Influence Of Classroom Physical Environment On Mastery Of Number Activity Concepts Among Pre-Primary Learners In Embakasi Sub County, Nairobi

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Abstract: The kind of environment in early childhood classroom enhances multiple sources of stimulation which encourage development of physical, cognitive, emotional, and social skills needed by learners to master concepts in various activity areas. The physical environment is crucial when it comes to mastery of various activity concepts specifically number activity concept. The purpose of this study was to investigate the influence of physical classroom environment on preschool learners' mastery of number activity concepts in public pre-primary in Embakasi Sub County Nairobi County. The study was grounded on Lev Vygotsky's social-cultural theory while concurrent triangulation design within a mixed method approach was adopted. The target population comprised of the 25 public preschools, 75 pre-school teachers, 25 centre managers, 3 Sub County coordinator and 1536 preschool learners. A sample size 75 pre-primary teachers, 25 Centre managers, 3 Sub County Coordinators and 461 learners were considered. The study utilized cluster, simple random and saturation sampling techniques to select the sample size while questionnaires, interview Schedule, and observation checklist were used to collect data. Descriptive and inferential statistics were used to analyse quantitative data with the aid of Statistical Package for Social Sciences (SPSS) version 23 while qualitative data was analysed thematically. Findings indicated that physical classroom environment had a positive effect on mastery of number activity concepts with $(n=61; r=.588; p<.05)$ strong positive correlation and it accounted for 33.5% (Adjusted $R^2=.335$) of the variation in pre-primary learners' mastery of number activity concepts in Embakasi Sub-County. With the F-ratio in the ANOVA F (1, 59) =31.201; p< .05, the study concludes that the regression model was well fit for data collection. The study recommends that the government finds a significant need to build more appealing classroom physical environment in public pre-primary centres to ensure child friendly environment which are warmly decorated and spacious, with good temperature and well painted walls that boosts good health and safety. The study advocates for age appropriate furniture which accommodates and allows all learners to sit properly.

Keywords: Pre-primary learners, physical environment, Number activity, classroom space, learners' furniture, classroom layout, Embakasi, Nairobi.

I. INTRODUCTION

The physical learning environment is a powerful tool for teaching and learning and when it is set up with the knowledge of how children learn and develop, learners feel that they are supported and valued in whatever they are doing and learning is mastered McFarland (2012). As noted by Qonita and Yoyon (2019) in Indonesia, physical environment of the classroom reflects on learning environment and the design elements of the physical environment of learners. Further analysis revealed that elements of the physical classroom environment design with attention to lighting, color combinations, doors and

windows, floors, walls and furniture selection, creates a comfortable and safe atmosphere for learners.

In a study carried out by Taylor and Vlastos (2009) in Mexico noted that learning environment makes a silent curriculum where the relationship between the physical environment and the design of the classroom has power to impede and boost the learning process just as the overt curriculum. The study further suggested that the environment should encompass the space and furniture, seating arrangements, the light density, colour, personal displays, acoustics, temperature and living kinds. In Georgia, Bucholz and Sheffler (2009) carried out a study which discovered that a positive environment makes learners feel a sense of belonging, trust and learners are encouraged to tackle challenges, take risks, and ask questions. Weimer (2009) also looked at the environment as providing relevant content, clear learning goals and feedback, opportunities to build social skills, and strategies to help students succeed. These studies were supported by Hanner (2013) in a study carried out in USA on the physical classroom environment .The study pointed out three main areas in the classroom as having weight to learning as; physical environment, non-physical environment, and emotional environment. The study further asserted that these areas can be modified to create a stronger atmosphere which promotes learning while the work of the teacher is seen as arranging desks or hanging learners' work so that they can be motivated to learn and keep focus.In a study carried out by Tsavga (2011) in Nigeria noted that classroom environment plays a crucial role in molding learners' behaviours which determines how a student behaves and handles learning tasks to meet the demands in learning. However, Asiyai (2014) noted that classroom environment plays a significant role in motivating learning.

As cited by Kenya institute of curriculum development (2008) a classroom should be well organized and spacious for free movement of learners and teachers in accessing learning resources and enabling teachers to pass round assessing learners' activities and motivating them to learn. The findings were further advocated by Mwoma, Begi and Gakii (2018) in a study to determine the safety measures in pre-primary learners in informal settlements. The study findings revealed that pre-primary learners are faced with a myriad challenges like poor infrastructure, lack of play space and play equipment, congested classrooms and school compounds which are not fenced. The study found out that these challenges impact negatively to the achievement of number activity concepts. In a study carried out by Pianta, La Paro, Payne, Cox, Bradley, (2002) reckoned that Schools have a key role in establishing and maintaining relationships and what happens at school largely determines learners 'success. However, Dockett and Perry (2013) noted that communities and schools make significant contributions to children's connections with the school transition process and school engagement.In a descriptive survey design Nyagaya (2015) investigated on the factors influencing the level of teachers' satisfaction in public primary schools in Kayole Division, Embakasi Sub County. The study sampled 196 teachers from 20 public primary schools to take part in the study. Using quantitative analysis the study revealed that inadequacy of school facilities led to teachers' dissatisfaction. Similarly,

Chuma (2012) in Mandera East- Kenya noted that adequate and sufficient arrangement of classroom environment enable effective instruction process which establish a conducive atmosphere for learners and teachers.

