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Factors Affecting the Implementation of Pre-Schools Science Curriculum In Kenya: A Case of Kericho Municipality, Kericho County.

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ABSTRACT

This study investigated factors affecting the implementation of Science curriculum in pre-schools this study was to assess the extent to which the adequacy of science apparatus and materials affect the implementation of science curriculum in pre-schools.

This study adopted descriptive survey design. The objectives of the study included establishing the activities pre-school teachers involved learners in during science lessons and assessing the adequacy of science apparatus and materials in pre-schools. It also sought to establish the extent to which pre-school teachers prepared and used instructional materials. Stratified sampling and random sampling techniques were employed in the study. A sample of 62 pre-school teachers and 50 school administrators were selected from both public and private pre-schools. Questionnaires and observation checklist were used.

The study found that the major factors affecting the implementation of science curriculum were; inadequate involvement of learners in carrying out some of the child-centred activities involved in the scientific method of learning, inadequacy of science teaching materials and apparatus, poor storage facilities for keeping teaching and learning resources, and lack of enough science textbooks

The findings of the study will be used by pre-school teachers and the school administrators to improve the teaching of science. in pre-schools through involving learners in carrying out science activities, preparation and use of science teaching materials and use of teaching methods which encourage learners to use scientific/inquiry. Based on the research findings of the current study, it was recommended that the Ministry of Education, Science and Technology should consider extending SMASE in-service training programme to pre-school teachers to induct them on the current practices of teaching science. It was recommended that pre-school teachers should embrace the practice of improvisation and make their own science teaching and learning resources using locally available materials and the county government should also consider increasing allocation of funds to pre-schools to enable them purchase science text books and other learning materials.

Keywords: Science curriculum, pre-school, Mathematics and Sciences

Introduction

Pre-school Education is getting renewed attention among the nations of the world (UNESCO, 2012). Being (2009) observed that pre-school science is enjoying renewed attention in the United States and attempts are being made to improve scientific literacy and achievement among the nation's citizens. During the National Teachers Science Association congress held in Arlington city, North America, the participants reported that the teaching of science in pre-school has not been given maximum attention and they recommended that more professional development should be injected into early childhood science (Mckomark, 2010). Research studies carried out in Florida showed that school readiness in science lags behind other domains at least among learners (Kimberly, 2011). This shows that the teaching of Science in pre-schools is not comprehensive.

According to Torkington (2002), the African governments allocate very small budgets to Early Childhood Development and Education programmes. Pre-school Education in Africa is mostly managed by communities and local governments unlike the primary schools.

Bose, *et al.* (2013) found that teaching in pre-school in Botswana, like in other African countries is faced with a lot of challenges. In their research study, they found that almost half of the pre-school teachers faced challenges while teaching science. Hence, the implementation of pre-school Science curriculum is not being addressed adequately in Africa. There is also a renewed attention to improve scientific literacy at all levels of education in Kenya (CEMASTE, 2009; POK, 2013). In an effort to improve the learning of Science in primary schools, the Ministry of Education Science and Technology is presently implementing Strengthening of Mathematics and Science Education (SMASE) project in primary schools countrywide. The project aims at improving the teaching of Science and Mathematics by improving pedagogy, use of instructional materials and attitude of teachers and learners towards the same (CEMASTE, 2009).

Mulima & Indoshi (2008) in their study on conditions for implementation of science curriculum in ECDE centres in Emuhaya; Kakamega County found out that majority (91.2%) of ECDE centers lacked science materials and equipment.

N'gasike (2010) conducted a research study on methods of teaching Science and Mathematics in Early Childhood Education in Turkana County and found out that learning of science in ECDE is mainly theoretical. Kathure (2011) also investigated the impact of children's performance of science activities in East Division, Isiolo County and found that children performed better when they carried out own investigations. The above research studies did not investigate factors affecting the implementation of science curriculum in pre-schools.

