



Mathematics Teacher's Preparedness and Their Effect on Learner Acquisition of Basic Operational Skills in Kakamega Central Primary Schools, Kenya

Emily Chepkorir Naibei^{1*}, Shikuku Beatrice Nakhanu¹ and Aurah Catherine¹

¹*Department of Science and Mathematics Education, Masinde Muliro University of Science and Technology, Kenya.*

Authors' contributions

This work was carried out by author ECN under the supervision of authors SBN and AC. Author ECN designed the study, wrote the protocol and wrote the first draft of the manuscript under the supervision of authors SBN and AC. Author ECN also managed the literature searches and analyzed the results with the help of author AC. All authors read and approved the final manuscript.

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ABSTRACT

Mathematics is a subject that is taught right from pre-primary school to higher level of learning. It is a compulsory subject both in primary and secondary school curriculum. Mutunga and Breakell refer to mathematics as "The queen of all sciences". Yet students' performance in Mathematics in both primary and secondary school is dismal. Empirical studies by UWEZO Kenya on literacy and numeracy show that quite a number of pupils in primary schools have difficulties in solving problems involving basic operational skills. Efforts have been made by the Kenyan government to improve performance but there is still poor performance in both primary and secondary schools especially in Mathematics. The purpose of this study was to investigate Mathematics teacher's preparedness and their effect on learners' acquisition of basic operational skills in primary schools. The objective of the study was to establish the teacher preparedness in instructional practices in mathematics when teaching basic operational skills and to assess the relationship between teacher preparedness and the learner acquisition of basic operational skills. Descriptive survey design was used. Teacher's

*Corresponding author: E-mail: naibeiemily2014@gmail.com;

questionnaires, classroom observation schedules and Mathematics pupil's performance test were used to collect data. The study population comprised of all lower primary school mathematics teachers and pupils drawn from Kakamega central sub-county, stratified random sampling was used to select 16 public and 4 private schools and simple random sampling was used to select 10 pupils and 1 teacher from each school. Validity of the research instruments was determined with the help of experts from the department of Mathematics and Science Education of Masinde Muliro University of Science and Technology. Reliability of the research instrument was established through pilot study. The data collected was analyzed using descriptive and inferential statistics. It was found that there is a strong relationship between Mathematics teacher preparedness and the learner acquisition of basic operational skills. It is perceived that the findings of the study will unveil the teacher's unpreparedness which may be contributing to poor acquisition of basic operational skills and hence poor performance in Mathematics.

Keywords: Teacher preparedness; basic operational skills; primary schools; Kenya.

1. INTRODUCTION

Mathematics is a subject that is taught right from pre-primary school to higher levels of learning. Mutunga & Breakell asserts that Mathematics is central in studying other disciplines such as Economics, Agriculture, Physical sciences and Geography [1]. Mathematics is a compulsory requirement in all career choices. Despite its usefulness, the learners perform poorly in the subject both in primary and secondary schools [2]. Empirical studies done by UWEZO Kenya (2015) indicate that most pupils in primary schools cannot compute sums which are of lower level than their level. For instance a report by Cherotich and Wakhisi [3], in the standard newspaper indicates that class three pupils could not solve standard two problems on numeracy. The report showed that only 24 out of 100 class three pupils in Kakamega County could solve class two problems without difficulty. Annual assessment report by Twaweza Uwezo Kenya (2015) placed Kakamega, Bungoma, Busia and Vihiga Counties among the worst performers in literacy and numeracy. This shows that children have problems in basic operations. According to Kalejaiye, 1998, basic operations (addition, subtraction, multiplication and division) are the heart of mathematics and without children acquiring the necessary skills, there is no future for mathematics [4]. Educational research findings show that students' achievements are decisively related to the teachers' activities or performances [5]. These are mainly; clarity in presenting the subject, skill in usage of teaching/learning aids and teaching method.

So, there is need to establish the teacher preparedness in teaching basic operational skills.