The learning environment remains an important factor in any achievement of concepts despite the varying learning environments there are, the ministry of education has aligned early childhood under the management of County governments. The board of management assume the responsibility of outlining the standard quality of pre-primary centres as enshrined in the early childhood development education declaration policy (2018).Among the requirements; the centre must meet the requirements of the occupational health, safety regulations and building standards, welfare and safety of the pupils, teachers, non-teaching staff and other persons within the institution .the centres ought to put heightened fire fighting equipment, first aid and other emergency equipment which are accessible for any emergency as cited by the early childhood development service standards (2006). The same sentiments were asserted by the safety standard manual which noted that pre-primary centers should ensure clean, safe and properly utilized classrooms, offices, kitchen, toilets and other physical structures in the environment (Republic of Kenya, 2008).As cited by National Early Childhood Policy Framework in Kenya (2008) an ideal learning area should have minimum qualities as indicated as indicate in table 1.1 below.

Ideal classroom	Un ideal classroom
-doors and windows have locks -Indoor space adequate for movement -Chairs and tables age- appropriate -Are toys safe and appropriate for the age group -Supportive relationship with mutual understanding -enough ventilation -physical facilities are conducive for learning	-physical facilities un conducive -Classroom lack locked doors Poor furniture and not age- appropriate Poor infrastructure Inadequate ventilation Overcrowded classroom with no space for learning -poor unsupportive relationship

Table 1.1: An ideal and Actual classroom
National ECD Policy Framework of Kenya (2008)

As identified by Dusenbury (2016) a classroom should be designed in a way that ensures safety, comfort and welcoming at first sight. The study further suggests that safety of learners should be the first considerations when creating the design of a classroom since it creates adverse impacts to learners' motivation, attitude, behaviour, and lower levels of academic achievement. This was witnessed in the levels of performance in Embakasi East Zone. The statistics from Zonal analysis indicated that mastery of number activity concept was spread throughout the measures as indicated in the table 1.2 below.

LEARNING AREA	EXCEED EXPECTATION	MEET EXPECTATION	APPROACH EXPECTATION	BELOW EXPECTATION
Number work	415 38.09%	112 13.67%	300 7.29%	610 39.71%
Language activity	713 46.74%	400 26.04%	223 14.51%	300 19.53%
Environment	685 44.59%	305 19.8%	240 15.62%	3o6 19.92%
Psychomotor learning	724 47.13%	420 27.34%	229 14.90%	163 10.61%

Religious activity	763 49.67%	200 13.02%	359 23.37%	214 13.93%

Source: Zonal Analysis (2018)

Table 1.2: Analysis of learning areas in Embakasi Sub County

Most learners fall under the category of below expectation which is an indication that performance is way below average. This report showed that Embakasi East zone had the highest number of learners (74.47%) who had met the KICD (2017) expectations in psychomotor then language activities followed closely by 72.46% score. Environment and religious learning areas scored 64.45% and 62.69% respectively hence mastery of number activity concepts was quite below average in comparison to other learning areas. From the aforementioned background to the study, one of the major factors that were identified to influence mastery of number activity concepts was the classroom physical environment. Based on account of below average performance as depicted in Table 1.2 the present study sought to establish the influence of physical classroom environment on mastery of number activity concepts.

II. STATEMENT OF THE PROBLEM

Sustainable development goal four Agenda aim to ensure inclusive and equitable quality education which promotes lifelong learning opportunities for all by 2030.To ensure this, Kenya aims at providing a globally competitive and quality education, training and research and this can be achieved by integrating early childhood education into primary education. With the competence based curriculum (2017), Kenya aims to develop skills and knowledge in early years which is seen as an import of pre-primary school readiness based on the acknowledgement that learners need to possess a predetermined set of capabilities to succeed in later schooling. However, the National ECD Policy Framework (2018) eludes that to succeed in education, an enabling quality learning environment which is learner friendly need to be created as cited by the ECD Service Standard Guidelines for Kenya (2008).From the aforementioned background to the study, the significance of the learning environment is publicized as a silent curriculum whereby learners evolve their hidden talent to transit to other levels of learning. In addition, the performance of learners in number activity has been on the downward trend as indicated by Uwezo (2012) and zone analysis (2019) as compared to the other learning areas. However, there is scarce literature available on the possible contribution to achievement of number activity concept which could be inadequate hence to unlock the potential of achieving number activity concepts. Based on this premise, the current study therefore was geared towards determining the predictive power of classroom environment on mastery of number activity concept in early childhood in Embakasi Sub County.

III. METHODOLOGY

Nairobi County has a total area of 696.1 Km^2 of which 105 .8 5 km^2 make Embakasi Sub County. The Sub County is located between Longitudes 36° 45^1 East and Latitudes 1^0 18^0 South and it lies at an altitude of 1,798 meters above sea level. Embakasi Sub-County is one of the seventeen (17) sub-counties in Nairobi County which has 3 divisions, 6 locations and 13 sub-locations (Kenya National Bureau of Statistics, 2009). The target population comprised of the 25 public pre-primary, 75 pre-primary teachers, 25 centre managers, 3 Sub County Coordinators and 1536 preschool pupils totalling to 1662 respondents. The sample for the centre managers, pre-primary teachers and Sub County Coordinators were chosen using saturation sampling which ensured (100%) selection on the targeted population Borg & Gall (2007). The researcher used two-stage cluster sampling technique to select learners from the three geographical regions of Embakasi (Zones A-C). Using random sampling 30% of the learners from each cluster were selected which represented 155 learners from Zone A, 157 learners from Zone B and 149 learners from Zone C totalling to 461 learners. The study adopted concurrent triangulation design within the mixed method approach whereby quantitative and qualitative data were collected concurrently in one phase then analyzed separately, compared and combined at interpretation stage Creswell (2014). Data was collected through Pre-school teachers' questionnaire, interview Schedule and observation checklist.

