Tanzania

A Project Report on Improvement of Performance In Primary School Mathematics In Tanzania: A Case Of Mlimani Primary School

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1. Introduction

Mathematics has for long time in many countries being regarded as foundation subject for students to succeed in variety of content areas during a student's educational experience. Mathematics is crucial not only for success in school, but being an informed citizen, being productive in one's chosen career, and in personal fulfilment. In today's technology driven society, greater demands have been placed on individuals to interpret and use mathematics to make sense of information and complex situations. Logical thinking inherent in mathematics provides basis for mathematics and technology.

This foundation is built beginning from when a child is in primary school. At this level children achieve a basic level of numeracy and competence in dealing with numbers. Also due to the rigorous and analytical basis upon which it is founded, mathematics serves as an ideal platform for the development of problem solving abilities as well as an avenue to develop analytical and logical thinking within children. At the primary school level the applications that mathematics has in the real world should be emphasized. This is where the mathematics a child is taught will serve as the foundation for all mathematics the student will use for the rest of his life. In addition, a primary school mathematics curriculum should also engender students with a love of learning. Learning comes in many forms, and mathematics at this level should take advantage of a child's natural tendency to explore, play and discuss newly discovered ideas to help students master concepts. All these objectives depend on the ability of teacher to teach effectively.

However, experiences of learning mathematics for many students in Tanzania have never been thrilling. The reality is most have been taught by rote, and when students are

young and in lower grades they find ways to get by because failure to answer correctly was and still in some schools, usually met with corporal punishment. Teaching of mathematics is very traditional and theoretical; many concepts are very abstract to learners and hardly related to daily life. Didactic approach in which teacher control methods of instruction are very common, as the way teachers were taught can affect the way they teach when they enter the profession. Such history left imprints on the present and mathematics is generally feared by teachers and students alike and this has implications in both teaching and learning.

The teacher plays a key role in ensuring effective teaching occurs in a classroom. Studies have shown that one of the characteristics of highly effective mathematics teaching and learning is a learning climate (see for example, Elias, M. J., Arnold, H., and Hussey C. S.,2003;Marzano, R. J.,2003 & Bransford, J.D., Brown, A.L., Cockling, R.R.,2000). Learning climate is a safe environment promoted and supported by the teacher in which high, clear expectations are established and positive relationships are fostered to promote learning; and active learning is emphasised. In this climate, teacher creates learning environments where students are active participants as individuals and as members of collaborative groups and their work is valued; motivates students and nurtures their desire to learn in a safe, healthy and supportive environment which develops compassion and mutual respect. Teacher also encourages students to accept responsibility for their own learning and accommodates the diverse learning needs of all students. Teacher effectively allocates time for students to engage in hands-on experiences, discuss and process content and make meaningful connections. What's more this teacher designs lessons that allow students to participate in empowering activities in which they understand that learning is a process and mistakes are a natural part of learning.

Furthermore students are expected to actively participate and authentically engaged and used as a learning tool. They also collaborates/teams with other students; exhibits a sense of accomplishment and confidence and takes educational risks in class.

Such a learning climate is even more important in primary school where foundation is laid, though it is yet to exist in most schools in Tanzania. The learning climate will affect the quality of mathematics offered in the classrooms. As UNICEF recommend in their manual for child friendly school (UNICEF, 2009), learning environment plays a crucial role in good performance of a child.

2. Background of the study

In the implementation of international rights of the children, education of children is compulsory. From a child's rights perspective there are a number of overarching prin-

ciples that relate to education. Education is a right, but also an enabling right, a right that facilitates children and adults access many of their other rights throughout their lifetimes.

Education also must be available without discrimination. But it is not merely a concern with quantity. Children have a right to a quality education that will serve as the basis for lifelong learning.

In addition, education must address the **best interests** and ongoing **development** of the whole child. This means that, in addition to being child centred, education is much more than attention to cognitive development. It is also concerned with the child's social, emotional, and physical development. Education must accord dignity to every child. Thus, respect as a value is critical (UNICEF, 2007).

