KRTs had internalized the reflective teaching model emphasized in the SbTD programme and developed skills and understandings about reading and learning to read and the capacity to translate these into classroom practices that positively impacted on students' learning to read. We were convinced that the very good KRTs were operating at Shulman's (1986) pedagogical content knowledge level.

Summary and Conclusions

The discussion in this chapter has followed the lower primary reading teacher along his/her considerably long journey to becoming a good teacher of reading – one who is, has and is able to combine the three types of knowledge found to be critical ingredients of quality teaching of reading (and other subjects) – content knowledge, pedagogical knowledge, and pedagogical content knowledge.

The key points that emerged from the foregoing analysis are:

1. The teacher's journey starting in the PTTCs is hampered by PTE reading teacher educator's lack of adequate knowledge, understanding and pedagogical knowledge for teaching reading which leads to emphasis on theoretical knowledge at the expense of understanding and pedagogical knowledge. The fact that the curriculum and curriculum materials present teaching reading as a technical endeavor in which the teacher only needs to engage students in set activities using a set of TLMs exacerbates the problem. Further, the trainee passes all exams and graduates fairly easily as he/she is able to demonstrate competence in the theoretical knowledge emphasized in the PTE program.

2. Trainees have limited knowledge of the lower primary reading curriculum as the primary school syllabus is not a key focus in the reading method classes.

3. In the PTTCs, the emphasis in teaching reading in lower primary classes is on the use of the look and say method at the expense of the phonic method and many NQTs lack the confidence to use the phonic method to help students who are encountering difficulties in learning to read.

4. On entry into teaching, the newly qualified teacher finds little in the way of professional support so as to continue learning how to teach reading. In fact, in some cases, the NQTs lose even the few techniques they had learnt in college such as the use of TLMs. Most importantly, the NQTs seem helpless once theoretical knowledge gained from their training does not work and many children in their classes don't learn to read.

5. The SbTD trained KRTs had a deeper understanding of reading and pedagogy.

6. The KRTs, were more effective in teaching reading in lower primary classes. Their instructional decisions seemed to be informed by considerations of the learning needs of the different learners in their classes.

In conclusion, we posit that the reading teachers' journey can become more enriching if ITE could be reformed to ensure that trainee teachers make a strong start and only need CPD to renew and extend their knowledge, understanding and practice.

Chapter 4: Learning to Teach Mathematics

Introduction

The international research on mathematics teacher preparation for lower/elementary teaching suggests that, teachers' knowledge of mathematics, how it should be represented in teaching, and their knowledge of pedagogical procedures, factor into how their students learn mathematics (Fennema & Franke XXX). It also appears to be the case that the extent to which teacher trainees get exposure to and develop understanding of curricular materials, including textbooks shapes their level of effectiveness in teaching school mathematics (see Ma 1999). Teacher trainees come into training with whatever knowledge and understanding of mathematics acquired through schooling. Research on elementary school mathematics teachers' knowledge and its impact suggest that, "when a teacher has conceptual understanding of mathematics, it influences classroom instruction in a positive way" (Fennema & Franke, XXX p 151). Thus, what goes on as far as this link is concerned must presumably make a difference to how they perceive and rationalize their competence in teaching. This chapter seeks to uncover the process of learning to become a primary mathematics teacher – from college to early years in school, focusing on what training focuses on, and how it is understood and transformed into practice at classroom level. It also examines some of the underlying knowledge base in primary mathematics of trainees and teachers in the early years of teaching. The objective is to examine which aspects of this knowledge changes from training to early years of teaching. Beginning to understand more about these shifts is a necessary precursor to improving primary teachers' effectiveness in teaching mathematics for understanding.

4.1. The Identity, Knowledge and Practice of Mathematics Teacher Educators

Eight mathematics teacher educators, six male and two female, drawn from four PTTCs in the Coast and Central provinces were selected for the study. Observations of lessons in which the teacher educators taught methods for teaching mathematics in the lower primary followed by interviews enabled us to gain some insights into the knowledge, understandings and practices that informed the trainees own knowledge, understanding and practice.

4.1.1 Background Characteristics and Training of Mathematics Teacher Educator

One of the eight teacher educators had a Masters degree in mathematics education. All the other seven were Bachelor of Education degree holders trained to teach mathematics and one other secondary school subject. Four teacher educators had taught in secondary schools for periods ranging from five months to 10 years prior to being deployed to teach in the PTTCs while three had taken positions in the PTTCs immediately following graduation from the university. The teacher educators PTE teaching experience ranged from one to 26 years. Consequently, all the teacher educators had neither the training in teaching PTE mathematics, nor any experience in teaching primary mathematics and each one faced serious challenges when they first started teaching in the PTTCs. The challenges they faced revolved around teaching methodology at two levels – PTE methodology for mathematics that is, how to teach trainees how to teach mathematics, and methodology for primary school mathematics. Lack of knowledge of primary school curriculum and primary schools generally did not help matters. The teacher educators recounted to us the difficulties they faced as the following excerpts illustrate:

> *You know in high school, we teach the content, we teach the children how to calculate basically in Maths but here in college I discovered you need to teach people how to go and teach and I had never been exposed to the primary school curriculum before, in fact when I came here first I didn't know anything about primary school and then I was supposed to teach them to go and teach there* (female teacher educator in a PTTC in Central Province)

> *When I was first posted here is when I realised that some things that we think are obvious, are not always obvious because I remember when I was very new somebody had to show me how to demonstrate multiplication of 0 X 4, you know that kind of thing, so the stress here is on the methodology but the content is more basic. The challenge I faced here was on methodology and not content* (a female teacher educator in a PTTC in the Central Province)

> *When I first came to teach at the TTC, I faced very many challenges. One, the syllabus itself, when you look at the primary syllabus because you have a thorough understanding of how maths is, you tend to think it is so easy to teach but let me give you an example, you may think that the topic addition can be taught in one lesson and yet it can't. This is because you need to teach that concept of addition in a way that trainees can acquire the skills to be able to teach it to children* (a male teacher educator in a PTTC in the Coast Province).

Clearly, these teacher educators were struggling with the difficult issue of how to represent mathematical concepts and operations which, to older learners appear easy, in ways that will help lower primary school students grasp these concepts and operations. In the words of one of the teacher educators, they found this to be '*very hard'.* All the same, they were looking in the right direction as they seemed to be hinting at pedagogical content knowledge. According to Shulman (1987), pedagogical content knowledge is "the most useful form of representation of ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations – in a word, the ways of representing and formulating the subject that '*makes it comprehensible to others"* (p. 9, emphasis added).

We sought to find out how then the teacher educators learnt how to teach PTE mathematics. The question as to whether they were inducted into PTE mathematics generated different responses. But what seemed clear was that there was no formal induction programme in the colleges and thus different teacher educators had different experiences. The experiences ranged from virtually no induction to some loose arrangements with colleagues who were in the PTTCs for longer. One teacher educator described his experience thus:

> *If there was induction then it was very little, let me say there wasn't. We were just told these are the rules of the college, these are the classes, this is how you are supposed to conduct yourself but the content of it, was an individual effort* (a male teacher educator in a PTTC in the Coast Province).