Theoretical Framework

This study was guided by Piaget's (1970) theory of cognitive development which explains that during cognitive development, children go through the same developmental sequences, but they do so at different levels. These developmental stages are sensory-motor stage (0-2 years), pre-operational stage (2-7 years) and concrete operational stage (7-11 years). A pre-school child is at pre-conceptual stage of cognitive development. According to Piaget (1970), the learners' ability to learn science, the way they learn and the way they do activities and understand concepts and ideas depends on their level of cognitive development. Children build their understanding of the world through carrying out activities and manipulating objects. Piaget believed that young children can observe and experiment with purpose if provided with adequate and relevant objects to manipulate. Pre-school teachers should provide learners with opportunities and materials and to guide and supervise them as they solve problems.

This study was also guided by the learning theory of Fredrick Froebel (1852). Froebel (1852) pointed out that the purpose of teaching and instruction is to enable the learner to learn by doing rather than being given facts by the teacher. Froebel (1852) likened teachers of young children to gardeners who prepare the ground, set the stage for growth with regular watering and adding fertilizer and stand back waiting for growth to occur. He believed that children are "small scientists" hence, should be trained to think, reason, question, validate information and make their own decisions based on facts. He advocated scientific learning for pre-school children. Scientific learning involves solving problems using real facts and empirical data to arrive at conclusions and to make decisions. Like Piaget, he also believed that children must be allowed to make their own decisions from early life and must be allowed to question the way things are.

Science Teaching Apparatus and Materials

Science teaching apparatus and materials are teaching and learning resources used in teaching science activities (KIE, 2006). The availability and quality of teaching and learning resources is a key factor in the effective delivery of the curriculum (MOEST, 2000). MOEST further states that teaching and learning resources should be planned and utilized in the most effective manner to bring about efficient provision and relevance in education. According to KIE (2006), the success of any science programme largely depends upon the quality and quantity of materials that can be utilized when needed.

Kathure (2011) observed that when teaching and learning resources are used appropriately, they assist teachers to add concreteness to their presentation of material. They also encourage

learner involvement, aid learners in conceptualizing abstract ideas and help understanding, mastery and retention of the ideas or concepts. In addition, if teaching and learning resources are not used, the lesson will be teacher-centered and didactic and pupils will not learn how to work independently and in groups (MOEST, 2000). Teaching and learning resources also sharpen learners' power of observation (Morrison, 2007). Pre-school teachers should therefore use adequate science apparatus and materials in every science activity lesson to facilitate the learning of Science. According to Right (2012), teaching and learning materials are important because they can significantly increase student achievement by supporting student learning. Teaching and learning materials are intended to provide children with real life experiences and an opportunity for them to use their full senses (touch, sight, smell, hear and feel) to enhance learning (Rai and Richardson, 2003).

Scheme of Work

Ayot and Achieng (2009) defined a scheme of work as a detailed outline of what is to be taught to specific learners at a specific level of learning in a given period of time. Republic of Kenya (2008) stipulates that pre-schools teachers should prepare and use thematic schemes of work. Pre-school teachers use thematic schemes of work to teach all activity areas in pre-school. A pre-school thematic scheme of work contains a theme planned to be taught in all subjects in pre-school.

A theme is a central idea or topic around which learning takes place. The first part of pre-school scheme of work shows the administrative details, that is, the term and the year. A thematic scheme of work has nine columns namely: week, lesson number, theme, sub-theme, objectives, teaching/learning activities, teaching /learning resources, references and remarks. Pre-school teachers should prepare schemes of work regularly. See Appendix V pg. 91.

Teaching Methods Used in Teaching Science in Pre-school

According to Quist (2000), pupils learn more effectively if the teacher uses a variety of child-centred teaching methods. KIE concurs with Dawn that pre-school teachers should use a variety of child centred methods to facilitate learning in pre-school. Hong and Diamond (2012) also argued that the types of teaching approaches used in teaching young children science affect children's science outcomes. Kathure (2010) recommended that participatory methods such as experimentation, demonstration, field trip and project should to be used in teaching science because they enable the learners to acquire process skills, enjoy learning and apply what is learnt to every-day life.

