Influence Of Children's Cognitive Abilities on Pre-Primary Learner's Acquisition of Science Skills in Tharaka North Sub - County.

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Abstract: As Kenya gears up to attain vision 2030, Education for All goals, and MDGs, ECDE has been recognized as essential programs of helping the country realize its goals.The purpose of this study was to establish the influence of learners cognitive abilities on children's acquisition of science skills in pre-primary schools in Tharaka North Sub- County, Tharaka Nithi County, Kenya. This study was based on Social Cognitive Theory. This study utilized a mixed methodology entailing qualitative and quantitative. The target population in this study was 1780 subjects comprising 95 early childhood teachers, 95 head teachers and 1590 pre-school children. Using stratified random sampling the researcher selected 10 teachers from the zones accounting for 10% representation of the target population making a total of ten, the sample of teachers. The instruments for data collection were questionnaires for teachers and head teachers and observation checklist for the children. Piloting of the instruments was carried out in Meru South Sub- County where they were pre-tested to the selected Early Childhood Children. Before data collection, the instruments were administered only once to a sample of 2 teachers and 2 head teachers in two preprimary schools. Cronbach Alpha analysis was computed, to establish the reliability of the instruments, and a coefficient of 0.83 was obtained, and hence the instruments were deemed reliable. As for the content and construct validity of the instruments, the development was done with guidance of the supervisors. The quantitative data was presented in tables, bar graphs, and pie charts. Qualitative data was analyzed thematically by use of themes derived from the responses. The study established that the pupils cognitive abilities had an influence on the learners ability to acquire science skills. However, it was established that most of the children had below average cognitive ability, and this contributed to low performance in Science activity areas. The researcher recommends that the teachers should be guided on the most effective methods of learner readiness assessment during the joining of the pre-school, and transition to class one. This will help in assessment of their cognitive abilities and thus guide the teachers on how best to teach the child.

I.   INTRODUCTION

Globally, science skills are regarded as a basic requirement that helps all individuals of the society to productively engage in day-to-day socio-economic and technological advancements (Copple &Brekekamp, 2009). Worth and Grollman, (2009) expound that it is through science activities that ECD learners get the chance to play with tools and be exposed to concepts that is crucial to future learning. Notably, children acquire more knowledge by adding new information into their existing frame of reference about the world (National Research Council, 2001). As they carry out science activities in pre-school classrooms their intellectual and linguistic development is enhanced (French, 2004).

Metz, (2004) argues that by participating in scientific inquiries, children exponentially increase their comprehension of scientific concepts. The cognitive processes linked to early inquiries and exposure to science approaches empower kids to develop a base for learning while they gain more advanced knowledge in that field (Brenneman, Stevenson-Boyd &Frede, 2009). Usually, children develop the curiosity to discover new things, but need help in understanding what they see and how link the acquired information to what they already know. When grown-ups motivate learners to observe, manipulate, query, describe, and investigate in a secure setting, they provide them the platform, which is necessary for good outcomes in their studies and profession as scientists (Lehr, 2005).

Several countries across the world like Jordan have recently showed a great interest in the child education. For example, Jordan was among the first countries to formulate and adopt a national strategic plan to

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develop early childhood (Ministry of education, 2007). That plan focuses on providing a secure environment that enable children develop their abilities through legislations, policies, and programs that care for a child's mental, emotional, physical, and social sides. It also has a child's development criteria, which is divided into five key parts related to: developing language, teaching literacy skills, promote a child's social and emotional life. Also included is logical thinking and methods of teaching. The part of logic and thinking focuses on secondary criteria that include developing the concept of comparison, discovering special relation and the awareness of the concept related to organizing and serialization.

One of the ways that teachers prepare learners for assessment of learning is by making sure that the latter can remember the content knowledge, but constructivist theories of learning science and to scientific enquiry does not support this thought. Ponchaud (2001) explain that due to government initiatives by United Kingdom primary teachers such as in literacy and numeracy, which have led science to be taught in short afternoon lessons.

