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The Congruence between Teaching and Learning! Exploration of the Relationship between Preschool Teaching or Instructional Methods and Mathematics Performance in Lower Primary Schools in Kenya

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Abstract
The obstacles and difficulties hindering good performance in mathematics by Lower Primary school children seem to originate from inconsistence of instructional methods applied by teachers at the level. These methods don't agree with the ones initially applied by the children's teachers at preschool level. The effect of that could result in denying children a precious start to their future mathematics performance. There is a persistent indication that a discontinuity exists between pre-school learning methods and those in the lower primary schools. Teaching methods of the lower primary should be amended to make allowance for the stages of children's development and provide opportunities to encourage children to improve in their ability to understand and apply mathematical concepts. The purpose of this study was to explore the impact of the pre-school mathematics programme on mathematics performance in the Lower Primary Schools of the Makuyu Zone, Murang'a South District. The objectives of this study were: - to investigate continuity of teaching methods from pre-school to lower primary school; and to compare the relationship between performance in mathematics of children who had had pre-school education with those who had not. This study used a descriptive survey design to achieve the set objectives. Purposive (deliberately) sampling was used to select a sample population of 60 pupils; a lottery (random choice) method of sampling was applied to get 30 teachers, whereas 10 head teachers were chosen through appointment (deliberate) sampling. Open-ended questionnaires to collect data from the selected teachers and head teachers were applied; and for the children's responses, an interview schedule was employed. Observational checklists were also used where archival records were to apply. To test the construct validity and reliability of the research instruments, the researchers used 'split-half'. The researchers pilot-tested the research instruments with a small representative group from the population. The data collected was analysed, using frequency counts and percentages and presentations were done in tables, bar graphs, pie charts and histograms as necessary to present a better picture of the findings. This study recommends frequent mathematics methodology seminars, workshops/in-service training for lower primary mathematics' teachers which will guarantee effective methodological knowledge for teachers to teach mathematics effectively. Children's learning at play should be very much emphasized. To avoid discontinuity this study recommends that in the lower primary male and female teachers should alternate to make the learners get used to male teachers. More male teachers should also get to teach in the preschool level.
Keywords: Preschool; Mathematics Performance; Instructional Methods

1. Introduction

In the previous five years, Kenya has been registering a consistent deterioration in mathematics performance in its lower primary schools every year. This has been a cause of worry and a source of anxiety on the part of parents who have been seeing their children as a window of their future hope. This, study examined impact of the pre-school instructional methods on mathematics performance in lower primary schools in Kenya. Unearthing the mystery surrounding the issue with the aim of finding a lasting solution to the phenomenon is now inevitable.

The purpose of this study was to investigate the impact of the pre-school mathematics programme on mathematics performance in the Lower Primary Schools of the Makuyu Zone, Murang'a South District. The objectives of this study were: - to investigate continuity of teaching methods from pre-school to lower primary school; and to compare the relationship between performance in mathematics of children who had had pre-school education with those who had not. This study used a descriptive survey design to achieve the set objectives.

2.0. Statement problem

It is not known how preschool teaching or instructional methods impact mathematics performance in the lower primary schools of the Makuyu Zone, Murang'a South District. Performance in Mathematics in lower primary level of primary schools in Kenya has been registering a consistent deterioration every year. This being a major cause of anxiety to parents, their hope in their children has been seen to dwindle.

3.0. The purpose of study

The main aim of the study was to explore relationship between Preschool Teaching or Instructional Methods and Mathematics Performance in Lower Primary Schools in Kenya

4.0. Objectives of the study

1. To examine continuity of teaching methods from pre-school to lower primary school in Lower Primary Schools in Kenya
2. To compare the relationship between performance in mathematics of children who had had pre-school education with those who had not in Lower Primary Schools in Kenya

5.0. Significance of study

Whilst the hope was that access to this information would result in a hundred percent enrolment rate for pre-school learning, any marked improvement in the take-up rate was to enhance a child's ability to move from pre-school to primary school with maximum benefit to the child. The study aimed at providing recommendations resulting from the findings, that the government could use to benefit the parents, teachers, community, policy makers, curriculum developers and other pre-school education stakeholders, such as Faith Based Organizations (FBOs), Community Based Organizations (CBOs), and Non- Governmental Organizations (NGOs) among others. Parents should be the ones most interested in the ECDE programme.

