

2016

# Baseline School and College Survey Report

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## List of abbreviations

COSTECH	Commission for Science and Technology
CPD	Continued Professional Development
ESD	Education for Sustainable Development
ET	Expert Teachers
eera	European Educational Research Association
HELVETAS	HELVETAS Swiss Intercooperation
ICT	Information and Communications Technology
INSET	In-service Education and Training
IPA	Innovation for Poverty Alleviation
JET	Joint Education Trusts
MEPP	Mathematics Education Primary Programme
MOE	Ministry of Education
MoEVT	Ministry of Education and Vocational Education and Training
PHZH	Die Pädagogische Hochschule Zürich
PRESET	Pre-service Education and Training
QUEETS	Quality Education through the Expert Teacher System
SITT	School-based in-service teacher training
Std	Standard
TIE	Tanzanian Institute of Education
TET	Trainers of Expert Teachers
TTC	Teacher Training College
TTU	Tanzanian Teachers' Union
UNESCO	United Nations Educational, Scientific and Cultural Organization

# Executive Summary

The purpose of this baseline study is to provide information and recommendations which will influence and inform:

- the instalment of a school-based in-service teacher training (SITT) and
- in this new phase of the Queets project, Maths didactics training for Tutors of Teacher Colleges
- sustainable models of teacher development as outlined in the QUEETS Project Document phase 2016-2018

## The process

### Sampling frame

An appropriate sampling frame was selected in terms of the schools and the colleges. 12 Pilot schools and 8 controls were selected. The regions and districts are stated in the tables below. Selection Criteria of the schools was defined within the project.

#### List of Pilot Schools

Pilot Schools	Region	District
Jitengemene	Kilimanjaro	Moshi municipality
Kimanganuni	Kilimanjaro	Moshi DC
Dr Shein	Kilimanjaro	Moshi rural
Muongano	Kilimanjaro	Moshi municipality
Nkwamwasi	Kilimanjaro	Hai
KambiyaRaha	Kilimanjaro	Hai
Naura	Arusha	Arusha district
Unga Ltd	Arusha	Arusha City
Naurei	Arusha	Arusha City
Ziwani	Manyara	Babati
Kwang'w	Manyara	Babati
Nakwa	Manyara	Babati

*Table 1: List of Pilot schools*

#### List of Control Schools

Control Schools	Region	District
Uparo	Kilimanjaro	Moshi DC
Mijongweni	Kilimanjaro	Hai
Mailisita	Kilimanjaro	Hai
Msandaka	Kilimanjaro	Moshi Municipality

<b>Laroi</b>	Arusha	Arusha City
<b>Olasiti</b>	Arusha	Arusha Municipality
<b>Komoto</b>	Manyara	Babati Town
<b>Imbilili</b>	Manyara	Babati

**Table 2:** list of control schools

## Baseline methodology

An instrument was designed to allow for the description of:

- The infrastructure at the schools
- The infrastructure and classroom organisation
- Teaching and learning resources in the classroom.
- The mathematics lesson observed.
- Pupil engagement during the mathematics lesson
- The classroom culture.

The tool made provision for basic description of mathematics teaching and the environment in which the mathematics teaching takes place. So the structured classroom observation provided a lens and make visible mathematics teaching.

The tool contained a checklist with a rating scale within the above categories. The checklist focussed our attention during the observation in a number of settings which included:

- Meeting with the Head Teacher
- In the classroom observing the mathematics lesson.

It needs to be acknowledged that the checklist is restrictive but the instrument can be used:

- As a way of describing current teaching practice
- To make aspects of instruction visible
- As a motivation for change in practice
- To serve as a motivation for coaching in schools
- To serve as a motivation for coaching in schools

## Key Findings

This report contains our findings and in summary the report focuses on:

School survey

- a. School and classroom infrastructure
- b. Teaching and learning aids
- c. School leadership
- d. Classroom practice
- e. Mathematics pedagogy and mathematics content

## Colleges survey

- College infrastructure
- Mathematical pedagogy
- Teaching and learning aids

## We found:

- varying degrees of participatory teaching methods whether in school or in the colleges.
- shortage of mathematical teaching and learning aids in the mathematical classroom or within the colleges
- highly structured mathematical lessons
- that class size has little impact on the pedagogy
- teaching methods are mainly teacher centred
- questions in the mathematics classroom are closed
- the degree of community involvement does impact on the functioning of the school

## Recommendations

### The report recommends the following:

- Strengthen school leadership in order to support any form of school based development
- The modelling of mathematics lessons with large classes
- Including learner centred practices together with the current teaching practice
- Increase the access to locally made teaching and learning resources

# Report of Baseline School Survey

## June/July 2016

### Introduction

The Mathematics Education Primary Programme was tasked with conducting a baseline survey of selected pilot and control schools in June 2016: The terms of reference are outlined in Appendix 1. This baseline survey records school conditions, classroom practices, staff views and aspirations prior to the implementation of the QUEETS programme 2016 – 2018. This report reflects the observations, findings and recommendations of the based on the lessons observed and focus group discussions at the selected pilot and control schools. It forms the baseline against which progress over the period 2016 - 2018 can be monitored and evaluated.

Although schools were on holiday during the period of the baseline survey, President John Magufuli had instructed that teachers and Standard 4 and Standard 7 pupils remain at school during the school vacations to prepare for the national exams. This meant that only Standard 4 and Standard 7 pupils were at school. For this reason, only Standard 4 and Standard 7 lessons were observed.

The SITT Core Group together with the project co-ordinator selected the schools and arranged the visits (see Appendix 3 for the list of schools visited). An observation instrument was drawn up. This was refined in the initial meeting with the SITT Core Group (The observation instrument is presented in Appendix 4). The school observations provided MEPP and the SITT Core Group (see Appendix 2 for a list of people who visited schools) with valuable insights into conditions in primary schools and their teaching and learning practices.

### Initial findings of classroom observations and focus group discussions at schools

#### a. School and Classroom infrastructure

There was a large variation in the numbers of pupils at schools. The smallest school size was 151 pupils, the largest school size was 2 385 pupils, mean size of schools observed was 697, the median school size was 455. The smallest I class size was 25 pupils, the largest class size was 104 pupils, the mean class size was 48, the median class size was 46.

- Some schools had access to water, others did not.
- All schools had a head teacher's office; one school had an administrative block.



- One school had a library; many schools had a cupboard in which books were stored. Some schools stored books in the head teacher's office or staff room.
- Some schools had an adequate number of toilets for staff and pupils, others did not.
- Some of the older schools were built in a different way to most of the other schools.
- The level of maintenance of school buildings differed from school to school.
- Some schools had sufficient classrooms, others did not.

Commonalities included:

- All schools had gardens, lots of space outside, grounds were maintained
- There are sufficient desks for pupils. There was a campaign to provide desks for pupils during June and July 2016.

When speaking to the Head Teachers many of them said that since President John Magufuli made the announcement of free education for all, parents stopped supporting the school financially<sup>1</sup>. Head Teachers, reported that this has caused difficulties because, whilst most fees are covered (including exam fees), some indirect costs will still remain for example: feeding schemes, school and sports uniforms and learning materials such as exercise books and pens. At most schools feeding schemes have been halted and at several schools' infrastructural improvements have been discontinued due to lack of funds.

#### **b. Teaching and Learning Aids**

The use and availability of teaching and learning aids varied amongst schools. Some teachers used everyday household apparatus as teaching aids. Some teachers and pupils made their own teaching aids. The only ministry supplied mathematical teaching aids we observed was a set of three dimensional geometric objects.

#### **c. School leadership**

A pleasant and resourced school environment helps to motivate teachers. A head teacher who successfully implements positive changes is able to stimulate teachers to do the same. We saw Head teachers with various levels of expertise and experience: ranging from a few months to many years. Some head teachers who were able to do a lot with very little: they were able to access resources by involving the parent community and donors. Other head teachers appear to be overwhelmed; they discussed problems that were beyond their locus of control. This reduced their problem solving capabilities. Some head teachers reduced their role to monitoring. This kind of leadership can demotivate teachers.

#### **d. Classroom practice**

Teachers were very professional about their teaching. Teachers were expecting us and had prepared for our visit. At about three of the twenty schools teachers were not quite ready to

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<sup>1</sup> On November 27, 2015 the Tanzanian government issued Circular 5 which implements the Education and Training Policy 2014 and directs public bodies to ensure that secondary education is free for all children. This includes the removal of all forms of fees and contributions.

teach when we arrived. Teachers presented their best practice to us. What we saw was not necessarily the common everyday practice. Most lessons followed a highly structured format, which is influenced by the lesson planning format. We observed:

- Highly structured lessons: where the structure was created by the lesson plan. Pupils were familiar and comfortable with the structure.
- Closed questions aimed at constructing a preconceived highly ritualised common text
- There were few mathematical teaching aids, supplied by government in use. However, we did see mini-white boards and 3-D objects supplied by the educational authorities. Where teaching and learning aids were used, teachers generally supplied or made them themselves. Often everyday materials or apparatus were used (string, cans, bucket, plates, oranges etc.). One teacher made geoboards
- In all the schools the most used teaching tool was the chalkboard.
- Where text books are used, most often shared between pupils. Teachers often use a textbook to guide the questions that are written on the chalkboard for pupils to complete during the exercise part of the lesson.
- Highly proceduralised mathematics teaching
- Little connection between mathematical topics

From our observations and discussions with the SITT Core Team, we concluded that best teaching practice is understood by the teachers in the following ways:

- Combining written work on the chalk board together with using manila paper.
- Careful layout of the mathematics recorded on the board.
- Using teaching aids
- Demonstrate sound mathematical content knowledge.
- Following the structure of a lesson plan:
  - The introduction which involves teacher explanation sometimes questions to support prior knowledge.
  - Focus on knowledge, especially new knowledge combined with prior knowledge. Lots of questions and answers and chorusing of content or definitions.
  - Reinforcement of the new knowledge.
  - Consolidation, which took the form of pupils completing exercises, either from the chalkboard or from textbooks when made available. While the pupils do the exercises the teacher would walk around marking or simply checking the work.
  - Reflection, this did not always take place.
- All communication in the class is teacher led.
- Ensuring that pupils enthusiastically answer questions posed.
- Getting learners to sing a song about learning mathematics at the beginning and at the end of the lesson.
- Kindness and enthusiasm for teaching shown by the teachers.

#### e. Mathematics pedagogy and mathematics content

Lydia Arseni Kimaryo says that since the 1990s there has been a significant emphasis on participatory methods in teaching and learning in primary school education in Tanzania. She goes on further to state that:

*Most of the teachers in the primary schools have been oriented to teaching practices based on traditional teaching approaches where learners' participation is very limited. The use of traditional methods where the one who gets get and the one who misses miss is triggered by a number of factors, for example large class sizes, instructional materials, teacher qualification, quality of the learner, school management, environment surrounding the school and school culture (presented at the ECER 2008, From Teaching to Learning? conference*

<http://www.eera-ecer.de/ecer-programmes/conference/1/contribution/938/>

Shirima in his dissertation; defines participatory methods as:

*Participatory teaching methods compel teachers to create learning environments which give a room for students to discover by themselves instead of being spoon fed. Participatory teaching methods develops creativity, fosters problem solving and intrinsic motivation*

*The assumption behind participatory teaching methods is that students are given an opportunity to actively construct meaning and understanding during the learning process. Participatory teaching methods discourage passive assimilation of knowledge and support acquisition of knowledge, skills and attitudes by solving life problems (MOEC, 2005).*

We saw different level of pupil participation in different classes. The level of pupil participation seemed unaffected by class sizes: pupils' participation was low in some of the small classes; the highest level of pupil participation occurred in the largest class we observed.

Usually after the lesson introduction, teachers would demonstrate a method, sometimes pupils chanted a common text (often a definition or formula), in most lessons we saw individual pupils asked to repeat the procedure on the board. Then pupils practice this individually in their books. This process prepares pupils for an individual written exam.