2.1 The scope of child rights in Tanzania

Tanzania ratified the UN Convention for child rights in 1991 and the African Charter and the Rights and Welfare of the Child in 2003 also has put in place the Child Development Policy in 1996 (URT, 1996) and enacted the landmark law of the child in 2009 (URT, 2009). The ratification of the convention followed by establishment of policies, legislation, services, resources and administrative reform meant to ensure that the right of the child is upheld and the implementation of Child Rights Convention (CRC) are in place.

Ratification of regional and international Conventions on the rights of a child in itself is an important step in recognition of the child in the country. The enactment of the law of the child which is a very recent product of the Parliament of Tanzania, and the policy on the development of the child give provisions for child protection against all kinds of humiliation in the country. Tanzania's leading children's organizations have joined The Children's Agenda, an initiative that aims to ensure children's issues were well represented in the October 2010 elections, featuring in party manifestos and commitments of the future government.

Ratification of the convention and having a law is one thing but their implementation is quite another. The country to some extent has managed to implement article 28 and 29 of CRC. The 3 Ps (Provision, Protection and Participation) have been implemented though to some extent. Primary education is free for all, secondary education is mostly free and parents have to pay about 15 US$ annually as capitation fee. Secondary education is not yet provided free for all, only about 50% of those who complete primary education joins secondary education. However there are challenges to ensure respect of views of children are observed and parents/guardians/teachers are always acting in the best interest of the children. Corporal punishment has been abolished to some degree.

Heads of school are allowed to cane children under certain circumstances; teachers are not allowed to cane a child though they still do it. Psychological punishment is practiced in schools and many teachers and parents do not consider it as punishment as long as it is not physical. Participation of children in decision making in school and classroom matters is still limited.

2.2 Mathematic Problem in Tanzania

Mathematics has long history of being a badly performed subject in Tanzania though it forms the bedrock of mathematics and technology. Table 1 and 2 summarizes the national examination results for mathematics at PSLE (Primary school leaving examination) and GCSE (General certificate for Secondary examination) levels respectively for some years. For primary school examination, the number of passing students is unfortunately not getting better. From the table the average pass is 41.5% for students who passed the final exam in those five years. On average, only about 28% of secondary school students passed the examination, but this is very low. At higher levels, the percentage is higher, but the number of students now is very few. The specialisations that suffers most for the deficiency are mathematics and engineering, and to some extent commerce and business.

Table 1: General Performance of Mathematics in Primary School Leaving Examination

Year	**Pass** (%)	**Fail** (%)
2003	63.6	36.4
2004	33.4	66.6
2005	47.0	53.0
2006	45.8	54.2
2007	17.4	82.6

Source: National Examination Council (NECTA)

Table 2: Form Four National Examination Basic Mathematics Results: 1999-2009

Year	**Pass** (%)	**Fail** (%)
1999	26.8	73.2
2000	28.7	71.3
2001	24.5	75.5
2002	31.2	68.8
2003	26.9	73.1
2004	29.9	70.1
2005	23.5	76.5
2006	23.4	76.6
2007	31.3	68.7
2008	24.3	75.7
2009	17.8	82.2

