Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.13, No.12, 2022

Influence of Molding Numbers on Developing Mathematical Competence Among Pre-School Learners in Mutha Zone, Kitui County, Kenya

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Abstract
The purpose of this study was to investigate the influence of molding numbers on developing mathematical competence among pre-school learners. The study was guided by the following objectives: to establish the influence of type of numbers modeled on developing mathematical competence among pre-school learners and to determine the influence of materials used on modeling numbers on developing mathematical competence among pre-school in Mutha Zone, Kitui County. The target population comprised of 60 pre-school teachers in Mutha Zone, 60 pre-school teachers and 450 learners. A sample of 18 head teachers, 18 pre-school teachers and 150 pre-school learners participated in the study. This was done through simple random sampling procedure where each respondent had equal chances of being selected for the study. Data were collected through the use of questionnaires and observation checklist. Data analysis was done using the statistical package of social sciences (SPSS) software. The findings of the study were; there is a statistically significant association between type of numbers moldedand Mathematical competence among pre-school learner ($\chi^2_{(1, 4)} = 41.429$, $p = .000$) and that there is a strong positive relationship, $r(15) = 0.646$, $p<0.05$ between modeling material and Mathematical competence among pre-school learner. The recommendations of the study were; the Ministry of Education must sensitize all the pre- school teachers to teach mathematics using modelings should provide plasticice to their learners since it was established that most schools were using clay which was making the learners to be dirty. The parents can also be encouraged by head teachers to buy plasticine for the learners so that they can also continue molding at home.
Keywords: Molding, pre-school learners, Mathematical Competence, type of numbers, molding material, Clay, Platicine.
DOI: 10.7176/JEP/13-12-06
Publication date: April 30th 2022

I. Introduction

Mathematics is a way of thinking about relationships, quantity and pattern via the processes of modeling, inference, analysis, symbolism and abstraction (Hein, 1991). The basic tenet of constructivism as described by Boardman (2006) is that, learners construct their own meaning through continuous and active interaction with their environment. Social constructivism recognizes that, early mathematical skills and concepts are not only critical to ensuring that young children begin school with the tools they need to perform well academically, but they are also the foundation for development of rational and logical thought processes (Mwangi, 2009). Learning mathematics is a constructive process of conceptual growth, often involving the reorganization of concepts and growth of general cognitive abilities.

Early mathematical concepts lay the foundation for later learning by providing children with underlying mathematical structures which are built over time. However, although early mathematical concepts are fundamentally important, they are also complex (Boardman, 2006). From an analysis of six longitudinal studies by Diamond (2010), it was established that early mathematics skills were more powerful predictors of later academic achievement in mathematics. In their daily activities, children develop numeracy, reasoning, thinking skills and problem-solving through the learning and application of mathematics. Besides, mathematics is a subject of enjoyment and excitement offering the children opportunities for creative work and moments of enlightenment and joy. Mathematical ideas can be used in children's play and everyday experiences. Young children develop some mathematical concepts through self-guided discoveries and adult support is essential to maximize learning (Ere swell, 2011).

Mathematics is a basic tool in the development of science and technology, commerce and industry hence aids in the economic development of a modern society (Scadamalia, 2006). Furthermore, mathematics is used as a 'filter' or 'handle' more than any other subject. All children therefore need to be equipped with this essential tool of productiveness so that in time they may make their contribution to the economy and their societies and also improve their own qualities as human beings.

Early childhood activities should be practical with plenty of manipulative strategies such as models that include stones, blocks, bottle tops, and flash cards among others (Mwangi, 2009). These activities should enable

children to expand their understanding of number, shape, size and patterns as they have observed the world around them. Models are three dimensional simplified representation of a real object. When used in the teaching of mathematics activities, being three dimensional models give a feeling of substance and depth of the real object and can be manipulated by children thus motivating and stimulating them in the teaching and learning process. Other activities like rope skipping also promote counting knowledge of children during classroom instruction of mathematics activities thus making the concepts easy to understand.