In several of the lessons we pupils were put into groups, but at times this reduced participation rather than increasing it, because the person selected as the group leader controlled the questions, and wrote the answers and ignored the contributions of the rest of the group. We also saw some group work in which pupils did discuss mathematics, make apparatus and do calculations co-operatively.

Pupils in 3 of the 20 schools observed had made their own learning aids. In the largest class we saw pupils making their own learning resources out of locally available resources. This lesson seemed to match with our understanding of participation by pupils

Sometimes we saw teachers and student teachers write up worked examples or parts of lessons on manila. At times this was not information that was useful to preserve and stick up on the wall as a poster. Sometimes it could just as easily have been written on the board. Using manila charts does not always add value to the learning experience.

During the first week, we observed that pupils were eager to answer questions and write solutions on the board, and sit in groups. It was unclear whether the use of group work and attempts at participatory methods were a result of the QUEETS training or whether it was to meet the criteria outlined in the classroom observations schedule. At one school the lesson showed some evidence of using aspects of the methods for finding perimeter and area from the QUEETS mathematics training. There were also manila charts on the wall which indicated that the teacher had used the method of multiplication from the QUEETS mathematics training. This was the lesson that was demonstrated during Bettina Jenny's mission.

During the second week we saw one teacher asking open ended questions<sup>2</sup>. In Manyara we saw several lessons in which teachers implemented training from the QUEETS geometry training. We saw pupils making learning aids in three lessons, we saw children using the space outside and moving their bodies to learn maths (in one lesson at a control school), we saw genuine discussion about mathematics when pupils worked in groups. In one class as pupils built teaching aids and discussed mathematics, we saw an eagerness and excitement that was so infectious that SITT Core Group members could not stop themselves from joining in.

It appears as if teachers have not themselves experienced participatory methods (except for the QUEETS training). Teachers have also not received support in how to implement participatory methods in their classrooms. What we observed were attempts at participatory methods, which took a variety of forms namely:

- Teachers pose a question and learners answer and answer correctly.
- When teachers spoke pupils listen attentively: active listening appears to be interpreted as a form of participation.
- Choral responses show participation by pupils.
- Pupils demonstrate knowledge through rote memorisation. This shows that they are going to pass the exams really well.
- Pupils do not ask any questions of clarification. This shows that the teacher has taught well
- Pupils participate by verbally giving an answer or writing out the demonstrated procedure on the chalkboard.
- Pupils do not speak to each other or share and make sense of the content collectively
- Using manila or any visual aid in the teaching demonstrates use of teaching aids and therefore is seen as facilitating pupil engagement.
- Where there are limited resources, the teacher demonstrates using the teaching aids and pupils observe.
- Pupils quietly copying exercises from the chalkboard indicates individual participation.
- There is a general understanding that silence in the maths class shows respect, so silence is seen as a form of participation.
- Strict adherence to the lesson plan and entrenched classroom routines contribute to good participatory methods.

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<sup>2</sup> This was a teacher at a control school. The SITT Core Group recommended that this teacher be included in further training e.g. SITT training, and that the school be included as a pilot school.

- Placing learners in groups demonstrates participatory teaching methods.

Mathematics as a subject is taken extremely seriously in all the schools that we visited. We got the sense that the subject is highly regarded and that teachers who teach mathematics confidently are also highly regarded.

At one school teachers said that pupils loved mathematics. At all other schools teachers reported that pupils do not like mathematics.

In most of the lessons it appeared as if teachers viewed Mathematics as a series of rules and procedures. Teaching mostly aimed at assisting pupils to implement the procedures correctly. There was little attempt to help learners to see the meaning of the mathematics and understand the mathematics conceptually. In most lessons we saw teachers asking closed questions only, trying to routinize procedures and assuming that there is only one way to get to an answer. The one method of arriving at an answer is influenced by the structure and the expectation of the answer format of the Standard 7 exam. Teachers teach for the exam and for the pupils to perform well.

Gaps in pupils' knowledge was blamed on the teaching in the early standards. At most schools teachers reported that pupils do not learn their tables in Standard 1 and 2. Since 2012, MEPP has observed no interest in trying to improve the teaching of Mathematics. There appears to be an assumption that because most adults have a sense of numbers and find the basic operations easy, that that teaching young children mathematics is easy.

## Initial findings pertaining to the SITT model

Central to the SITT approach are the teachers and their ability and interest in changing their classroom teaching practice.

### Scope

The QUEETS Project document phase 2016 – 2018 (pages 21 – 22) states how SITT will work:

*“The expert teachers can for, together with other experienced teachers, the SITT Team at their school. The availability of trained expert teachers at school is not a pre-condition for SITT, but is of course an ideal starting position to introduce SITT effectively and fast.*

*Expert teachers shall present their way of teaching approaches and methods to their fellow teachers directly in the classroom with their classes.*

*In the future of the project, ETs and other experienced teachers can additionally become mentors for their colleagues. The role of these mentors is to support fellow teachers in teaching different subjects and methods, by visiting their classes and giving individual constructive feedback. SITT, in its ideal form, can lead to an understanding of mutual support over the years....*

*Regular peer-to-peer exchange among teachers or head teachers from different schools at a local level at low cost, but with a high practical aspect, should also take place.”*

MEPP together with the SITT Core Group, the programme co-coordinator and financial administrator had focus group discussions with head teachers and other teachers about SITT at each school.

In an evaluation of an Inset Pilot programme, the evaluators Hardman & Dachi (2012: 45) suggest that:

*‘the evaluation supports the view that the school-based teacher development programmes needs to continue with helping teachers to explore their own beliefs and by getting them to reflect on their classroom discourse practices as a way of enhancing expert thinking and problem solving so as to bridge the gap between theories and actual classroom practice. Therefore, in the context of Tanzania, a national model of INSET training which builds on existing systems and structures at school and school cluster level should be adopted as the most effective way of providing support and development to teachers’.*

## Findings

During the conversations with Head Teachers and the staff after the classroom observation the SITT Core Team spoke about the SITT intervention and provided a motivation for doing SITT in schools. Below are the findings of these discussions.

- At the pilot schools, teachers agreed to in-service teacher training at their schools. However, teachers, including head teachers did not seem very enthusiastic about school-based development. This could be because most teachers have no experience of school-based nor classroom-based development.
- The most common form of inset is through residential seminars. Teachers appreciate these seminars not only for content but also because of the per diem they receive. It is widely acknowledged that teacher salaries are low and at times erratic. This means teachers need to do additional work to make ends meet. Some teachers indicated that if they do training this is extra work and if they are going to do it, they need to be compensated for it. Moving to a different and unpaid form of in-service training may well meet with resistance.
- Many teachers felt that they do not have time to do school based training: they indicated that their workloads are already heavy.
- At some schools, teacher morale was low. This would have impacted on teachers' enthusiasm for anything new. Low morale was partly due to environmental conditions (e.g. some schools had no toilets for teachers, some schools had no staff room, many schools had large class sizes, some school buildings were down, at most schools pupils were poor). However, there were schools where conditions were challenging but leadership was a strong motivating factor. Teacher morale is at least partly a function of school and educational management.
- We are not convinced that expert teachers or schools have the motivation and the capacity to sustain to sustain a SITT model without a lot of extra support.

## Recommendations for the SITT Model

In order to start thinking beyond the observations and focus group discussions we structured a reflection on the SITT Mode: see *Appendices 5 and 6*. The process of reflection started during MEPP's mission (2016), needs to continue. In particular, the SITT Core Group needs to carefully reflect on:

- **Participatory methods.** Facilitators, teachers of expert teachers and expert teachers had participatory methods modelled in the QUEETS Mathematic training. However, seeing something happen with colleagues at a workshop is not the same as seeing it work in your classroom. Teachers need to be shown in their own classrooms with the little resources they have, how to plan for participatory teaching and how to do it. We need to acknowledge that the traditional Tanzanian form of teaching is deeply entrenched. Careful thought has to be given to how create a shift in the practice. In addition, there needs to be careful consider of how pupils will react to a shift in teaching methods, and how to support teachers through this process.
- **High stake exams.** The exams determine and influence how mathematics is taught, how mathematics is viewed. The national exams tend to privilege classroom mathematics

practices that favour memorisation of procedures. The SITT Core Team needs to think about how to balance the rote learning, chanting, strong emphasis on memorisations, closed questions, highly structured lessons together with participatory teaching methods, learner-centred teaching, developing higher order thinking skills and conceptual understanding.

- **Visible model of SITT.** Schools appear not to have experienced of a SITT model. They have never been part of one, never seen how it works. They have nothing to relate to. Serious thought needs to be given to how one implements the SITT model in schools. All Head Teachers told us that the Expert teachers on return to schools shared what they had learnt from the course. This was done once only. Sharing of expertise what was not seen as an ongoing process. All Head Teachers claimed that teachers support each other and sometimes do this by sharing of content matter and teaching in each other's classrooms. Although ETs received training, they have not been supported in how to implement these methods and ideas in their own classrooms. They are good teachers, but good teachers who have had experience of teaching and learning happening in particular ways.
- **Incentives.** In many of the schools Head Teachers and staff spoke about remuneration. This will definitely influence the initial start of the in-service programme. The results of the two year KuiFunza pilot project<sup>3</sup> indicated that where schools and teachers were incentivised, pupils results improved. The report stated "More resources available in schools and more motivated teachers mean that children learn." *Guardian* of 24 June 2016: 1 – 2. However, incentives do not need to be financial. Most theories of behavioural change focus on praising when behaviour changes positively. Helen Abadzi (2006:201) writes that teachers should be given frequent classroom feedback by principals and district officers and that this should be more than "corrective feedback" ... "teachers need someone to praise them ... increasing the intrinsic motivational rewards ... signalling a job well done".
- **School Leadership** and the nature and form of the support that is expected from Head Teachers. How does one encourage them to support an in-service programme at their school? Head teachers need to be mentored in order to support an in-service programme at their school.
- **Teachers**, in terms of whether the QUEETS training and planning of SITT to date has equipped teachers to take ownership of their own professional development? Can they hold and sustain an in-service programme at their school?

### **Visioning, training and support need to take precedence over monitoring and evaluation**

Monitoring and evaluation is crucial in any project. It must happen at a project level. However, the primary role of development is change and improvement. At a classroom and school level it is as important or more important to develop ways of supporting change and progress. It seems that a dominant practice is for project members and stake holders to criticise and judge lessons and schools, and present themselves as experts who know more than practising teachers. People tend to think more in terms of monitoring and evaluating than in terms of supporting and being catalyst for changing practice. We need to be incredibly conscious that we are not inspectors.

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<sup>3</sup> KuiFunza was implemented in 350 schools, across 10 districts in Tanzania by the Commission for Science and Technology (COSTECH), Twawesa and the Innovation for Poverty Alleviation (IPA)



Bettina Jenny's May 2016 Mission report outlines SITT training for SITT groups at pilot schools. It states that:

- *“About 2 members of the SITT team of each pilot school shall get a training by Rolf Gollob, PHZH, followed by a few days of coaching in the 12 schools (by the facilitators).*
- **Test phase 2-3 months**
- *Intense coaching by facilitators, education consultant*
- *Assessment after testing period and adaptations”*

It is crucial that the SITT team at each school not only get training and in situ coaching, but that they also receive on-going intense in-situ coaching by facilitators and educational consultant for a period of at least 3 months, but this probably needs to continue for the duration of 2016 – 2018. Below we recommend two ways of coaching, supporting and mentoring teachers at a distance.

**a. Remote mentoring using video for showing teaching practices in action**

Teachers tend to teach the way that they are taught. All institutions have developed practices over time, it is difficult for an individual to resist these practices and even more difficult for a single individual to change these practices: teachers in schools are no exception. It is difficult for a single teacher to change the culture of teaching and learning at a school. It is extremely difficult for a novice teacher to resist the culture of teaching and learning at a school. Abadzi (2006), states that the use of video material can simulate classroom contexts sufficiently to assist teachers to link the learning to their context of work.