On the other hand, in two colleges, the teacher educators explained that if a new teacher educator was assigned to teach the first year class when methodology is taught, such a teacher educator was assigned to the head of mathematics department for induction. However, interestingly, when a new teacher was assigned to teach second year class, such an arrangement was nonexistent. How such teacher educators were expected to learn whatever those receiving induction from the heads of department, from was not clear. We can only hypothesis that the heads of mathematics department did not consider the content of the induction fundamentally important to the teaching of mathematics in PTTCs. Conversely, they might have felt that newly appointed mathematics teacher educators could somehow pick what they needed easily along. This is contrary to what one teacher educator told us about her experiences trying to learn how to teach PTTC mathematics more or less on her own. The female teacher educator from one of the PTTCs in Central Province said she found it to be '*very hard'* while another teacher educator remarked that it takes a teacher educator at least two years to familiarise him/her self with teaching at the PTTC. Clearly, trainees taught by such a teacher educator learnt little about teaching mathematics in that period.

With no prior training in PTE mathematics and virtually no induction, mathematics teacher educators claimed that their knowledge to teach at the PTTCs was obtained from two main sources – from colleagues through informal arrangements and from books. Some of them talked to us about how they found *helpful, very good* colleagues who helped them. A teacher educator explained to us as follows:

> *When I joined this college, the former principal of this college, who was extremely good in methodology and content, taught me a lot…he used to tell me… do your teachings like this* (a male teacher educator from Coast Province).

It appears that teacher educators learning from more experienced colleagues were learning by being told what to do in the classroom rather than through a discursive, practice and reflective process to deepen their understanding of learning to teach mathematics. Newly appointed teacher educators could therefore have been acquiring shallow knowledge and mere techniques with little understanding about how trainees learn to teach lower primary school mathematics. It is such weak theoretical and practical knowledge base that such teacher educators were drawing from in their lessons. The implication is that trainees were probably not developing strong pedagogical knowledge for teaching mathematics in the lower primary.

This perception about teaching mathematics as the mere conduct of activities was legitimized by the PTE mathematics syllabus and textbooks that emphasised activities without trying to help trainees conceptualize how the activities enable the students understand mathematical concepts.

As indicated in Chapter 2, the first PTE mathematics textbook was published in 2008; and there were hardly any reference materials in the colleges on teacher training for mathematics teachers. Access to books on methodology therefore took considerable effort on the part of the teacher educators. A teacher educator who characterised herself as a perfectionist described to us her search for books as she tried to get knowledge on how to teach teacher trainees:

> *Let me say that when I do something, I like to do the right thing and when I discovered I was not getting enough information, I decided to do my own research. There are some various books I was able to get from the library. Sometimes, I would go through some libraries in the universities and borrow very, very old books and pick up some of the ideas because I realized that for you to teach in primary school you need to approach the subject from the practical point of view and I realized that …some books have a lot of that so I would read a lot of those books and get those ideas* (A teacher educator in a PTTC in the Central Province).

Efforts such as those of the above teacher educator are laudable. However, we hypothesised the '*very very old books'* she managed to get from the university libraries would not be informed by emerging conceptualisations of good teaching as a complex mix of knowledge, understanding, practice and pedagogical content knowledge which is best approached by the teacher adopting a reflective stance to teaching (Shulman 1987).

4.1.2 Teacher Educators' Knowledge and understandings of learning to teach

Knowledge and understandings about learning to teach mathematics

In our interviews with teacher educators, we focused on getting their understanding of what is important for trainees to learn about teaching mathematics in lower primary. We felt this would give us some insights into their understandings about learning to teach mathematics. We asked the teacher educators what they thought a good teacher of mathematics in the lower primary should know and / or what are the qualities of a good teacher of mathematics in lower primary are. The teacher educators did not immediately tell us things related to helping children learn mathematics. One teacher educator intimated that a good teacher is the one who lays a good foundation such that the students do well throughout their education

> *If for instance you have forty pupils and I have forty pupils, we teach the same in different classes and then my children after going to form one keep on excelling even after form four then I can say there is something which I invested in those children … to me, I would*

want to see that teacher who can keep the mathematics fire burning (a teacher educator from the Coast Province),

Several teacher educators associated good teaching of mathematics with trainees passing either the PTE examination and teaching practice or the lower primary teacher helping children pass exams or simply just doing what the teacher educator has told them they should do. One teacher educator said he would consider a trainee to be a good teacher of lower primary if '*he* (a trainee) *is able to do what I normally tell them they are supposed to do*' (teacher educator from Coast Province). Surprisingly, another teacher educator included good grooming as part of the qualities of a good lower primary teacher of mathematics. When we probed further, he argued that this will make the students like the teacher and therefore develop positive attitudes towards mathematics. In fact, several teacher educators mentioned affective attributes as constituting good qualities of good teachers of mathematics. On the other hand, teacher educators also considered good mastery of content critical to good teaching.

However, the teacher educators seemed to agree on two things (i) the importance of the teaching being systematic and following well defined steps or stages and (ii) the use of TLMs. Responding to the question '*What was your objective in the lesson?*' A teacher educator from a PTTC in the Coast Province said, '*I wanted the students to be aware of the stages of lesson development'.* Our observations of teacher educators' lessons indeed revealed a heavy emphasis on steps/stages of teaching concepts and / or operations. The trainees also indicated that this was the case and indeed they were very satisfied with this approach. The teacher educators indicated that teaching systematically helped learners understand concepts. However, they did not explain to the students or to us exactly how this happens. It seemed to us that the trainees were learning what to do when teaching without getting an adequate understanding of how it would help lower primary students learn mathematics. The danger with this is that the trainees could be acquiring notions of teaching as a technical endeavour that can be accomplished through following laid down procedures without any consideration of the reality of the classroom situation.

This rigid approach to teaching can be attributed to several factors. Firstly, the teacher educators did not have any training and few had had any CPD and therefore knew no other way. Secondly, as demonstrated in Chapter 2, the mathematics syllabus and textbooks required it of teacher educators. In fact, some of the teacher educators justified what they were doing by telling us that they were following the syllabus. Thirdly, there were no books on teaching methods in the lower primary in the college libraries. Fourthly, trainees passed the PTE examination and teaching practice and therefore, it probably never occurred to the teacher educators that there was a problem with the approach.

Knowledge and understanding about TLMs

Use of TLMs was considered to be critical by virtually all the teacher educators. According to some of them, mathematics concepts are abstract and thereof teachers need to use TLMs especially real objects to engage learners in activities. They explained:

> *We realized that when primary kids are taught practically they internalize what you are teaching but if they are taught by theory, just theory, they will forget the same* (a female teacher educator in a PTTC in the Central Province).

> *We should try to engage learners in activities so that they can realize it by themselves* (A male teacher educator from the Coast Province).

However, the teacher educators seemed not to have grasped exactly how use of TLMs helped students internalize concepts. It was like using of TLMs would work like magic the outcome of which is students '*realizing it by themselves'.* Many teacher educators also mentioned motivational attributes of TLMs pointing out that they help make the lesson interesting to young learners.

Surprisingly, there was no discussion about appropriate use of TLMs or even which TLMs were good for what concepts / operations. In the case of teaching place value for instance, in their demonstrations, teacher

educators used a variety of TLMs including sticks, counters, place value tins, number line and the abacus. Interestingly, there was no discussion as to the circumstances in which it might be better to use one TLM than another TLS. In one of the lessons we observed, students showed a preference for the abacus which suggested that they found it easier to teach place value using the abacus. However, the teacher educator did not take this as signalling that the trainees had not understood how to use the other TLMs.