Validity of the scale of measure was given to experts from the faculty of education to verify its relevance, clear or ambiguous with the objective of the study while a 10% pilot study was conducted and subjected to Pre-testing to assess the clarity of the instruments items to collect data for the objectives. The internal validity of the constructs was investigated by subjecting the survey data to suitability tests using the Kaiser-Meyer-Oklin measure of sampling adequacy (KMO Index) and the Bartlett's Test of Sphericity. KMO index revealed a more than 0. 7 construct validity which was considered as adequate for the study. Quantitative data was analyzed using descriptive and inferential statistics-with the help of statistical package for social science (SPSS version 23) while qualitative data was analysed through content analysis or thematically.

IV. QUESTIONNAIRE RETURN RATE

Summary of the questionnaire return rate is presented in Table 1. Out of the 75 questionnaires administered to pre-school teachers, 61 were completed and returned which represents 81.3%. The study considered this as adequate according to Mugenda and Mugenda (2009).

Respondents	Questionnaires administered	Questionnaires returned	Return rate (%)
Pre-school teachers	75	61	81.3

Source: Research data (2019)

Table 4.1: Questionnaire Return Rate

With regard to interviews with centre managers, an appointment was made with all the targeted 25 managers. However, only 20 appointments representing 80.0 % of the target sample were honoured and interviews were conducted on them. The researcher was unable to contact the remaining 5 centre managers during the period of the study. Three sub county coordinators were interviewed and this represented

100%.

Table. 4. 3 pre-school presents summary of the response rate.

Zone	Administered	Returned	Response Rate (percentage)
Zone A	9	9	100
Zone B	8	6	75
Zone C	8	5	62.5
Total	25	20	80

Source: Research data (2019)
Table 4.3: Pre-schools Return Rate

Concerning pre-schools, a total of 20 schools out of 25 were conducted which also represented 80% of the total sample. Therefore, a total of 20 observation checklists, rubrics rating scales and modified version of early childhood environmental rating scales were completed which was considered more than adequate for data analysis and drawing inferences. Finally, the response rate for pre-school pupils was 82.4% which the study considered sufficient enough for data analysis, conclusions and inferences on the rubrics.

A. DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

The study considered several background information concerning respondents. These included: the zones, age, sex, education and the year of experience for respondents.

B. GENDER OF PRE-SCHOOL TEACHERS

Statistics revealed that majority 58 (95.1%) of pre-school teachers are females, while the fewer respondents were male at 3 (4.9%). This imply that pre-school teaching in Embakasi Sub-County is female dominated. This could also mean that there are more female ECDE professionals than their male counterparts. This finding concurs with study which was carried out by Onditi (2014) on women high drain in institutions of higher learning in Kenya. The study revealed that more women occupy lower cadres in teaching than other professions a practice which holds the view that children development is more suited to women and that ECDE teaching is considered as less-masculine but female suited in the society. With regard to centre managers, statistics indicate that majority of them, 14 representing 70%, were females while the fewer, 6 (30%) were males (see Table 4.4). This implies that while teaching in pre-schools in Embakasi sub-county is a female affair, management of ECDE facilities is a female dominated.

C. AGE BRACKET OF RESPONDENTS

According to the findings, majority of the pre-school teachers, 23 representing 37.7% of the pre-school teachers were in the age group 30-39 years, followed by those aged between 40-49 years who represented 21 (32.8%). In addition, 10 (16.4%) of pre-school teachers in Embakasi sub-county were aged 50-59 years, while 8 represented 13.1% below 30 years. Additionally, these statistics indicated that ECDE teachers are distributed across all ages. Concerning the age bracket of centre managers, statistics reflected that majority 9

(45.0%) of the pre-school centre managers were aged between 40-49 years, followed by those aged above 50 years who were 8 representing 40.0 %. According to these findings, 15.0% of the centre managers were aged between 30-39 years and finally, no centre manager was below 30 years of age. This showed that management of preschools in Embakasi sub-county is held by elderly people, who probably have several years of experience.

D. EDUCATION LEVEL OF RESPONDENTS

In this study, education was an indicator for pre-school teacher's qualifications. To begin with, results showed that majority of the pre-school teachers (52.5 %) had undertaken certificate courses in ECDE, followed by 14 pre-school teachers (23.0%) of those interviewed who had diploma in ECDE. Statistics further showed that 9 out of 61 pre-school teachers had bachelor's degree in ECDE. Finally, there was close to a tenth, 6 (9.8%) of pre-school teacher in all the surveyed schools who were untrained. These results implied that most of the pre-school teachers in Embakasi sub-county had pre-requisite qualifications, hence competent enough to transfer knowledge to pre-school learners. This argument was in consistent with the existing literature that preschool teachers' effectiveness is directly related to teacher's education and training (Gakiria, 2012). Teachers who are effective envision their learners' goals hence utilizing their knowledge and skills to enable learners to actualize their goals.

On the other hand, findings on education of centre managers (Table 4.4) indicated that, majority 14(70%) of the centre managers were diploma holders, followed by those with certificates at 4 (20.0%). Finally, statistics reflected that 2 respondents (10%) of the centre managers interviewed had bachelor's degrees. These revelations implied that most preschools in Embakasi sub-county are managed by people who are well informed.