Rotumoi & Too (2012) observed that availability and adequacy of space and number of learners in the class influence the choice of teaching methods. Rotumoi & Too (2012) further noted that the choice of teaching methods adopted has an impact on the child's learning and subsequent development. KIE (2008) recommended methods suitable for teaching all the themes in the pre-school science syllabus. It is therefore, necessary that pre-school teachers use a variety of child-centred teaching methods to teach science activities in pre-school.

Competent teachers should continually develop the knowledge and skills necessary for teaching and should use them to assist learners in solving problems (Jusuf, 2005). Professional development enables teachers to upgrade their teaching skills. According to Fgatabu (2012) in-service courses are one way of promoting professional development of teachers. Rotumoi & Too (2012) observed that teachers' professional status is related to teaching behaviours and interactions they have with children.

Methodology

The sample of the study consisted of 62 (36 %) pre-school teachers and 62 (36 %) school administrators working in both selected public and private pre-schools within Kericho Municipality. The schools teachers and administrators were selected because they were responsible for implementing pre-school science curriculum. Creswell (2012) recommends that a sample size of 10%-30% of the accessible population is acceptable in social science. There are 19 public schools and 65 private schools, a total of 84 pre-schools in Kericho Municipality as shown in table 1 below.

To get the sample, pre-schools were placed into five strata according to education Zones (Municipal, Chepkutung, Kimugu, Kapcheptor and Motobo) and further stratified as private or public.

Table 1: Number of sampled pre-schools per zone and category

Zone	Type of pre-school	No. of pre-schools	No. of pre-school teachers	Sampled pre-school teachers	Sampled pre-school administrators
Municipal	Public	4	8	3	3
	Private	23	46	18	18
Motobo	Public	5	10	4	4
	Private	14	28	12	24
Kimugu	Public	1	2	1	1
	Private	18	36	12	12
Kapcheptoror	Public	5	10	4	4
	Private	1	2	1	1
Chepkutung	Public	4	8	2	2
	Private	9	18	4	4
Total		84	168	62	62
%		100	100	36	36

Source: Researcher, (2016)

Findings

The adequacy of Science Apparatus and Materials in Pre-Schools.

An observation schedule was used to rate the adequacy of science apparatus and materials and pre-school teachers were also asked to respond to the same in the questionnaire. The responses are shown in Table 3 below.

Table 3: Pre-school teachers' responses on the adequacy of science apparatus and materials (n=62)

Responses	Frequency	%
Quite Adequate	19	30.6
Adequate	24	38.7
Not Sure	6	9.7
Inadequate	9	14.6
Quite Inadequate	4	6.3

Source: Author (2016)

The findings in Table 4.14 above show that 24 (38.7%) of pre-school teachers rated the adequacy of science apparatus and materials adequate. Also 19 (30.6%) rated quite adequate, 9 (14.6%) rated inadequate, 6 (9.7%) were not sure, 4 (6.3%) rated quite inadequate. This means that majority 43 (69.3%) of pre-schools had adequate science apparatus and materials. The findings did not agree with the findings of Kathure (2010) that science apparatus and materials were inadequate in pre-schools.

Table 4: Pre-school teachers' responses on adequacy of science text books

	Pre-school teachers (n=62)		School administrators (n=50)	
Responses	Frequency	%	Frequency	%
Quite adequate	6	9.7	12	24
Adequate	23	37.1	14	28
Not Sure	6	9.7	3	6
Inadequate	23	37.1	17	34
Quite inadequate	4	6.5	4	8
Total	62	100	50	100

Source: Author, (2016)

The findings in Table 4 above show that only 23 (37.1%) of pre-school teachers recorded the availability of science text books in pre-schools inadequate. The same number 23 (37.1%) recorded adequate, 6 (9.7%) recorded not sure, 6 (9.7%) also recorded quite adequate, and 4 (6.5%) recorded inadequate.