What surprised us was that although the teacher educators put so much value on TLMs they indicated to us that they aware that primary school teachers don't use them. They attributed this to either pressure of work as teachers try to cover the syllabus in a highly competitive examination oriented system or to sheer negligence. Older teachers consequently mock NQTs for using TLMs by saying things like, '*Hizo charts, mtachora mtachoka' (***Kiswahili for you: will draw those charts and you will get tired of drawing**) and telling the NQTs that the charts will not improve the mean grade[34]. One teacher educator estimated that NQTs give up using TLMs within a year of their starting to teach. What was surprising was that no teacher educator indicated that perhaps trainees did not understand how to use TLMs to help young learners learn mathematics. In other words, it seemed that they did not reflect on their own practice in teaching the use of TLMs. In fact, the teacher educators were satisfied with their ability to teach the trainees how to teach mathematics to lower primary students.

4.2 Teacher Educators' Practices

In our observations of lessons in PTTCs, we sought to understand what trainees were learning about how to teach lower primary mathematics from what the teacher educators were saying and doing in methodology classes. We found that teacher educators used various methods in teaching how to teach lower primary mathematics. We found teacher educators tended to follow similar patterns. Key ingredients in these lessons were teacher educator explanations with or without demonstration, trainees demonstration of how to teach different concepts with TLMs, and question and answer. In all cases, teacher educators were keen to mark out the steps or stages a teacher should use in teaching different concepts and operations and the fact that trainees should use TLMs. The lesson in the table below which was taught by a female teacher educator is an example of a lesson with all the key ingredients.

Although most of the lesson followed the above process, we observed two lessons that were significantly different. In one lesson, the teacher educator adopted simulation approach and took on the role of a lower primary teacher teaching the concept money. In the other lesson, the teacher educator used ICT to teach how to teach measurement. However, the structure of the lessons remained the same as in the above example of a lesson. For example, in the lesson in which the teacher educator used ICT, he used the power point to provide definitions, summarize key points, list TLMs and activities that should be used and give questions. This was interspersed with demonstrations by the teacher and also the trainees.

We also heard from the teacher educators themselves and the trainees that owing to pressure of time, the lecture and note taking method was also used. In all these lessons, there were no discussions on what to do if some students still didn't learn. What we observed were discussions about common misconceptions yet such discussions were not situated in observed misconceptions in real classrooms.

The foregoing discussion on teacher educators background, knowledge, understandings and practice, suggests that the teacher educators' view of learning to teach mathematics was informed by a technical rationality model. Trainees are not trained to think about what they are teaching, who they are teaching and the different ways in which what they are teaching can be formulated and reformulated to ensure that students develop deep understandings of concepts and operations as a result of different representations of the same thing; and so that trainees can also be well equipped to help learners at different levels of learning mathematics in the lower primary classes.

[34] This is the average score for the school or class in an examination

Operations on Whole Numbers: Addition of Three Digit Numbers without Carrying

Step 1: The teacher educator introduced the lesson by asking review questions on pre-number activities. She first asked the question: What are pre-number activities? The trainees answered – grouping, ordering and matching. She then asked how children can be taught the concept/idea of a number. A trainee provided an explanation of how a teacher can use counters.

Step 2: A trainee was called to the front to explain and demonstrate how she would teach addition of three digit numbers using sticks. She did so successfully using place value containers and talking through the activity. The class of trainees behaved like lower primary children and asked questions about the demonstration

The teacher educator then clarified how to teach digits 1 to 9 and what a child should do when the number of units becomes ten (10), using a bundle of sticks (tying one bundle of ten). She explained on the chalkboard the representation of 1 bundle of tens as 10.

Step 3: The teacher educator introduced how to teach the concept of place value on the chalk board using bundles of sticks to demonstrate. 2 bundles of 10 sticks and no 'ones' - 2 bundles of 10 = 2 and 0 i.e. no tens.

Step 4: Addition using the place value concept - This was done by teacher educator through explanation and demonstration using bundles of sticks. She used the example of 23 + 2. She explained that you have to add the ones first and then the tens She finally got the answer 2 tens and 5 ones.

Step 5: The class was asked to discuss in groups, how they would practically teach the value of digit 4 in the number 47. The teacher educator went round the groups assisting them

Step 6: A trainee was picked to demonstrate the procedure of teaching place value on the chalkboard. She explained this using bundles of sticks and asking the class questions as she did so. She ended up with 4 bundles of tens, and 7 single sticks.

Step 7: Involved using the abacus and three different colour bottle tops to represent different values – hundreds, tens and ones. A student was called to the front to demonstrate. She asked the class questions as she demonstrated.

Step 10: The teacher educator concluded the lesson by summarizing the approach to be used in teaching addition without carrying and the approach to be used with carrying.

4.3 Teacher Trainees' Reflections on Learning to Teach Mathematics

In the FGDs, we sought to understand the knowledge and understandings the trainees had acquired in the PTTCs about teaching mathematics in lower primary. Our data showed that the trainees' Knowledge about lower primary mathematics curriculum was limited as they had not had ample opportunity to interact with the syllabus and the text books. The colleges had few copies of these in the library but the teacher educators did not create opportunities for the trainees to study these curriculum documents in the actual lessons. Trainees only got to work with the syllabus and textbooks when they went on teaching practice. Indeed, studying the primary school mathematics syllabus did not seem to be an important part of the practice in the PTTCs. Virtually all teacher educators confessed they did not use the primary school curriculum documents in their lessons and explained that the trainees were expected to familiarize themselves with the syllabus as they made their schemes of work in preparation for TP.

In the FGDs, the trainees indicated that their training had equipped them with different methods of teaching mathematics in the lower primary as well as knowledge of the structure of mathematics lessons. The trainees claimed they had learnt methods such as discussion, demonstration, dramatization / role play, practical approaches and activities, and even field trip as the methods they had learnt. Knowing different methods of teaching mathematics gave the trainees considerable satisfaction. A trainee from a PTTC in Coast Province explained, '*I feel I am a better equipped teacher now because now I understand about methodology and have learnt many different methods of teaching'* (a trainee from a college in Central Province).

Although the trainees hardly used the term 'learner/student/pupil-centred' methods, they talked of having learnt the value of using activity/practical methods; and of involving learners in the lesson and they were full of praise for the methods. A trainee from a PTTC in the Coast Province explained:

> *When you involve learners during teaching, they learn better through active learning or participation. They get the concepts very well. But if the teacher is just teaching alone and the learners are only listening, they tend not to get everything because the lesson tends to bore but when you involve them it means they participate and they are active so they get what the teacher teaches (Trainee from a TTC in Central Province).*

Indeed, one trainee declared:

> *I will not teach the way I was taught by those old teachers. I have to use a lot of practicals but the way they taught was like lecture method* (Trainee from a TTC in Central Province).

The trainees were particularly happy because they had learned how to structure mathematics lessons. Trainees who had had some prior teaching experience before joining the TTC were most satisfied with the training. One of them stated:

> *I am now glad that I know the stages to follow when teaching contents in maths. I now understand how the various steps of the lesson structure should follow from the start to the end* (A trainee from a TTC in Central Provinces).