SMASE primary INSET (2011), noted that teachers need to take time in planning their lessons [6]. Planning gives teachers opportunity to reflect on the most appropriate activities that will enhance effective learning using the resources available. Quality teaching begins with planning. Planning for instructions as observed by [7], allows the teacher to organize his materials in a way that will interest learners and provide a variety of activities and tasks suitable for the range of ability of a particular class. Teachers need to have the current syllabus, schemes of work, lesson plan, and record of work covered and pupil's progress record [8].

2. THE PROBLEM

In Kakamega central Sub-County, the performance of Mathematics has been poor for a very long time. This is observed from internal evaluation tests and even national examination results. In 2015, the Mathematics mock results mean scores were 37.80 and 45.60 out of 100% for classes 7 & 8 respectively. In 2016, an evaluation test was done and the mean scores were 38.92 and 45.53 respectively (Kakamega central Sub-County Education office, 2016). This cannot just be ignored and assume that all is well. There must be reasons why the performance of Mathematics is low in the sub-County and hence the need for this study.

The Ministry of Education has had an increasing focus on the quality of education in lower primary particularly in the areas of literacy and numeracy [9]. Basic operations like addition, subtraction, multiplication and division of numbers form the foundation of Mathematics [10]. The quality of classroom education depends on how the teacher imparts instructional content, how the

learner acquires the content and to what extent the educational objectives are being achieved in a given lesson [11]. Inadequate or lack of instructional materials and generally unpreparedness on the part of the teacher leads to poor teaching and learning [12].

2.1 Objectives of the Study

1. The objective of the study was to establish the Mathematics teacher preparedness on instructional practices in mathematics when teaching basic operational skills.
2. To assess the relationship between Mathematics teachers preparedness and the learner's acquisition of basic operational skills.

2.2 Research Questions

1. How do Mathematics teachers prepare for teaching basic operational skills?
2. What is the relationship between Mathematics teacher's preparedness and the learner's acquisition of basic operational skills?

2.3 Significance of the Study

The findings of the study will help the Mathematics teachers to appreciate the need to prepare schemes of work, lesson plan and teaching/learning aids. The results from this study has shown that teachers who had prepared a scheme of work, lesson plan and teaching/learning aids, their pupils performed much better than those pupils whose teachers had no lesson plans nor teaching/learning aids in the performance test. This study is important to practicing teachers, Mathematics educators and quality assurance and standards officers. It is hoped that the findings of the study will be used to improve the quality of teaching and learner's achievement in Mathematics.

2.4 Research Design

In this study descriptive survey research design was adopted. This involved collection of quantitative and qualitative data in an attempt to answer the research question. According to Koul, descriptive survey does not deal with the manipulation of variables [13]. This type of study method helps gather data at a particular point in time with the intention of describing the nature of existing conditions [14]. Teacher's questionnaire,

classroom observation schedule and Mathematics Pupil's Performance Test were used to collect data. The study population comprised of all lower primary school Mathematics teachers and pupils who were drawn from primary schools in Kakamega central sub-county.

2.5 Sampling Design

The study employed stratified sampling and simple random sampling technique to select the study sample. This method was used in order to give each subject in the population an equal chance to be selected in the sample. There were 76 primary schools in Kakamega central Sub-County during the time of this study. 61 schools were public primary schools and 15 were private primary schools. The schools were stratified into two divisions. Simple random sampling was used to select 10 schools from each division. The schools were then categorized into public and private primary schools. Standard (Std) 3 class was purposively selected because this is where learners are expected to have acquired all the four basic operational skills. Schools which had more than one stream, simple random sampling was used to select one Std 3 class. This was followed by simple random sampling to select ten Std 3 pupils and one Mathematics teacher from each school. Samples from simple random sampling yield data that can be used in generalization (infer to the entire population) [15,16].

2.6 The Sample

The population for this study was Std 3 pupils and Mathematics teachers. The sampled schools included 8 public primary schools from Municipality division, 8 public primary schools from Lurambi division and 2 private primary schools from each division. Therefore 10 schools were selected from each division. This gave a total of 20 schools which is justifiable representation of the total population [17]. Ten Std 3 pupils were selected from each school which gave a total of 200 pupils. One Std 3 Mathematics teacher was selected from each school.