Source: NECTA

Negative attitude and bad performance made many students shy away from studying mathematics or mathematics related subjects at tertiary level. However, Mathematics is compulsory at post-primary education and its knowledge is assumed to be essential for all members of our society. Mathematics competencies are seen as a critical determinant of the Post-Secondary educational and career options available to young people (Ojo, 1986). Other researchers such as Barrow and Woods (1987) emphasized the need to make mathematics a compulsory subject at the primary and secondary levels if scientists, technologists and engineers are to be produced. These arguments and the like put pressure on the government to ensure mathematics remains core in the education system, though performance in general is very poor. Many reasons have been given as to why mathematics is performed poorly (e.g.Kitta, 1994 and Lulandala, 2004). Obodo (2000) and Kitta(1994), lamented about the poor state of mathematics instruction in Tanzania and averred that the problem of quality of mathematics instruction and learning are from diverse sources. The teacher has been accused to be responsible for the low quality of student performance in our schools (Cooney, 1994, Lulandala, 2004). Others have blamed students for their learning problems or learning difficulties. Research indicates that there are a number of reasons these students experience difficulty learning mathematics (Mercer, Jordan, & Miller, 1996; Mercer, Lane, Jordan, Allsopp, & Eisele, 1996; Mercer & Mercer, 1998; Miller & Mercer, 1997.). These reasons include: lack of confidence, being passive learners, memory problems, attention problems, cognitive/metacognitive thinking deficits, and mathematics anxiety. All these contributed to low motivation and negative attitude towards mathematics hence poor performance.

2.3 Teaching of Mathematic in Primary Schools

The curriculum documents in all basic education levels state categorically that the curriculum is learner-centred but in school teachers practice teacher-centred teaching methodologies. Traditional didactic approaches which are teacher-centred in nature and teacher control methods of instruction are very popular, for their easiness to implement and support from traditional cultures. Children are taught largely through rote methods, sometimes receive incorrect instruction or skip areas that are not confidently understood by teachers. These classroom practices violate articles 3, 13 and 14 of child rights convention.

Maths is perceived by many children in Tanzania as complicated and difficulty due to poor teaching, as a result children fall victims of lacking real mathematical understanding and useful problem solving skills. They do not understand maths and the language of numbers, they do not see the point of it and can not use it to improve the quality of their life. Eventually they abandon mathematics completely some at primary school but most in higher levels of education.

This project was not working in isolation but a continuation of other CRC projects established in the country. The project which was closely related to this work was done by batch 11 on Girls participation in Mathematics subjects at secondary level. From that project it was very clear that children have poor foundation of mathematics and mathematics in early years of education. Though the results in table 2 above indicate poor performance in mathematics, it is of little use to discuss mathematics problems at secondary level while the foundation is not solid. Therefore this project intended to address some of fundamental issues in teaching and learning of mathematics at primary school level.

2.4 Problem project intended to research and solve

Mathematics has always being regarded as a difficulty subject at different levels. Children find it abstract and de-contextualised. Traditional teacher-centred approaches practiced in schools hardly involve children in creating their own understanding of the subject. Most parents distant themselves from school believing teaching and moulding the children in liking mathematics is the duty of the teacher. All these and other factors hinder effective teaching and learning of mathematics. The question is, was it possible to develop a programme in primary schools that will involve teachers, parents and students in creating conducive learning environment for mathematics that will eventually improve students' interest, motivation and in due course improve performance?

3. Purpose

The broad aim of this project was to improve teaching and learning of mathematics in primary schools through more participatory approaches. Specifically the project sought to:

- To find out the current status of primary school pupils participation in learning of mathematics in Tanzania
- To find out the CRC gaps in the teaching and learning of mathematic in Primary Schools in Tanzania
- To develop a Child Right Based exemplary mathematics learning programme(to establish child friendly teaching/ techniques among mathematics teachers)

4. Methodology

This project adopted developmental research design approach. Richey and Nelson (1996) contends that, the developmental research is the systematic study of designing, developing and evaluating instructional programs, process and products that must meet the criteria of internal consistency and effectiveness. Van den Akker and Plomp, (1993) define the developmental research by its two fold purpose (i) Supporting the development of prototypical product (including providing empirical evidence for their effectiveness) and (ii) generating methodological directions for design and evaluating of such product.

Developmental research is a cyclic process. Different phases of prototypes, which are to be evaluated, have to be created in a cyclic process until reasonable and acceptable exemplary lesson materials or in-service training is achieved. The design and development phases are expected to evolve around three evolutionary cyclic developments of both lesson material prototypes and in-service programs. The in-service programs were in-house training of mathematics teachers in the school and the training includes design and implementation of lesson plans that foster collaboration and active learning, creation of learning climate.