They indicated that before the training, they were not aware of the stages in a lesson. Indeed, they expressed confidence about their ability to teach lower primary mathematics. One trainee put it thus:

> *I can say I have learnt a lot. I am now able to go to class and teach properly. Before I joined this place, I thought people just go to class and teach so long as you know how to calculate math, you can calculate what the pupils can understand. But now I know the procedure (Trainee from a PTTC in Central Province).*

The trainees asserted that knowing the teaching methods and how to structure lessons had given them self-confidence which they didn't have before the training. Talking about what they gained through their training, one trainee explained:

> *I think what we have gained from the training is self-confidence. Some of us had done the practice out there in primary schools but you were not sure of yourself - you just imitated what you saw your teachers doing but, now, after we have come to the TTC, we have self confidence. We have confidence in ourselves such that when we go there we know how to start it and how to end it* (Trainee from a PTTC in Central Province)

The trainees' confidence is understandable since in the textbooks and in the lessons, teaching mathematics in the lower primary was presented as unproblematic. Virtually all the trainees in the FGDs indicated that they had learnt about different teaching aids for teaching mathematics in the lower primary and how to use them. They mentioned teaching aids such as counters, strings, concrete objects or realia, flash cards, the abacus, and place value tins. However, the trainees seemed to have acquired only theoretical knowledge about TLMs. A trainee from a PTTC in the Coast Province explained:

> *Normally, teaching aids help in understanding more. When you use teaching aids, the children are able to understand more easily than if it is theory*

Indeed, the trainees seemed to have inadequate understanding of how exactly using TLMs enables understanding as the following excerpt illustrates:

> *If you want to get them to know numbers one to nine using the counters, take nine coins then you count the nine coins then you count with them that is, one coin up to nine. At the time you are counting one coin, you write one in words; now make them to recognize that one is represented by a letter to show that you write now the numeral. Now write them in words up to nine so from there they will recognize that if we have nine coins this is how it will be written in numeral form. Yah so you associate the number of things with the numerals* (A trainee from a TTC in Central Province).

On the other hand, trainees demonstrated overconfidence about their preparedness to teach mathematics at the lower primary. Asked about the challenges they expected to face as teachers of mathematics in the lower primary, the trainees identified general issues such as pupils attitudes towards mathematics, their own lack of knowledge of local languages in areas where local languages were the mandated languages of instruction, how to maintain class control and lack of teaching-learning resources. We pressed trainees to identify challenges related to their competence but they failed to identify any.

Though rare, a few trainees demonstrated the precursors of reflective thinking about teaching. For example, in an attempt to explain what the mathematics teacher should know in teaching lower primary, one trainee stated:

> *It is good for the teacher to think from a child's perspective such that whenever a child gives a wrong answer, the teacher can be able to think how the child could have thought so that he has given that answer (*A trainee from a PTTC in Coast Province)

The above excerpt suggests that the trainee has some awareness of the need to think through what is happening in the classroom. Teachers' identification of the thinking behind learners' outputs is essential in making decisions about how to represent concepts in ways that will help the learner understand.

On the other hand, it was evident that the trainees had not had opportunity to reflect on what teaching mathematics in the lower primary means. When we asked what the qualities of a good lower primary mathematics teacher are, trainees mostly identified only general attributes of a good teacher touching on knowledge of content, use of teaching aids and affective attributes such as good rapport with the learners, understanding the learners, being friendly with the learners. Despite our probing, the trainees did not identify mathematics specific teacher.

4.4. Linking Knowledge to Practice: Insights from NQTs Teaching Practices

In this research, we wanted to understand the extent to which NQTs used what they had learnt in their training and the extent to which they adapted it to fit the situations they found in the classes they were teaching. We therefore observed NQTs teaching a variety of topics in lower primary classes and subsequently engaged them in discussions about their teaching. In total, we observed 19 NQTs (2 male and 17 female) teaching mathematics in lower primary classes and conducted interviews with them following each observation.

NQTs practice

In the observations, we saw NQTs structure their lessons so that they had an introduction in which they asked questions on the previous lesson. In some cases, they reviewed what was taught previously by writing on the chalkboard an operation based on a concept that was covered in the previous lesson and solved it through question and answer.
The introduction was followed by what they called lesson development in which time they taught the new concept. They usually did this through what they called 'involving learners'. Learner involvement comprised individual students or the whole class doing some activities using TLMs or the teacher working out a sum while asking questions about what she/he was doing. The TLMs included counters such as pebbles, seeds and bottle tops, sticks, a clock and teacher and student-made beam balances. The next step of the lesson involved the students working on assigned exercises individually in writing with the teacher going round the room marking.

In the interviews, the NQTs expressed satisfaction with using this highly structured approach to teaching mathematics. They were proud of having learnt how to teach mathematics *systematically* in their training. However, they were not able to explain how teaching mathematics *systematically* was helping their students learn. For example, on asking and probing an NQT to explain to us the importance of the systematic steps he was observed to have used, he was unable to do so and only said the steps helped the students to retain what they had learnt thus:

> *The systematic steps are very useful. They are very useful because they help the children to retain much what you have taught; when you take them through those steps at least they can remain with something concrete in their minds* (An NQT from Central Province).

The same use of practices learnt without adequate understanding in college was found to apply to the use of TLMs. NQTs repeatedly told us that TLMs are useful in enabling the teacher present concepts in a comprehensible form for the child as in the following excerpts:

> *Okay, to me I think having trained …. I am able to know that a child in may be standard one doesn't know what 2 is but now from here I can be able to show that child what 2 is by giving him two objects so that the child understands what is 2* (NQT from Central province)

> *In maths, it becomes very easy for the pupils when we use teaching aids such as counters in addition and subtraction, a 'shop' while teaching about money, and also if it is measurements in standard two and three the use of measuring sticks. So these materials help the children to understand. If we teach orally without using the materials, they tend to forget* (An NQT from the Coast Province)

In these statements the NQTs reinforce the notion that linking mathematical concepts to concrete materials aids understanding but they don't tell us why or how that is so.

However, contrary to what they were saying, we found that the NQTs were not using the TLMs effectively. During classroom observation in which the teacher taught addition, we noted that although the teacher had insisted that the pupils must use counters, some of the pupils would quickly do the sums mentally and give the

correct answers. However, the teacher would ask them do the sums again using counters. When asked why she did this, the teacher explained that this was important because the pupils were of different levels (fast and slow learners) and as such it was necessary that they all counted so that they give the weak pupils time to learn how to count. Clearly, this approach amounted to holding students back from making progress.

NQTs didn't seem to know how to help weak students. Virtually all of them said that their strategy was to give them extra tuition after school. But when we probed further and asked the NQTs to tell us how they taught those they gave extra teaching in the afternoon, they indicated they followed the same methods they had used in the class. These would be the same methods that had not succeeded in helping the students learn.
From our observations, it emerged that many of the NQTs had inadequate understanding of teaching-learning methods. For example, in one of the lessons we observed, an NQT from the Coast Province used the group work methodology and had the children sit and work in groups. The NQT's explanation as to why she found it useful to organize students in groups for mathematics was:

> *We encourage group work, because it also helps them in as you know small children have a tendency of being possessive of their things. Right from home, they are like this thing is mine this thing is mine but when it comes to class you teach them how to share. You realized that in every table, I gave one textbook so that they share, although I also have a number of text books in the cupboard. So the reason of keeping them in group is to teach them how to share and; also to teach them how to work together as a team (NQT from Coast Province).*

The explanation given had nothing to say about how putting students in groups helps them learn mathematics. The explanation also suggests lack of understanding of group work method. In fact, keeping books in the cupboard while there are not enough to go round seems unjustifiable.

