

INFLUENCE OF TEACHERS' IMPROVISATION OF SOUND-PRODUCING MATERIALS ON ACQUISITION OF SCIENCE SKILLS AMONG PRE-PRIMARY SCHOOL LEARNERS IN KIAMBU COUNTY, KENYA

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ABSTRACT

Acquisition of science skills among pre-primary school learners has had its fair share of challenges with many pre-primary school learners manifesting low competencies in manipulation, experimentation and observation skills. The purpose of this study was to assess the influence of teachers' improvisation of sound-producing materials on acquisition of science skills among pre-primary school learners. It was guided by social constructivism and instructional theories. It adopted mixed methodology and applied concurrent triangulation research design. Qualitative data values were analyzed thematically based on objectives and presented in narrative form. Simultaneous triangulation design since it was single-stage structure in which analyst actualized the quantitative and subjective techniques during the equivalent time allotment and with equivalent weight. Quantitative data were analyzed descriptively and inferentially using linear regression analysis with the help of Statistical Packages for Social Science (SPSS 23) and presented using tables. The study established that pre-primary school learners manifest low science skills. That is, their manipulation, experimentation and observation skills are still below average. The study findings showed that teachers still have challenges in improvisation of sound-producing materials. The study recommends that the pre-primary curriculum developers emphasize improvisation of sound-producing materials as much as possible, and frequent inspections should be done. For future studies, researchers may put greater interest in conducting a similar study with national scope to ascertain the influence of improvised instructional materials on the levels of science skills among pre-primary learners.

Keywords: Sound-producing materials improvisation, Science skills acquisition, Pre-primary teachers

INTRODUCTION

Effectiveness of use of locally improvised materials to teach young children science concepts cannot be overemphasized. Such locally improvised materials include; strings, drums, shakers, hollow sticks, clapping and water. In San Diego, Horne (2010) conducted a study, which revealed that locally improvised materials have effect on sound production. Traditionally, these materials were collected from almost all areas of the country and were then traded through long-established routes to various centers where the instruments would be assembled and used for learning different science skills.

Improvised sound-producing materials stimulate both the right and left sides of the brain, producing better results in standardized test scores and understanding of subjects like math and science. In addition, drumming helps with decision-making skills, impulse control and increases memory. In the same vein, in a longitudinal study conducted in China, Zeece (2009) revealed that among the many traditional musical instruments of China, the most popular nowadays include the stringed instruments called the *erhu*, *pipa*, and *guzheng*, and the *dizi* flutes. The stringed instruments originated in foreign regions and were culturally modified for application in classroom situation to enhance children's

mastery of science concepts. Zeece (2009) asserted that culturally improvised string instruments make sound with vibrating strings and the pitch is modified by the thickness, tension, and length of the string which has been adopted to teach science (Macedo, (2018).

In Brazil, pernambuco wood, a tropical hardwood from Brazil, has, traditionally, been the primary source of violin bows. In most countries in Sub-Saharan Africa, Balogun (2015) posit that, in wind instruments, like the flute and trumpet, vibrating air makes the sound. The air particles move back and forth creating sound waves. Balogun (2015) indicated that blowing across a flute's blowhole sets up slinky-like waves in the tube which can help pre-primary school learners acquire manipulation skills in science. In the clarinet, a vibrating reed, that is, a thin piece of wood set in the mouthpiece, gets the waves started (Balogun, 2015). Different pitches are played by pressing keys that open or close holes in tubes making air column inside the tube longer or shorter. In Nigeria, stringed instruments improvised by pre-primary school teachers are played by pressing the fingers down on the strings (Dogara and Ahmadu, 2012). This pressure changes the strings' length, causing them to vibrate at different frequencies to make different sounds.