Education Level	Frequency	Percent
Certificate	4	20.0
Diploma	14	70.0
Bachelors	2	10.0
Total	20	100.0

Source: Field Data, 2019
Table 4.4: Level of Education of Centre Managers

E. RUBRICS RATING SCALE

The study sought to creates insight on the dependent variable, preschool learner's performance in number activity concept. It was done by rating how learners performed in different number activity concepts which included classification (sorting and grouping of objects, matching and pairing, ordering objects and rote counting). Number work included reorganizing numbers, counting objects, number sequence, addition, subtraction, identifying missing numbers, reading numbers, pairing, matching numbers and objects. The study also collected data on measurement, identifying big and small surfaces, tracing Kenyan currency, filling big and small containers and relating daily activities with time. Patterns and

relationships included sorting by colour, shapes and sizes, ordering objects based on one attribute, reorganizing simple patterns while geometry included identifying circles, squares, triangles and rectangles(Table 4.6) presents summary results based on frequency responses and percentages.

Number activity Concept	Exceed Expectation	Meet Expectation	Approach Expectation	Below Expectation
Classification	76 (20%)	108 (28.42%)	80 (21.05%)	116 (30.53%)
Numbers	90 (23.68%)	87 (22.89%)	123 (32.37%)	80 (21.05%)
Measurement	65 (17.11%)	130 (34.21%)	60 (15.79%)	125 (32.89%)
Patterns and Relationships	75 (19.74%)	84 (22.11%)	89 (23.42%)	132 (34.74%)
Geometry	127 (33.42%)	85 (22.37%)	90 (23.68%)	78 (20.53%)
Total	**86 (22.63%)**	**100 (26.32%)**	**78 (20.52%)**	**116 (30.53%)**

Source: Data Analysis, 2019

Table 4.6: Rubrics Rating Scale

The results indicated that, 76(20%) learners exceeded expectations in classifying concepts. In addition, 108 (28.42%) of the learners met the expectation, 80 (21.05%) approached expectation while 30.53% of the learners performed below expectation in classification. On numbers, the study found out that 90(23.68%) of the learners exceeded expectations, 87(22.89%) met expectation, and 123(32.37%) of the learners approached the expected performance. Still on numbers, 80 (21.05%) learners performed below expectations. In measurement, the study reveals that 65(17.11%) of learners exceeded expectation, 130(34.21%) met expectations, 60(15.79%) approached expectation, while 125(32.89%) were rated below expectation. With regard to patterns and relationships, findings indicated that 75(19.74%) exceeded expectations, 84(22.11%) met expectations, 89(23.42%) of the learners approached expectations and 123(34.74%) performed below expectations. Finally, on geometry, 33.42% of learners exceeded expectations, 22.37% met expectations, 23.68% approached expectation, while 78(20.53%) were rated below expectation. On the overall basis, 86(22.63%) out of 380 learners surveyed had exceeded expectations in mathematical concepts, 100 (26.32%) learners met expectations, 78(20.52%) approached expectations, and the remaining 116 (30.53%) of the learners were rated below expectations. This means that majority of the learners in pre-schools within Embakasi sub-county are rated below expected performance in number activity concepts based on Early Childhood Environmental Rating Scale.

V. INFLUENCE OF CLASSROOM PHYSICAL ENVIRONMENT ON MASTERY OF NUMBER ACTIVITY CONCEPTS

In regard to the influence of physical classroom environment on pre-primary learners' mastery of number activity concepts data was collected from pre-primary teachers, centre managers and Sub County ECD Coordinators. In addition, observation check list was used to collect data. Parameters investigated under this objective including

adequacy of classrooms, appearance, ownership of the classroom space, classroom materials/structures present in class. Where statements associated with the relationship between classroom physical environment and mastery of number activity concepts were rated on a Likert scale (1-Strongly Disagree (SD), 2-Disagree (D), 3-Undecided (UN), 4-Agree (A), and 5- Strongly Agree (SA). Descriptive statistics on pre-primary teachers are summarized below

Construct	1	2	3	4	5	Mean	S. D
Physical classroom space area is adequate for furniture at designated area.	10 (16.4%)	13 (21.3%)	16 (26.2%)	15 (24.6%)	7 (11.5%)	2.93	1.26
Seating arrangement facilitates learning for all learners.	1 (1.6%)	24 (39.3%)	10 (16.4%)	18 (29.5%)	8 (13.1%)	3.13	1.13
Classroom physical nature is visually appealing.	3 (4.9%)	17 (27.9%)	6 (9.8%)	24 (39.3%)	11 (18.0%)	3.38	1.21
The classroom is bright and comfortable for learners to learn.	20 (32.2%)	12 (19.7%)	10 (16.4%)	14 (23.0%)	5 (8.2%)	2.14	1.37
Practical aids that provide a variety of tracing, puzzle and for sequencing sets for enjoyment are found in the centre.	7 (11.5%)	23 (37.7%)	9 (14.8%)	16 (26.2%)	6 (9.8%)	2.85	1.22
Learners own the physical environment of the classroom.	8 (13.1%)	22 (36.1%)	10 (16.4%)	18 (29.5%)	3 (4.9%)	2.77	1.16
Manipulative for problem solving development of fine motors kills and creative structures are available in the centre.	15 (24.6%)	16 (26.2%)	10 (16.4%)	14 (23.0%)	6 (9.8%)	2.93	1.26
Mean average status of classroom physical environment						**2.89**	**1.11**

Key: 1-Strongly Disagree, 2-Disagree, 3-Undecided, 4-Agree, 5-Strongly Agree and SD-Standard Deviation.
Source*: Data Analysis, 2019*

Table 4.7: Classroom Physical Environment (n=61)

From table 4.7 Findings regarding adequacy of classroom physical environment indicated that majority 16 (26.2%) of the respondents were undecided on whether classroom physical space was enough for furniture. 15(24.6%) agreed that classroom physical space was enough for furniture while 7(11.5%) of pre-primary teachers strongly agreed. However, 13(21.3%) of the pre-primary teachers disagreed and 10(16.4%) strongly disagreed with the assertion that physical classroom space was adequate for furniture. This means that 22(36.1%) agreed that there was adequate physical space while 23 (37.7%) disagreed with the sentiment with a mean score of 2.93and a standard deviation of 1.26 implying that majority of the respondents were undecided on this issue.