When we probed about NQTs sources of knowledge other than the PTTCs, one NQT indicated that he had learnt to teach from experienced teachers while some others indicated they had learnt from their own experience. However, elsewhere in our data from teacher educators and even from trainees, experienced teachers were not seen as progressive with regard to their teaching methodology. Therefore there is need to be cautious about their being models to be emulated. On the other hand, NQTs learning from their own experience is also to be taken with caution as their training had not even inducted them into the reflective approach to teaching.

4.5 Exploring Topics Teacher Trainees and NQTs find Difficult to Teach

We were also interested in gaining the perceptions of the exiting teacher trainees and NQTs on topics in the primary school curriculum they perceive to be difficult to teach (Table 6). For the teacher trainees their perceptions will largely be based on their college preparation, whilst NQTs perceptions are likely to be influenced by experiences of teaching in real classrooms. An underlying presumption behind our analysis is that, NQTs idea of difficulty will factor in classroom context and how that affects their pedagogical practices. It is important to be reminded that the NQT sample used had relatively considerable teaching experience – two and half years on average. We would expect that optimism and confidence in their abilities would be lower than that of trainees since they have had many experiences trying to teach these topics.

As noted in the FGDs with trainees, they were very confident of their ability to teach primary level mathematics, and felt the training received had prepared them well to promote effective learning of the subject. Much of this confidence appears to be driven by the emphasis of the TTC curriculum on mathematics knowledge for teaching as the focus of their professional learning activity, and what seems to be a view of practice based on transmission of that knowledge. If teacher training is resulting in progressive changes associated with the effects of training, then NQTs if adequately prepared to teach primary mathematics topics should find it increasingly easier to them. It may also be that, because the training does not expose prospective teachers to critical engagement and reflection on teaching primary mathematics topics, they may feel less confident handling certain topics once they start teaching in real classrooms.

In the survey, trainees and NQTs responded to questions on topics that they think (trainees) and have found (NQT) difficult or easy to teach. As Table 6 shows, there are some differences between the two groups in relation to teaching some topics. Clearly, when it comes to teaching addition of two or three digit numbers involving renaming, NQTs think it is more difficult than trainees. This difference is statistically significant and the effect size appreciable (Cramer's V = 0.2654). One of the topics we saw teacher educators teach trainees was addition of two or three digit numbers using instructional apparatus, such as the abacus. Although it involved demonstrations either by the teacher educator or trainees, the view from a child's perspective and especially how teachers could organize learning using these apparatus was never the subject of discourse in the college lessons we observed. NQTs in their practice seem to go through the motion of using TLMs in much the same way as they would have been taught in college, but forgetting it would seem, that this time those at the receiving end were children who might simply not grasp the conceptual idea of place value using the concrete materials.

NQTs and trainees indicated that they found 'estimating and measuring of length, volume and weight' somewhat difficult, and NQTs appear to find 'multiplication of numbers' much more difficult than trainees. Solving word problems is considered somewhat difficult by both groups. What both groups indicated they found easy to teach is teaching 'the meaning of numbers and counting', and 'place value'. In the case of the latter, we found teacher educators expending considerable effort in teaching the concept using 'bundles of sticks', abacus, stones.

Table 6: Mathematics Topics Trainees and NQTs find easy or difficult to teach

Which of the following maths topics do you find difficult or easy to teach in lower primary	Respondent	Mean	Std. Dev	Pearson Chi2	Cramer's V
Adding two or three digit numbers involving renaming ('carrying')	NQTs	3.38	0.92	0.000	0.2654
	Trainees	3.91	1.02		
Comparing Fractions	NQTs	3.34	1.06	0.068	0.084
	Trainees	3.52	1.14		
Division	NQTs	3.69	0.88	0.001	0.1199
	Trainees	4.00	0.88		
Estimating and Measuring of Length, Volume and Weight	NQTs	3.36	0.96	0.000	0.1507
	Trainees	3.33	1.31		
Multiplication of numbers (two digits and three digits)	NQTs	3.06	1.23	0.000	0.1373
	Trainees	3.54	1.24		
Place Value (0 to 100) i.e. tens, units etc	NQTs	4.00	0.80	0.078	0.084
	Trainees	3.90	1.06		
Recognising Fractions	NQTs	3.60	1.06	0.105	0.791
	Trainees	3.69	1.07		
Solving Word Problems	NQTs	3.08	0.90	0.000	0.1925
	Trainees	3.15	1.27		
Subtracting from two or three-digit numbers involving regrouping ('borrowing')	NQTs	3.27	0.96	0.000	0.1998
	Trainees	3.73	1.08		
The meaning of numbers and counting	NQTs	4.13	0.75	0.018	0.096
	Trainees	4.11	0.96		

Note: 1=not suitable; 2= very difficult, 3= difficult; 4= easy 5= really easy

It would appear, from the results, topics beyond this foundation topic are viewed as somewhat challenging. In fact as highlighted in the table, results that were statistically highly significant in terms of differences between the trainees and NQTs were mainly topics that would require teachers to possess profound understanding and knowledge of the different ways in which students could be assisted to develop deep understanding. It requires a consideration of how to make these topics clearer using a range of approaches that might address fundamental misconceptions or challenges of learning some of the basic concepts in primary mathematics.

What are we to make of these results? Bearing in mind the need to be cautious in interpreting these results, especially given that what we are dealing with is cross-sectional and not longitudinal data, it does suggest that perhaps college level training does not provide sufficient critical reflection on practice combined with studying the

content and materials that have been prescribed for teaching these topics. It should come as no surprise that trainees tend to be overconfident in their ability to teach, and NQTs feel less so once they have encountered real classroom teaching.

4.1.3 Experienced Teachers knowledge, understanding, Practice and PCK

As indicated in Chapter 1, there are few CPD programmes focusing on primary mathematics. In this research, we found only two (i) The national SbTD programme programme that trained what they called Key Resource Teachers (KRTs) - one for every primary school in Kenya. The mathematics KRTs we worked with were trained in 2002 and were fairly mature teachers, (ii) the Reading to Learn (RTL) programme that had just started on a pilot basis in the Coast Province. Discussions in this section are based on observations and interviews of 5 SbTD KRTs in Central Province and in Nairobi City. Given this very small sample size, our findings should be read with caution. However, we feel they give some indication of the knowledge and practices of some of the mathematics KRTs.

The SbTD programme adopted the reflective teaching model of teacher education. In the following paragraphs, we highlight the key pedagogical differences between the KRTs and NQTs that emerged from our data. The key differences between the KRTs and the NQTs emerging from our data were with regard to pedagogical knowledge, classroom interaction and use of TLMs.

Unlike the NQTs, the KRTs demonstrated strong pedagogical knowledge. They taught the class as a whole, in groups and individuals. They taught the class as a whole mostly at the beginning of the lessons when they were introducing new concepts. They then got the students to work in groups. Usually, they had mixed ability groups with the weak students in a separate group. They were therefore able to have students learning at their appropriate level.