We suggest that lessons of best practice and participatory teaching and learning are captured on video. The purpose of using videos in the third phase of the QUEETS projects and especially in the in-service and pre-service part of the project is to:

- offer teachers a way to ‘see’ teaching from a different perspective.
- see colleagues attempt participatory teaching methods in real classrooms and familiar contexts.
- provide teachers with the opportunity to reflect on their own practice.
- allow the space for teachers to be aware of, confront their own assumptions and habits formed.
- provides teachers in a school with a common set of experience that they can draw on.
- make available to teachers the opportunity to visit and revisit an experience. When one visits a classroom it is very hard to revisit what one saw, but with videos one can play a scene over and over again.
- allow for a depth of analysis that is not possible with live observation

- According to Brunvand, S (2010), capturing images of practice and other instances of classroom activity on video creates a permanent record that can be reviewed and analyzed without limitation. He suggests that video also facilitates the viewing of the same situation multiple times and from multiple perspectives, providing the opportunity for deeper analysis (Beck et al., 2002; Sherin, 2004). The repeated analysis of a case can result in a more refined integration of concepts and a broader understanding of potential perspectives (Lunderberg & Scheurman, 1997).

#### **Content and length of the video**

The videos should be short, anything between 5 and 10 minutes. These videos can be loaded onto the QUEETS website which teachers can download from their cell phones. The video material could be used in both pre service, in-service and school based professional development. According to Brunvand. S,

*With video it is unnecessary to make immediate judgments in response to student questions or pedagogical dilemmas that arise. Teachers can stop, reflect, discuss, and access alternate resources before deciding on an appropriate course of action. They can also view a single video from multiple lenses which can impact what teachers notice and how they interpret information (Miller, 2006). For instance, during a first viewing the teacher may choose to focus only on content issues, whereas during a second viewing, attention may turn to issues of classroom management or assessment strategies exhibited by the enacting teacher. (2010)*

#### **Videos on Mobile phones**

Many teachers have mobile phones, often smart phones. Teachers who lack access to the internet will therefore be able to receive these short videos on their phones.

We suggest that teachers video very short teaching moments, of what they consider their best practice and that these video clips are then sent to the QUEETS Programme Coordinator. A selection of which videos of best practice to share is made. These videos can be sent by bulk SMS or Whatsapp to teachers and tutors

The use of videos and the sharing of best practice means that the teachers will have access to examples of best practice always in their pockets. This shifts the dependency from ETs to each teacher in the school. In each school teachers can use the mobile videos to discuss and critique teaching and learning.

We suggest that small incentives are provided to the teachers whose videos are selected. QUEETS might be able to ask one of the cell phone service providers like Vodacom to donate air time vouchers to teachers.

## **b. Remote mentoring using Lesson Plans**

Sustainability becomes more important during this phase of the project. Sustainable programmes, especially at school level need to be cemented as soon as possible.

We think that one way of doing this is developing lesson plans using the Tanzanian format and structure. By definition, a lesson plan is a detailed but concise description of the various teaching, learning and assessment activities (including an outline of resources) that a teacher wishes to employ in the course of mediating a selected collection of knowledge, skills and values in a particular lesson. A great deal of evidence has demonstrated that the lesson plan is a very important component of teaching and learning. It benefits the teacher and the learner by acting as a clear guide to teaching and learning (JET: The role of the lesson plan in JET's teacher development model: exploring solutions to challenges, 2012).

These lesson plans can be developed collaboratively and then shared among teachers. The mathematics content of the lesson plans will meet the requirement and timing of the Tanzanian mathematics syllabus. The lesson plans will illustrate content as well as pedagogy and focus on participatory teaching methods. We believe that teachers need access to examples of planning for participatory teaching methods.

Teacher training colleges will be able to use the lesson plans during the didactics modules and students will be able to use the lesson plans when doing their teaching practice.

Once teachers are comfortable with the pedagogy embedded within the lesson plans or they at least tried it once, then adaptations to the lesson plans should be made because teaching from prepared materials without adaptation does not adequately respond to the needs and diversity of a student cohort (Ball, 2000).

The lesson plans can be supported with a guide and questions to assist the teachers in making sense of the content. Examples of questions:

- What broad learning outcome does the lesson intend for the learners to achieve?
- What are the specific learning outcomes that the lesson intends for the learners to achieve?
- What teaching methodology will be employed in order to ensure that the learners achieve the specified learning outcomes?
- What teaching and learning activities will be employed in order to ensure that the learners achieve the specified learning outcomes?
- What teaching and learning support materials will be used in order to facilitate the teaching and learning activities that will enhance the achievement of the specified learning outcomes?
- What assessment methodology and activities will be employed in order to assess the learners' achievement of the specified learning outcomes?
- How much time will the teacher and the learners spend on each of the selected teaching, learning and assessment activities in order for the learners to achieve the specified learning outcomes?

# Report of Baseline Survey of Teacher Training June/July 2016

## Introduction

The Mathematics Education Primary Programme was tasked with conducting a baseline survey (including observations of mathematics didactics lessons and focus group discussion) of all teacher training institutes that train primary school teachers in Kilimanjaro, Arusha and Manyara in June 2016: The terms of reference are outlined in Appendix 7. This baseline survey records, classroom practices, staff views and capacity-building needs prior to the implementation of the QUEETS programme 2016 – 2018. This report reflects the observations, findings and recommendations of the based on the lessons observed and focus group discussions with tutors at the teacher training institutes. It forms the baseline against which progress over the period 2016 - 2018 can be monitored and evaluated.

Tanzanian teacher training institutes were closed during the middle of June. For this reason, the visits to the colleges and the university were carried out in the second half of the mission. The Helvetas office set up dates for MEPP and the SITT Core Group to visit each of the teacher training institutes in Kilimanjaro, Arusha and Manyara. In the first college visited, not all students had yet returned. Tutors and staff at the teaching institutions were welcoming and professional. We observed lessons in six of the seven institutions<sup>4</sup>. The observation instrument is presented in Appendix 8). The lessons provided MEPP and the SITT Core Group with valuable insights into conditions at teacher training institutes and their teaching and learning practices.

## Initial findings of classroom observations

In a study of teacher education in Tanzania Hardman, Abd-Kadir & Tibuhinda (2012: 827) note that:

*“In the sub-Saharan African region generally, pre-service education and training (PRESET) is judged to be of poor quality. It is found to be largely lecture-based (usually from trainers who lack experience and expertise in primary education) with little in the way of supervised practical teaching, thereby creating a large gap between theory and actual classroom practice, and a repetition of secondary education at several times the cost (Lewin and Stuart, 2003; Mattson, 2006; O’Sullivan, 2010) ... In the face of these challenges, there is a growing recognition that **a focus on pedagogy and its training implications needs to be at the heart of the commitment to improving the quality of education and learning achievement in the region** (Schwille et al., 2007; Stuart et al., 2009; Mulkeen, 2010).” (emphasis added)*

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<sup>4</sup> We arrived very late at Patandi Teachers’ Training College, so instead of observing a lesson we were given a tour of the facilities that are designed around special needs education. The staff at Patandi Teachers’ Training College were very inspired by their work and very inspiring.

Most of the lessons observed were with pre-service student teachers. At most of the colleges there classes were very large<sup>5</sup>. Lectures at teacher training institutes are scheduled to last one hour.

Most of the lessons observed followed a similar format to the typical format of a primary school lesson, namely teacher explanation followed by students practising calculations (initially selected students doing calculations on the board, followed by all students doing calculations in their notebooks), and sometimes concluded with a review of the work covered in the lesson. Most of the lessons observed focussed on mathematical content taught in about Standard 7 or secondary school.

Asking individual students to write up calculations on the board using the procedures outlined at the beginning of the lesson, appeared to signify student participation. This concurs with the baseline review of teacher training colleges of Hardman, Abd-Kadir & Tibuhinda (2012: page 831) for Teacher Development and Management Strategy:

*“Tutor-fronted interaction made up of explanation, question and answer, and use of the chalk board, took up nearly 80% of the time; the rest was made up of individualised work, group work, administration and interruptions. Only two of the tutors observed reviewed what had been covered in the session. The absence of teaching and learning resources in the form of textbooks, charts, and practical equipment meant that the students had to copy notes from the chalk board. Nine of the classes observed were focused on the development of student subject knowledge, with only three covering teaching methodology so as to address the knowledge, skills and attitudes needed to teach the subject matter. Even here, a transmission model dominated so there was little blending of theory with practice....In these sessions, college tutors appeared to be offering idealised images of schools rather than the reality of the Tanzanian primary classroom.”*

Each college has a specialisation for example, Singachini Teachers’ Training College focuses on Early Childhood Development, Patandi Teachers’ Training College focuses on Special Needs Education (they have three specialities: audial impairment, visual impairment, mental impairment). However, currently colleges also offer the general teacher training courses.

The principals at several of colleges were new to that college, having been recently transferred from principal positions at other colleges.

We did not observe textbooks being used by students at any of the institutions. This was backed up by discussion with tutors and lecturers who indicated that no textbook is prescribed and students do not have textbooks. Only at Mount Meru University was there any reference to a hand-outs or course notes.

At most of the colleges tutors tried to move away from the traditional school format in some way. Tutors tried to either increase student participation or link the mathematics to everyday life. However, these were mostly surface level changes, and did not deal with conceptual issues in

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<sup>5</sup> According to the 2013 Basic Education Statistics in Tanzania (BEST) Report, the ratio of student teachers to qualified tutors to in government colleges is 21:1. Classes observed exceeded this number: many were more than two to three times this number (the exception was the class of in-service diploma students at Mamire College). In-service teacher classes may well be smaller, but this does not account for the discrepancy between the BEST 2013 student: tutor ratio and the size of the classes observed.

mathematics, the development of higher order thinking nor yet focus on issues of pedagogy. The exception to this was Singachini Teachers' Training College, where the lesson was not only very practical with a high level of student participation and linked to their everyday experiences but also focussed on developing the concepts conceptually. At the end of the lesson at Singachini TTC, the tutor asked the students to summarise the key points of the lesson. This lesson was in sharp contrast with a lesson on speed that we observed at a control school in Kilimanjaro, which was very abstract and procedural. Tutors and students at other training colleges would benefit from having this lesson demonstrated to them or from watching a video of the lesson.

At Mamire we observed a group of that have returned to college to upgrade their qualifications. We observed a didactics lesson for in-service teachers. Different student teachers presented different parts of the lesson, which they had prepared on manila charts. The tutor then critiqued their work (the critique did not deal with pedagogy, but rather choice of examples and calculating procedures). A tutor from another college indicated that this is generally the approach used for the didactics lessons for in-service teacher training. She explained that because teachers have teaching experience, they are given topics to micro-teach in class. Whilst it is important to acknowledge students experience and ability, asking students to micro-teach for all the didactics classes, reduces the opportunity to change practices. Students are more likely to draw on the methodologies they experienced as school pupils and that they used as teachers than to link it with theoretical lectures covered in the initial years of their diploma courses. It should also be remembered that people spend more time in school than they do in training colleges.

Abazi (2006: 126) states that:

*"Students extract teaching rules from the past behaviour of their own teachers .... and to adopt counterproductive practices that are used around them in school.... People are genetically programmed to imitate, particularly during childhood".*

According to Professor Catherine Ward, cited in Pinnock D (2016: 269) change is possible if one is able to visualise a different path. Tutors need to model a different way of teaching, through their didactics and other classes and they need to link these methods explicitly with the theory that student teachers learnt in the first years of a teaching diploma. Student teachers need to experience different models of teaching from those they were exposed to at school. Student teachers also need support to try out a different methodology. Otherwise it is unlikely that most student teachers will experiment with new methods during micro teaching, block teaching practice or when they return to class.