This study advises them on the importance of early education and the role they can play in the development and education of their children. Most ECDE centres were supported in various ways by the community, either financially or by providing the volunteers needed to run them. When the community had received information on which they can make a decision, they were more likely to be sensitive to those issues relating to children, and so be more likely to initiate and implement a more inclusive ECDE programme.

The policymakers should identify areas of concern, and address them in the best interest of the child. The curriculum developers should identify the loopholes that are present in the pre-school Mathematics curriculum and likewise address them. NGOs, FBOs, CBOs also could assist by sponsoring the training of pre-school teachers, either for in-service mathematics long courses or for short courses, to deliver quality mathematics education to pre-school children. Other development partners such as the United Nations International Children Education Fund (UNICEF), World Bank (WB) and the International Monetary Fund (IMF) could be asked to assist financially, where necessary.

6.0. Literature Review

6.1. Continuity of Teaching Methods

Even with recommendations of the likes of Wachiye, (1996) that the use of resources is very advisable because it involves the use of more than one of the human senses, during the learning process, it was a clear evidence that many teachers forget, or are unaware, that learners require psychomotor (motivation and effective) skills. Any educational system should work towards maximum efficiency in the use of available resources to improve the quality of education. Consequently, there is a need for visual teaching aids for active participation in lessons by school children. Teachers seem to be using dated approaches to teaching. Productive methods of teaching as opposed to learning by rote (repeating words but not understanding the meaning) must be adopted. The methods used should not ignore learner-based participatory activities. New teaching methods should flow in a continuous way, from the old teaching methods of the expository kind to the new child-centred method. To achieve this, mathematics teachers should use such techniques as the lecture, the discussion of mathematical concepts, group work (to aid understanding of manipulating numbers), text book reading, games involving numbers and slides. The aim is to improve numeracy (ability to use numbers in arithmetical calculations). Instructional methods contribute towards success in learning a subject, and that also applies where mathematics is concerned.

6.2. Preschool Attendance and Mathematics' Performance

There is a critical importance of consistent preschool attendance. Students who attend preschool regularly are significantly more likely than chronically absent pre-schoolers to be ready for kindergarten and to attend school regularly in later grades. Sickness and logistical obstacles affecting families were the key factors driving preschool absences. The range of logistical obstacles facing families included transportation and childcare issues.

The impediments and problems hindering good performance in mathematics by pre-school children seem to originate from parents' tendency to ignore taking their children for pre-school education, because they were either not interested, or because they couldn't afford it. They waited for their children to reach school age and then took them straight to primary school instead. This denied children a precious start to their future mathematics performance, and the problem was investigated in this study and was fully researched. All logistical obstacles facing families, which result in denying children pre-schooling opportunity, should be the business that should be seen vital to be dealt with by parents, the government and general stakeholders.

Weddy and Catherine, (1992) considered that there are several aspects to be considered for determining a learner's performance in a mathematical context. These included the attitude of the mathematics' instructor, the teaching methods employed, the content of the syllabus, and the attitude of the parents. All these aspects influence a learners' attitude towards mathematics and so, consequently, mathematics performance. Trained teachers should apply their learnt skills to relate well with children, with parents, and with community and school committees. They also have learned to make good use of learning resources and materials, as well as guiding children better, and stimulating them in learning, so resulting in a better academic performance by their pupils.

However, the consistent use of norm-referenced evaluation, instead of criterion-referenced evaluation in pre-schools, has resulted in many children feeling hopeless when comparing themselves with others whom they call 'clever'. The result is that these children carry a low concept of self – esteem to primary school and even into adult life, so it is important that this adverse effect should be eliminated.