This is how a particularly good KRT explained what she did in class and why:

> *I introduced the lesson step by step and then I gave an exercise. Then I went round marking the pupils' books and I also helped those who were a bit left behind because some could get, they only need a little assistance and I did give them. I also gave the quicker ones textbooks so that they could be able to continue. I have to make sure that everybody is occupied doing something that is why I was issuing textbooks and cards while I concentrated on marking and assisting the weaker pupils* (A KRT from Central Province)

She explained why she gave different TLMs to different children thus:

> *Some of them have gone through private nursery schools - most of them cover the primary one syllabus so they know everything and I can't take them back so I have to keep on pushing them forward. They know how to open textbook, they know how to use the textbooks, I have taught them from the beginning of this term and so when they are working with the textbooks they will give me time to concentrate on the weak ones. That is why I give them textbooks - you noted I did not give everybody. It was certain groups because I have grouped them according to their ability. I know the groups that use the textbook and for the cards. If you noted, the cards had simpler sums. So those who were coming up I gave them the cards so that they could be able to join the textbook group so that by the end of the year all of them will be using the textbooks because you don't just give them textbooks just because it is written for class one. Some of them don't know how to use them; some have not gone through nursery school so you teach them from opening the page, how to turn the papers, slowly by slowly*

The KRTs seemed to have a good understanding of what lower primary children need to learn mathematics and taught for understanding. One KRT explained:

> *Just like in reading, when you want a child to read, you give the child enough time, enough practical work, enough resources to go through the subject. Also, in mathematics, I give them ample time. In their groups, and even individually attend to each child and then the child understands, more so those who have got difficulties, we award them other times* (KRT from *Central Province)*

This same teacher told us that performance in her class improved when she started using knowledge and skills she learned from the SbTD programme. She said, '*The percentage mark for my class zoomed up'.*

The KRTs emphasized the need to give the children ample time and practice to learn mathematics. A KRT told us that she creates enough time for the children to learn as the following excerpts illustrate.

> *you give the child enough time, enough practical work, enough resources to go through the subject*

> *You will have to do it many times - like I did it now may be 30 got it 50 did not get. Tomorrow I will do it again, and maybe 32 will get. You do it so many times until they get whatever you want them to get. It is not a one time thing*

The '*it is not a one time thing'* underscores the importance of the teacher being patient with the students and therefore giving them many opportunities to learn.

We observed the KRTs use peer teaching. They had carefully chosen group leaders who were among the fast learners of mathematics and who seemed to have been taught how to lead groups and how to help the others in the group. On one occasion, as we were entering, we found a pupil teaching an attentive class and the KRT told us she had learnt how to use peer teaching in the SbTD programme and added, *'I tried it and I found it is working'.*

A commonly cited challenge for teachers in Kenya is the shortage of TLMs. In the interviews, the KRTs told us that the SbTD programme emphasized the use of TLMs in teaching mathematics. However, in our observations, we noted that the KRTs used the TLMs judiciously as in the case of the teacher who said she does not give textbooks to all the children in Standard 1 and that she first teaches the child how to use a book. With regard to availability of TLMs a KRT told us that it was not a big challenge for her and explained to us how she managed by collecting and making her own TLMs thus:

> *When it comes to materials side of it, you give yourself enough time to collect, enough time to prepare them, and even if the school does not provide, you have to put yourself together and know what to do. If you checked in my class, there were no manilas; maybe one or two. All the others are calendars. I come to your place and see an old calendar and get from you. Then I come and use it either the part with the pictures or the back side so that I have adequate materials for the pupil through collecting. You have to collect the materials* (a KRT from Central Province).

Our interview data reveals that the KRTs had developed their pedagogical knowledge from several sources including the PTE programme, the SbTD programme and from their practical practice as in the reconstructed questions and answers below:

Interviewer	*: Where did you learn that it is important to do the practical with the children before you engage them in doing the exercise?*
KRT	*: When I was training in college*
Interviewer	*: So that is not something you learnt through SbTD that is your own creativity?*
KRT	**:** *Yeah the teacher has to be creative. You have to imagine how your lesson will be.*
Interviewer	*: Can you use anything else for planning?*
KRT	*: We can use the syllabuses and the schemes of work or sometimes we can also think*

Interviewer *: Where did you learn the idea of making the concept simpler to the level of the children?*

KRT *: It is contained in the textbook.*

Interviewer **:** From where did you learn how to use teaching-learning materials?

KRT *: I can confidently say that although I was exposed to the use of resource materials during my P1 training, it was so theoretical. I frankly learnt how to use resource materials effectively during the SbTD training*

Interviewer *: Anything else you learnt from SbTD training?*

KRT *: Something else that I learnt is reflective teaching. Yes, you reflect back on what I have taught after the lesson. That one we learnt from KRT. Yaah, reflective teaching.*

Summary and Conclusions

The discussion in this chapter has followed the lower primary mathematics teacher along his/her considerably long journey to becoming a good teacher of mathematic defined as one who has and is able to combine the three types of knowledge found to be critical ingredients of quality teaching of mathematics (and other subjects) – content knowledge, pedagogical knowledge, and pedagogical content knowledge. The key points emerging from the discussion are:

1. The PTE programme is ineffective in preparing trainees to teach mathematics in the lower primary classes.
2. The lack of training and / or induction for mathematics teacher educators coupled with lack of materials on training teachers to teach mathematics at the lower primary leads to gaps in the teacher educators' understandings of learning to teach mathematics in the lower primary.
3. Because of 1 above, teacher educators emphasise theoretical knowledge instead of practical knowledge acquired through practice and reflection on practice. The consequences are that trainees develop a shallow understanding of teaching mathematics in the lower primary and do not acquire adequate pedagogical knowledge about teaching mathematics.
4. Trainees and NQTs associate teaching mathematics in the lower primary with unreflective conduct of activities using various TLMs. They learn to associate rigidly structured lessons with good teaching.
5. NQTs have a shallow understanding of TLMs and do not know how to use them effectively. Due to their lack of understanding and competence in using TLMs, and the examination oriented nature of the primary school curriculum, NQTs soon abandon use of TLMs in favour of traditional methods of teaching even as they continue to claim that theirs is learner-centred teaching.
6. SbTD trained KRTs were better able to adapt their teaching to the learning needs of their students and used a combination of teaching methods
7. The KRTs conducted more meaningful learner-centred teaching using TMLs appropriately
8. The KRTs had developed their knowledge, understanding and practice though various channels including ITE, books, the SbTD training and personal practice.

Chapter 5: Costs and Efficiency

5.1 Introduction

The purpose of exploring costs in a study of teacher preparation is to address two main issues, one of which relates to tutor-trainee ratios and its relationship to costs per trainee, and second the implications for improving effectiveness – that is to address the question: what teaching group sizes would optimise efficiency in the preparation of a lower primary mathematics or reading teacher. Group size is important for reasons that have to do with opportunities for engaging trainees in practical learning in colleges and the resources associated with it. If small group work activity and tutorial support is to be promoted to enhance the professional learning experience of trainees, then ensuring relatively small class sizes under conditions of improved instructional resources is important. The costs and efficiency analysis looks at the relationship between class sizes, tutor-trainee ratio, teaching periods per week and the cost per trainee. Data from the two francophone countries (Mali and Senegal) and two of the Anglophone countries (Ghana and Kenya) are used for the analysis[35]. In order to make categorical statements about the cost effectiveness of any of the individual programmes we would need to have a great deal more complex data, but the analysis presented here raises issues which might start a discussion amongst policy makers.