Statement of the Problem

In Kenya today, there are over six million children under the age of six. Their education, care, socialization, and development are major concerns for the country. The Government recognizes pre-school education as one of the educational cycles, which can lay a firm, healthy foundation for children during the formative years. Teaching science in preschool has become a necessity, as the activities taught at this stage have greater impact in their later learning (Kato &Meeteren, 2008). Pre-primary science activities lay a foundation for children's acquisition of science skills. The acquisition of these skills is determined by the way children are prepared in school. Research findings in Kenya reveal minimum level of children engagement in science activities at school. This probably could be due to lack of knowledge of science from teachers and the significant others and inadequate school resources to acquire materials for science learning at school. Studies conducted in Kenya shows that teachers who engage their children in science activities facilitate them to acquire science skills that makes them perform better in science subjects. However, most of the studies available have not examined how learners' cognitive abilities may influence children's outcome in science skills acquisition in pre-primary school. This study sought to investigate influence of learner's cognitive abilities on children's acquisition of science skills in pre-primary schools in Tharaka North Sub- County, Tharaka Nithi County, Kenya.

Research Hypothesis

The following hypothesis was tested for thesignificance at 0.05 alpha levels:
   H_{o1}: There is no significant association between learner's cognitive ability influence and acquisition of
       science skills by pre-primary learners in Tharaka North Sub- County

Theoretical Framework

This study is based on Social Cognitive Theory (SCT) developed by Albert Bandura in 1986. SCT explains that in situations where individuals view a model made to perform a behavior and its outcome, they tend to recall the series of actions and use the information to guide their subsequent actions. Likewise, new behaviors are not solely learnt when people try them, but rather, the survival of humanity relies on the copying of other people's actions. Whether individuals are fated or condemned for their actions and its results, the observer may opt to replicate behavior modeled. The three variables that are essential in this theory are personal factors, behavioral factors, and environmental factors. These variables said to be interlinked with each other, thus enabling learning to take place. This theory can be applied to this study in that it models the importance of the learning environment to the learners, and their cognitive abilities. The learner's ability to learn science is determined by the learner's cognitive abilities, and the ability of the particular pupil to integrate the concepts.

II.   METHODOLOGY

This research adopted mixed research methodology, and entails the data collection, analysis of attribute and numerical data. This study entailed concurrent triangulation research design. The design was used to obtain diverse but corresponding findings on the same subject to grasp the problem of the research better. The research study was carried out in Tharaka North sub- County, which is classified as an Arid and Semi-Arid land, Tharaka Nithi County, Kenya. Tharaka-Nithi County is one of the 47 counties of Kenya located in Kenya's former Eastern Province. The county has an area of 2609 km² and had a population of 365,330 as of the 2009 census. The targeted population for this research was 1780 subjects consisting of 95 early childhood teachers, 95 head teachers, and 1590 pre-school children. The research utilized stratified random sampling to select teachers proportionally from each zone. A ten percent of the teachers target population was selected. The researcher selected 12 teachers from the zones accounting for 10% representation of the target population making a total of ten, the sample of teachers using stratified random sampling.

Using stratified random sampling, the researcher proportionately selected 99 children to participate in the study. Stratification was done to ensure that each and every zone was represented in the findings of the study. Questionnaire, Interview Schedule and Observation Checklist were applied for data collection. The researcher went through the field data, removed any missing or inaccurate data. Cconsequently, the researcher coded the quantitative data and analyzed it using a software used to analyse data known as SPSS. Descriptive analysis was applied in analysis of the quantitative data. Numbers were used to summarize and present the data that has been obtained from the field. This specifically includes frequency counts, percentages, and inferences to establish if there is a link between the variables. Pearson Correlation Product Moment was computed to establish if there is relationship and the nature of the relationship. Qualitative data that was collected from the field was analysed and discussed thematically. This qualitative data obtained supported the quantitative findings as well as elaborate on the concepts obtained.

III.   RESEARCH FINDINGS AND DISCUSSION

Gender Distribution of Teachers

The distribution of the sample population by gender was established. By comparing gender distribution of the sample population it would be possible to study the gender distribution of the respondents, and find out if it was biased or there was gender parity among pupils, head teachers and teachers. Figure 2 shows the gender distribution of the respondents.
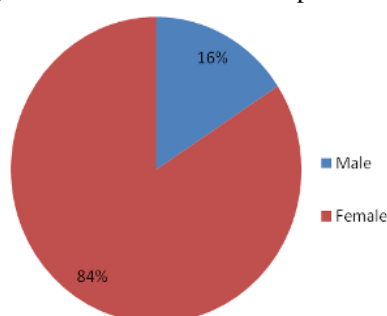
Figure 2: Gender Distribution of Teachers

The figure shows that majority (84%) of the respondents were females. This implies that there was gender disparity in favour of females in the teacher sample population. Female teachers are important according to Boadu (2000) who noted that female teachers are essential in being role models and in providing counseling, especially on issues related to puberty to the girls.