The Curriculum Support Officer in Mutha zone (2017) argues that inadequacy, and lack of availability of teaching and learning materials has been a major concern in most of the ECDE centers in Mutha Zone, due to poverty levels, ignorance and lack of know how among teachers in making or acquiring the materials. Again lack of Government active involvement in ECDE learning has contributed to inadequate acquisition of Mathematical skills. Due to scarcity of resources in public ECDE centers and their unavailability, caused by mismanagement of funds, poor monitoring, poor maintenance and equipping of schools, compounded with inadequate materials like textbooks, chalks, teaching and learning equipment and materials, is a major setback in mathematics performance in many schools. Parents in the home environment also play a major role in offering education support for children. However, a big population of parents have little know how on mathematical activities and are unlikely to help their children to learn mathematics at home.

Data at Mutha Zonal Education office (2021) indicated that the performance in Mathematics in pre-schools had consistently deteriorated compared to other subjects such as language competence, physical/outdoor competence and Creative Art competence. This has raised concern from parents who have been seeing their children joining grade one without acquiring the most basic Mathematics skills adequately and continuing with poor performance in primary schools. It is against this background that this study intended to investigatethe influence of molding numbers on developing mathematical competence among pre-school learners in Mutha Zone, Kitui County.

Statement of the Problem

When children first come to school, they bring inquisitiveness, energy, active range of social, intellectual and emotional experiences and an abundance of mathematical knowledge gained from their everyday experiences (Lipton & Speike, 2003). During learning process, teachers support learning by providing activities and materials that find engaging by facilitating learning, supplying a developmentally appropriate environment and interesting materials and adequate time to explore play and interact. The ECD curriculum contains of sufficient information for correct pedagogy (The ECDE syllabus-Kenya, 2000). It emphasizes on child classroom interaction and holistic development. However, many ECD teachers in Mutha Zone use teacher classroom approach where children largely get direct instruction from the teacher who does most of the talking while the learners passively listen. The teacher takes control and dominates by taking an active role in the actual instructional process. He or she is thus viewed as a sole provider and custodian of knowledge.

An active participation of learners is ignored and learner's individual needs are not given attention. The teacher dictates the choice of the content, the methodology, activities to be carried out and the learning resources without involvement of the learner. In Mutha Zone has been registering a consistent deterioration in mathematics competence in its preschools compared to other competencies. The poor results have raised concerns from very many stakeholders in the sub county. That is why the researcher was prompted to carry out a study to find out whether molding numbers has influence on mathematics competency acquisition among pre-school learners.

Purpose of the study

The purpose of this study was to investigate the influence of molding numbers on developing mathematical competence among pre-school learners in Mutha Zone, Kitui County. Specifically, the study sought to establish the influence of type of numbers modeled on developing mathematical competence among pre-school learners and to determine the influence of molding materials used on modeling on developing mathematical competence among pre-school learners in Mutha Zone, Kitui County.

Research Hypothesis

This study was guided by the following hypothesis:

$H_{01:}$ There is no statistically significant association between type of numbers modeled and Mathematical competence among pre-school learners.

$H_{02:}$ There is no statistically significant relationship between molding materials used and development of Mathematical competence among pre-school learners.

Research Methodology

The study employed a descriptive survey design. Descriptive survey design is a good way of measuring characteristics of large population (Orodho, 2010). The study targeted 60 public pre-school teachers, 60 pre-

school teachers and 450 pre-school leaners in Mutha Zone. Simple random sampling technique was used in selecting a sample of 18 head teachers, 18 pre-school teachers and 150 pre-school learners. To gather information for this study the researcher used questionnaires, observation schedule and interview schedules.

Results

The response for this study was 15 head teachers, 15 pre-school teachers and 150 pre-school learners.The questionnaires were used to gather information from teachers regarding thematic areas aiding in answering the research questions. Observation schedule were administered on the pre-school learners while the interview schedules were administered to the head teachers. The data was then analyzed on the basis of the questionnaires.