The International Evaluation Group of the World Bank observes that:

*"instructional activities in many teacher training institutions mirror the activities of primary and secondary school teachers" (Abadzi, H, 2006: 126).*

At Mandaka Teachers' Training College, the lesson focussed on an introduction to algebraic expressions. The tutor opened the lesson by asking student to talk to the person next to them about "what is algebra". Students' answers referred to the use of variables instead of numbers. There was no attempt to explain algebra more conceptually (often mathematics educators talk of algebra as generalised arithmetic and functional thinking).

Hardman, Abd-Kadir & Tibuhinda (2012: 832, 833)

*“suggest the need to acknowledge the importance of local cultural and educational circumstances so as to avoid the simplistic polarisation of pedagogy into ‘teacher-centred’ versus ‘child-centred’ that has characterised much of the educational discourse in the international donor community providing aid to less developed countries like Tanzania (O’Sullivan, 2006; Barrett, 2007; Alexander, 2008; Hardman et al., 2009; Schweisfurth, 2011). By recognising the centrality of whole-class teaching, college tutors can help trainees develop more of a dialogic pedagogy to broaden the repertoire of whole class teaching currently found in many Tanzanian primary classrooms. ...In this way dialogue and discussion can be included alongside the more traditional drilling, closed questioning and telling, thereby raising cognitive engagement and understanding Hardman and Abd-Kadir (2010)” ....*

*“For example: the use of open and closed questions and teacher statements; giving students time to answer; sharing questions at the start of a lesson; encouraging students to ask their own questions; beginning a lesson by giving pairs of students a question to answer from the last lesson; asking pairs to discuss a question for a minute before they answer; getting a pair or group of students to set questions for another pair or group; treating answers with respect and giving students credit for trying; probing answers; commenting on a response to exemplify, expand, justify or add additional information; building student responses into questions thereby acknowledging their importance to the classroom discussion.”*

As teachers or tutors or lecturers try to infuse new methods into the methods that they may initially will use the forms (techniques and classroom arrangements) of learner-centred pedagogy, but not its substance (engaging with students’ ideas and understanding). Most of the lessons observed at the teacher training institutes used a slightly more dialogic method within whole class teaching. This is referred to by Vavrus’ (2009:305) term “contingent constructivism”.

Guthrie (1990: 228) cited in Vavrus concludes that formalistic teaching can be effective in poorly resourced context. He suggests that “in these contexts the question to ask is not how we can improve the quality of teaching by promoting alternatives to formalism, but how can we improve the quality of formalism?”

Vavrus (2009: 310) cites Lewin and Stuart’s (2003: 203) on how the development of teacher’s abilities to use constructivist approaches “will require time, debate, and professional development among lecturers, curriculum developers, MOE personnel, and the wider educational community.”

The real aim is for pupils, students, student teachers and teachers to understand the concepts of mathematics; to develop confidence in learning mathematics and in using mathematics; to be able to use appropriate recordings and procedures for calculating. Any training of tutors (or even evaluation of school and college classroom practices) should avoid focussing on the surface features of a learner-centred approach or constructivism (like group work, use of teaching aids, references to everyday lived reality etc.) but rather try to identify whether pupils / student / teachers are developing a conceptual understanding of mathematics.

## Findings from Focus Group Discussion and the Consultative Workshop with Teacher Training Institutes

According to the 2013 edition of the 2007 “Curriculum for Diploma in Teacher Education Programmes in Tanzania” tutors on the diploma courses need a Masters degree in teacher education and at least three years of experience in teaching at a secondary school. Tutors on Certificate course need a university degree with relevant professional specialisations (primary education / pre-primary education / physical education) and four years of relevant teaching experience (primary education / pre-primary education / physical education), according to the according to the 2013 edition of the 2007 “Curriculum for Certificate in Teacher Education Programmes in Tanzania”. Currently all qualifications at teacher training colleges are either Ordinary Diplomas or Higher Diplomas. The 2014 MOEVT – UNESCO *Enhancing Teacher Education for Bridging the Education Quality Gap in Africa The Case of Tanzania: Needs Assessment Report (2014)* states that 98% of college tutors in Tanzania in 2012 were qualified. In discussion with college tutors it appeared that most were trained as secondary school teachers and not all have had the pre-requisite years of school-based teaching experience, even fewer the pre-requisite years of primary school-based teaching experience.

Colleges raised lots of problems and frustrations during the focus group discussions and during the workshop: amongst these issues was the fact that the teacher training curriculum seems to be in flux. The representative from the Ministry of Education explained that the current curriculum was designed by the National Council for Technical Education (NACTE). In a recent debate in parliament many people indicated dissatisfaction with this curriculum. This sentiment echoed debates worldwide about whether competency based curricula, which were initially designed for technical skills are suited for educating professionals: the nature and form of the training needed for teachers is different to the nature and form of training needed to train forklift drivers. The representative from the ministry indicated that a new teacher training curriculum is currently being designed by the Tanzanian Institute of Education (TIE).

Lecturers at Mount Meru University were particularly vocal about the problems with the current curriculum. One of their concerns was with the module system. They felt that particularly in Mathematics Education, student teachers should see topics as connected and should not just cram for a module and forget the content after writing off a module. Work covered later depends on concepts learnt earlier: they feel that writing off modules works against student teachers developing an understanding of how later work builds on earlier work. They felt that teachers are at the heart of education, but that pupils with lower level qualifications become teachers and that those very low levels of qualifications become primary school teachers. Lecturers were critical of how entrance levels to university teacher training courses had been lowered: this they described as bowing to political pressure<sup>6</sup>. Lecturers felt side-lined in the process of centralising the curriculum, and in the centralising of selection and admission of students to training institutes. They feel that they have too

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<sup>6</sup> The government rescinded this later in June 2016.



little time fill the gaps in student teachers' knowledge and to teach them the mathematics they need to know.

Another problem that was raised is that there is no textbook prescribed for Mathematics teacher training. The lecturers from Mount Meru University indicated that they would like QUEETS to design a self-study Mathematics textbook (that had explanations, worked examples and lots of exercises (to stimulate an interest in Mathematics), along with a teacher's guide (to facilitate teaching). This is clearly beyond the scope of this project, and this was indicated this at the consultative meeting with tutors.

The 2014 MOEVT – UNESCO *Enhancing Teacher Education for Bridging the Education Quality Gap in Africa The Case of Tanzania: Needs Assessment Report (2014:56)* states that

*“Currently all 34 public Teachers' Colleges are connected by internet via the VSAT systems and pre-installed Solaris as Operating system, and Open Office as application software. Internet connectivity services are still on hire basis. Fibre Optical cable has already been laid down in all Regions and Districts, and the Government, through the Tanzania Telecommunications Corporations Limited (TTCL), is finalizing a plan to connect educational institutions and health centres using the District distribution points”*

They do however, acknowledge that

*“the ICT infrastructure installed in the 34 government TCs faces a number of challenges namely:*

*(i) The Sun Thin Client Technology, Open Office and Solaris installed is outdated technology as it was installed in 2007. It requires replacement and installation of a new technology which can meet the current teacher education and training needs;*

*(ii) The number of ICT facilities that do not match the number of student-teachers as well as the one for tutors;*

*(iii) Unreliable internet connectivity and power supply;*

*(iv) Unavailability of Digital Learning Resources (DLRs) for teacher education and training*

*(v) Technical training programmes were not adequate to make ICT tutors competent;*

*(vi) Lack of graduate tutors specialized on IT methods to implement ICT curriculum for teacher training at Diploma and certificate; and*

*(vii) Lack of expertise on availing DLRs through development/creation in teachers' colleges.”*

The teacher training institutes we visited have computer laboratories. These are used for ICT training. Tutors indicated that there is not internet access from the computers in the laboratories. Currently there are insufficient computers for students to use in their spare time, or for lecturers to use during content or methodology slots. One lecturer indicated that students use their cell phone to access the internet.

Colleges have libraries, but most were not happy with the extent of their collections. Mamire Teachers Training College in particular feels that it needs help expanding its material on teaching issues on teaching subjects.

Colleges have teaching aids. Most lessons we observed the tutors did not use teaching aids. This could have been because of the nature of the lessons taught (although some topics could have allowed the use of teaching aids). One tutor felt that it was important that student teachers were involved in the making of teaching aids. This will not only benefit them, but take pressure off tutors to make resources for the classes to use. Singachini Teachers Training College had the most impressive store of teaching and learning resources, most of these were handmade.

Colleges have well maintained grounds. Mamire Teachers Training College reported that they do not have sufficient ground to practice self-reliance by growing their produce.

Most colleges are at a distance from the nearest town hence students tend to be residential.

MEPP, explained that the focus of SITT is on primary school methodology: on changing practices in primary school Maths, English and ESD classes to enhance the learning experiences for pupils. Thus support for colleges needs to be on the **didactics / methodology courses** NOT the academic content courses which focus on secondary level mathematics. We added that the evaluation of the ministry's Teacher Development and Management Strategy of 2008 – 2013 implemented INSET. A suggestion is that school improvement needs programmes that **focus on pedagogy (methodology)**.

Although we attempted to focus the discussion on the method courses, participants raised concerns about the content courses. Most tutors and lecturers at teacher training institutes were not trained to teach in primary schools and have not taught in primary schools, and their focus appears to sway naturally towards the mathematics content lectures, which is much closer to secondary school mathematics content.

Tutors were shown the QUEETS manual at the consultative workshop. Most tutors found it difficult to engage with, because they are more familiar with textbooks and a self-study guides. The QUEETS manual does not use a standard textbook format: it is designed for use by a trainer who had undergone trainer training.

One college asked for all topics to be covered. This resonates with the frustration voiced by others about the lack of a textbook. Other tutors listed topics. The topic that appeared in everyone's list was geometry. The second most named topic was algebra.

The SITT project cannot deal with all problems experienced by colleges. The SITT project cannot assume responsibility for providing resources on the same level as the government. For example, it has already been stated that it cannot provide computer laboratories. It is also beyond QUEETS scope to write mathematics textbooks for student teachers, especially for the content courses. The rationale for the SITT programme to work with teacher training colleges is that it could provide support for helping pre-service teachers rethink methodologies for teaching primary school pupils.

College curriculum is in flux (this adds to tutors' demotivation). It is difficult to write material that meets needs of the curriculum if curriculum is under reconstruction. The school curriculum however,

is stable. The SITT Core Group therefore recommended that the primary school mathematics syllabus is used as the reference for training college tutors.

## Recommendations for training tutors at colleges

The aim of QUEETS is to improve the learning experience of pupils in primary school. For this reason, any training on mathematics will focus on the content of primary school mathematics. Whilst using the content of primary school mathematics, the main focus of a mathematics package for teacher training colleges will be on didactics / methodologies that best develop conceptual understanding of primary school mathematics. This will resonate with local and international research (see earlier references earlier to Abadzi, Hardman et al, evaluation of QUEETS 2012 – 2014) on how best to support improvements to primary school education in Tanzania.

The expectation that because teachers or tutors receive training outside of their teaching context, it will be easy for them to change their practices when they go back to school or college is unrealistic on many grounds. Training in seminar form is of limited value. According to Meena (2009) cited in the 2014 MOEVT-UNESCO report (2014:50):

*“although such seminars and workshops are common, they do not significantly impact on the teachers’ work. They are presented as if they are not connected with teachers work and setting (MoEVT & OUT, 2007).*

This concurs with the finding of both the QUEETS evaluation of 2014 and the evaluation of the Teacher Development and Management Strategy run by the Education Ministry 2008 – 2013. Recent work on cognitive neuroscience indicates that knowledge learnt in one context is not easily transferable to another context. As Abazi (2006: 127 - 129) states *“mere provision of teacher training is not sufficient to change behaviors.... training given outside of the workplace may not always be recalled during work. Recall depends on the environment where material has been learned”* and *“material is recalled best under the circumstances it was learned....The fact that recall depends on environmental cues may be one reason why workshops ... often have limited impact on job performance (2006:170 – 173)*

Because there is much evidence that indicates minimal transfer between seminar training and teaching or lecturing. We propose that a mix of in situ training with tutors and some seminar based training with tutors<sup>7</sup>. This will include teaching a class of college students, with the help of tutors. Tutors would be involved in planning lessons with MEPP. This way tutors get an experience of a way of training student teachers. This enables tutors to see how students respond to a participatory primary methodology. All interested college tutors (from any of the colleges in the three regions) are participant observers in the training. Outside of the lecture time, we discuss with tutors the theory behind the construction of the methodology and plan with tutors for future classes.