Teachers Academic Qualification

On the academic qualifications of the teachers, the study obtained the following findings.

Table 1: Teachers Academic Qualification

Education level	F	%
Masters degree	2	12.5
Bachelors degree	8	50
ECDE Diploma	1	6.25
ECDE Certificate	5	31.25
Others	0	
Total	**16**	**100.0**

As seen on Table 1, 6.25% of the teachers ECDE diploma, while 31.25% had an ECDE certificate qualification. As for the head teachers, the information obtained reveals that 50% of the teachers had a bachelor's degree, while only 12.5% had master's degree. It can therefore be adduced from the study that the population of the teachers had various levels of academic qualification with most of the teachers at the certificate level.

Tenure of Service

The length of time spent in an organization leads to the development of understandings and experiences. The length of service of teachers was established and findings obtained are presented on the figure 3
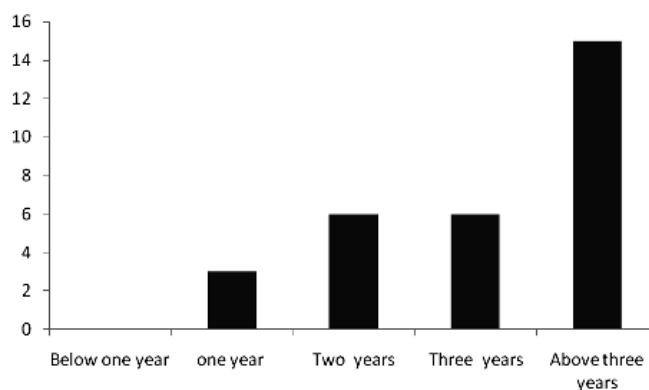
Figure 3: Teachers' Tenure of Service

According to the obtained in figure 4.2, majority (50%) of the teachers had served for more than three years. It was elicited that 20% of the teachers had served for 2 and 3 years in the preschools. The length of time spent in an organization leads to the development of shared understandings and experiences (Smoley, 1999). Increased tenure in an organization is positively related to effectiveness, and performance (Mahoney, 1988).

Influence of Children's Cognitive Abilities on Pre-Primary Learner's Acquisition of Science Skills
Descriptive Statistics
The study sought to establish the Examine how children's cognitive abilities influence pre-primary learner's acquisition of science skills in Tharaka North Sub -County. The findings obtained are presented on the table 2.

Table 2. Influence of Children's Cognitive Abilities on Pre-Primary Learner's Acquisition of Science Skills

Statement	SA 5	A 4	U 3	D 2	SD 1	Mean	Std. deviation
Children who are fast in absorbing knowledge acquire science skills easier than those who are slow in absorbing.	16.7	83.3	0	0	0	4.2	1.312
The children who have been able to acquire other learning skills in other activity areas are also able to acquire science skills with ease	16.7	66.7	0	0	16.7	3.7	.886
The pupils who acquire science skills in the preschool are the ones with the highest learning abilities in other activity areas.	0	66.7	0	33.3	0	3.3	.974
Acquisition of science skills is an indicator of the learner's abilities to learn.	33.3	50	0	16.7	0	4.0	1.141
Ability to manipulate learning materials is an indicator of the children ability to learn science skills	66.7	16.7	0	16.7	0	4.3	.999

Table 2 shows that, majority (83.3%) of the teachers were of the opinion that children who are fast in absorbing knowledge acquire science skills easier than those who are slow in absorbing. The study further established that the children who have been able to acquire other learning skills in other activity areas are also able to acquire science skills with ease, as was revealed by 66.7% of the respondents, while only 16.7% of the respondents disagreed. Nasibi (2005) argues that engagement of children in science activities such as observing science materials and specimen, experimenting with objects among others, offer learners the chance to learn and acquire science skills such as hypothesizing, inferring, questioning and communicating.

The study further established that the pupils who acquired science skills in the preschool are the ones with the highest learning abilities in other activity areas, as was agreed by 66.7% of the teachers, while only 33.3% of the respondents disagreed. Klahr, Zimmerman, and Jirout (2011) argue that the objective science education intervention is to develop, enrich, and sustain a child's innate and natural curiosity in scientific knowledge and procedures. Notably, learning transpires when the learners acquire the ideas, attitudes, knowledge, experiences, and skills that are meant to make him or her contribute positively to the society.