2.7 Research Instruments

The purpose of this study was to establish Mathematics teacher's preparedness and their effect on learner's acquisition of basic

operational skills. To achieve this, 3 instruments were used, namely: Mathematics teacher's questionnaire, Classroom observation schedule and Mathematics pupil's performance test. The teachers questionnaire and classroom observation schedule were used to establish the teacher preparedness in teaching basic operational skills. Mathematics pupil's performance test contained questions testing on the four basic operational skills.

2.8 Validity of Research Instruments

Validity is the measure of accuracy of data obtained from the instruments used in the study. If the data collected is a true reflection, then the inferences made therefore, based on such data will be accurate and meaningful [18]. The research tools were developed and validated with the expert help from supervisors and other members from the Department of Science and Mathematics Education of Masinde Muliro University of Science and Technology. This was to determine whether they are adequate, itemized logically and intent tailored.

2.9 Reliability of the Research Instruments

Reliability refers to the measure of consistency of the results obtained during a particular study (Frankel & Walter, 1993) [19] to establish the reliability of the questionnaire, the split-half method was used. The researcher used the split half to test the reliability of the instruments, where the scores were divided into two equal parts and correlated. This was followed by calculating the Correlation Coefficient using the Pearson's Product Moment Correlation Coefficient (PPMC). The results obtained for the teacher's questionnaire indicated a reliability coefficient of 0.75, that of classroom observation was 0.78 and for the pupil's performance test was 0.83. These values were deemed appropriate for collecting data as proposed by Kerlinger [20], who asserts that a positive correlation coefficient greater than 0.50 is deemed reliable.

2.10 Data Collection

Questionnaires were given to Mathematics teachers who answered the questions and returned. Three Classroom observations were conducted for each school. The classroom observation schedule had a check list which

contained items indicating teacher preparedness. The items included availability of schemes of work, lesson plan, current syllabus and teaching/learning aids. These items were scored and the mean score for each school was calculated and results recorded. Mathematics pupil's performance test was given to the sampled pupils. The test was marked and scored out of 100%. The mean score for each school was calculated and recorded.

2.11 Data Analysis

The data collected was analyzed using both descriptive and inferential statistics. The descriptive statistics used included frequencies and percentages. Correlation analysis was done to establish the relationship between the study variables. The results were presented using illustration tables.

3. RESULTS AND DISCUSSION

The following results were obtained;

3.1 Demographic Characteristic of the Respondents

Most Mathematics teachers teaching standard 3 pupils in primary schools have P1 certificates. This is 75% of the teachers teaching mathematics in standard three. Also 95% of the teachers are professionally trained and only 5% are not professionally trained. This implies that the teachers are well versed with all that is expected from a professionally trained teacher. The teachers are also experienced and have been in the teaching profession for over 11 years. This represents 13(65%) out of 20 teachers sampled out. Since it is believed that "experience is the best teacher" it is expected that the performance of Mathematics in standard 3 should be above average.

3.2 Teacher Preparedness in Instructional Practices

The study intended to establish the teacher preparedness in the teaching of basic operational skills. The results are shown in Table 1.

Table 1 shows that most teachers 18(90%) prepare schemes of work before going to teach. A half of the teachers sampled out prepares lessons plan before going to class to teach. From the table, it is observed that 4(20%) of the

teachers teaching mathematics in standard 3 prepare teaching aids and use them in teaching basic operational skills. Only 6(30%) of the teachers use and refer to the current syllabus when preparing schemes of work for the subject. It was observed that 12(60%) of the teachers reflect on their lessons after teaching. This results show that standard 3 mathematics teachers do not prepare adequately for their lessons. The worst of all is lack of teaching aids. Basic operational skills require the teacher to have enough teaching aids.

Table 1. Teacher preparedness in instructional practices

	No. of teachers	%
Schemes of work available	18	90
Current syllabus available	6	30
Lesson plan available	10	50
Prepares teaching aids	4	20
Reflects on his/her teaching	12	60

This study agrees with studies done by Farrant, Mukwa and Too (1992), who observed that most teachers do not prepare adequately for their lessons. They asserted that for effective teaching, teachers need to prepare a scheme of work, lesson plan and teaching/learning aids [8,11]. Also SMASE (Strengthening of Mathematics and Science Education) primary project (2011), stressed on Mathematics and Science teachers to take time to plan for their lessons and prepare teaching aids in order to make their lessons active and learner centred.