In each year MEPP and all tutors go to one college, but a different college each year. We suggest training tutors and doing joint planning before working in a college with students in 2016 and 2017. One possibility is to do this at a college in the Kilimanjaro region in 2016 and in the Arusha region in

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<sup>7</sup> There is widespread critique of seminar based teachers training.

2017. In 2018, we suggest that tutors prepare the lessons and present to each other and MEPP in a workshop, give each other feedback and then do training at a college. This training should be open to members of the SITT Core Group who have not yet received training on mathematics teaching through QUEETS.

All colleges mentioned that they would like training in geometry, most colleges mentioned algebra, some colleges mentioned fractions. To develop a sense of the importance of mathematics topics in Tanzanian primary schools, we examined how many periods are allocated to topics across the seven standards in the Tanzanian Primary School Mathematics syllabus.

Number of periods allocated to topics in the Tanzanian Primary Mathematics syllabus								Total
Topic	Std 1	Std 2	Std 3	Std 4	Std 5	Std 6	Std 7	
<b>Whole numbers and operations on whole numbers</b>	136 +	78	82	60	69	52	77	<b>418</b>
<b>Money</b>	20	24	32	25	28		8	<b>137 +</b>
<b>Fractions</b>	48	36	30	20	20 +	26	14	<b>194 +</b>
<b>Measurement</b>			26	83	55	32	10	<b>206</b>
<b>Geometry</b>		20	20	50	33	60	96	<b>279</b>
<b>Algebra</b>					12	16	14	<b>42</b>
<b>Co-ordinates</b>						14	8	<b>22</b>
<b>Statistics</b>				15	12 +	16	16	<b>59 +</b>
<b>( + indicates that the number of periods for some sub-topics were not specified in the English Version of the Tanzanian Primary Mathematics syllabus)</b>								

**Table 3:** Number of periods allocated to the Tanzanian Primary Mathematics Syllabus

This shows that number (whole numbers) and geometry remain the most important topics in Tanzanian primary schools. Algebra is only done from Standard 5 onwards, and co-ordinate geometry from Standard 6 onwards. Even in the years that these topics are taught, very little time is allocated to them.

Based on the baseline survey, the relative importance of topics outlined above, the topics that inservice teachers reported as challenging, the information gathered during the consultative workshop with tutors and visits to colleges, including the way people responded to the manual, we propose that it will not be valuable to writing a training package before November 2016. We suggest that we first work more with tutors using the current QUEETS Mathematics Manual and postpone the writing of a package until after the first round of working with teacher training colleges in November 2016. After the training in November 2016 (during December 2016 – February 2017) MEPP writes up the training package, in a college-friendly format. This gets translated to Kiswahili, and a KiSwahili version produced in Tanzania between March 2017 and June 2017.

We suggest that we train on:

- primary school geometry in 2016 (with a special focus on plane shapes)
- primary school fractions in 2017
- primary school algebra and co-ordinate geometry in 2018

Student teachers should be interviewed about whether they feel able to implement these new methodologies on their Block Teaching Practice.

If possible videos should be made of tutors training students. These can be used as a resource in later years.

The suggestion for working with colleges came from TTU and Helvetas. It was not requested by colleges. The colleges raised a number of problems, most of which cannot be addressed by the QUEETS project (see Appendix 10: College suggestions for training package). Some tutors were not yet convinced that the QUEETS college intervention would be valuable to them. We suggest that only colleges that are interested in being part of the programme are involved at this stage, and that other colleges could join at a later if they become interested. There seems little point to force all colleges to be part of the programme.

## Appendix 1

### Terms of reference: qualitative baseline school survey

- Develop tools for data collection (for example, observation sheets and questionnaires) and present it to the project coordinator and partners.
- Desk study of provided literature (project document, QUEETS phase one Evaluation report, 2014 capitalisation of experiences, etc).
- Final decision on a matching methodology (in consultation with the project team) that would enable a comparison of findings between the treatment area, 12 SITT pilot schools and 8 control schools.
- Qualitative assessment of teaching at primary level: Visit of 12 test and 8 control group schools:
  - Further development of lesson feedback form of QUEETS
  - Rapid assessment of two lessons per school: in Mathematics
  - Develop questionnaire and perform focus group discussions with group of teachers about SITT approach at each school, by focussing on the activities undertaken at school in daily bases, success, challenges, suggested ideas, and best practices towards sustainability of SITT approach
- Exchange Meet with project team, TTU as the major partners and associates to present overview of initial findings.
- Carry out data collection, so as to provide baseline information as the basis for project monitoring and evaluation.
- Write a draft report how the survey was implemented and the results obtained.
- Identify gaps and need of additional information as well as suggest any relevant areas for improvement.
- Write a final report.

## Appendix 2

### The team visiting the school

On Monday 13 June 2016 we were introduced to the SITT Core Group and informed that they would be accompanying us during the school visits. The entire team did not go to all the schools together and this was depended on their availability and the area being visited.

The team comprised of:

Agatha Lebethu	MEPP
Heather Collins	MEPP
Reginald Christonsia	TTU HQ Focal Point
Nuru Shenkelwa	TTU Regional Secretary Manyara
Nicholaus Moshi	MOEVT Representative
Mary Mwashu	Quality Assurance Officer
Fabian Bulugu	HELVETAS Programme Co-Ordinator
Mika Munisi	Head teacher at Muumgano Primary School
Samirah Qadar	Tutor at Marangu Teachers Training College
Joyce Urassa	Municipal Academic Officer

## Appendix 3

### List of schools visited

#### Pilot Schools

Pilot Schools	Date	Region	District	Lesson Observed	Std	School size	Class size
<b>Jitengemene</b>	14-June	Kilimanjaro	Moshi municipality	Algebra – solving algebraic equations	7	<b>1001</b>	<b>57</b>
<b>Kimanganuni</b>	14-June	Kilimanjaro	Moshi DC	Geometry – Types of triangles	7	<b>316</b>	<b>25</b>
<b>Dr Shein</b>	15-June	Kilimanjaro	Moshi rural	Adding and subtracting up to 100 000	4	<b>614</b>	<b>69</b>
<b>Muongano</b>	15-June	Kilimanjaro	Moshi municipality	Geometry – Area of rectangles	7	<b>382</b>	<b>53</b>
<b>Nkwamwasi</b>	16-June	Kilimanjaro	Hai	Money – interest	7	<b>242</b>	<b>28</b>
<b>KambiyaRaha</b>	16-June	Kilimanjaro	Hai	Co-ordinate geometry	7	<b>746</b>	<b>73</b>
<b>Naura</b>	20-June	Arusha	Arusha district	Geometry – perimeters of squares	4	<b>610</b>	<b>51</b>
<b>Unga Ltd</b>	20-June	Arusha	Arusha City	Algebraic equations	7	<b>2385</b>	<b>45</b>
<b>Naurei</b>	20-June	Arusha	Arusha City	Fractions	4	<b>1221</b>	<b>41</b>
<b>Ziwani</b>	22-June	Manyara	Babati	Geometry – surface area of rectangular prisms	7	<b>417</b>	<b>42</b>
<b>Kwang'w</b>	22-June	Manyara	Babati	Geometry – plane shapes (using tangrams)	7	<b>730</b>	<b>104</b>
<b>Nakwa</b>	22-June	Manyara	Babati	Geometry – plane shapes – triangles and quadrilaterals	7	<b>649</b>	<b>58</b>



## Control Schools

Control Schools	Date	Region	District	Lesson Observed	Std	School Size	Class size
<b>Uparo</b>	17-June	Kilimanjaro	Moshi DC	Algebraic expressions	7	<b>352</b>	<b>26</b>
<b>Mijongweni</b>	17-June	Kilimanjaro	Hai	Geometry – area of rectangles	4	<b>336</b>	<b>40</b>
<b>Mailisita</b>	17-June	Kilimanjaro	Hai	Geometry –rectangles	4	<b>381</b>	<b>40</b>
<b>Msandaka</b>	17-June	Kilimanjaro	Moshi Municipality	Measurement – speed	7	<b>406</b>	<b>29</b>
<b>Laroi</b>	21-June	Arusha	Arusha City	Geometry – surface area of cylinders	7	<b>373</b>	<b>55</b>
<b>Olasiti</b>	21-June	Arusha	Arusha Municipality	Geometry Area of a rectangle	4	<b>2126</b>	
<b>Komoto</b>	23-June	Manyara	Babati Town	Whole numbers up to 1 billion	7	<b>492</b>	<b>47</b>
<b>Imbilibi</b>	23-June	Manyara	Babati	Geometry – 3D objects	7	<b>151</b>	<b>32</b>

# Appendix 4

## The primary school mathematics classroom observation instrument

### MATHEMATICS CLASSROOM OBSERVATION INSTRUMENT

School: \_\_\_\_\_

Teacher: Surname \_\_\_\_\_ First Name \_\_\_\_\_

Gender: \_\_\_\_\_

Region: \_\_\_\_\_

District: \_\_\_\_\_

Ward: \_\_\_\_\_

Head Teacher:

Surname \_\_\_\_\_ First Name: \_\_\_\_\_

Gender: \_\_\_\_\_

Number of learners in the school: \_\_\_\_\_

Number of teaching staff: \_\_\_\_\_

Date: \_\_\_\_\_ Starting time of lesson: \_\_\_\_\_

Mathematical Topic observed: \_\_\_\_\_

Class size \_\_\_\_\_

Boy/Girl Split \_\_\_\_\_

Time lesson ended \_\_\_\_\_

Name of Observer: \_\_\_\_\_

### School infrastructure

Purpose							
Theme		Functional services					
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NOT EVIDENT	AVAILABLE
1	There is functional clean water supply at the school						
2	Sufficient ordinary classrooms are available						
3	The school ground is accessible and well maintained.						
4	There is an administrative block/area						
5	There is a staff room for teachers.						
6	Adequate electrical supply.						
7	The school has a fence/hedge around it.						
8	The school has a school garden						
	There is a library/study room						
	There is a resource room						
	There are adequate number of teachers						
	There are adequate number of mathematics teachers						
	Classrooms have adequate ventilation and light						
	There is a feeding scheme at the school						
Comments							

### Classroom infrastructure and organisation

Purpose						
Theme		The classroom has functional services				
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NOT EVIDENT
1	There are sufficient desks for learners					
2	The classroom space is organised to stimulate learning					
3	The classroom is clean					
4	The seating arrangement is organised to give learners the best option to see and hear the teacher					
5	The classroom has a chalkboard					
6	The size of the classroom is adequate for the number of learners.					
7	There is a table and chair for the teacher					
	The classroom has a soft board					
	The classroom has adequate ventilation and light					
Comments						

## Teaching and Learning Resources

Purpose						
Theme		Teaching and Learning Resources				
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NEEDS SUPPORT
1	The teacher has access to chalk and a duster.					
2	The teacher has access to newsprint					
3	The teacher has access to mathematical teaching equipment					
4	The learners have access to mathematics textbooks					
5	The learners have own stationary e.g. a pencil and a ruler					
6	The learners have their own mathematical set					
7	Each learner has a mathematics class work book					
Comments						

## Planning

Purpose						
Theme		Lesson design				
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NEEDS SUPPORT
1	There is evidence of a lesson plan					
2	Lesson objectives are stated in the lesson plan					
3	Planned activities are differentiated					
4	Planned activities are appropriate for the standard.					
5	Planned activities show participatory methods					
6						
Comments						

## The Lesson

Purpose						
Theme		Lesson implementation				
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NO EVIDENCE IN THE LESSON
1	The lesson takes into account prior knowledge of learners					
2	The teacher was able to connect mathematical concepts					
3	The mathematics is developed in ways that will enable the learning of related concepts in higher standards					
4	The mathematics presented by the teacher was correct.					
5	The teacher is able use pupils solutions or methods to strengthen other pupils content, if needed					
6	The teacher checks for understanding throughout the lesson					
7	The teacher poses high quality questions and problems that develop thinking					
8	The teacher provides sufficient time and opportunity to practice the content. E.g. by doing exercises					
9	Pupils record mathematics in their notebooks e.g. notes or exercises					
10	There is evidence of participatory methods in the lesson					
11	The teacher summarises the mathematical content towards the end of the lesson.					
12	The teacher provides opportunities for learners to explain their thinking					
13	The teacher appears confident in the mathematics topic					
14	The teacher is confident in explaining the mathematics topic					
15	The teacher provides enough information for pupils to understand the content					
16	The mathematics written on the chalkboard is legible and organised					

17	The lesson is well structured and a good pace is maintained.					
18	There is informal assessment of pupil's understanding					
19	There is consolidation of key mathematical facts					
20	The teacher connects the mathematics taught to daily life.					