Basically developmental research is *Learn by doing* type of research which revolves around first trying the proposed program/lesson, then evaluate the effectiveness, afterwards modify program/lesson based on evaluation results, and try the program/lesson again till perfection is attained. Thus, development research approach is:

- Cyclic research process
- Prototypes are developed in the cycles except for the final one
- The prototypes are formatively evaluated

This cyclic process is summarised in figure 1.

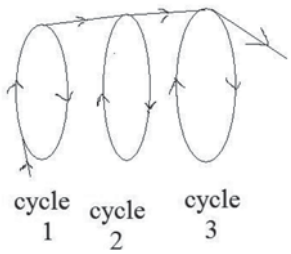

Figure 1: The three cycles of developmental research

In the school where the project was done, the cyclic in-service program was done to one class (standard V) this year. The children involved in the study this year will be

followed in their performance in mathematics for next two years when they will be completing primary school education. Though the project has carried out to only the two cycles of development (small scale tries out); one more cycle will be carried out between September and December 2012, before the results are shared with other classes and possibly other schools.

4.1 Area of the project

The study was being conducted in one primary school in Dar es Salaam Region. This school was formerly owned by Dar es Salaam municipality, however since July 2011, the ownership was transferred to University of Dar es Salaam. The school was purposely selected because, first it is accessible by the project team members hence easy to meet teachers and students; secondly it is much easier for project team members to use the school as exemplary in future to disseminate results to other nearby schools or even to the whole region because of its strategic position.

4.2 Needs analysis

Before the first cycle was developed, needs analysis were done. This involved visiting the school, meeting with school head, meeting head of mathematics and mathematics teachers, talking to children, observing some mathematics lessons and interviewing mathematics teachers. This was done to establish the status of mathematics teaching in the school and some of CRC gaps that existed in the school. It was agreed that grade five was more appropriate level for the work and three grade five mathematics teachers agreed to participate in the project. Also the topic "Geometry" was selected as a starting point, though other topics followed later. There was nothing special about the school, so it was assumed similar needs could be recognized in other schools when the findings are tried in other schools.

4.3 The design of the participatory lesson and trial out

The prototype participatory lesson plans were designed, developed and tried in the school by the three teachers and project owners. In the training of teachers and classroom try-outs, indirect teaching strategy was emphasised. In this strategy the lesson always begin with children's experiences and end up with facts or principles to be mastered, and in between learning, understanding and skills are developed. However, teachers were also free to change the teaching strategy and use others where conditions favor. The necessary corrections are yet to be made in order to make sure teachers during the teaching they use different teaching techniques to enhance participation of pupils in learning mathematics. Also involvement of parents in the whole teaching and learning

is yet to be done. Discussions with teachers on how to engage parents has been done, now is the matter of implementation.

4.4. Data Gathering Techniques and Instruments

The choice of the techniques used in this study was dictated by the tasks and key questions for which data and answers were gathered by particular instrument. The most desirable approach with regard to the selection of appropriate techniques for data collection depends on the nature of the particular problem and on the time and resources available. The study employed both qualitative and quantitative collection techniques. The Former dealt with opinions, beliefs and attitudes which were collected through interviews and questionnaire while the later dealt with analysis of data from the lesson observation checklists and questionnaire.

There is a large range of types of questionnaire, although the main types as stipulated out by Cohen and others (2000) are structured, semi-structured and unstructured questionnaires, which may be closed-ended or open-ended. In this work structured closed ended questionnaires was used to collect data from pupils (students) on their perception of mathematics.

An interview is a data collection technique that involves data collection through direct verbal interactions between the interviewer and interviewee (Masawe, 1995). It is an interchange of views between two or more people on a topic of mutual interest (Cohen, et. al., 2000). Interview was used to collect view from teachers about their experience with the new approaches in the classroom where CRC values are also considered.