Preparation of Instructional Materials

The schools administrators were also asked to respond to whether pre-school teachers made the said instructional materials.

Table 5: Respondents' responses on making schemes of work regularly

	Pre-school teachers (n=62)		School administrators (n=50)	
Responses	Frequency	%	Frequency	%
Strongly Disagree	2	3.3	0	0
Disagree	3	4.9	1	2
Not Sure	1	1.6	4	8
Agree	22	36.1	17	34
Strongly Agree	34	54.1	28	56
Total	62	100	50	100

Source: Author, (2016)

The findings in Table 5 show that majority 34 (54.1%) of pre-school teachers strongly agreed that they made thematic scheme of work regularly. Also 22 (36.1%) agreed, 3 (4.9%) disagreed, 2 (3.3%) disagreed strongly and only 1 (1.6%) were not sure. This means that majority 56 (90.2%) of pre-school teachers made schemes of work.

The same table also shows that 28 (56 %) school administrators strongly agreed that pre-school teachers made and used schemes of work regularly, 17 (34 %) said they agreed, 4 (8 %) were not sure and only 1 (1.6%) disagreed. Majority 45 (90%) of pre-school teachers made schemes of work.

Table 6: Responses' on making lesson plans regularly

	Pre-School Teachers (n=62)		School Administrators (n=50)	
Responses	Frequency	%	Frequency	%
Strongly Disagree	1	1.6		0
Disagree	5	8.1	1	2
Not Sure	2	3.2	3	6
Agree	21	33.9	26	52
Strongly Agree	33	53.2	20	40
Total	62	100	50	100

Source: Author, (2016)

The findings in Table 6 show that 33 (53.2%) of pre-school teachers strongly agreed that they made integrated lesson plans for lessons, 21 (33.9%) agreed, 5 (8.1%) disagreed, 2 (3.2%) were not sure and 1 (1.6%) disagreed. This implies that majority 54 (87.1%) of pre-school teachers made integrated lesson plans for all lessons.

The same table also shows that majority 26 (52%) of the school administrators agreed that pre-school teachers made integrated lesson plans, 20 (40%) strongly agreed, 3 (6 %) were not sure and only 1 (1.6%) disagreed. Majority 46 (92%) school administrators agreed that pre-school teachers made lesson plans for all science lessons.

Table 7: School administrators' responses on checking of scheme of work and lesson plans regularly (n=50)

Responses	Frequency	%
Strongly Disagree	0	0
Disagree	4	8
Not Sure	1	2
Agree	23	46
Strongly Agree	22	44
Total	50	100

Source: Author (2016)

The findings in Table 7 above show that 23(46 %) of school administrators agreed that they checked teachers' schemes of work and lesson plans regularly, 22(44%) strongly agreed, 4(8%) disagreed and only 1(2%) was not sure. This means that the majority 46 (92%) of the school administrators checked pre-school teachers' scheme of work and lesson plans regularly as opposed to Fgatabu (2012) findings that school administrators did not check pre-school teachers' scheme of work and lesson plans regularly, hence contributing to non-preparation the same. Frequent checking of instructional materials enhances motivation in teachers to prepare them frequently.

The Teaching Methods Used by Pre-School Teachers to Teach Science

Pre-school teachers were asked to indicate the teaching methods they used to facilitate learning of science in pre-schools. Most respondents indicated that they used more than one method to teach science as shown in Table 4.19

Table 8: Respondent's responses on methods used to teach science in pre-school (n=50)

Teaching method	Pre-school teachers n=62		Observation n=50	
	F	%	F	%
Group work	43	69.35	8	16
Demonstration	0	0	4	8
Role play	0	0	0	0
Discovery method	40	64.45	4	4
Experimentation	50	80.64	26	52
Practical Activity				
Question and Answer	51	82.25	43	86
Nature walk	50	80.64	3	6
Story telling	53	85.48	0	0
Songs	0	0	11	28
Poems	0	0	7	14

Source: Author, (2016)

The findings in Table 8 above reveal that the majority 53 (85.5%) of pre-schoolteachers indicated that they used story-telling to teach science, 51 (82.2%) indicated that they used Question and Answer, 50 (80.6%) indicated that they Experimentation/Practical activities.