Dogara and Ahmadu (2012) posit that in the process, pre-primary school learners are able to master manipulation skills as a way of producing sound. Thus, manipulation of strings is a concept that can be used to teach science to pre-primary school learners. In KwaZulu Natal in South Africa, Land (2009) revealed that building social skills is an important part of pre-primary school science curriculum. Children learn science through modeling skills and behaviors, from sharing toys or crayons to accepting and appreciating the differences in other learners. Drumming, as an aspect of improvisation, provides a hand-on demonstration of how to work as a group, interact on an equal level and become a full part of the cooperative illustration that the myriad of drums can provide as pre-primary school learners each add a unique voice to a collective song (Land, 2009). Furthermore, these social skills help build self-confidence as well as a feeling of belonging among peers.

Uwezo (2010) revealed that 60% of the pre-primary school learners do not have the basic manipulation skills, while 34% of the learners could not perform simple tasks that demonstrate science skills. A report by KNEC (2018) to monitor learner's achievement in literacy and numeracy had revealed that 52% of pre-primary school learners were incompetent in manipulation, experimentation and observation skills. The Education Network in Kenya (2011) also pointed out that 19.8% of pre-primary school learners in Kiambu County do not possess the science skills required to enter grade one.

For pre-primary school learners with communication disabilities, whether from disorders like autism or attention deficit disorder, emotional or language problems, drumming give a voice to those who struggle with one of the most important life skills in science. In Kenya, through the various drums available that promotes core strength and requires learners stand while playing, drums help with gross and fine motor skills, as well as hand-eye coordination (MoE, 2009). The action of drumming itself, either with the hands, sticks or mallets and the physical demands for holding and steadying drums, increases the ability of children to physically move and function on par with peers.

In a study conducted in Kisumu East District, Burnett (2010) revealed that children's sound-producing toys were and still are an integral part of children's world. The researcher further asserted that traditional sound producing materials used are made from various materials in their environment, that is, wood, horn, reed, feathers and leaves. Such improvised sound-producing materials were part of children's everyday life and many of them are still found as souvenirs. In

Kiambu County, improvised sound-producing objects really attract primarily the interest of learners (Wilson, 2013). Children used to make sound from the simplest small boards on a string producing buzzing sound when rotating plant leaves or they would use debarked branches to (*guslice*) made from maize stalks. However, there are hardly any information about the organization of improvised sound, instrument handling and, generally, the sound/musical effect and how such concepts can be applied to teach science skills; a concept that calls for further interrogation.

The study sought to:

- i. Assess the levels of acquisition of science skills among pre-primary school learners in Kiambu County, Kenya
- ii. Examine the influence of teachers' improvisation of sound-producing materials on acquisition of science skills among pre-primary school learners in Kiambu County, Kenya.

Statement of the Problem

Early exposure to improvisation of materials for teaching and learning sound production prepares pre-primary school learners for science skills since learners acquire knowledge through interaction with familiar materials within the environment. It is also evident that when sound-production instructional materials are effectively utilized, pre-primary school learners are motivated to learn and able to understand the science skills being taught. However, in Kiambu County, the situation is quite different with acquisition of science skills by pre-primary school learners being low. As indicated in the background, a survey conducted by Uwezo (2010) revealed that 60% of the pre-primary school learners do not have the basic manipulation skills, while 34% of the learners could not perform simple tasks that demonstrate science skills. A report by KNEC (2018) to monitor learner's achievement in literacy and numeracy had revealed that 52% of pre-primary school learners were incompetent in manipulation, experimentation and observation skills. The Education Network in Kenya (2011) also pointed out that 19.8% of pre-primary school learners in Kiambu County do not possess the science skills required to enter grade one. Despite these statistics, few empirical studies had interrogated the extent to which teachers' improvisation of sound-producing materials influences acquisition of science skills among pre-primary school learners, hence the study.

Theoretical Framework

The study was guided by the instructional theory which was postulated by Gagne (1999) and offers explicit guidance on how to help people learn and develop. Instructional theories focus on how to structure

material for promoting the education of human beings, particularly pupils and learners. It outlines strategies that the teacher may adopt to achieve the learning objectives. Instructional theories are adapted based on the concept being taught and more importantly, as per the learning style of the pupils.