5.2 Assumptions[36]

This analysis looks at the elements of the college based training that are directed towards how to teach language and mathematics and need to be considered along with the issues raised in previous chapters about the balance between methods teaching and subject content teaching. The cost per trainee (Ct) can be shown as a function of average tutors' salaries $(AvTs)$ and tutor to trainee ratios[37] (TTR). In general, economic concern with cost efficiency would imply minimising $AvTs$ and maximising TTR in ways consistent with maintaining quality. But this will depend on what is delivered to trainees in the college mathematics and reading curriculum, which will also depend on salary costs per trainee and how this translates into tutors contact hours with trainees and the work which surrounds these contact hours. So, for example, a tutor could teach a group of 100 trainees to maximize cost efficiency, but the constraints on resources and intensity of practical learning activity would mean this is achieved at the expense of cost effectiveness – high practical/group learning intensity at sustainable costs. The cost and efficiency question is whether lower tutor salary costs per trainee and higher trainee-tutor ratios can be achieved without necessarily diminishing trainee contact time or practical intensity. Addressing this and other related questions is important because of the implications for (re) structuring the TTC reading or mathematics curriculum, the resources required to deliver the curriculum, and the number of tutors that might be needed to optimise teaching group size. It is worth pointing out that recurrent teaching costs per trainee will rise with average tutors' salaries and fall as the TTR increases. The main cost drivers can be separated into recurrent, salary and non-salary costs, and into fixed and variable costs. Recurrent salary costs are due to teaching faculty and support staff (Lewin, 1999). In our analysis we have assumed non-teaching salaries in the colleges relative to teaching salaries to be small. We have also excluded capital, equipment and supplies, and other costs such as maintenance, repairs, services etc.

5.3 Relationship between costs, tutor-trainee ratio and tutor workload

Efficiency indicators for the 4 TTCs in Kenya are presented in tables 7 and 8. They show a high trainee-tutor ratio for both English and Maths. Class size in College 1 is high compared to the other 3 colleges.

The average tutor salaries in the four colleges differ considerably which has implications for the costs per trainee. For English the cost per trainee is Ksh163, Khs438, Khs472 and Khs551 respectively. For the total number of

[35] Data from Tanzania and Uganda were not sufficiently complete to be included in the analysis

[36] The methodology for the cost and efficiency analysis is informed by Lewin's (1999) MUSTER discussion paper 1 on "Counting the Cost of Teacher Education: Cost and Quality Issues

[37] See appendix 1 explaining the mathematical relationship.

trainees, college 4 has relatively high costs per trainee due mainly to the fact that it employs more tutors to achieve a lower TTR. College 1 is able to achieve lower costs per trainee because of its high TTR. College 2 average teaching group size is slightly lower than that of College 1. For Mathematics, the cost per trainee is: Khs163, Khs370, Khs344 and Khs359 respectively. Again, it is clear that College 1 has the lowest costs per trainee because of the relatively high TTR, but also because tutors receive the lowest salaries compared to the other colleges. What is interesting is that the difference in cost per trainee for mathematics is not as wide as in English. This is likely to be due to the salary scale of the tutors. In effect, if tutors on average are on a high salary scale, the cost per trainee is likely to be higher for the same number of tutors and trainees. The opposite will also be true.

If Colleges employ more English and Maths tutors they would reduce the average teaching group size and potentially improve the quality of contact hours, but this is likely to increase costs per trainee if average salaries increase. Organising instruction around teaching groups in one place – the college classroom – is unlikely to allow for hands-on exploratory work where trainees work in groups with the classroom discourse characterised by investigations and practical activities. A more efficient way to improve professional learning at the level of costs indicated would be to shift much of the responsibility for learning to trainees, and allow tutors to act more as facilitators. This could be achieved with the current level of staffing. The organisation of learning in TTCs is very similar to that of secondary schools where trainees sit in rows listening to the tutor with little interactive space for activity learning and group work.

By keeping the teaching size the same as the TTR, tutors are able to have relatively low teaching loads per week, but this diminishes the intensity and quality of group interaction. It is important to note that what is delivered in terms of taught time (taught hours per week) for a particular cost, is a function of the number of trainees per tutor, the amount of teaching associated with the teaching posts and the average teaching group size. If group size is reduced this could potentially increase the teaching load. The bottom line is that, professional learning for trainees should operate under conditions that allow for smaller group sizes, otherwise tutors are likely to adopt teaching approaches that are less interactive (e.g. lectures and note taking).

Table 7: Efficiency indicators in 4 colleges

College[38]	Class Size English	Class Size Maths	Number of Trainees		Number of Tutors		Trainee-Tutor Ratio (TTR) English	Trainee-Tutor Ratio (TTR) Maths
			1st year	2nd Year	English	Maths		
College 1	84	84	340	330	2	2	170:1	170:1
College 2	40	40	510	490	10	7	102:1	128:1
College 3	43	43	435	415	7	5	109:1	145:1
College 4	37	37	350	320	7	6	88:1	117:1

Table 8: Efficiency and unit costs: English

College	Number of Trainees	Number of Tutors	Trainee-Tutor Ratio TTR	Average Salary per Tutor (in Ksh.)	Average cost per trainee	Average Teaching Group Size	Number of Trainees Teaching Periods per Week	Teaching Load
College 1[39]	670	2	170:1	27,760	163	170	16	16
College 2	1,000	10	102:1	44,700	438	102	14	14
College 3	850	7	109:1	51,500	472	109	18	18
College 4	670	7	88:1	48,500	551	88	14	14

[38] Except for College 1 where the two teacher educators teach both first year and second year classes, in the rest of the Colleges half of the tutors teach first years and the other half teach second years. Therefore for these three Colleges, the Trainee-Tutor Ratio (TTR) for both English and Maths is calculated using half the number of educators in the respective colleges.

[39] College 1pays tutors a standard monthly salary of Ksh. 27,760

Table 9: Efficiency and unit costs: Mathematics

College	Number of Trainees	Number of Tutors	Trainee -Tutor Ratio TTR	Average Salary per Tutor (in Ksh.)	Average cost per trainee	Average Teaching Group Size	Number of Trainees Teaching Periods per Week	Teaching Load
College 1	670	2	170:1	27,760	163	170	14	14
College 2	1,000	7	128:1	47,400	376	128	12	12
College 3	850	5	145:1	50,000	344	145	12	12
College 4	670	6	117:1	42,000	358	117	12	12

Conclusions

The key lessons from the cost and efficiency indicators are as follows:

If tutor-trainee ratio is reduced, allowing more tutors to teach methods, the recurrent teaching costs per trainee will increase if the average tutor salary is kept at minimal levels, (This is based on the calculation of Cost per trainee: CS = $\frac{AvTs}{TTR}$, see appendix 1), which raises the question of what might be gained by reducing the average teaching group size and increasing the number of method tutors who teach reading or mathematics. If group size is reduced without increasing the number of method tutors, teaching loads will increase and this could potentially reduce learning efficiency. But if more tutors are employed this is likely to increase TTRs and potentially increase the cost per trainee as the formula suggests.