In observations, the researcher is given an opportunity to look at what is taking place in a real situation of the problem under study. It helps a researcher to see things that might otherwise be unconsciously missing or those ideas that participants might not freely talk about in an interview situation. Stressing on the use of observation instrument in data collection, Cohen and co-authors (2000:305) put it this way:

> "Observational data are attractive as they afford the researcher the opportunity to gather 'live' data from 'live' situations…we cannot study the world without being parts of it"

Observation checklist was used in classroom to observe how teachers were managing and interacting in the classroom in addition of their teaching ability. This information was very useful in deciding the next step in the cyclic process of the design.

5. Results

The results presented are divided into number of subsections which are closely related to the objectives of the project.

5.1 Needs analysis results

After visiting the school then talk to the school head, head of mathematics unit, mathematics teachers and some children in their class following observations were made. Some of these observations later guided the design and development of the in-service programs and exemplary lesson materials.

- *Poor active participation of children in learning* – not all children were actively engaged in the mathematics lessons. Some teacher claimed those students had low confidence and poor self- esteem hence poor participation because their lower performers in the class.
- *Authoritative teaching* – teachers were very authoritarian and were walking around the class with cane to threaten a child which misbehaved. The teachers believed that without a can children will always misbehave, and the only way to ensure discipline in the classroom was to threaten the child with stick or sometimes to can who were regular offenders.
- *Insufficient resources* – the classrooms had very few textbooks, let alone other amenities that may be considered as luxuries such as teaching aids including, models, manila sheet, etc.
- *Very little participation of parents in children learning*- the team was told that most parents are hardly cooperative in issues pertaining to their child education. The parents claimed to be busy and have no time to make closer follow-up of their children progress in school. These parents believe it was the responsibility of teachers to take care of the children during the day time.
- *Negative ways to discipline children*- also observed was how children were punished physically and verbally. Though there was no serious abuse, but it was clear that there exist mistrust between children and the teachers. Teachers did not know better how to discipline children positively and children either did not know the consequences of not keeping their responsibility clearly.
- *Complains of teachers about pupils deterioration of interest in mathematics by years* – the head mathematics together with his teachers complained of lack of interest of mathematics by a good number of children. They could not pinpoint good reasons as to why this was happening. But later on when the team was talking to the head alone, he admitted the competence of some of his teachers could be one of the contributing factors. Some teachers he said, are very good in reproducing worked examples in the textbook but do not like to be asked questions, those same teachers may give tasks

from the textbook to children and look for the answers to correct the tasks without reflecting on the answers.

5.2 Awareness of child rights

After talking to children and teachers, the change agents realised that they were aware of many rights of children. After inquiring more about the source of that knowledge, the children said, they were good followers of many programmes on television which are sponsored by non-government organisations (NGO'S) on children rights. Some of the findings were:

- Teachers and children were aware children have the right to education that allows each child to receive instruction, to enjoy a social life, and to build his or her own future. They are aware this right is essential for economic, social and cultural development.
- Children were also aware of their right for protection though there are many incidences of abuse of this right reported on television and other media especially in mining areas and in rural areas.
- The Children were aware on their freedom to express opinions, to have a say in matters affecting their own lives, to join associations and to assemble peacefully but this awareness was found to be low. The low awareness affects their contribution and participation in the whole process of teaching and learning. The culture seems to have played role in this.

5.3 The effects of training and lessons on classroom practices

The results will be discussed in many facets relating to in-service training and exemplary lessons. 130 children participated in the study who were taught by three female teachers.

5.3.1 Perceptions of children on mathematics

The findings from children questionnaire indicate that most children perceived mathematics positively. 80% were self confident and mathematics did not seem to be difficult to them. 70% think they could get good grades in mathematics and felt secure when doing mathematics. However 60% agree the subject is hard and 25% indicated that they score worst grades in mathematics.

It was interesting to find out that at that level of education, gender was not an issue in mathematics teaching and learning. 85% of children believed both boys and girls can equally do well in mathematics, it was an appropriate subject for both and girls who were genius in mathematics were not seen as peculiar by others. Collaboration among

the children was not seen as a problem and in the classroom teachers treated boys and girls equally.