The rationale of using instructional theory is that it appreciates the role of the teacher in instruction and it is important that the teacher make sure that pupils have the necessary skills in order to accomplish the task. Independent study is very flexible and can be used as a major instructional strategy with the whole class, in combination with other strategies, or it can be used with one or more individuals while another strategy is used with the rest of the class. In the same vein, this theory appreciates the fact that improvisation allows full participation of pre-primary school learners in activities, enhances socialization, enhances cognitive development, allows children learn new science concepts through discovery, exploration and experimentation, it enables shaving of ideas and promote self-confidence and self-esteem.

In the use of locally improvised materials to teach science skills, pre-primary school learners are exposed to various experiences, allowed to fully participate in activities, socializes, allow children learn new science concepts through discovery, exploration and experimentation and finally build self-confidence and self-esteem. The study was also guided by The Social Constructivism Theory which was postulated by Vygotsky (1978) giving rise to the premise and idea that learners are not passive recipients of information, but that they should be actively involved in constructing their knowledge as they interact with the environment and through the reorganization of their mental structures. Learners are therefore viewed as sense-makers, not simply recording given information but interpreting it. This view of learning led to the shift from the “knowledge-acquisition” to “knowledge-construction” metaphor. The rationale of using social constructivism theory in this study is that it underscores the fact that acquisition of science skills is a dynamic, continuous process of change where new learning results in and affects learning environments through improvisation.

Delimitations of the Study

This study was done in public pre-primary schools in Kiambu County. The study focused on the influence of teachers’ improvisation of sound-producing materials on acquisition of science skills among pre-primary school learners. Mixed methodology was used and thus concurrent triangulation research design was applied. In this study, questionnaires were used to collect

quantitative data from pre-primary school teachers whereas interviews were used to collect qualitative data from headteachers and sub-county directors of education as did observation checklists for pre-primary school learners.

RESEARCH METHODOLOGY

The study adopted mixed methodology and applied concurrent triangulation research design. The target population comprised of 12 sub-county directors of education, 438 headteachers, 1500 pre-primary school teachers and 40, 595 pre-primary school learners totaling to 42, 534 respondents from which a sample of 396 respondents were selected using the Central Limit Theorem. Stratified sampling was applied to create 12 strata based on the number of sub-counties in Kiambu County. From each sub-county, the sub-county director of education and one head teacher was selected using purposive sampling. However, from sub-county, three pre-primary school teachers and 28 pre-primary school learners were selected using simple random sampling.

This procedure enabled the researcher to sample 12 sub-county directors of education, 12 headteachers, 36 pre-primary school teachers and 336 pre-primary school learners. Questionnaires were used to collect quantitative data from teachers, interview schedules for headteachers and sub-county directors whereas observation checklist were used to gather qualitative data from pre-primary school learners. Qualitative data values were analyzed thematically along the objectives and presented in narrative forms. Quantitative data were analyzed descriptively and inferentially using linear regression analysis with the help of Statistical Packages for Social Science version 23.

Research Design

The researcher applied simultaneous triangulation design since it was single-stage structure in which analyst actualized the quantitative and subjective techniques during the equivalent time allotment and with equivalent weight. As per Creswell (2014), this plan for the most part includes the simultaneous, however independent, assortment and investigation of quantitative and subjective information with the goal that the specialist may best comprehend the examination issue.

RESULTS AND DISCUSSIONS

Response Rate

In this study, 36 questionnaires were administered to teachers out of which 32 questionnaires were filled and returned. The researcher also interviewed nine headteachers and ten sub-county directors of education and also conducted observation schedules among 293 pre-primary school learners. This yielded response

rates shown in Table 1. Table 1 shows that headteachers, pre-primary school teachers, sub-county director of education and pre-primary school learners registered a total response rate of 396 this means it is an average of 90%. This affirmed the assertions of Creswell (2014) that a response rate above 75.0% is adequate and of suitable levels to allow for generalization of the outcomes to the target population.