It is important to stress that for ITE, high ratios should be thought of as unsuited for delivering an ITE curriculum that requires trainees to engage in learning activities with extensive exploratory or reflective work, which is what we believe will significantly improve the training experience along the lines recommend in this report. In all the college classroom observations, teaching was organised in large groups where the lecture method was common Although this ensures low costs per trainee, it is unlikely to produce rich and diverse instructional practices where group work and activity learning is the focus.

The advice to policy makers is that in reaching any decision about how to improve learning experiences in the colleges, teaching group size and teaching load should be the critical factors. Although reducing TTRs can increase costs per trainee this has to be looked at also in terms of the potential for improving the quality and efficiency of learning to teach.

Chapter 6: Key Issues for Policy and Practice

6.1 Introduction

This research on Teacher Preparation and Continuing Professional Development in Kenya was set up to fill the gap in knowledge about how the initial and continuing education of teachers impacts on the practice of teachers. The study focused on the preparation that teachers who teach reading in English and mathematics in the lower primary receive and the support experienced teachers receive through CPD programmes. A central issue in the research was whether the process of learning to teach reading and mathematics at lower primary level develops in the teacher the different types of knowledge essential for effective teaching – knowledge about the subject matter (content knowledge), knowledge about how to engage with the learner (pedagogic knowledge) and knowledge about how to represent and formulate content knowledge in ways that make it comprehensible to the learner (pedagogical content knowledge). The research therefore investigated the different kinds of knowledge that teachers at various stages of preparation – trainees, newly qualified and experienced teachers who have received CPD support - have and their understandings of how this can be applied to construct classroom practice. However, the research first addressed the issues of teacher supply and training in Kenya as well as the issues of teacher education policy and curriculum generally and that of reading and mathematics in lower primary in particular. In the rest of this chapter, we focus on the key findings of the research and recommendations for TE policy and practice in Kenya.

6.2. Key Findings

It is our belief that this study has come up with important findings for teacher education in Kenya generally and for teacher education for reading and mathematics for lower primary teachers in particular. However, we are aware of the limitations of the study.

An important limitation in the study is with regard to the discussion on ongoing and / or recently implemented CPDs for mathematics and reading leading to the decision to focus only on the SbTD programme in Chapters 3 and 4. Owing to limitations of time and other resources, the researchers found it extremely difficult to collect sufficient information on the programmes. In particular, curriculum and project materials were not readily available to the researchers for analysis. In addition, we were able to work with only 5 KRTs all teaching both mathematics and reading. As already indicated earlier in this report, it was extremely difficult to find the KRTs (and NQTs) as there was no information in local education offices on the schools in which they could be found. The researchers had therefore to go from school to school inquiring whether there were KRTs teaching in reading and mathematics in the lower primary classes which was very time and other resources consuming.

Further, some of the NQTs in our sample had as many as four years of teaching already. This was because it was difficult to find NQTs as the government has not hired teachers for over two decades. Teachers hired in public schools during this period were hired at school level by the Parents/Teachers Associations (PTAs) and therefore information on the schools that had such teachers was not readily available even in education offices. On the other hand, private schools hire teachers directly and hence information on teachers is only available in the schools. Consequently, as was the case with finding KRTs, the researchers had to go from school to school inquiring if there were NQTs teaching mathematics and English in the lower primary. To make matters worse, we found that head teachers preferred to assign NQTs to upper primary classes which made it even harder for us to find NQTs teaching in the lower primary. However, we were able to observe 34 NQTs (15 teaching reading and 19 teaching mathematics).

In addition, the fact that the time available for the research was limited meant that the researchers worked under considerable pressure in getting the data collected and analyzed and in writing the report. Finally, some of the areas in which the schools are located are quite remote, with poor infrastructure and home to the world famous Kenyan wildlife.

The foregoing limitations, constraints and challenges notwithstanding, the key findings of the study are:

1) Kenya has made tremendous progress and virtually wiped out untrained teachers from the public education sector.
2) There has been no serious effort to interrogate the concept of quality teachers and how the curriculum and structure of PTE can be changed to enhance the quality of training the trainees receive and therefore the quality of teachers and teaching in the country. Rather, raising teacher grades and entry requirements for the PTE programme have been the two main teacher quality improvement strategies adopted.
3) Teacher education policies have not focused attention on ensuring that primary school teacher trainees acquire the knowledge, pedagogical skills and pedagogical content knowledge that they will need to help lower primary school students learn to read and understand basic mathematics – the two areas that are considered critical for further learning and for living.
4) The PTE curriculum design and implementation is not in consonance with the progressive teacher as a reflective practitioner teacher education model suggested in various ways in the teacher education policy statements, goals and objectives.
5) The PTE formal and co-curriculum is overloaded leaving little time for focus on development of the knowledge, understandings and skills that trainee teachers will need to help primary school learners learn.
6) The PTE curriculum and practice focus more on theoretical knowledge about teaching - how to structure reading and mathematics lessons, teaching-learning activities and the use of teaching learning materials - and less on understanding and pedagogical knowledge.
7) There is inadequate focus on teacher training for reading and mathematics in the lower primary classes.
8) The PTE programme is less effective in training teachers for lower primary mathematics and reading than the ECDE programme
9) There are gaps between the PTE and the primary school reading and mathematics curricula.
10) There are no training or induction programmes for PTTC teacher educators. They are therefore ill prepared to offer quality training for primary school teachers as they have virtually no professional knowledge about primary schools or about teaching those who will teach young children.
11) There seems to be a theoretical recognition of the importance of CPD, however, little has been done to institutionalize and improve the quality of CPD programmes in Kenya.
12) There has been little CPD focus on key curriculum areas such as early reading and mathematics despite the importance of these subjects.
13) The nationally implemented school-based teacher development (SbTD) CPD programme that introduced the concept of reflective teaching in Kenya seems to have had positive impacts on the teaching of some of the teachers trained.

6.3. Recommendations

On the basis of the foregoing findings from this research on teacher preparation and continuing professional development in Kenya, we make the following policy and practice recommendations:

6. There is an urgent need for teacher quality and teacher education policy dialogue with a view to the development of a comprehensive research-based policy on teacher education generally and on teacher education for teachers of reading and mathematics in the lower primary.
7. The teacher education curriculum and practice should be reviewed and to focus on teacher education models that have been shown to produce effective teachers generally and effective reading and mathematics teachers for the lower primary in particular. The curriculum should focus on equipping trainees with content knowledge, pedagogical knowledge and pedagogical content knowledge.
8. The teacher education reading and mathematics curricula for lower primary should be reviewed to enhance the link with the lower primary school reading and mathematics curriculum.

9. The teacher education curriculum for reading in the lower primary curriculum should be strengthened to include particular emphasis on the phonics approach which has been shown to be effective in helping struggling readers decode print and thereby become independent readers.
10. It is critically important that Kenya institutionalizes CPD as a strategy for improving the quality of education. In this regard, it is necessary that further critical analysis of the CPD programmes discussed in this report – SbTD, EGR, RTL and SMASSE – is carried out to inform a government driven and sustained reading and mathematics CPD programme for lower primary teachers.

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