Table 1: Chi-Square test for molding numbers and Mathematical competence among pre-school learner

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	41.429(a)	4	.000
Likelihood Ratio	58.869	4	.000
Linear-by-Linear Association	35.210	1	.000
N of Valid Cases	15		

a 23 cells (92.0%) have expected count less than 5. The minimum expected count is .05.

Table 1, shows that the Pearson Chi-Square is $\chi^2_{(1,\ 4)} = 41.429$, $p = .000$. This tells us that there is a statistically significant association between type of numbers modeled and Mathematical competence among pre-school learners. We do therefore reject the null hypothesis which stated that there is no statistically significant association between type of numbers modeled and Mathematical competence among pre-school learners. These results agree with those of Smith (2002) who argued that those learners who interacted more in molding numbers of certain types were able to solve problems involving shapes and number recognition faster than their counterparts.There was a statistically significant association (Pearson Chi-Square is $\chi^2(1,4) = 41.429$, p = .000) between type of numbers modeled and Mathematical competence among pre-school learners.

Table 2: Correlation for Molding material and Mathematical competence

		Molding material	Mathematical competence
Molding material	Pearson Correlation	1	.646(**)
	Sig. (2-tailed)		.000
	N	15	15
Mathematical competence	Pearson Correlation	.646(**)	1
	Sig. (2-tailed)	.000	
	N	15	15

** Correlation is significant at the 0.01 level (2-tailed).

Table 2 shows that there is a strong positive relationship, r (15) = 0.646, p<0.05 between modeling material and Mathematical competence among pre-school learners. We do therefore reject H_{02}which stated that there is no statistically significant association between modeling material and Mathematical competence among pre-school learners. These results agree with Mbala, Manene and Ottieno (2019), who argued that providing children with materials like plasticine and clay will enable them develop mathematical competence through playing with these materials as opposed to other materials.

Table 3: Molding Numbers and Developing Mathematical Competence among Pre-school Learners

	Statement	**SA F (%)**	**A F (%)**	**N F (%)**	**D F (%)**	**SD F (%)**	**Total F (%)**
i.	Most schools provide learners with molding opportunities	6 40.0	4 26.7	2 13.3	2 13.3	1 6.7	**15** **100.0**
ii.	Providing learners with opportunities plasticine and clay will enable them develop mathematical skills	8 53.3	3 20.0	1 6.7	2 13.3	1 6.7	**15** **100.0**
iii.	Molding activities help learners to solve problems involving shapes	9 60.0	2 13.3	2 13.3	1 6.7	1 6.7	**15** **100.0**
iv.	Molding helps early learners helps in enhancing their memory	7 46.7	3 20.0	1 6.7	3 20.0	1 6.7	**15** **100.0**
v.	Most schools in rural areas have difficulties in acquiring plasticine	8 53.3	4 26.7	1 6.7	1 6.7	1 6.7	**15** **100.0**

Table 3 shows that majority (60%) of the respondents strongly agreed with the statement that, molding activities help learners to solve problems involving shapes. This was followed by 53.3% who strongly agreed that, providing learners with opportunities, plasticine and clay will enable them develop mathematical skills and most schools in rural areas have difficulties in acquiring plasticine. On the other hand, 46.7% of the respondents

strongly agreed that molding helps early learners in enhancing their memory and 40% strongly agreed that most schools provide learners with molding opportunities. These results agree with Wachanga and Mwangi (2004) who argued that molding number shapes with clay and plasticine by early learners helps in enhancing their memory.

II. Conclusions and Recommendations

The study concluded that the type of numbers molded and the molding materials used influence the development of mathematical competence among pre-school learners. It recommends that schools should provide plasticine to their learners since it was established that most schools were using clay which was a health hazard to the learners. Parents can also be encouraged to buy plasticine for the learners so that they can also continue molding at home.

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