Table 1: Response rates

Respondents	Sampled respondents	Those who participated	Achieved return rate (%)
Headteachers	12	8	108.0
Pre-primary School Teachers	36	32	88.9
Sub-county Director of Education	12	10	83.3
Pre-primary School Learners	336	293	87.2
Total	396	34	92.0

Table 2: Levels of pre-primary school learners' science skills

Science Skills	Excellent %	Very good %	Good %	Fair %	Below average %
Manipulation skills	14.3	4.8	2.3	35.7	42.9
Experimentation skills	7.1	7.1	25.0	39.3	28.6
Observation skills	25.0	10.7	35.7	21.4	7.2%

Table 3: Descriptive findings on teachers' improvisation of sound-producing materials in pre-primary schools

Test Items	Ratings					Mean	Std. Dev.
	SA %	A %	U %	D %	SD %		
Pre-primary school teachers frequently swirl strings or ropes in order to generate sounds during science activities	56.5	10.5	4.5	13.5	15.0	3.906	1.444
In many pre-primary schools, teachers rarely blow hollow sticks to produce sound while teaching science skills	51.5	8.5	7.5	9.0	23.5	3.560	1.316
In many pre-primary schools, teachers frequently clap their palms using dry pieces of wood during science activities	55.5	12.5	3.5	14.5	14.0	3.837	1.418
Teaching of sound production activities has not been made easy when pre-primary school teachers improvise a variety of materials	35.5	4.5	2.5	4.0	53.5	3.699	1.367
During science activities, pre-primary school teachers do not frequently improvise sound-producing materials	27..5	4.5	3.5	7.0	57.5	3.975	1.470

Table 2 shows that 42.9% of the pre-primary school learners manifest manipulation skills which were below average, 35.7% were fair, 2.3% were good, 4.8% were very good whereas 14.3% manifested excellent manipulation skills. Similarly, 28.6% of the pre-primary school learners exhibited experimentation skills which were below average. 39.3% were fair, a quarter (25.0%) were good, 7.1% were very good whereas 7.1% had excellent experimentation skills.

Pre-primary School Learners' Science Skills

The study assessed the influence of teachers' improvisation of sound-producing materials on acquisition of science skills among pre-primary school learners in Kiambu. This was assessed by observation using a schedule during science activities in their pre-primary schools and were recorded as manipulation, experimentation and observation skills (Table 2).

However, a quarter (25.0%) of the pre-primary school learners had excellent observation skills, 10.7% were very good, 35.7% were good, 21.4% were fair with only 7.25 of the learners manifesting observation skills which were below average.. From observation, it was established that a minority (21.4%) of the learners manifest either good, very good or excellent manipulative skills while for the remaining majority (78.6%) it was either fair or below average. This means

that only a quarter of the learners could be said to have good observational skills. Thus, developing and extending children's interest is particularly important in the pre-primary school years, when attention and self-regulation are nascent abilities. The study agrees with Dogara and Ahmadu (2012) who indicated that pre-primary school learners are able to master manipulation skills as a way of producing sound.

Teachers' Improvisation of Sound-Producing Materials and Acquisition of Science Skills among Pre-primary School Learners

The study sought to assess how often pre-primary school teachers improvise sound-production materials and the extent to which such improvisation influences acquisition of science skills among pre-primary school learners. Descriptive data were collected from pre-primary school teachers, organized, summarized and the results are shown Table 3.

Table 3 reveals that 18(56.5%) of the pre-primary school teachers strongly agreed with the view that they frequently swirl strings or ropes in order to generate sounds during science activities as did 4(10.5%) who agreed. Only a paltry 2(4.5%) were undecided, 5(13.5%) disagreed whereas 3(15.0%) strongly disagreed. These findings corroborate the findings of a study carried out by Horne (2010) that sound-producing materials have a positive impact on acquisition of science competencies.

Horne (2010) observed that traditionally, materials were gathered from all parts of the country and were then exchanged through since a long time ago settled courses to different centers where the instruments would be assembled and used for learning different science competencies. According to Horne (2010), pre-primary learners who have a broad base of experience in domain-specific knowledge and move more rapidly in acquiring more complex skills. Thus, these findings indicate that children are inclined to learn, analyze, and investigate, as well as take into consideration supporting and augmenting the limits of the learning in which kids are now effectively locked in.