Comments



## Pupil engagement

Purpose						
Theme		Pupil engagement				
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NOT PART OF THE PRACTICE
1	Pupils are attentive and engaged in the lesson e.g. pupils listen to and follow instructions, expressions on their face, body language					
2	Pupils seem to show an interest in the lesson and the topic					
3	Pupils ask questions for clarification					
4	Pupils pay attention while another pupil is speaking					
5	Pupils demonstrate their thinking or solutions					
6	Pupils answer questions willingly					
7	Pupils talk about the mathematics to other pupils					
8	Most pupils understand the content					
Comments						

## Classroom culture

Purpose						
Theme						
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	Not PART OF THE PRACTICE
1	Active participation is encouraged by the teacher					
2	An enthusiasm for Mathematics is demonstrated by the teacher					
3	There is a climate of respect for pupils' questions, ideas and contributions					
4	The pupils demonstrate respect for the teacher					
5	Teacher acknowledges correct answers positively.					
6	The climate of the lesson encouraged pupils to explain, question, offer conjectures, and justify their thinking.					
7	Pupils are allowed opportunities to discuss and work collaboratively.					
8	Pupils are able to work independently					
9	Classroom management techniques and skills of the teacher encourages active participation					
10	The teacher addresses pupils by name					
Comments						

## Appendix 5

### Reflection on SITT Core Group after the first week of observation

On Friday 17 June after all school in Kilimanjaro region were visited, a meeting was held at the TTU Office in Moshi to reflect on what we experienced during the week. To structure the conversation, we (MEPP) created the following categories for reflection. Each person could decide which category they wanted to comment about:

- Pupil confidence
- Learning Aids
- School leadership
- Conceptual understanding – meaning of mathematics
- Learning experience

The thoughts and experiences from the SITT Core Group are capture verbatim below.

#### ***Pupil confidence***

- Most pupils lack confidence to:
  - Ask questions
  - To correct a teacher
  - To admit a point/concept which is not clear
  - To say NO, when majority say yes
- I saw pupils in the schools where they do not wear school uniforms and shoes, hence become dirty and organised, while in the classrooms. (control school)
- Pupils seem to be confident in some schools, but depended on subject teachers – the way she/he treats them. For some schools Nkwamasi and Mijongweni pupils were able to do the questions on the chalkboard. TEACHERS HOULD BE ADVISED TO LOVE AND ENCOURAGE ALL THE PUPILS IN THE CLASSROOM, TO PARTICIPATE FULLY DURING TEACHING AND LEARNING ACTIVITIES.
- STD 4 TEACHER (in lesson on subtraction) built learner confidence through:
  - Own confidence and happy attitude
  - Songs (mixed mode)
  - Teaching aids
  - Knowledge of pupils
  - Works with each pupil (pilot)

- In the school in which pupil's especially standard seven pupils' confidence was high this followed good command of the subject by the teacher. Girls showed higher confidence than boys for standard 4 pupils at Dr Shei primary school.
- I saw and heard pupils always saying "yes" –always chorusing "Yes"
- I saw pupils only working independently most of the time
- Pupils confidence in most of the pilot schools is high. Pupils are learning without fear, as when are asked a question, they do respond immediately and they even compete to answer the question by raising hands.
- Many pupils have low knowledge in Mathematics. This has built fear and hence reduced their confidence

### ***Learning aids***

- In most schools pupils are not engaged in preparation of learning aids. Teachers fail to utilise the local available resources to prepare teaching aids.
- Many teacher complain that mathematics is difficult lesson but not pupils. *Note:* teacher who teach mathematics should mobilise and encourage pupils to like maths subject.
- I was very little learning aids being used. There were very few learners who had the opportunity to engage with learning aids.
- Students do not use the available tools/aids when answering questions. (pilot school)
- Some of the teachers did not use their environment/surroundings to make teaching aids by using material which are in their surroundings. They think that they need to get money in order to buy. They should use their initiative and creative one.
- Many teacher have not prepared their teaching aids; hence they used lecture methods in teaching which is not participatory to learners hence the lesson became difficult to be understood. (control school).
- No learning aids used in teaching in all school we visited.
- In most schools visited, learning aids were not used effectively so as to make teaching easier. Some teachers used teaching aids which they failed to utilise to make the concept known and understood. There were also complaints from teachers who seem to depend upon the government to supply teaching aids rather than being creative.
- Learning aids in simple mathematics are simple to make. I didn't see the learning aids such as Geometry and Algebra

### ***School leadership***

- Head Teachers should be creative in order to eradicate some challenges in their school e.g. Dr Shein doesn't have enough water. The Head Teacher could find the means of getting money to harvest rain water during rainy season.
- Leadership is practised in a closed box. Most school leaders do think beyond their campus for improvement e.g. to learn what others are doing out there e.g. in:
  - Leading
  - Professional development
  - In solving challenge toilets
  - Co operating with local community
- Most school leaders wait/depend on everything from Government.
- Muwengo and Nwkamasi Primary Schools have my role model in school leadership. They are close to their teaching staff.
- The Head teacher at Nkwamasi Primary School was unique in her leadership style. Apart from other responsibilities she also teaches maths in standard 7. She leads by example as normally many head teachers in Tanzania do not teach but just behave like managers. She is also good in supervising and coordinating and encouraging team teaching. The head teacher at Mailisita Primary School was/is good as she has been able to organise parents meeting to solicit funds from school friends/partners. She has been able to build extra ordinary toilets including disabled ones.
- "partially accountable leadership"
- Having powerful and innovative head teachers in school results to having good performing schools. (pilot schools)
- I met a head teacher who uses very little money to farm 5 acres of land to provide food for learners. (control school)
- Input Press output, outcome, input.

### ***Conceptual understanding – Meaning of mathematics***

- Most teachers do not connect the concepts of maths learned to the real life situation, so learners fail to understand the meaning of maths.
- Meaning of mathematics still a challenge to explain in some of teachers, particularly in Geometry and Algebra. Other topics such as "speed" is simple to explain to the kids.
- I saw pupils using formula for Area, but I am not sure if they understand the concept.

- Pupils understanding of mathematics is affected by teaching approaches used by our teachers – they prefer vertical approach of teaching rather than horizontal and action oriented teaching.
- Pupils don't understand the real meaning, it's like marking the procedure but when twisted, they get lost.
- Pupils prepared for examinations not knowledge development. Everything is disjointed, no conceptual understanding. Leadership problem.

### ***Learning experience***

- Learners are good and ready to learn and they respect teacher, BUT in some schools teachers miss some techniques in delivering lessons e.g. encouraging language and group discussion
- No reflection of school life and real life situation. (No desired change of behaviours)
- Many blame lower standards. Few offer solutions to improve learning in lower standards.
- Where teachers are unhappy, despondent, demotivated and pupils fearful then learning does not flourish. (std 7, Jitengemene pilot school)
- Some teachers fail to organise their classroom, they sat together being 4 pupils in a single desks while there are a lot of desks unused, which facilitating copying works from their fellows rather than having independent studying. (Control school)
- I was interested by the method of using group discussion conducted by Kambi ya Raha Primary School, where 70 pupils in the overcrowded class work collaboratively their groups in three rows (mathematics subject in pilot school)
- Highly organised and structured classroom environment
- The learning environment is controlled and teacher driven. The learners/pupils are passive participants
- Many teachers direct more efforts to teach higher standards (5, 6 and 7) than lower grades. Consequently they get trouble to correct mistakes done by teachers in the lower grades i.e. neglecting pupils, skipping topics. If the 'base' is not good, performance in the class becomes poor.
- When learners sit in a group it does not always mean the whole group is participates or learns (pilot school).

## Appendix 6

### Reflection meeting with SITT Core Group after the second week of observation

**Friday 24 June 2016, ARUSHA 14:50**

**How can we support teachers to share best practice?**

*Teachers teaching in a ward could be grouped/assembled to be to share teaching methodology/approach, skills and knowledge about maths teaching.*

*Head Teachers need to be oriented so as to support SITT with proper understanding.*

*Encourage them to share knowledge*

*Develop simplified modules to assist them in Teaching and Learning.*

*Form networking*

*To have a time table/schedule when to facilitate other teachers*

*We can support teachers to share best practice through demonstration classes done at the school level and through coaching and feedback sessions conducted at school level.*

*By having competent facilitators to facilitate*

*To have close monitoring*

*By developing model lesson plans that teachers can use.*

*Use the competent ETs and TETs to have seminars once/twice a year with fellow teachers in ward level/district level and regional level*



### **What are the implications for the SITT Model?**

*If the model is going to be well thought , it will help to solve the critical problems of Education in Tanzania.*

*Focussing on support to good practice to make it better, NOT criticising, judging and monitoring.*

*Can stimulate learning for the pupils*

*Active participation during the learning process.*

*No pupils could be left behind during the learning process*

*Teaching and learning aids stimulate learning*

*Two/one control school could become pilot school (s)*

*SITT is highly needed to be practiced however close follow up should be done by the coordinators/Core group where possible.*

*To support the programme imparting the participatory method in learning and teaching from in-service teachers to teachers training colleges.*

### **What are the gaps of the SITT approach?**

*To change the mindset of teachers that seminars/workshops/and other trainings can happen at school by using existing experts and other competent teachers in school*

*Teaching and learning aids still challenging. Most of the teaching and learning aids are prepared by the teachers and it should be participatory.*

*School feeding programme can be an obstacle to SITT approach as sometimes SITT model involves sport and games and a learning process.*

*Translation of curriculum into practice.*

*Linkage of lesson taught with real life of pupils*

*Cascading of the model within school environment*

*Relaying on tradition means development of teaching and learning materials.*

*How will good practices at one school be shared with other schools?*

*School understanding what the SITT approach is and how it works, how it will affect them and their pupils*

*Working in groups does not always increase participation*

*Who will time to support teachers at their work places?*

*Close follow up for ET's.*

*Long distance from TETs and ETs*

***What challenges do we notice that face us/SITT***

*Some teachers couldn't be competent in using participatory method.*

*Different levels of:*

- participatory approach*
- understanding of group work*
- understanding of best practice*

*Distance from one school to another*

*Unforeseen acts like death case reported in one of the schools*

*College time table (opening of the terms)*

*It was difficult to know if the preparations and teaching approaches were done regularly or just to suit the visitors purpose.*

*Even teachers who attended training, some failed to show mastery of the topics they were teaching*

***What was good about what we saw this week?***

*Pupils engaged in making their own learning aids.*

*Teachers were able to apply appropriate approaches as they were trained, though not all*

*Geometry topics were taught confidently with actual practice by pupils*

*There were trainable teachers in control schools.*

*Some schools had feeding schemes*

*Teachers are ready for SITT approach*

*Participatory methods are undertaken in primary schools*

*Active pupils participation in the learning session.*

*Some teachers still remember and apply the teaching methods which they were taught by MEPP*

*We saw examples of pupils really discussing mathematics not just answering the teacher's question*

*Conceptual understanding of mathematics, not just procedures.*

*Impressed on teaching and learning of Maths.*

*Improvisation of teaching and learning resources*

*Teachers were motivated*

*One teacher asked the class? Why is the formula like that? Higher order thinking skills*

*Pupils making learning aids from local materials.*

*Use of participatory methods, teaching aids, working in groups, sharing in mathematics solution.*

*Easy learning e.g. making of different shapes using rope.*

*Making use of space outside of the classroom and using pupils bodies as learning Aids*

*Pupils eager to learn.*

*Pupils participated in development. Different mathematical models/geometric shapes.*

*Creativity.*

*Law of practice has started to function especially for the five schools of Manyara*

*There is an increase of commitment of teachers and learners in some schools.*

We used the reflections from the meeting above to shape our own recommendations for the SITT Model.