The revelations of adequacy space were further reinforced by an in-depth interview with center managers who argued that physical space was a big challenge in pre-primary centers as observed by one centre manager;

Learning has to go on. To ensure that all learn, we are forced to create room by removing desks out to allow all learners to seat (CM 17)

An interview with the Sub County ECD Coordinator, asserted that urgent measures needed to be put in place in most schools in the sub-county to improve learning environment. As noted;

"I admit there is a problem. Sometimes we advise teachers to reorganize themselves to see that learning takes place"……………. (SC2)

Equally, classroom observation revealed that most of the pre-primary centre surveyed, were quite small, and could hardly accommodate enough furniture for learners. In some schools, the study established that classrooms learning space were quite outstretched and learners were seating on the floor due to lack of furniture and space.

The undecided in the study could be attributed to lack of enough space to accommodate furniture hence poor seating arrangement as observed .The implication here is that most pre-primary do not have adequate class infrastructure and learning is intolerable especially during rainy seasons. Safety of learning environment is of utmost importance for learners as advocated by the ECD Declaration Policy (2018) and cited by Adeyemo (2012) that setting arrangement has a direct impact on perception, comfort, motivation, and concentration of learners. The same sentiments were echoed by Buchong and Sheffer (2009) that good seating arrangement ensures comfort and contributed to a safer classroom layout for children to engage in purposeful learning.

Regarding seating arrangement that facilitate learning for learners, 18(29.5 %) agreed and 8(13.1%) strongly agreed that setting arrangement facilitated learning for all learners. 24(39.3%) of the pre-primary teachers disagreed and 1(1.6%) strongly disagree while 10 (16.4%) were undecided on whether seating arrangement aided learning in the classroom. The average mean on this quest was 3.13 with standard deviation of 1.13 implying that most 26(42.6%) of the pre-primary teachers agreed that seating arrangement facilitates learning in pre-primary while 25(40.9%) of learners disagree with this statement.

An in-depth interview with the centre manager established that seating arrangement is not taken seriously due to large numbers of learners. The manager further explained that some learners are forced to share desks or seat on the floor. Sometimes chairs are joined together to create space for a third child to seat and learn. One of the centre managers noted;

"Learning is unbearable especially when it is raining. Most learners seat in muddy classroom and sometimes learning has to halt to get the room ready for learning"…….. (CM14)

The Sub County ECD Coordinator also ascended that good seating arrangement has been attributed to smooth and orderly learning that produce results but there is nothing that can be done unless the government provides. This is evident from qualitative data report from one of the ECD sub County coordinator who noted;

*"The situation in some centre is wanting and it needs agent attention to elevate the glory of early childhood education"………………. (*SC3)

Classroom observation proved the assertion that the situation is wanting. Despite the many learners in the classroom, desks were not enough to cater for all learners. While others were seating, others fought for a space to seat. In some schools, teachers were forced to remove desks out so that they can control learners by equalizing them by seating on the floor. Some classes had mats while others sat on sacks while other on cemented floors.

From the assertion on classroom environment CM14 and QA3, it emerged that seating arrangement in Embakasi County is wanting. The expressions indicated that learners willingly come to school to learn and they persevere to get that knowledge despite the situation. The findings were in agreement with Chepkonga (2017) study in West Pokot that reported that early childhood lacked standardized environment that facilitate provision of quality education to all learners. However the findings agreed with Pipkin (2015) in Northeast Tennessee's report that teacher's personal experience and philosophy of education guided the physical environment design to develop number work activity concept.

On whether the physical nature of the classroom was appealing, 24(39.3%) agreed and 11(18.0%) strongly agreed that the physical classroom was appealing. On the contrally, 17(27.9%) disagreed and 3(4.9%) strongly disagreed while 6(9.5%) were neutral on the statement.

The results of the study indicate that majority 35 (57.4%) of the pre-primary teachers were in disagreed that classroom physical environment was visually appealing. On the contrary, 20 (32.8%) disagreed with this assertion. The undecided were only 6 respondents representing 9.8% of the respondents. The mean average of 3.38 and a standard deviation of 1.21 implied that majority of the pre-primary teachers were in disagreement with this notion that classrooms were appealing or not.

Qualitative data from the centre manager claimed that classroom looks depended on the teacher. The manager added that teachers are managers of their classes and they ought to reorganize their classroom to look like a learning environment by displaying learners' work and material used in learning. When the researcher asked the manager about the outlook of the classroom this is what one manager had to say;

"This is how I found the classroom. These rooms were built by the government and there is nothing we can do to make them better. We use them as they are and we have tried to inform the authority about the problem we are experiencing, but nothing has been done so far………….. (CM13)

An interview report from the Sub County ECD Coordinator revealed that their hands were tied and there is nothing they can do unless the government through the city council acts fast to elevate the situation. As noted

"Teachers are forced to handle the situation as it comes. We have written to the city council but the situation is still the same. There is no response and we are still waiting………… (SC2)

A closer observation indicated that classrooms were not appealing at all. Most of the classrooms had untidy walls and floors; some in tall buildings with poor lighting and lacked natural lighting. Some schools had poor ventilation which could threaten the health of learners. These revelations implied poor classroom environment which is likely to hamper mastery of number activity concepts in pre-primary centers.