7.0. Research Methodology

This study used a descriptive survey design to achieve the set objectives. Purposive (deliberately) sampling was used to select sample population of 60 pupils; a lottery (random choice) method of sampling was applied to get 30 teachers, whereas 10 head teachers were chosen through appointment (deliberate) sampling. Open-ended questionnaires to collect data from the selected teachers and head teachers were applied; and for the children's responses, an interview schedule was employed. Observational checklists were also used where archival records were to apply. To test the construct validity and reliability of the research instruments, the researchers used 'split-half'. The researchers pilot-tested the research instruments with a small representative group from the population. The data collected was analysed, using frequency counts and percentages. It was presented in tables, bar graphs, pie charts, histograms and as necessary to present a better picture of the findings

8.0. Research Findings

Research findings were analysed using frequency counts and percentages. To present a better picture of the findings they were presented in tables, bar graphs, pie charts, histograms and as necessary. The information was categorized into themes, based on objectives and was interpreted qualitatively

8.1 Continuity of teaching methods from pre-school to lower primary

The researchers sought to know whether the children attended preschool education. Majority of the children indicated they had attended preschool education as represented by 60% of the respondents as compared to 40% of the respondents who indicated they did not.

These findings are presented in the graph below. 10% of those who said had attended preschool education had been identified by their teachers as hadn't gone to preschool. The probability was that they had once enrolled in preschool just to drop a little later without adequately completing the course Kabiru, and Njenga, (1997).

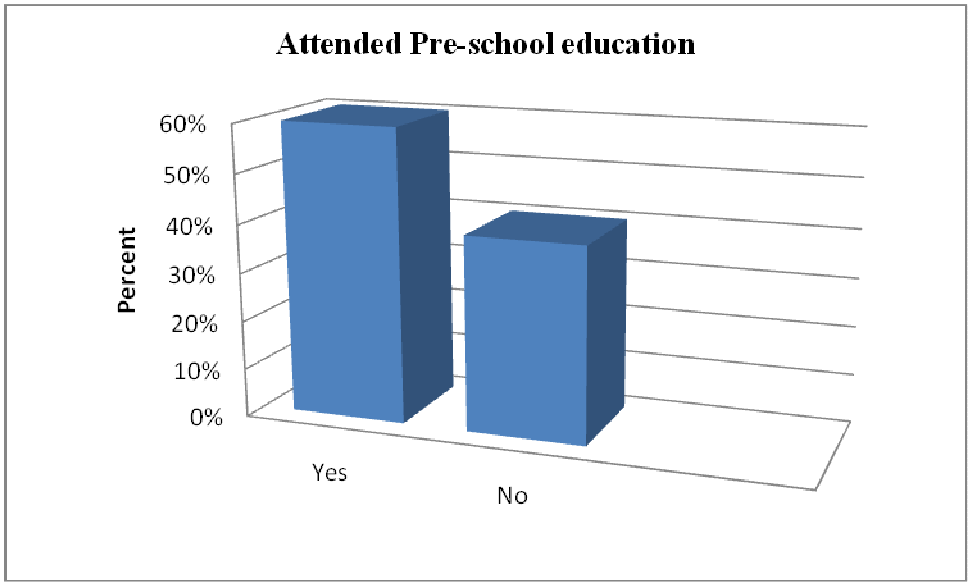

Figure 8.1: Whether children attended preschool

For those that attended preschool education the researchers wanted to know whether former teacher

was a man or a woman. Based on the findings majority of the preschool teachers were women. This finding was confirmed by 94.1% of the respondents who indicated that their former preschool teacher was a woman as compared to 5.9% of the respondents who indicated that their former preschool teacher was a man. These results are summarized in the table below.

Table 8.1 Former preschool teacher's gender

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Man	2	5.9	5.9
	Woman	28	94.1	100.0
	Total	30	100.0	

At the time of research study, 63.2% of the mathematics teachers were women while only 36.8% were men. On being asked the gender of mathematics teacher they would prefer, 60% of the respondents indicated they liked a woman to be their mathematics teacher as compared to 40% who said they liked a man. The summary of these results are presented in the tables below.

Table 8.2 Current mathematics teacher's gender

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Man	21	35.0	35.0
	Woman	36	60.0	95.0
Invalid		3	5.0	100.0
	Total	60	100.0	

Table 8.3 Mathematics teacher child likes

Status	Variable	Frequency	Valid Percentage	Cumulative Percentage
Valid	Man	22	36.7	36.7
	Woman	33	55.0	91.7
Invalid	Undecided	5	8.3	100.0
	Total	60	100.0	

Some children seem to be comfortable with their current mathematics teachers. Others seem to be not comfortable with them whereas, still some were not sure. The ultimate call here is to have every mathematics teacher to become tender to the learners, alert to their needs and desires, creative to win them in his / her pedagogical practices and resourceful in mastery of the content. This is because children would cite some of their reasons of favouring one gender of a teacher over the other as it are not harsh and /or has adequate knowledge of mathematics.