Slightly more than half, 17(51.5%) of the pre-primary school teachers strongly agreed with the view that, in many pre-primary schools, teachers rarely blow hollow sticks to produce sound while teaching science skills. 3(8.5%) agreed. 2(7.5%) were undecided, 3(9.0%) disagreed whereas 8(23.5%) strongly disagreed. These findings corroborate the assertions of Anini (2011) who asserts that improvisation of various sound-producing materials provides pre-primary learners with opportunities to expand and deepen their understanding by providing several choices and developmentally

suitable experiences. These findings are indicative of the fact that hollow sticks could have been difficult to find from the environment of the participants for use in the teaching and learning process and this explains clearly why they were rarely used by the participants. The findings of the study established that the teachers utilized clapping of hands more than they used strings and hollow sticks. In light of these findings it is evident that the learners were not exposed to varied stimulus variation on teaching and learning of sound-production. As a result, the learners' acquisition of scientific procedure skills might have been compromised. This is so since science teaching needs variation of teaching strategies to enhance its acquisition.

Slightly more than half, 18(55.5%) of the pre-primary school teachers strongly agreed with the view that, in many pre-primary schools, teachers frequently clap their palms using dry pieces of wood during science activities. 4(12.5%) agreed. However, 1(3.5%) were undecided, 5(14.5%) disagreed whereas 5(14.0%) strongly disagreed. These findings corroborate the assertions of Balogun (2015) who concurs with this view and adds that wide-ranging selections of sound producing materials produce distinctive pitches which appeals different to the individual tastes of the learners. According to Balogun (2015), the use of clapping of hands to improvise sound production may have two possible implications, firstly, it may help the learners to understand their bodies more and secondly it may also be an indication that the teachers were not conducting adequate research of other available materials in the students' environment.

These findings indicate that pre-primary learners benefit from improvisation of sound-producing instruments through the bilateral access of the brain. Improvised sound-producing materials stimulate both the right and left sides of the brain, creating better results in standardized test scores and comprehension of skills. However, the findings show that clapping using a piece of wood was more preferred in teaching learners' experimental skills. Hence, there is need to do more and more research in the environments where teachers and learners come from exhaustively. The study, however, revealed that 12(35.5%) of the pre-primary school teachers strongly agreed with the view that teaching of sound production activities has not been made easy when pre-primary school teachers improvise a variety of materials.

A paltry 2(4.5%) agreed. 1(2.5%) were undecided, 2(4.0%) disagreed whereas 17(53.5%) strongly disagreed. 9(27.5%) strongly agreed with the view that, during science activities, pre-primary school teachers do not frequently improvise sound-producing

materials. 2(4.5%) agreed. 1(3.5%) were undecided, 3(7.0%) disagreed whereas 19(57.5%) strongly disagreed. These findings lend credence to the findings of a study conducted in San Diego in which Horne (2010) revealed that locally improvised materials have effect on sound production. These findings affirm the fact that the effectiveness of using locally improvised materials to teach young children science concepts cannot be overemphasized. Such locally improvised materials include; strings, drums, shakers, hollow sticks, clapping and water.

Inferential Findings on the Influence of Teachers' Improvisation of Sound-Producing Materials on Acquisition of Science Skills among Pre-primary School Learners

To verify the relationship between teachers' improvisation of sound-producing materials and

acquisition of science skills among pre-primary school learners, data were collected on how often pre-primary school teachers improvise sound-producing materials (very often =5, often = 4, sometimes = 3, rarely = 2 and never = 1) and learners' outcomes in science activities. The results are shown in Table 4:

Table 4 shows that pre-primary school teachers who frequently improvise sound-producing materials during science activities have their learners register impressive outcomes and competencies in difference science skills. These results were subjected to linear regression analysis to test the null hypotheses and results are shown in Table 5:

H₀₁: *There is no significant influence of teachers' improvisation of sound-producing materials on pre-primary learners' acquisition of science skills in Kiambu County.*

Table 4: Results of how often pre-primary school teachers improvise sound-producing materials and learners' outcomes in science activities