The contention from the classroom observation, center manager (CM13) and the Sub County ECD coordinator (SE2) were in agreement with Hanner (2013) who pointed out that physical environment, non-physical environment and emotional environment affect mastery of number activity concepts. Steve and Richard (2013) also noted that students' first step into a classroom make judgments on how the teacher has set up the classroom to allow them to communicate nonverbally. The same result was advocated by Adeyemo (2012) study in Nigeria that physical environment directly impact on the perception, comfort, motivation and concentration which creates a sense of safety and comfort for exploration, engagement and successful learning.

Most teachers disagreed on the brightness and comfort of the classroom. Out of the 61 who took part 14(23.0%) agreed and 5(8.2%) strongly agreed. On the contrary, 12(19.7%) disagreed and 20(32.2%) strongly disagreed that classroom were bright and comfortable for learners. Although 19 (31.2%) of the pre-primary teachers generally accepted that their classrooms were brighter and comfortable for learners, more than a half 32 (51.9%) of them insisted that their classrooms were neither bright nor comfortable for learners. However, a total of 10 (16.4%) pre-primary teacher were undecided. In general, the pre-primary teachers were in disagreement as reflected by a mean response of 2.14 and standard deviation of 1.37.

An interview with centre managers confirmed this sentiment that some classes are not bright and teachers keep the light on especially in the morning and when it is raining. One of the centre managers observed that;

"When there is no electricity, it is hard for teachers to teach. Some teachers take learners out while others reschedule their lessons to fit the situation"…… (CM 11)

An interview with the Sub County ECD Coordinator had this to say;

"The classrooms are generally small. If the learners are many and there is no light it becomes difficult to teach"……………. (SC3)

These revelations were confirmed by observation conducted in the classrooms which revealed that; most classrooms were overcrowded with few windows which forced teachers to switch on light especially where there was electricity.

From the classroom observation, center manager (CM11) and Sub County ECD Coordinator (SC3), it can be concluded that there is a problem with classroom lighting in Embakasi. Poor lighting reduces visibility and cause visual discomfort leading to loss of interest and lack of concentration. The classroom visual environment leads to good contrast levels on the chalkboard which is a prerequisite to better visibility. The implication of these results is that most classrooms have no adequate lighting and are not comfortable. This was in agreement with Barrett, Fay, Zhang and Lucinda (2015) who

reported that that Lighting, Temperature, Air Quality, Ownership, Flexibility, Complexity and the Colour of the classroom predict learners' progress. The study further confirmed that the utility of the naturalness, individuality and stimulation of the classroom act as a driving vehicle for organizing and studying the full range of sensory impact of an individual occupying a given space. These sentiments were cited by Cheng (2014) that the safety of the classroom environment is paramount for learners' development and learning capabilities.

From table 4.7 Practical aid that provide a variety of tracing, puzzle and for sequencing was approved by most teachers. Among those who took party 16(26.2%) agreed and 6(9.8%) strongly agreed that practical aids provide a variety of tracing ,puzzle and for sequencing and sets for enjoyment were found in the centers. Among those who took part, 23(37.7%) disagreed and 7(11.5%) strongly disagreed.

The study showed that majority 30 (49.2%) of the pre-primary teachers disagreed that there was availability of practical aids that provide a variety of tracing, puzzle and for sequencing sets for enjoyment in the centre. However, 22 (36.0%) of the respondents alluded that the centers had practical aids. On the other hand, 9 (14.8%) of the pre-primary teachers were undecided reflecting a mean of 2.85 with standard deviation of 1.22.

An interview with centre managers reveals that most of the schools did not have practical aids while others proved to have a few learning aids which were not sufficient. In some centers learning aids were too old to be used by learners.

An interview with the Sub County ECD Coordinator ascended to this sentiment and had this to say;

"It is long since I saw such aids in schools. Even if they are there, the large numbers in our classes limits them from using these aids. For instance, the issue of space and infrastructure is a great problem which needs agent attention"………………. (SC 2)

Through classroom observation it was revealed that most schools did not have practical aids for tracing, puzzling and sequencing sets for enjoyment. A few schools which had were not in a state to be used by learners.

Early childhood is full of practical and an introduction to practical skill enhances concentration and boost self-esteem and independence. As noted by Montessori (2012) child-size replicas of adult tools for developing fine motor skills strengthen intellectual and personal will while Feez (2018) noted that young children in Montessori classroom are taught to fold cloths as napkins resulting in squares, rectangles, and triangles as geometry shapes in practical life activities whereby learners learn names of shapes, and later come to apply them on other material.

With regard to classroom environment ownership, it was established that 18 (29.5%) agreed that learners own their classroom environment while 3(4.9%) strongly agreed. Out of the total number of teachers who participated, 22(36.1%) teachers disagreed and 8 (13.1%) teachers strongly disagreed.

This was reflected by majority 21 (34.4%) of the pre-primary teachers agreed while 30(49.2%) disagreed that learners own physical environment of the classroom. However 10(16.4%) were undecided with a reflection of a mean of 2.77 with a standard deviation of 1.160.