When asked whether they are given mathematics homework 63.3% of the children indicated yes as compared to 36.7% who indicated no. The researchers followed with a question seeking to establish where the child does their homework. Majority of the children (71.1%) indicated that they did their homework at home as compared to 28.9% of the respondents who indicated they did it at school. These results are summarized in the table below.

Table 8.4 Mathematics' games and play

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Yes	11	19.0	19.0
	No	47	81.0	100.0
	Total	58	100.0	

Even those who said that they are given, they couldn't give examples of the games and plays they were given by their teachers. Games and sports would provide a natural and automatic avenue for voluntary learning in children. This would make learning fun and hence not only enticing but also interesting to them. This provides a golden opportunity for them to learn at the best of their interest. This can best be initiated by teachers as well as the caregivers, something that can be possible only if they are not only doing it to stimulate the learners but also having positive attitude towards mathematics.

The researchers made some observations in the respondents' classrooms to establish availability and level of improvisation of learning materials, learners' motivation to participate in mathematics learning activities and how children were encouraged to compete and establishing children's work display. Generally, there were very inadequate learning materials in those classes, with some classes having none at all. Majority of the classes where were some, they were in form of charts. A few classes had learning corners like; shop corner, nature garden, nature corner and models.

Table 8.5 Availability of learning materials in classes

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Yes	4	13.8	13.8
	No	25	86.2	100.0
	Total	29	100.0	

On improvisation, majority of the classes observed improvised highly as compared to 3.8% where improvisation was done anyhow. The results are presented below.

Table 8.6 Improvisation of the learning materials

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Done anyhow	1	3.8	3.8
	Improvised	19	73.1	76.9
	Highly improvised	6	23.1	100.0
	Total	26	100.0	

Based on the findings of this study, children work was not displayed to encourage competition. This was confirmed by 86.2% of the classes observed as compared to 13.8% of those that did. And on how children's work is displayed 100% of the observed classes were at the learners' eye level. The results are presented in the tables below.

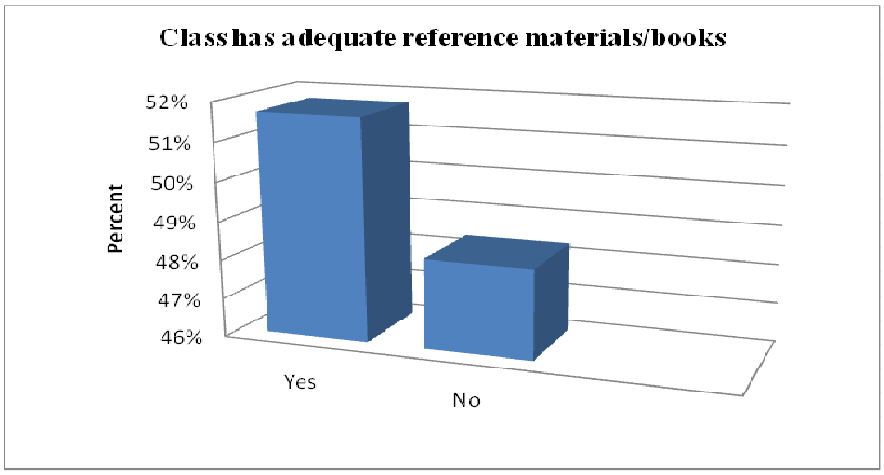

Figure 8. 2: Adequacy of reference materials /books

The researchers asked the head teachers how they rated preparation of schemes of work, lesson plans, and progressive records in their lower primary. Based on the findings the head teachers were satisfied with preparations of schemes of the work with 60% of them rating it as adequate and 40% as very adequate. These findings are presented in the graph below.