Learners' age and cognitive abilities assist teachers to select teaching and learning materials, activities, and contents appropriate to the learners' age. Developmentally appropriate curriculum allow for open-ended actions that enable learners to make independent choices and include aims for the activities offered (Buten,

2010). The study further established that acquisition of science skills is an indicator of the learner's abilities to learn, as was agreed by 50% of the respondents, while only 16.7% of the respondents disagreed.

The study further established the majority (66.7%) of the teachers strongly agreed that that the ability to manipulate learning materials is an indicator of the children ability to learn science skills while only 16.7% of the respondents disagreed. A study conducted by Usman (2013) in Lagos, out of the 948 parents, only 7.7% sent their kids to either nursery or daycare. Parents do not value pre-school education even though early intervention is crucial especially for children with special needs. A child's formative years are fundamental as they determine how he or she will interact with and manage his or her environment.

Inferential statistics

The fourth hypothesis of the study was; **H_{01}:***There is no significant association between learner's cognitive ability influence and acquisition of science skills by pre-primary learners in Tharaka North Sub- County.* A Pearson correlation coefficient between one independent variable (children's cognitive abilities) and the dependent variable (learner's Acquisition of Science Skills) was calculated and the results are presented on the table 3.

Table 3. Pearson Correlation between Influences of children's cognitive abilities on pre-primary learner's acquisition of science skills

			Learner's acquisition of science skills
Children's Cognitive Abilities	Pearson Correlation	1	.900**
	Sig. (2-tailed)		.000
	N	16	95
**. Correlation is significant at the 0.05 level (2-tailed).			

Table 3 established that the strength of association between the children's cognitive abilities and learner's acquisition of science skills is very high (r=0.900) and the correlation coefficient significantly very high (P<0.05). This indicates that 81% ($r^2=0.9^2$) of the variations in children's cognitive abilities had an influence on learner's acquisition of science skills. This implies that the null hypothesis; **H_{01}:***There is no significant association between learner's cognitive ability influence and acquisition of science skills by pre-primary learners in Tharaka North Sub- County was rejected.* The cognitive processes linked to early inquiries and exposure to science approaches empower kids to develop a base for learning while they gain more advanced knowledge in that field (Brenneman, Stevenson-Boyd &Frede, 2009). Usually, children develop the curiosity to discover new things, but need help in understanding what they see and how link the acquired information to what they already know.

Thematic Analysis of Qualitative Data

In order to collect more information on the Influence of children's cognitive abilities on pre-primary learner's acquisition of science skills the researcher conducted in depth interviews with the headteachers. The study sought to establish the methods used to assess the learners cognitive abilities joining pre-school.

Teacher 1 responded that; '*The learners are required to do a test, to assess their cognitive abilities, before transiting to the next class.The preschool carried out an all inclusive assessment where the preschool teacher assessed the child on various platforms, including age, physical size and cognitive abilities'.*

The study further sought to establish from the respondents' how children's cognitive abilities influence pre-primary learner's acquisition of science skills.

Teacher2 indicated that '*The learners with higher levels of cognitive abilities were able to acquire science skills (manipulation skills, observation skills, classifying skills and recording skills) with ease than those that had less cognitive abilities. The preschoolers with higher cognitive abilities learn and understand faster than those that had less of cognitive abilities. At times, the learners with higher cognitive abilities ended up playing and making noise in the classrooms.*

These findings reveal that the learner's cognitive abilities had an influence on the rate of science skills acquisition in preschools. These findings agree with a study conducted by Usman (2013) in Lagos, out of the 948 parents, only 7.7% sent their kids to either nursery or daycare. Parents do not value preschool education even though early intervention is crucial especially for children with special needs. A child's formative years are fundamental as they determine how he or she will interact with and manage his or her environment.

IV.   CONCLUSIONS

Based on the findings of this study, the researcher makes the conclusion that the pupils cognitive abilities had an influence on the learner's ability to acquire science skills. However, it was established that most of the children had below average cognitive ability, and this contributed to low performance in Science activity areas.

Recommendations for Practice

Based on the findings of the study, the researcher recommends that; The teachers should be guided on the most effective methods of learner readiness assessment during the joining of the pre-school, and transition to class one. This will help in assessment of their cognitive abilities and thus guide the teachers on how best to teach the child.

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