Qualitative data from the centre manager affirmed that majority of centre managers agreed that ownership of the classrooms depended on teachers' organization as managers of the classroom. For instance, one centre manager observed:

"Management of the class depend entirely on the teacher. Learners should be involved in many activities which take place in the classroom like drawing and modelling, choosing their prefects and managing what is found in the classroom and eagerly take up responsibility tolearn new things".................... (CM 18)

An interview with the Sub County ECD Coordinator had this to say:

"There is a lot learners can do. Teachers can allow learners to choose themselves in various responsibilities, manage their class and work together to assist one another"............... (SC3)

An observation of the classrooms revealed that most classrooms were overcrowded with limited space to display and create centres of interest. When the researcher asked one of the teachers how they ensure learners own their class? This is what the teacher had to say:

"Learners do everything in class. Some of them are group leaders and there are those who guide others to read in readiness for the daily lessons in the morning. Learners choose their prefects and take care of their things in class".............. (T53)

By offering the opportunity for learners to own their classroom, learners are able to evolve onset skill and this motivates them to make the most of their education. As noted by Martin and Sass (2010) in Australia, classroom management reflects on establishing order, dealing with misbehaviour, offering appropriate instruction, and taking care of students' emotional and cognitive abilities. The same sentiments were echoed by Nie and Lau (2009) in Singapore that classroom management practices includes; taking care, engaging and controlling behaviour.

On the item "whether manipulative for problem solving development of fine motor skills and creative structure are available in the centres," 16(26.2%) teachers disagreed with the statement while 15(24.6%) strongly disagreed. Those who agreed represented 14(23.0 %) and 6(9.8%) strongly disagreed. From the discussion, the results of the study showed that majority 31 (50.8%) of the pre-primary teachers disagreed with the assertion that manipulative for problem solving development of fine motors kills and creative structures are available in their centre while20 (32.8%) respondents agreed. Those who remained undecided represented 10(16.4%) with a mean response of 2.93 and a standard deviation of 2.93.

Qualitative interview with centre managers confirmed these findings. One center manager articulated that;

"This is the main challenge we are experiencing. Seating down and writing especially in a rainy season is difficult not to mention scarcity of fine motor resources"…………. (CM18)

The Sub County ECD Coordinator had this to say about manipulative;

"There is a lot to do in early childhood starting from classroom infrastructure and fine motor resources are a major challenge. The situation is unpredictable"……………. (SC1)

The classrooms observation confirmed that most classrooms were squeezed. There was a limited resource for fine motor skill some schools had plasticized which was found in a few centers.

To ensure good start for pre-primary writing skill, there is needed to strengthen their fine motor muscles. This concurs with Sugate, Stoeger and Pufke (2017) study which revealed that fine motor skills remained distinct factors in pre-primary years and predict high achievement on multiple subtests at kindergarten entry. The same sentiment was cited by Pitcford, papini, Outhwaite and Gulliford (2016) that development of Fine Motor Integration in pre-primary remains a significant predictor of number activity writing skills.

TESTING HYPOTHESIS 2

H$_o$2: *There is no statistically significant relationship between classroom physical environment and Pre-primary Learners' Mastery of Number activity Concepts.*

To analyse the effect of physical classroom environment on the performance of number activity concepts, the study conducted Pearson's moment correlation analysis to test the hypothesis. The hypothesis was tested with classroom physical environment as the independent variable and pre-primary learners' mastery of number activity concepts as the dependent variable. The significant level (p-value) was set at .05, such that if the p-value was less than 0.05, the null hypothesis would be rejected and conclusion reached that a significant difference exists. If the p-value was larger than 0.05, it would be concluded that a significant difference does not exist. Table 4.8 shows the correlation analysis results in SPSS output.

		Classroom Physical Environmen	Pre-primary Learners' Mastery of
Classroom Physical Environment	Pearson Correlation	1	.588**
	Sig. (2-tailed)		.000
	N	61	61
Pre-primary Learners' Mastery of Number activity Concepts	Pearson Correlation	.588**	1
	Sig. (2-tailed)	.000	
	N	61	61

**. Correlation is significant at the 0.01 level (2-tailed).
Source: Data Analysis, 2019
Table 4.8: Pearson Moment Correlation for classroom physical environment and Pre-primary Learners' Mastery of Number activity Concepts

The finding of the study shows that there was statistically significant positive correlation between classroom physical environment and pre-primary learners' mastery of number activity concepts (n=61; r = .588; p<.05). Since p-value is less than 0.05, the null hypothesis was rejected. Hence, there exists enough evidence to conclude that there is statistically significant positive relationship between classroom physical environment and pre-primary learners' mastery of number activity concepts, with high level of classroom physical environment associated to improvement of pre-primary learners' mastery of number activity concepts and vice-versa. Sanders (2011) argues that attributes such as temperature,

lighting, paint colors, teaching techniques, classroom rules, procedures, discipline, and teaching strategies form the classroom environment whereby physical characteristics such as tables, chairs, books and layout are included. The study further argues that despite ensuring these attributes, the physical environment should be easily accessible to allow easy access, adaptive to both group project learning and lecture, accessible and foster effective teacher-student engagement. However, McDaniels (2012) noted that a positive learning environment optimizes learning by building a cohesive classroom community with a pleasant working environment for teacher and learners. The study noted that a well-designed and organized classroom environment improves the morale and success of learners when they feel safe, secure, and comfortable.

Qualitative findings indicate that conducive physical classroom environment is imperative for a productive learning environment. For instance, most pre-primary teachers argued that spacious classrooms help learners to move freely and learners can carry out group work with ease. To emphasize on this, a teacher in one of the schools surveyed explained that;

"If classroom is spacious it enables learners to interact with each other and the teacher to move freely within the classroom as opposed to a constrained physical environment".................. (T40).

It was also discovered that a spacious classroom environment enables better display of learning material for easier visibility to all learners, are accessed with ease and enhances what is taught. In addition, a spacious classroom facilitates proper arrangement of classroom furniture which create room for movement of the teachers, learners and helps special needs or learning difficulties learners to move freely and interact with others. A teacher reported that;

"A conducive classroom environment makes number activity lessons enjoyable to all learners. It gives chance to all learners to interact and learn concept taught in class from others with easy"............... (T25).