## Appendix 7

### Terms of reference qualitative baseline at teacher colleges: Level of Math teaching and capacity building needs

Assess the quality of Math (didactics) teaching in all seven teacher colleges in Arusha, Manyara and Kilimanjaro. This should include the availability of Math teaching aids and the verification of the availability of computer rooms. The option of the built-up of a webpage with links to useful Math teaching material online and the set-up of short didactic videos for Math could be considered, where the majority of training colleges have access to computers.

Exchange with Math tutors and principal about capacity building needs and challenges, locally made teaching aids and Math curriculum for teachers.

Write a short assessment report about quality of Math (didactics) teaching in all seven teacher education institutions. Relate methods used in teacher training colleges to those used for QUEETS in primary schools. Explain how the survey was implemented and the results were obtained.

Identify elements of a training package for Math tutors (e.g. module of 12 or 40 hours to be taught at colleges (fitting in the existing teacher education curriculum) or selective topics to be included individually in teaching).

Prepare a proposal for a training package for Math tutors (content, methodology, feasibility, level of integration in teacher education curriculum, feasibility for QUEETS regarding costs, duration of training and number of lessons for teacher education students, etc.), how it can be implemented (including coaching) and monitored (part of the report).

Identify gaps and need of additional information; suggest any relevant areas for improvement.

Write a final report.

## Appendix 8

### List of Teacher Training Institutes visited

Teacher Training Institute	Date of visit	Region	District	Lecture Observed	In-service / Pre-service teachers	Didactics / Content
<b>Mamire TTC</b>	22-June	Manyara	Babati DC	Statistics	Returning in-service	Didactics
<b>Mount Meru University</b>	27-June	Arusha	Arusha Rural	Statistics – standard deviation and variance	Returning in-service	Content
<b>Monduli TTC</b>	27-June	Arusha	Monduli	Algebra – radicals and exponents	Pre-service	Didactics
<b>Patandi TTC</b>	27-June	Arusha	Arusha City	No lecture observed		
<b>Marangu TTC</b>	28-June	Kilimanjaro	Moshi Rural	Algebraic graphs - slope	Pre-service	Didactics / Content
<b>Mandaka TTC</b>	28-June	Kilimanjaro	Moshi Rural	Algebra - introduction	Pre-service	Didactics
<b>Singachini TTC</b>	29-June	Kilimanjaro	Moshi Rural	Measurement – Speed -	Pre-service	Didactics

## Appendix 9

### Teacher college/university mathematics classroom observation instrument

Teacher College/university: \_\_\_\_\_

Tutor: Surname \_\_\_\_\_ First Name \_\_\_\_\_

Gender: \_\_\_\_\_

Region: \_\_\_\_\_

District: \_\_\_\_\_

Ward: \_\_\_\_\_

Number of students in the education department: \_\_\_\_\_

Number of teaching staff: \_\_\_\_\_

Date: \_\_\_\_\_ Starting time of lecture: \_\_\_\_\_

Mathematical Topic observed: \_\_\_\_\_ Class size \_\_\_\_\_

Male/Female Split \_\_\_\_\_

End time of lecture: \_\_\_\_\_

Name of Observer: \_\_\_\_\_

### College/university infrastructure

Purpose						
Theme		Functional services				
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NOT EVIDENT
1	There is functional clean water supply at the college/university					
2	Sufficient ordinary classrooms/lecture theatres are available					
3	The college/university ground is accessible and well maintained.					
4	There is an administrative block/area					
5	There is a staff room for tutors.					
6	Adequate electrical supply.					
Comments						

### Classroom infrastructure and organisation

Purpose						
Theme		The classroom has functional services				
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NOT EVIDENT
1	There are sufficient de for students					
2	The classroom space is organised to stimulate learning					
3	The classroom is clean					
4	The seating arrangement is organised to give students the best option to see and hear the tutor/lecturer					
5	The classroom has a chalkboard					
6	The size of the classroom is adequate for the number of students.					
7	There is a table and chair for the tutor/lecturer					
Comments						



## Teaching and Learning Resources

Purpose						
Theme		Teaching and Learning Resources				
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NEEDS SUPPORT
1	The tutor/lecturer has access to chalk and a duster.					
2	The tutor/lecturer has access to newsprint					
3	The tutor/lecturer has access to mathematical teaching equipment					
4	The students have access to mathematics textbooks					
5	The students have own stationary.					
6	The students have their own mathematical set					
7	Each student has a recording notebook					
Comments						

**Planning and organisation**

Purpose						
Theme		Lecture design				
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NEEDS SUPPORT
1	The tutor arrives on time					
3	There is evidence of a plan					
4	Lecture objectives are stated in the plan					
5	Planned activities are differentiated					
6	Planned activities are appropriate for the standard.					
7	Planned activities show participatory methods					
8	Reference is made to course notes/handouts or prescribed textbooks					
Comments						

## Instructional strategies

Purpose						
Theme		Lecture implementation				
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NOT PART OF THE PRACTICE
	The lecture takes into account <i>prior knowledge</i> of students					
1	The tutor/lecturer was able to <i>connect mathematical</i> concepts					
2	The <i>mathematics</i> presented by the tutor/lecturer was <i>correct</i> .					
3	The tutor/lecturer is able <i>use students solutions</i> or methods to strengthen other students content, if needed					
4	The tutor/lecturer <i>checks for understanding</i> throughout the lecture					
5	The tutor/lecturer <i>poses high quality questions</i> and problems that develops thinking					
6	The tutor/lecturer <i>provides sufficient time and opportunity to practice the content</i> . E.g. by doing exercises					
7	Reference is made to <i>participatory methods</i>					
8	The tutor/lecturer provides opportunities for students to explain their thinking					
9	The tutor helps students to <i>apply theory</i> .					
10	The tutor/lecturer <i>is confident</i> in explaining the mathematics topic					
11	The tutor/lecturer <i>provides enough information</i> for students to understand the content					
12	The <i>mathematics recorded</i> is legible and organised					
13	The tutor <i>uses course material</i> appropriately.					
14	The tutor makes reference to additional reading materials					
15	The <i>lecture is well structured</i> and a <i>good pace</i> is maintained.					
16	There is <i>consolidation of key facts</i>					
17	The tutor/lecturer <i>summarises the mathematical content</i> towards the end of the lecture.					

Comments

### Varying and pacing of instruction

Purpose						
Theme						
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NOT PART OF THE PRACTICE
	During instruction the tutor <b><i>pauses after asking questions</i></b>					
2	The tutor <b><i>accepts students responses</i></b>					
3	The tutor <b><i>draws non participating students</i></b> into discussion					
4	The tutor <b><i>prevents specific students from dominating the discussion</i></b>					
5	The tutor <b><i>demonstrates active listening techniques</i></b>					
6	The tutor <b><i>allows enough time to complete tasks</i></b>					
7	The tutor is able to <b><i>complete the planned topic scheduled for the task</i></b>					
Comments						

## Content Knowledge

Purpose						
Theme						
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NOT PART OF THE PRACTICE
1	The tutor/lecturer is knowledgeable about the subject matter					
2	The tutor/lecturer is confident in explaining the subject matter					
3	The tutor/lecturer uses a variety of illustrations to explain the content					
4	The tutor/lecturer provides for sufficient content detail.					
5	The tutor/lecturer focuses on important content in the field					
6	The tutor/lecturer incorporates views of women and minorities					
7	The tutor/lecturer corrects bias in assigned materials					
Comments						

**Rapport with students**

<b>Purpose</b>						
<b>Theme</b>						
<b>No</b>	<b>Elements observed</b>	<b>OUTSTANDING</b>	<b>GOOD</b>	<b>ACCEPTABLE</b>	<b>NEEDS IMPROVEMENT</b>	<b>NOT PART OF THE PRACTICE</b>
1	The tutor welcomes student participation					
2	The tutor has high expectations from students					
3	The tutor models good listening habits					
4	The tutor motivates students					
5	The tutor stimulates interest in the subject					
6	The tutor uses effective classroom management techniques					
7	The tutor welcomes multiple perspectives					
<b>Comments</b>						

### Student engagement

Purpose						
Theme						
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NOT PART OF THE PRACTICE
1	Students are attentive and engaged in the lecture					
2	Students seem to show an interest in the lecture and the topic					
3	Students ask questions for clarification					
4	Students pay attention while another is speaking					
5	Students demonstrate their thinking or solutions					
6	Students answer questions willingly					
7	Students talk about the mathematics to other students					
8	Most students understand the content					
Comments						



## Classroom culture

Purpose						
Theme						
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NOT PART OF THE PRACTICE
1	Active participation is encouraged by the tutor/lecturer					
2	An enthusiasm for Mathematics is demonstrated by the tutor/lecturer					
3	There is a climate of respect for students' questions, ideas and contributions					
4	The students demonstrate respect for the tutor/lecturer					
5	Tutor/lecturer acknowledges correct answers positively.					
6	The climate of the lecture encouraged students to explain, question, offer conjectures, and justify their thinking.					
7	Students are allowed opportunities to discuss and work collaboratively.					
8	Students are able to work independently					
9	Classroom management techniques and skills of the tutor/lecturer encourages active participation					
Comments						

### Impact on Learning

Purpose						
Theme						
No	Elements observed	OUTSTANDING	GOOD	ACCEPTABLE	NEEDS IMPROVEMENT	NOT PART OF THE PRACTICE
1	The tutor broadens students views					
2	The tutor encourages students analytical ability					
3	The tutor fosters and demonstrates respect for diverse point of views					
4	The tutor provides a healthy challenge to former attitudes					
5	The tutor develops students appreciation of mathematics					
6	The tutor develops students appreciation of mathematics teaching					
Comments						

Chism, N.V.N (2007) *Peer review of Teaching: A Sourcebook*. Bolton, M.A: Anker

## Appendix 10

# College tutors suggestions for a mathematics Training Package

On Thursday 30 June we met with tutors from the teacher training institutes. MEPP, explained that the focus of SITT is on primary school methodology: on changing practices in primary school Maths, English and ESD classes to enhance the learning experiences for pupils. Thus the support offered to colleges needs to be on the didactics / methodology courses NOT the academic content courses which focus on secondary level mathematics. We added that the evaluation of the ministry's Teacher Development and Management Strategy of 2008 – 2013 implemented INSET. Suggested that school improvement needs programmes that focus on pedagogy (methodology). Although we attempted to focus the discussion on the method courses, participants raised concerns about the content courses. Most tutors and lecturers at teacher training institutes were not trained to teach in primary schools and have not taught in primary schools, and their focus appears to sway naturally towards the mathematics content lectures, which is much closer to secondary school mathematics content. The responses of the college tutors are capture verbatim below.