3.3 The Effect of Mathematics Teacher’s Preparedness on the Learners Performance in Basic Operational Skills

The study sought to assess the relationship between Mathematics teacher’s preparedness and the learner acquisition of basic operational skills. Classroom observations were conducted and a check list was used to ascertain presence of scheme of work, lesson plan, teaching/learning aids, pupil’s progress record and current syllabus. Activities carried out in class were also observed. The classroom observation schedule check list was scored and the average mark for each school was computed and recorded as shown in Table 2. The sampled pupils were given a Mathematics Performance Test which contained 20 questions testing on the

four basic operational skills. The test was marked and scored. The mean score for each school was computed and recorded as shown in Table 2.

Table 2. Observation schedule scores and performance test scores

School code	Observation schedule score	Test mean score
A	68.75	77.00
B	38.05	56.63
C	36.67	55.27
D	74.08	86.00
E	53.33	58.63
F	70.00	76.82
G	71.67	80.73
H	55.00	65.91
I	25.68	45.00
J	73.33	90.50
K	32.50	50.30
L	72.22	82.00
M	28.33	52.50
N	73.33	90.00
P	68.52	70.50
Q	28.33	42.34
RP	75.00	94.00
SP	73.25	92.62
TP	62.70	88.24
U	26.67	40.30
Overall mean	55.37	69.76

The observations made from Table 2 is that the schools which have high scores in the observation schedule also have high mean score in the performance test. For instance, school N has 73.33 in the observation schedule and 90.00 in the performance test score. The schools that have lower scores in the classroom observation schedule have low mean scores in the performance test. The observation check list was to establish the teacher’s preparedness in teaching basic operational skills. A high score implied that the teacher had all professional records such as schemes of work, lesson plan, pupil’s progress records and the current syllabus. Pearson’s Product Moment Correlation Coefficient was calculated and the r-value was 0.947 and the p-value was 0.0000. This is statistically significant and shows a strong relationship between Mathematics teacher’s preparedness and the learner’s acquisition of basic operational skills.

The observation made from this study concurs with what was observed by Quist, Mukwa and Too (1992). They observed that when a teacher

has all professional documents (a scheme of work, lesson plan, and syllabus for a given subject and relevant teaching/learning aid), he/she is able to deliver the lesson effectively and efficiently [7,11]. This also ensures better acquisition of skills by the learners. Another scholar, Zilliox [21], reported that in service elementary school teachers felt that they were teaching more and better Mathematics lessons and more comfortable with students use of hands on materials. Adediwura and Tayo (2007), also agrees that students' achievements are decisively related to teachers activities or performance in teaching.

4. CONCLUSION

The study has shown that 100% standard 3 mathematics teachers prepare schemes of work. This is commendable and should be encouraged. However, there is a challenge in lesson planning. It was found that 50% of the teachers sampled out did not prepare a lesson plan before going to class. This shows that the teacher goes to class when not well prepared. This is quite unfortunate since lesson planning helps the teacher to think of all the necessary teaching resources that are needed to make the lesson successful. The study also discovered that most Mathematics teachers do not refer to the current syllabus in their daily teaching. They simply follow the text book page by page. The implication of this is that some teachers may be teaching what is not required in a particular class.

Mathematics teachers are thus encouraged to refer to the current syllabus always. Finally, the study indicates that mathematics teacher's preparedness affects the learner's acquisition of basic operational skills. It was observed that learners taught by teachers who prepare schemes of work, had lesson plan and teaching aids achieved highly in the performance test. On the other hand, learners taught by teachers who had prepared schemes of work and had no lesson plan and teaching aids performed poorly in the performance test. Pearson's Product Moment Correlation Coefficient was found to be 0.947 which indicates a strong relationship. This implies that mathematics teacher's preparedness affects the learner's acquisition of basic operational skills.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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