How often pre-primary school teachers improvise sound-producing materials	Learners' outcomes in science activities (marks out of 50)
1	19
1	21
1	25
2	27
2	29
3	33
4	40
4	44
5	45

Table 5: Relationship between teachers' improvisation of sound-producing materials and acquisition of science skills among pre-primary school learners

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	15.488	1.592		9.726	.000
Frequency of Teachers' Improvisation of Sound-Producing materials	6.244	.544	.974	11.469	.000

a. Dependent variable: Acquisition of science skills by pre-primary school learners

Table 5 shows a linear model of the form: Acquisition of science skills = 15.488 + 6.244 frequency of improvisation of sound-producing materials. These results from the linear regression equation indicate that the coefficient for acquisition of science skills attributed to the frequency of teachers' improvisation of sound-producing materials is 6.244. This implies that, for every additional increase in the frequency of improvisation of sound-producing materials, acquisition of science skills is expected to increase by a factor of 6.244 marks. In the same token, the value

15.488 indicates that acquisition of science skills among pre-primary school learners is not only dependent on teachers' improvisation of sound-producing materials, but a multiplicity of other factors such as learner readiness, teacher factors and availability of scholastic materials amongst others.

Similarly, from the results in Table 5, the p-value, 0.000 is less than 0.05, that is, a low p-value (0.000 < 0.05). Hence, the Null Hypothesis, **H₀₁**, is rejected. These results indicate that there is significant

relationship between teachers' improvisation of sound-producing materials and acquisition of science skills among pre-primary school learners. These results indicate that improvised sound-producing materials stimulate both the right and left sides of the brain, creating better results in standardized test scores and comprehension of subjects like math and science Maki, W.S. and Maki, R.H., (2002.). Consequently, the use of improvised sound producing materials could be among the variables contributing to pre-primary learners' acquisition of science competencies.

Thematic Analysis: Influence of Teachers' Improvisation of Sound-Producing Materials on Acquisition of Science Skills among Pre-primary School Learners

The researcher also sought the view of headteachers and the sub-county directors of education on the influence of teachers' improvisation of sound-producing materials on pre-primary learners' acquisition of science skills. During the interviews, headteachers indicated that pre-primary school teachers always improvise teaching materials to teach sound production. Headteacher, H1, remarked,

"We have a limited assortment of improvised sound producing materials; this obviously limits stimulus variation in content delivery to our pupils. There is need for more instructional materials for effective teaching of science skill. The shortage is so dire that in most lessons teachers simply use the clapping of hands which becomes monotonous and does not appeal to the inquisitiveness of the pupils. This practice has to be improved such that teachers in our pre-primary centres can widen up their thinking and explore ways and means of improvising teaching aids."

The investigator engaged the county director of education the same issue. Asked about the sound producing items, the county director of education, SCDE1, observed;

"The syllabus advocates for pre-primary school teachers utilize varied teaching materials of teaching. In this regard the teachers are expected to use their resourcefulness and creativity and make do with the materials that are most familiar with the learners so as they give room for stimulus variation. We expect pre-primary school teachers to be more and more creative in improvising any piece of materials they get in their environment without ignoring any"

The head teachers were also interviewed on materials their teachers always improvised to teach sound production. When the participants were asked what were the materials used by teachers having been improvised for teaching sound production, the answers were varied from classroom furniture such as chairs and tables, body parts, sticks, carton boxes, cardboard guitars, paper plates among others. Head teacher, H2, said:

"The sound improvised materials are things like the learners strumming on cardboard guitars, listening to a paper plate of rice placed on a loud speaker among others. Teaching sound makes itself to fun classroom activities. But as we use it to teach, the topic – the learners are informed how sound is made and how it travels. This is very fundamental to the science curriculum. There is no doubt that there are challenges coming with this kind of improvisation. One challenge is the availability of the items to be improvised."