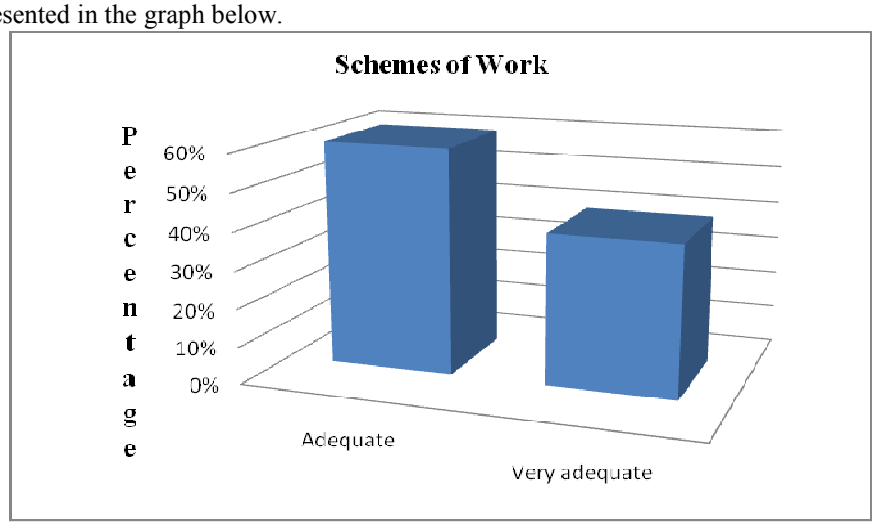

Figure 8. 3: Preparation of schemes of work

Lesson plans, the head teachers were equally satisfied with it with majority (50%) of them rating it as adequate and 30% rating them as very adequate. Only 20% of the respondents rated lesson plans as less adequate.

These findings are summarized in the table below.

Table 8.7 Preparation of lesson plans

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Less adequate	2	20.0	20.0
	Adequate	5	50.0	70.0
	Very adequate	3	30.0	100.0
	Total	10	100.0	

Progressive records were rated as adequate by 50% of the respondents while 40% rated them as very adequate. Only 10% of the respondents rated progressive records as less adequate. These findings are shown in the graph below.

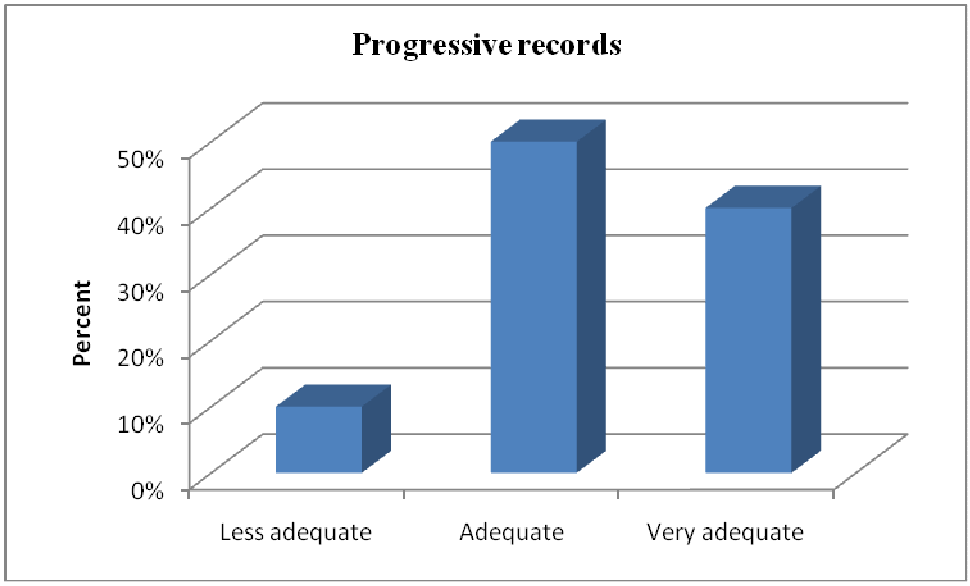

Figure 8.4: Preparation of progressive records

The researchers wanted to know how often the professional documents were certified for approval by the head teachers' office. On this, 70% of the respondents indicated very often while 30% indicated often. These findings are presented in the table below.

Table 8.8 Certification of the Professional documents by school's administration

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Often	3	30.0	30.0
	Very often	7	70.0	100.0
	Total	10	100.0	

Lesson plans were approved often and this was confirmed by 80% of the respondents. Those that indicated that lesson plans were approved very often were 20% of the respondents. The summary of these findings is presented in the table below.

