

Support Children to Develop Desire in Science, Technical and Technology: The Case of Kinondoni Pre-Primary Classroom, Tanzania

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Support Children to Develop Desire in Science, Technical and Technological Fields: The Case Study of
Pre-Primary Children at Kinondoni District, Tanzania.

Abstract

Recent studies have shown that science, technical and technological fields are underrepresented professionally from schools to university level. The interests to the mentioned fields can be traced back from early childhood education to higher learning levels. Teaching and learning materials either guided or free when integrated into children's games and plays become valuable resources that create desires into children to learn science, technical and technology skills. This study therefore, explored on the supportive teaching and learning materials employed by teachers and parents to build desires and interests of learning science, technical and technology knowledge and skills in their learning through games and plays. The study was conducted in Kinondoni district, Tanzania.

The study employed a mixed method approach based on descriptive survey design. The study collected data from 40 participants (parents and teachers) in only 20 pre-primary classes. Purposive sampling of teachers and parents together with random stratified sampling technique was adopted to get schools. Findings revealed that children curiosity and interest in learning science, technical and technological elements are impacted by various factors including: Types of teaching and learning supportive materials employed by teachers at school, types of plays and games engaged in, classroom environment, understanding of parents, parent's participation on children plays and communication done by closely related members like teachers and parents. Majority 20(100%) teacher was employing certain common games and plays that bored children. Many 16(80%) teachers do not implement recommended supportive materials effectively. The study conclude that supported children build foundation for future professionals, expertise and specialists. It is recommending that every person closer to a child should give positive support of children ideas, natural curiosity, thinking, perspectives to enhance their interest in learning the fields of science, technical and technology.

Keywords: Pre-primary school children, Science, Technical, Technology, Support material

Introduction

Over the past few decades, researchers and educators in the field of education and child psychology have collected significant evidence for the necessity of supporting children learning of science through plays and games experienced in their lives (Adair & Hoisington, 2018; Rachel, 2015). It has observed that every child is naturally scientist since in their daily learning activities they do all science processes and skills including questioning, observing, classifying, reasoning, predicting, testing, exploring in the way of naturally seeking real answers of their query (K12 Learning Liftoff, 2016; Adair & Hoisington, 2018). According to K-12 Learning Liftoff, (2016) science learning in children is based on curiosity and it is done through exploring the world around them. Varied studies established that plays and games routinely engaged in by children comprises knowledge and skills including Sciences, Technical, Technology and Mathematics (STEM) (Worth, 2010; Rachel, 2015). Supported plays and games of children with a focus on the integrated elements of STEM serve not only to build a basis for future professionals in these fields but also create desires, thirsty and curiosity of continue learning and understanding knowledge and skills associated with STEM. For instance, integration of computer technology in children games and plays offers unique opportunities for learning through exploration, creative problem solving and self-guided instruction (The Office of Educational Technology [TOET], 2016). Moreover, video games, computer simulations, virtual reality and other technology tools allow children to experience and manipulate infinite environment (Rachel, 2015). Technical skills in children games can be supported for instance, allow them to engage in construction materials like block building, drawing, running and jumping in allelic game (Hall & Schaverien, 2011).

However, despite scientific nature of children's style of learning by exploration and questioning of world around them through plays and games, it has observed that pre-school children are lacking support and encouragement in their approaches of learning (Worth, 2010; Rachel, 2015; Adair & Hoisington, 2018). Parents and teachers being people who most of their time stay with pre-school children were found in one way or another contribute to the loss of their interest in learning STEM elements encompassed in plays and games they engaged in (Rachel, 2015).

Several barriers created by pre-school children's teachers and parents have been identified including: limiting of children opportunities to play, provide inappropriate guidance in their plays and games, poverty, strictness to goal-directed activities, lack of appropriate objects or materials, interactive language, sticking and harshness. Rachel, (2015) and Ginsburg, (2016) noticed that

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plays to children is essential to their development because it contributes to the cognitive, physical, social and emotional well-being. Yet, while researchers and educators continue to spell out the importance of children learning of STEM through plays, the actual time children spend in playing continues to decrease especially in schools because of pressure of rising academic standards (Rachel, 2015). Pre-school children use most of their time in practicing reading, writing and numeracy with limited time for playing. It is unfortunate that other pre-school children stay at school for more than nine hours and the remaining time are not enough for plays and games that allow exploration of ideas. However, it is not known well which games and plays children engage in at school if really contribute to the promotion of the desires to learn STEM concepts.

Pre-school children's teachers and parents were also said to provide inappropriate guidance that can build in interest in learning STEM ideas. For instance, children need playing objects or materials such as toys, swings and other materials but most of the time they don't get them (Mathias, 2011). Hall & Schaverien, (2011) noticed that, pre-school children need much help and support of their learning from engagement of their parents because they explore materials and objects found at school and try to relate them with experienced ones at home. Guiding of preschool children's plays and games are important to rescue them from risks but when accompanied with supportive environment it becomes more significant (Rachel, 2015) conducted a study of children's learning through plays. The author found that supported learning environment to preschool children create interactive, joyful, roughs and wonders, exploration and develop critical thinking skills. These behaviors. Indeed, such behavior build foundation for future STEM professionals.