However, it was not very clear to many children about the relevance of mathematics in their life. A good number (55%) indicated mathematics has relevance in their life, but very few (26%) pointed out mathematics will help them in earning a living and 30% indicated they need mathematics in their future work.

5.3.2 Teachers' view on the training and its effect on classroom practices

Teacher thought the training equip them with new skills on how to handle cooperative learning and active learning teaching strategy. They think the training brought a new meaning to mathematics teaching and to children what it means to know mathematics. One teacher said "*the training made me to realise students must be given opportunity to study, discover, and invent many patterns of many different types while in the process of learning before they eventually know mathematics*". Another teacher commented about the cooperative learning this way "*I used to have unorganised group learning. But cooperative learning involves more than pupils working together on a task. It requires teachers to structure cooperative interdependence among the pupils. Now I know children have to work in small teams, each with pupils of different levels of ability, use a variety of learning activities to improve their understanding of a subject*". The teachers also mentioned the elements of group learning which to them they though were responsible for children realisation that each member of a team was responsible not only for learning what was taught but also for helping teammates learn, thus creating an atmosphere of achievement in their classrooms. They also mentioned children now work through the assignment until all group members successfully understand and complete it.

5.3.3 Actual practises of teachers in classroom

Observations of classroom practices confirm teachers' views in the interview, but also the change agents were able judge the extent those view were correct. Teachers were observed implementing different mathematics topics in the classroom over a time and the change agents noticed progressive improvement in their doing. There were areas where teachers had more success than others. Teachers were treating children equally, the level of children participation in the lesson increased, for example, they were more engaged in questioning and answering and in preparing the teaching aids. Children's works were also displayed on the wall and were told why works of such and such were exemplary. Children were asking more questions and teacher needed not to use canes to threat them in the class. Tasks given to children were more engaging mentally and they were working cooperatively.

However, there are areas where teachers need to improve. Children were hardly informed about learning outcomes early during the lesson, as a result it was difficult for them to self-assess and find the importance of mathematical concepts or principles

learned. Also teachers are still having difficulties making the subject matter meaningful by giving examples and tasks that are relevant to real life. Furthermore the questions asked by some teachers are sometimes not thought provoking enough.

6. Discussion and Reflection

When change agents began the project there was uncertainty whether there will be change of attitude among parents, teachers, and some pupils toward children's active participation in teaching and learning mathematics; uncertainty about adoption rate of CRC concept among school administrators and some teachers; the effects of traditions and culture that still hinder children the right to express an opinion, to be listened to and to participate in decisions which affect their well-being. However, the findings indicate positive changes in teachers, children and to some extent parents, though the changes are slow. Change is difficult thing and it will take time, so whatever has been achieved in this short time is satisfactory, and commendable.

More time is required for teachers to practice and to be mentored to acquire knowledge, skills and habits in areas where they are weak, but even to be stronger in areas where they have shown progress. With time and availability of resources, teachers can change the learning climate to a better one. Children also are now participating more in their learning, and that contributed to their liking of mathematics.

Availability of essential teaching and learning resources is still a challenge to teachers and school. The availability of such could be facilitated by participation of parents in the running of the school. During the project, the school together with change agents managed to meet once with most parents, and parents express willingness to work more close with the school administration. More textbooks are now available than when the project started, but they are not enough and are not the only resources required.

Parents could also be encouraged to participate more in helping children learn mathematics, but also motivate them in many ways to like mathematics, instead of themselves being negative about the subject. Lack of parents participations in bring up the children to like mathematics has been one of the complains of teachers in the interview.

7. Way Forward

The project so far has just began in one school, but in one class. The change agents have plans for future, to ensure the ideas that emerge from the pilot study are sustained and are spread to other schools.