Table 8.9 Lesson plans

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Often	8	80.0	80.0
	Very often	2	20.0	100.0
	Total	10	100.0	

On progressive records, majority of the respondents indicated that they were approved often while 30% indicated that progressive records were approved less often whilst 60% indicated that they were approved often. Only 10% of the respondents indicated that progressive records are approved very often. These findings are presented in the table below.

Table 8.10 Progressive records

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Less often	3	30.0	30.0
	Often	6	60.0	90.0
	Very often	1	10.0	100.0
	Total	10	100.0	

No attribution that can be made to the children's failure with regards to mathematics teachers not making schemes of work, lesson plans or progressive monitoring of the children's achievement. Their certification confirms that they are the right instruments for the right purpose and hence this cannot be cited as the cause of the children's poor performance in mathematics. A scheme of work is normally the most emphasized for its importance in organizing the content to be taught in a period of time. Lesson plan that the teacher uses to organize the content to be taught in a particular lesson is equally emphasized. Progressive records are mostly substituted by occasional evaluations commonly done at zone level, divisional level and so on.

The researchers asked the respondents to indicate how many times in the last five years they had attended a seminar, workshop or in-service training for teaching mathematics. Majority of the respondents (46.4%) indicated that they had never attended while 21.4% of the respondents attended once. Those who had attended more than once were 17.9% who attended only twice and 7.1% who attended thrice and four times each. These findings are summarized in the graph below.

Table 8.11Seminar, workshop or in-service training

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Never attended	14	46.4	46.4
	One Time	6	21.4	67.8
	Two Times	5	17.9	85.7
	Three Times	2	7.1	92.8
	Four Times	2	7.1	100
	Total Times	29	100	

Those that had a chance of attending a seminar, workshop or in-service training for teaching mathematics were asked to rate it and 66.7% rated it as very useful while 33.3% said it was useful. Half of the respondents, 50%, didn't respond to this question. The findings are presented in the table below.

Table 8.12Seminar/workshop/in-service course ratings by the teachers

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Very useful	10	33.3	33.3
	Useful	5	16.7	50.0
Invalid	Unfilled	15	50.0	100.0
		30	100.0	

There is lack of adequate seminar/workshop/in-service courses on appropriate methods of teaching preschool mathematics. These are the only avenues where teachers can get awareness and learn the required psychomotor (motivation and effective) skills. Teachers, including preschool teachers seem to be overlooking this (Edger, 1994). In Kenya's current education system, Makuyu zone included, it's possible that many teachers have never been adequately taught how to teach preschool and lower primary school mathematics, and so know nothing about how to motivate pupils to learn mathematics.

Lack of adequate in-servicing of mathematics teachers leaves the teacher with only the traditional methods of teaching. Some of these are obsolete and do not address the current challenges of lower primary school mathematics. These approaches lead the child learner to boredom and hate of mathematics (Eshiwani, 1984).

Teachers were asked to indicate whether the time allowed for mathematics was adequate. The respondents differed on this with 51.9% indicating that it was adequate as compared to 48.1% who felt the time allocated for mathematics was not adequate. These findings are summarized in the table below.

Table 8.13 Adequacy of time allocated for mathematics

Status	Variable	Frequency	Percentage	Cumulative Percentage
Valid	Yes	14	51.9	51.9
	No	13	48.1	100.0
	Total	27	100.0	

Respondents were asked to rate their completion of mathematics syllabus and majority (76.9%) of the respondents indicated that it was less adequate. Only 15.4% indicated that it was adequate while 7.7% said that

they had not completed it at all. A summary of these findings is presented in graph below.