About how improvisation of sound-producing materials enabled the pre-primary teachers to teach and enhance acquisition of science competencies, the head teachers felt that it all depended on engaging the learner's practically inside and outside the classes. Every bit of improvised sound-producing material must be felt by each individual learner rather than watching the teacher or other learners' practice. Regarding how sound producing materials were improvised, sub-county director of education, SCDE2, mentioned:

"Our teachers kick things off with a lively activity. Asking the learners to hum their favorite song while gently touching their necks will be attention raising. The teacher then finds out from the learners what they can feel. Next, the teacher plays some music through an improvised speaker that has some grains on a paper plate. The teacher then adjusts the volume up and down asking the learners to see the behavior of the grains. The learners always respond with answers in what they have "felt" or "seen". This, I believe, is quite interesting way of teaching through children playing actually"

On the modalities how teachers interact with pre-primary children to improvise teaching aids, headteacher, H3, narrated,

"As a follow-up activity, teachers ask the learners to make different sounds with their bodies. The learners whistle, clap or sing. The teachers then ask them to change the volume of these sounds and note the

differences in effect. The teachers also ask the learners to introduce a range of instruments accessible to them. Learners improvise instruments such as threads tight apart as guitars, use elastic bands of different lengths, change their stretch levels, and scrub against their milk bottles filled with different amounts of water. This becomes perfect when it is applied to learning."

The study revealed various themes in improvisation of sound producing materials among pre-primary learners in Kiambu County. The study established that teachers utilized clapping of hands, hollow sticks and strings to teach science competencies. The respondents emphasized that improvised sound producing materials are important in the teaching and can improve quality of teaching and educational outcomes. Asked if clapping palms as well as blowing hollow sticks and swirling strings were activities that pre-primary teachers used in Kiambu County, but with different level of emphasis, the county director of education, SCDE3, put it,

"We don't mean that our teachers do not use items like hollow sticks, palms and strings. What we are saying is that you find the magnitude for each of these items is different when you consider different teachers. Palms are always available and there is every reason to believe that these should be the most commonly used teaching aids."

The county director of education thought that may be pre-primary teachers were not motivated enough to explore their environment or were just too lazy to do it. When asked why pre-primary school teachers were not improvising teaching aids it was discovered that,

"One of the reasons why pre-primary teachers don't use improvised items could be that they are not properly motivated. Another reason is that they may be just lazy and they don't want to struggle looking for teaching aids. It should be noted that a teaching aid is worthy many words as they say, "A picture is worth a thousand words."

The words of the county director of education were echoed by one of the head teachers. When asked if they encourage the use of improvised teaching aids, head teacher, H4, had this to say,

"We always emphasize that our pre-primary teachers should use teaching aids as much as possible to capture the five senses. Even in colleges we are advised to use teaching

aids. More so, the type items we are talking about are readily available in our environments. All they need is to take time and improvise them."

These results show that majority of pre-primary teachers improvised materials from the pupils' immediate environment. The findings established that the teachers improvised clapping of hands (which was more available) more than they improvised strings and hollow sticks. In light of these findings it is evident that learners were not adequately exposed to varied stimulus variation in sound production.

SUMMARY OF FINDINGS AND CONCLUSIONS

From the study findings, it is evident that improvisation of sound producing materials is associated with high levels of science skills among pre-primary learners; positive increase in teachers' improvisation of heat producing materials results in an increase in pupils' science skills. These materials were available in the local environments where pre-primary teachers and children came from. There was need then to utilize whatever was available and cheap. pre-primary teachers in the study county were to be encouraged and motivated to use sound producing item more frequently than ever.

RECOMMENDATIONS

The study recommends that the pre-primary curriculum developers emphasize the improvisation of heat-producing materials as much as possible and frequent inspections are carried out. For future studies, researchers may put greater interest in conducting a similar study with national scope to certain the influence of improvised instructional materials on the levels of science skills among pre-primary learners. The Ministry of Education should organize for in-service training for pre-primary science teachers. In-service training for teachers is important to ensure that the teachers keep pace with technological changes in improvisation of sound-producing materials for instruction as opposed to relying on traditional archaic materials that are sometimes lacking in the learner's immediate environment. For instance, improvisation does not only mean using simple available materials in daily possession.

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