### Mount Meru University

1. Topics to be addressed
  - Arithmetic: Number systems; Ratios; Rates; currencies
  - Algebra: co-ordinate geometry
  - Geometry: Points, lines, angles and figures
  - Others: statistics and sets
2. Form
  - A self help textbook and a teacher's guide
3. Should have solved shortage of books in schools/colleges.
  - Arose the interest of mathematics learning.
  - Easier facilitation of mathematics lessons.

### Mandaka Teacher Training College

- a. Topics that training package should address
  - Geometry:
    - How to construct different geometrical figures using mathematical instruments
    - How to calculate areas and perimeters of different geometrical figures e.g. plane shapes and 3D shapes
- b. Form that the package should take
  - Teachers should use model lessons rather than lecture method>
  - Using teaching aids as much as you can.
  - Use learner centred methods

## **Monduli Teacher Training College**

1. Topics proposed  
Geometry
  - Quadrilaterals
  - Circles
  - (Perimeter and Area)  
Kinematics  
  
Measurements (length, time, weight etc.)  
  
Radicals and Exponents  
  
Algebraic Expressions  
  
Multiplication  
  
Accounts (hesabu za Fedha(ankra))
2. Proposed form  
Modules

## **Marangu Teacher's Training College**

1. The package should treat each topic
2. Each topic should address the following:
  - Conceptual development
  - Teaching methods / techniques
  - Propose teaching aids / materials with drawings / pictures
  - How to connect mathematical concepts
  - Applications of mathematics concepts in real life situations
  - Proposed time
  - Proposed higher order thinking tasks.

## **MAMIRE TC**

1. Contents (topics) that training package should address:
  - Geometry
  - Algebra
2. Forms that training package should take (book)
  - i. Arrangement of topics should be simple to complex
  - ii. Illustrations should be made to develop the concepts

- iii. Practical activities for each sub topics
- iv. Use of examples of teaching aids such as models, real objects, drawings/diagrams.
- v. Exercise at the end of each sub topics.
- vi. Methodology – learner centred

## SINGACHINI TC

Challenges:

- Methodology of teaching
- Most of the pupils think Maths is difficult subject
- Competent teachers (for the Govt)
- Class environment (for the Govt)

Topics:

- Geometry
  - Surface area of 3D
  - Algebra

$$\frac{6x^2y - 2xy^2}{y - 3x}$$

$$y - 3x$$

- Applications of integers
- Square root more than 4 digits

The package should be in form of:

- Books or
- Modules

## PATANDI TC

The topics that the training package should address to improve methodology.

Numbers:

- Natural numbers 1, 2, 3....
- Whole numbers (operation with whole numbers)
- Integers
- Squares and square roots
- Factors and multiples (LCM)

Fractions

- Concepts
- Types
- operations

Algebra

- Concept
- Equations with one unknown e.g.  $x + 5 = 12$

## Geometry

- Points
- Lines
- Plane shapes
- 3D objects
- Co ordinate geometry

The form it should take will be manual form

## Appendix 11

### Kitabu cha Mwongozo wa Mwalimu cha Kufindishia Hisabati Sehemu ya 2: Jometri

Below are a list of typo's and errors that occur in the abovementioned manual. Some of these are related to diagrams. Diagrams are a key part of the text in geometry. Where diagrams are missing, the activities no longer make sense. The errors marked in bold text impact on the seriously on the meaning of the text.

It is important that ET's who have the English manual are referred to the corresponding English pages so that they can see the correct mathematics. Tutors and student teachers also need to be given the errata list and corresponding pages of the English manual.

If there is a reprint of the manual, could the corrections be implemented.

- Page 121 line space before heading "kutumia zana za kufundishia....."
- **Page 235 See English Geometry manual page 20**  
**In Question 2, row 7 middle column, the top left hand diagram belongs in the row above. The bottom three diagrams can then be moved up into the bottom row,**
- **Page 242 See English Geometry manual page 24. The middle column should have two text boxes split by an arrow (see English version for how to split). Last column should have 3 text boxes (see English version)**
- Page 250 Top diagram replace English 1 cm and 2 cm with sm 1 and sm 2.
- **Page 254 Diagrams of triangles and quadrilaterals missing – see English Geometry manual page 36**
- Page 269 replace English 1 cm and 10 cm with sm 1 and sm 10, in diagrams.
- Page 270 replace English 1 cm and 15 cm with sm 1 and sm 15, in diagrams.
- Page 274 Top diagram replace English 1 cm, 2 cm and 8 cm with sm 1, sm 2 and sm 8.
- **Page 282 / 3 Set of diagrams (of rectangle and triangle missing): see English Geometry manual page 65**
- **Page 295 Top diagram does not belong on this page. Please replace with the correct diagram from English Geometry manual page 77. (this is the diagram from the Kiswahili Hisabati Jometri manual page 299 – and the English geometry manual page 81 – it does not belong on page 295).**
- **Page 295 Plane shape F is not a square. It should read mstatili F NOT mraba F.**
- Page 296 replace English 3 cm, 4 cm, 5 cm, 8 cm and 10 cm with sm 3, sm 4, sm 5 and sm 8 in diagrams.
- **Page 297 The arrows between last 3 text boxes are missing see English Geometry manual page 79**
- **Page 298 The arrows between text boxes are misaligned see English Geometry manual page 80**
- Page 301 replace English 1 cm, 2 cm, 3 cm, with sm 1, sm 2, sm 3 in diagrams.
- Page 302 replace English 1 cm, with sm 1, in diagrams.
- **Page 303 last diagram needs to be labelled  $C_2$  see English Geometry manual page 85**



- **Page 317** The sphere has been enlarged along the horizontal plane – its shape is no longer spherical (see English geometry manual page 100)  
Mche pembetata not mche pembe tata,  
The rectangular based pyramid is incorrectly labelled – shouldn't it be something like mraba makao piramidi or piramidi mraba makao  
On page 318 cones are called Pia, on page 317 they are called kiini.  
On page 317 cylinders are called masilinda, on page 318 they are called micheduara.  
The aim on this page was for the drawings of the prisms to be under the text about prisms and the drawings of the pyramids to be under the text about pyramids. Also for the drawing of the triangular prism to be alongside the drawing of the triangular pyramid, the drawing of the rectangular prism to be alongside the drawing of the rectangular-base pyramid, the drawing of the pentagonal prism to be alongside the drawing of the pentagonal pyramid, (see English geometry manual page 100). Please re-aligned pictures to help the reader makes sense of how to name the 3D objects
- **Page 319** Please delete the last picture on the right hand side, it is a prism not a pyramid
- **Page 320** Please check all text boxes, some of the words and letters are missing.
- **Page 322** The drawings of 3D objects in column 1 must be inserted, otherwise the activity does not make sense (see English geometry manual page 105).
- **Page 323** The drawings of 3D objects in column D and E of the top table, and all the plane shapes in all columns of the bottom table must be inserted, otherwise the activity does not make sense (see English geometry manual page 106).
- **Page 324** The drawings of all 3D objects in left hand column must be inserted, and all nets alongside must be re-inserted otherwise the activity does not make sense (see English geometry manual page 107).
- **Page 325** The missing diagrams must be re-inserted otherwise the activity does not make sense (see English geometry manual page 109).
- **Page 326** Question 4 second box pembetatu not pembe tatu
- **Page 331** The missing diagrams must be re-inserted otherwise the activity does not make sense (see English geometry manual page 114).
- **Page 333** Move last drawing up so that it does not run into footer
- **Page 334** Check letter labelling of questions (currently a, c, d, e, b) Dimensions of radius missing on circle (see English geometry manual page 117), Move rectangle to below text so that dimensions don't spill into last question

#### Appendices

- **Second and Third appendices missing (see English geometry manual pages 121 and 122)**
- **Pages 337 – 339, 341 – 345 Incorrect nets. (see English geometry manual pages 123 - 131)**

- There are a lot of dark grey bars on diagrams: is there not a way to remove these: page 227, 285, 296, 303 (here it obscures the label C2), 334
- In quite a few places “*pembe tatu*” instead of *pembetatu*. Can this be checked throughout? See for example page 286 (English Geometry manual page 68), page 317 (English Geometry manual page 100) Page 326 (English Geometry manual page 110)

## References

- Abadzi, H, (2006) Efficient Learning for the Poor: *Insights from the Frontier of Cognitive Neuroscience*. Washington: The International Bank for Reconstruction and Development/The World Bank
- Akyeampong, K., Lussier, K., Kattie, Pryor, J.. & Westbrook, J. (2013) "Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count?" in *International Journal of Educational Development* 33 (2013) 272–282
- Ball, D. L., & Cohen, D. K. (1999). Developing practice, developing practitioners: Toward a practice-based theory of professional development. In G. Sykes and L. Darling-Hammond (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 3–32). San Francisco: Jossey Bass.
- Ball, D.L. (2000). Bridging Practices: Intertwining Content and Pedagogy in Teaching and Learning to Teach. *Journal of Teacher Education*, 51(3).
- Brunvand, S. (2010). Best practices for producing video content for teacher education. *Contemporary Issues in Technology and Teacher Education*, 10(2), 247-256.
- Bulgar, S. (2007). Using supported video exemplars for the professional development of preservice elementary school teachers. *Contemporary Issues in Technology and Teacher Education*, 7(2), 28- 41.
- Chism, N.V.N (2007) *Peer review of Teaching: A Sourcebook*. Bolton, M.A: Anker
- EPPI-Centre, (2002). *How does collaborative Continuing Professional Development (CPD) for teachers of the 5-16 age range affect teaching and learning?* EPPI-Centre Reports on Line, London: Institute of Education.
- Guardian* 24 June 2016: 1 - 2
- Hardman, Abd-Kadir & Tibusinda (2012) Reforming teacher education in Tanzania. *International Journal of Educational Development* 32 (2012) 826-834
- Joint Education Trust (2012) *The role of the lesson plan in jet's teacher development model: exploring solutions to challenges*, posted Category: Creative Learners | Education system improvement | 20 August, 2012 - 15:44). <http://www.dgmt-community.co.za/organisations/jet/learning-briefs/role-lesson-plan-jets-teacher-development>
- Kimanyo, A.L. (2008) Primary School Teachers' Views On The Use Of Participatory Teaching Approaches In Teaching And Learning In Tanzania. European Educational Research Association. <http://www.eera-ecer.de/ecer-programmes/pdf/print/conference/1/contribution/938/>
- MOEVT – UNESCO (2014) *Enhancing Teacher Education for Bridging the Education Quality Gap in Africa. The Case of Tanzania needs Assessment Report*. Prepared by the Ministry of Education and Vocational Training (Tanzania) in collaboration with the National Team, UNESCO office Dar Es Salaam, and UNESCO Regional Office for Eastern Africa (Nairobi, Kenya). March 2014

Santagata, R, Zannoni, C & Stigler, J, The role of lesson analysis in pre service teacher education: An empirical investigation of teacher learning from a virtual video based field experience. In *Journal of Mathematics Teacher Education* 10 (2): 123-140 January 2007

Shirima, D. (2013). *Effectiveness of Participatory methods in Teaching of English Subject in Community Secondary Schools in Moshi Rural Districts: Challenges and Prospects*. Dissertation submitted to the Open University of Tanzania.

UNICEF, 2009b. *The Quality of Teaching and Learning in Tanzanian Primary Schools: A Baseline Study*. UNICEF, Dar es Salaam.

UNICEF, 2009c. *A Review of Teacher Education in Tanzania and the Potential for Closer Links between PRESET and INSET*. Dar es Salaam. UNICEF.

Vavrus, F., 2009. The Cultural politics of constructivist pedagogy: teacher education reform in the United Republic of Tanzania. *International Journal of Educational Development* 29, 303-311

Vavrus, F., & Bartlet, L. (2013) *Teaching in Tension. International Pedagogies, National Policies and Teachers' Practices in Tanzania*. Boston Sense Publishers.