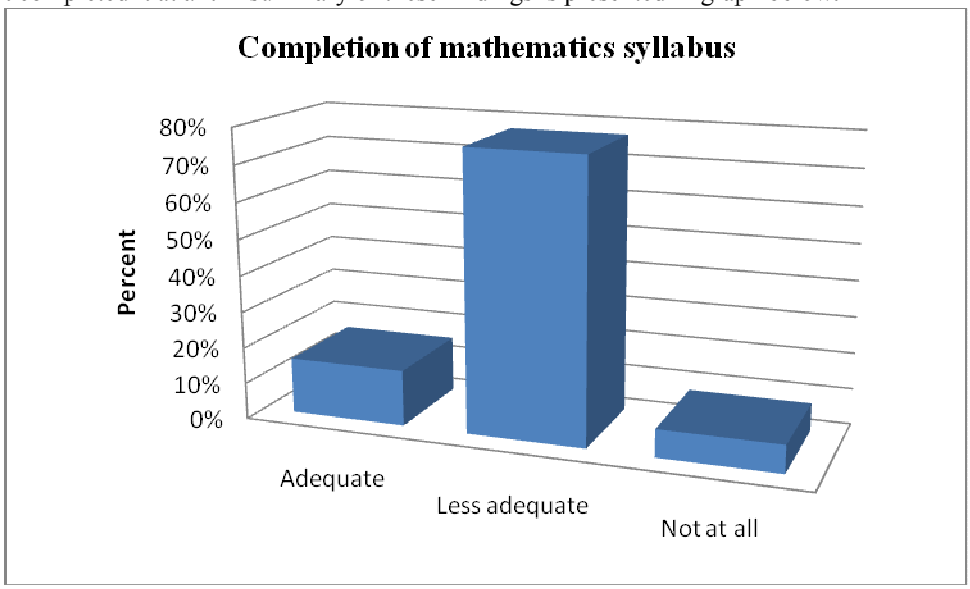

Figure 8. 5: Completion of mathematics syllabus

Time should be created to enforce mathematics concepts both to teachers and children. The teacher should be given time to complete mathematics syllabus whereas children should be introduced to participatory methods of learning mathematics, as suggested by Michael, (1987). This would make sure that they maximize their own time to spontaneously and voluntarily internalize the taught the concepts. This is only possible when this is done in play form. To create more time, teachers can use their free time to freely engage children in mathematics games and plays that will go a long way in reinforcing what they have taught. These games and plays can be a greater part of outdoor lessons, music lessons, and creative lessons besides mathematics lessons. The faster the concepts taught are internalized by children, the faster the teacher can adequately complete the syllabus.

The researchers sought to know how often the respondents gave their learners mathematics homework. Majority of the respondents (62.1%) indicated that they gave their learners mathematics homework daily. Only 3.4% indicated that they gave their learners mathematics homework once in two weeks while 20.7% and 13.8% indicated they gave their learners mathematics homework once weekly and twice weekly respectively. The findings are presented in the table below.

8.2 Relationship between performances in mathematics of children who have had preschool education with those who had not.

Children who attended preschool in most cases have a trend of attaining higher marks than their counterparts who did not attend preschool. Only 5 children who did not attend preschool, for instance, managed to get 100% marks as compared to 11 who attended preschool and managed to score 100%. There is a clear difference of about 5 marks in the mean standard score of the marks acquired by the two categories. This is because the child has formed the required learning prerequisites and positive interest towards learning. Stebbins et. al. (1971) asserts that this produces very long-term changes in the intelligence quotient. However, the difference is not significant as can be illustrated by the table and figure below.

Table 8.14 Relationship between performances in mathematics of children who have had preschool education with those who had not

Children who attended preschool	Frequency	Percentage	Cumulative Percentage
91-100	15	50	50
81-90	1	3.3	53.3
71-80	8	26.7	80
61-70	2	6.7	86.7
51-60	2	6.7	93.4
41-50	1	3.3	96.7
0-40	1	3.3	100
Children who didn't attend preschool	Frequency	Percentage	Cumulative Percentage
91-100	10	33.3	33.3
81-90	3	10	43.3
71-80	12	40	83.3
61-70	0	0	83.3
51-60	0	0	83.3
41-50	2	6.7	90
0-40	3	10	100

9.0. Recommendations and Conclusion

This study recommends that a mathematics teaching/learning methodology guide should be issued on how children should be given mathematics plays. This will enhance children's learning at play. To avoid discontinuity of teaching methods from pre-school to lower primary this study recommends that in the lower primary male and female teachers should alternate to make the learners get used to male teachers. More male teachers should also get to teach in the preschool level. The learning methods of the lower primary should be prepared with the stages of child development in mind and opportunities where children can improve in mathematics should be utilized.

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