- The change agents have agreed with the school to monitor the children progress in mathematics till when they finish primary school but also compare their mathematics final examination results with previous cohorts. To ensure the monitoring is done properly, the change agents will work with them again next year with a new set of teachers and a year after with another new set of teacher. This means in three years time the change agent team will be working in three classes with three different sets of teachers.
- The change agents also plan to work with the teachers from the school and spread their success in other schools in the neighbourhood. This will require resources and teacher's motivation. It is not yet clear how this will work out, but there are possibility getting support from other education stakeholders once positive results are obtained, and the word spread out.
- The team also plan to document the process and publish the results to bigger audience after this group of students have completed their primary school successfully with high grades in mathematics.

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9. Appendices

Appendix 1: Classroom observation form

Guiding statements in the observation	SA	A	N	D	SD
Teacher treats all pupils in their classroom equally, irrespective of sex, social-economic background, physical and learning ability					
Classroom is displaying pupils work					
Pupils and teachers interact easily and feel at ease to share their views and opinions					
Level of pupils' participation in classroom-based decision making process is satisfactory					
Teacher adapting the curriculum to reflect local culture + knowledge					
Teacher uses Child Centred Teaching approach in the classroom					
Teacher takes actions to ensure each child achieves mathematics mastery level					
Teacher continuously use classroom based assessment to pupils					
Pupils participate in making and using teaching aids					
Teacher ask questions that require thought provoking answers					
Pupils are given enough time to think of a reply					
Pupils work in groups collaboratively					

SA=Strongly Agree A=Agree N=Neutral D= Disagree DA = Strongly Disagree

Were the pupils informed about learning outcomes early during the lesson

_____

Which lesson objectives were achieved?_____

Which lesson objectives were not achieved?

_____

What evidence were there that pupils were interested/ not interested?_____

Appendix 2: QUESTIONNAIRES FOR STANDARD V PUPILS

This is questionnaire for pupils in the project of improvement of performance in primary school mathematics. The aim of this project is to develop recommendation for mathematics teachers on how to encourage pupils to participate in learning mathematics at primary level and to continue with mathematics and science carriers.

Your stream ……. Sex ……

Instructions:

The following statements states how you think and feel about mathematics. Please read each item carefully, and put an X in the box which best describes you.

SA = Strongly Agree; A = Agree; D = Disagree

	SA	A	D
I have a lot of self-esteem when it comes to mathematics.			
For some reason even though I study, mathematics seems usually hard for me.			
I'm not the type to do well in mathematics.			
Generally I have felt secure about attempting mathematics.			
I can get good grades in mathematics.			
Mathematics subject can mainly be done better by boys than girls			
Mathematics has been my worst subject.			
It is hard to believe girls could be a genius in mathematics.			
Studying mathematics is just as appropriate for girls as for boys.			
When a girl has to solve a mathematics problem, it is shame to ask a boy for help.			
Girls who enjoy studying mathematics are a bit peculiar.			
I would need mathematics for my future work.			
Knowing mathematics will help me earn a living.			
Mathematics which I learn is of no relevance to my life.			
Teachers are bias to boys when teaching mathematics			

THANK YOU VERY MUCH

Appendix 3: Teacher's Interview

This is interview for teachers who participated in the project of improvement of performance in primary school mathematics. The aim of this project is to develop recommendation for mathematics teachers on how to encourage pupils to participate in learning mathematics at primary level and to continue with mathematics and science carriers. Your views will be kept confidential and only used for reporting purposes of the project.

Question 1

How useful was the training in your classroom practices? Can you mention areas which you think you have benefited most?

Question 2

Performance of mathematics in this country has always been a problem. What do you think are the causes? How has the training address some of those causes?

Question 3

Children interest in mathematics has been waning recently. What do you think are the reasons? How has the training enabled you to address some of the causes? Do you think your students now perceive mathematics better after the training?

Question 4

What is your advice to parents pertaining their participation in teaching and learning of mathematics in this school?