The same number 50 (80.6%) of pre-school teacher indicated that they used nature walk, 43 (74.4%) indicated that they used group work and 40 (64.5%) indicated that they used discovery method. This means that pre-school teachers are aware of different teaching methods which they should use to facilitate teaching and learning of science activities. The findings in Most of the teaching methods which the respondents indicated that they used are those recommended for teaching science activities in ECDE syllabus (KIE, 2008)

From the observation ratings in the same table, it can be seen that 43 (85%) of pre-school teachers used Question and Answer, 26 (52%) used Practical Activity, 11 (22%) used songs, 8 (16%) used group work, 7 (14%) used poems, 4 (8%) used demonstration, 4 (8%) used discovery method and 3 (6%) used nature walk.

Challenges Faced by Pre-School Teachers in Facilitating Science Activities

The study also sought to establish the challenges faced by pre-school teachers in facilitating the learning of science in pre-school.

The respondents were asked to list the challenges facing the teaching of Science activities in pre-school. Several respondents indicated that they encountered more than one challenge as shown in table 4.20 below.

Table 9: The challenges pre-school teachers face in teaching science (n=62)

		Agree		Disagree	
Challenges		F	%	F	%
1	Inadequacy of science Teaching and Learning resources	41	66.12	21	33.82
2	Poor storage facilities for keeping T /L resources leading to loses	11	17.74	51	82.26
3	Lack of enough science text books	6	9.68	56	90.32
4	Classroom not spacious enough for learners to participate in science activities	6	9.68	56	90.32
5	Insufficient time to carry out practical activities	3	4.84	60	90.33
6	Lack of understanding basic science concepts	2	3.22	60	96.78
7	Failure to attend workshops , seminars and in-services courses	2	3.22	60	96.78

Source: Author (2016)

The findings in Table 9 show that the major challenges faced by pre-school teachers in implementing science curriculum were inadequacy of science teaching and learning resources 41 (66%), poor storage facilities for keeping teaching /learning resources 11 (17.4%), and lack of enough science text books.

Other challenges were 6 (9.68%), insufficient classroom space 6 (9.68%) and other challenges reported were minor and were rated 3 (4.84%) or below. This means that inadequacy of science teaching and learning resources, poor storage facilities for keeping teaching /learning resources, lack of enough science text books and sufficient classroom space affect the teaching of science in pre-schools in Kericho Municipality.

Conclusions

Based on the findings of the study, it was concluded that there were several factors affecting the implementation of pre-school science curriculum in Kericho Municipality, Kericho Sub-County. The study concluded that most pre-school teachers were not conversant with scientific/ inquiry method of teaching Science, where learners construct knowledge through carrying out investigations and arriving at principles.

The study also concluded that most pre-schools did not have adequate science teaching materials and apparatus and science textbooks were inadequate in pre-schools.

Recommendations for the Study

Based on the findings of the study the following were the recommendations of the study:

- i. The Ministry of Education, Science and Technology should consider extending SMASE in-service training programme to pre-school teachers to induct them on the current practices of teaching science, for example, scientific method of teaching science.
- ii. Pre-school teachers should embrace the practice of improvisation and make their own science teaching and learning resources using locally available materials.
- iii. The County Education Office should consider in-servicing pre-school teachers on the methodology of teaching pre-school science.
- iv. The school administrators, the School Management Committee and the stakeholders should look into ways mobilizing financial resources for constructing more classrooms with sufficient storage space for teaching and learning resources.

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