In addition, a centre manager of a certain school noted that;

"In a friendly and conducive atmosphere, learners understand with ease. They can easily understand concept taught as they look and say".................... (CM5).

However, observation by the investigator revealed that most ECDE classrooms were overcrowded with learners ranging between70-90. The classes were so small to accommodate even the recommended number of learners in an ECDE class of 25 learners per a teacher (KIE, 2008). In addition, chairs were limited in that teachers are forced to join the chairs together so that learners can share with their friends. In some schools' teachers were forced to use mats as chairs while others sat on the floor or used berries while writing work from the blackboard. For instance, a teacher reported that,

"There is nothing I can do, even when I want them to do group activities, after putting them in a group, going to organize another group, you find that they have moved from their group and they are scattered all over"............... (T34).

Observation further revealed that; the walls of the classroom were not appealing at all. The walls had a few spaces left for teachers to hang learners' work. Though the rooms were ventilated, learners hardly got time to enjoy free movement due to scarcity of space.

Moreover, the classroom structures were not enough. Learners are forced to share chairs which are joined together so that a third and fourth child can have a place to seat. In some schools teachers are forced to lid of the few chairs and tables so that they can create enough space for all learners to seat and learn. A teacher reported that writing was a big problem in the school since learners write while lying on their stomachs;

"The number of learners is more than expected, am forced to accommodate all learners so that they can have a chance to learn. The teacher cannot have one on one interaction with learners since there is no space to pass and reach out for the learners with difficult in class".......................... (T23)

To investigate how classroom physical environment influence performance in number activity concepts, the study computed a coefficient of determination. Table 4.9 shows summary results.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.588[a]	.346	.335	.38496

a. Predictors: (Constant), Classroom Physical Environment
Source: Data Analysis, 2019

Table 4.9: *Model Summary of Regression analysis of average performance in number activity and classroom physical environment*

The regression model indicated that classroom physical environment accounted for 33.5% (Adjusted R^2=.335) of the variation in pre-primary learners' mastery of number activity concepts in Embakasi sub-county. This represented a fairly large effect of the classroom physical environment on learners' mastery of number activity concepts in pre-primary. However, to establish if the effect of classroom physical environment was a significant predictor of learners' mastery of number activity concepts in pre-primary, variance analysis (ANOVA) was calculated and the results are summarized in Table 4.10 below.

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.624	1	4.624	31.201	.000[b]
	Residual	8.743	59	.148		
	Total	13.367	60			

a. Dependent Variable: Pre-primary Learners' Mastery of Number activity Concepts
b. Predictors: (Constant), Classroom Physical Environment
Source: Data Analysis, 2019

Table 4.10: ANOVA-Influence of classroom physical environment on Performance of number activity concepts

With the *F*-ratio in the ANOVA (Table 4.10), F (1, 59) =31.201; $p<.05$, the study concludes that the regression model was well fit for the data. Thus, classroom physical environment statistically and significantly predicted performance in number activity concepts in pre-primary in Embakasi Sub-County. The study noted that the effect of classroom physical environment is considerable.

VI. DISCUSSION OF FINDINGS

The study sought to establish the effect of classroom environment on mastery of number activity concepts by conducting a multiple regression analysis of the following equation:

$$Y = \beta_o + \beta_2 X_2 + \varepsilon.$$

Where Y = Mastery of number activity concept

β_o, β_1 = coefficients

X_1 = instructional resources

ε = Error term

Substituting the estimated betas, the regression equation becomes

$$Y = 1.936 + 0.178 X_2 + \varepsilon$$

With regard to classroom physical environment, the study established that it is positively related to mastery of number activity concepts as measured by the average performance in number activity. This relationship was indicated by a positive coefficient (0.178). The relationship is showed a statistically significant relationship since the p-value of 0.002 is less than 0.05. The size of the coefficient shows that classroom environment has a considerable impact on learners' performance, that is, a unit increase in the classroom physical environment could lead to about 18% increase in the performance. Other studies have also found this relationship significant. For example, Adeyemo (2012) noted that classroom physical environment had a direct impact on learners' performance.

From various literature reviewed, Safety and appealing nature of classroom physical environment had been attributed to basic features such as good lighting, conducive temperature, warm decorations, appealing color of the walls (Buchong & Sheffer, 2009). The study further eluded that conducive classroom physical environment attracts learners when it is set with a warm and appealing atmosphere which is necessary for learner's exploration, engagement and success. Thus, implementing some characteristics in classrooms proved to impact on performance positively. This could entail making sure that classrooms have the right paintings, spacious with good arrangement of furniture to allow free movement of learners and teachers, provides comfort which increase the level of concentration safe and provides motivation to learners to learn (Buchong and Sheffer, 2009).

VII. CONCLUSION AND RECOMMENDATION

Based on the findings, the study concludes that there was a statistically significant positive correlation between physical classroom environment and mastery of number activity concept in pre-primary centres. These findings were further supported by the qualitative data that showed that more spacious classrooms facilitate learning and better arrangement of furniture made movement of learners and teachers easy and enhance collaboration learning. It was worth noting that most conspicuous form of classroom environment in the study were warmly decorated, had wall painted, had favourable temperatures and lighting and increased learner's concentration which ultimately translated into better performance in number activity concepts. The study concluded that physical classroom environment positively influence mastery of number activity concept.

Based on the conclusions, the study recommends for a more appealing classroom physical environment in public pre-primary centres to ensure child friendly environment which are warmly decorated and spacious, with good temperature and well painted walls that boosts good health and safety. Additionally, the study advocate for age appropriate furniture which accommodate and allow all learners to sit properly.

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