APPENDIX 4: Few examples of activities which children learn and apply mathematics

PARAMETER AND AREA LESSON

This is a lesson a teacher did. First the teacher had the children trace their hand, open or closed or both, on a piece of graph paper. To find the area, they would need to count the squares inside the outline. There were many whole squares they could count, but there were also be halves and fourths they needed to put together to make a "whole". Then they used a piece of string or yarn to measure the outline of their hand. Using a ruler, they measured the amount of string that was needed to go around the perimeter.

ADDITION AND MULTIPLICATION

On average villages spend 958904 shillings daily for purchasing food. Out of that money 767123 is spent on purchasing vegetables. In one week the villagers spend how much on vegetables? How much do the villagers spend on non-vegetable food items?

DIVISION

Mwenge Primary school has total number of 788 pupils. Children were given free T-shirt to commemorate Independence Day. The T-shirts were of red, yellow and blue colours. How many students got red colour T-shirts.

Appendix 5: How the project was planned

Project Title: IMPROVEMENT OF PERFORMANCE IN PRIMARY SCHOOL MATHEMATICS			**Project duration**: 3 years		
Purpose (aim): To increase primary school children ability to real mathematical understanding and use for problem solving					
Activities		**Outputs** (short-term results)	**Outcomes** (medium-term results)	**Monitoring Tools**	**Time**
1. Sensitization	*Results*	- Agreement about training with school principal - Meeting with teachers to discuss and agree on the importance of having the training and status of mathematics in the school	Aware ness in: - Source of mathematics learning - New teaching methodologies that engage children. - Participation of children in learning of mathematics	Observation schedule	June 2011 (Output) January 2012 (outcome)
	Indicators	- Letter of acceptance from school principal - List of participants in the meeting with teachers	Observation of: – lesson plans – Changes in teaching approaches – More participation of students in classroom	*Output* As outcome indicators / *Outcome* As outcome indicators	June 2011 (Output) January 2012 (Outcome)
2. Training	*Results*	- trained teachers on new teaching methodologies - teachers trying the materials and methods in their classroom - Photographs of trainees and trainers attending the training	- Teacher's own developed teaching materials - Expanded teaching materials beyond topics introduced in the training	Observation Schedule	*July – August 2011*

	Indicators	- Training programme - Training materials - List of participants in the training	- Lesson plans reflecting knowledge and skills acquired in the training - Teaching materials reflecting knowledge and skills acquired in the training - Children's notebooks - Active participation of children	*Output* As for outcome indicators	*Output* As for outcome indicators	*July – August 2011*
3. Classroom implementation	*Results*	- use of the training in daily classroom practices - children participating in learning process - more motivated children who love mathematics and use it to solve problems - better results in mathematics performance	- The teaching approach is student-centred - Students are fully participating in teaching and learning process - Improved performance in mathematics.	- *Observation schedule* - *Student questionnaire* - *Documentary review (lesson plans)*		*August – September 2011*
	Indicators	- Observation to assess active participation of children, freedom of expression, teachers engage learners. - Questionnaire for children - children performance in homework and monthly tests	- Teachers demonstrate leadership skills in content delivery, group dynamics, etc. in classroom. - lesson plans - competent and confident children - improving test results	*Output*	*Output*	*August – September 2011*
Pre-evaluation	*Results*	- increased number of children actively participating in mathematics learning - Teachers have mastered new teaching that provide quality mathematics and allow children fully participate.	- Student demonstrating of critical thinking and problem solving skills related to real life. - Mastery of the new teaching methods, development of new lessons using the learned methods	- interview sampled students - Concept test - Classroom observation - Documentary review		Nov. 2011 – May 2012

	Indicators	- The extent children are engaged in the whole lesson e.g. numbers of questions asked by teachers, answering open ended questions, appropriate group learning, etc. - Increased number of children who understand in mathematics and can apply it in solving problems	- motivated students eager to learn mathematics - clear understanding of mathematics concepts - Confident teachers willing to lead the class - Lesson plans and lesson materials (lesson notes) reflecting training philosophy.	*Output*	*Output*	Nov. 2011 – May 2012