Similarly, a recent study by (TOET, 2016) established that technology-based games can be a powerful tool to promote playful learning of STEM even when they can be designed without any educational goal. Lan, (2019) studied on the ten tips to support children's learning of science. He recommended on schools to encourage parents to create favorable supportive environment in which children can learn science at home. He divided support needed to pre-school children into two groups, first 'Tangible support which are equipment like digital learning materials and the second is 'Intangible support which are like encouragement when a child complete a task. Lan, emphasized on adoption of 'Home-school collaboration' between teachers and parents in supporting children learning. However, this study didn't consider on states of parents if they can have understanding of importance of supporting their children by giving them supportive equipment. Also the problem of learning environment of a pre-school child either at school or home can be a factor to tangible or intangible support learning of STEM.

This is where a factor of poverty comes when you find parents or other guardians have no understanding on the importance of encouraging children's' plays and games through giving them needed materials. Mathias, (2011) noticed that poverty contribute to discouraging children from

learning on what they want to learn. Parents and teachers think of giving children books, test and exercises as important learning opportunities than plays and games while not. In such situation it means children need only a guide to help them shape their understanding and development in keeping progress of building critical-thinking skills about what they experience around them. Studies on poverty as a barrier of pre-school desires in playful learning of STEM didn't consider children's ability of using available support to explore and learn STEM concepts.

In Tanzania for example, the government designed a pre-primary education curriculum, teacher's guide and text books as tools that guide teachers in the provision of appropriate supporting materials to children to enable them develop intended competencies. The pre-primary education policy requires teachers to use their local environment to facilitate a child's effective learning (Tanzania Institute of Education [TIE], 2016). Moreover, the government stipulated the condition, quality and types of teaching-learning materials that appropriate to be used for pre-primary school children. Unfortunately, there is limited studies on the particular area in Tanzania.

This study therefore explored on the supports given to pre-school children at school and home by teachers and parents respectively. The aim was to assess if provided support promote children's desire in learning STEM elements as a basis for future professionals.

Problem Statement

Studies have shown that for many years Tanzania experienced underrepresentation of graduates and professionals in the field of science-technical and technology (Mathias, 2011). The problem of students' lacking interest of furthering learning of subjects in the STEM fields can be traced back since after independence to date (Mathias, 2011). Rearing and supporting young pre-primary school children's behavior of learning by doing science processes through games and plays is of paramount. While currently technology and interactive media are used in pre-primary classes to support and build desires into children to enable them keep on loving and practicing science, technical and technology knowledge and skills, pre-primary school teachers showed slowness in implementing recommended teaching and learning supportive materials. Yet, pre-primary school children are moving fast to the global growing of technologies by using mobile phone, video and media programs beyond their parents' and teachers. This study therefore seeks to explore on the supportive materials employed by pre-primary school children teachers and parents to build the desires into children of learning STEM elements through games and plays.

Purpose of the Study

The main purpose of this study is give an insight on what to do to enable pre-school children to build interest and desires in the learning of science, technical and technology fields through games and plays which currently are underrepresented in the educational professionals. **Specific**

Objectives

1. To examine on what the pre-primary education curriculum in Tanzania declares and the actual supporting materials provided by teachers to children.
2. To explore on the type of support provided to pre-school children at school and home to promote learning of science, technical and technology elements in their games and plays.
3. To assess the learning environment of pre-school children if support the learning of science, technical and technology elements integrated in games and plays.

Methodology

The study employed a mixed method approach based on descriptive survey design. The study collected data from 40 participants (parents and teachers) in only 20 pre-primary classes. Purposive and random stratifies sampling technique was adopted. Stratified random sampling was used in this study in the selection of the schools. The pre-primary schools were separated into two strata, which were government and nongovernment schools (public and private owned schools). This was done not for comparison purposes but for inclusion. Pre-primary school teachers were purposively sampled because of their profession of teaching such classes. The study used both primary and secondary data collection methods in order to fulfil the needs of research objectives. Primary data were gathered by using interviews and observations. Secondary data were obtained through documentary review which involved analysis of teacher's lesson plans, timetable, syllabi, children exercise books, materials/objects for games and plays.

Findings and Discussion

The thirsty and interest of pre-primary school children to keep on learning by doing are to be motivated by support of their actions through games and plays they engage in (Ginsburg, 2016). (Narsimhan, 2018) conducted a study where he employed experiment to teach important science concepts. He planned to start with simple items that children can explore. He put magnet, small object, pieces of calve molding and then engage children into the lesson. At the end he realized

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that children felt more comfortable and confident when they are given enough time, opportunity to participate and guided while appreciating any improved step. These findings imply that children need certain kind of support either materially or non-tangible materials like appreciation, congratulates, prizes, joyful and funny words, but also guidance on what they show interest in learning.

Tanzania government outlined some aspects to guide pre-primary education teachers in giving support of formal materials so as to enable children enjoy learning, understand concept and finally develop competences. For instance; the recommended materials were required to have the following qualities: T be developmentally appropriate to children's age and abilities; to be clean and safe to children, to be attractive, to enhance children's curiosity and inquisitiveness, be firm and durable, promote the development of the intended concepts and be sizeable and visible (TIE, 2016). Interviewed teachers when asked about these directive majority 15(75%) were not aware of these qualities of materials. Teachers said that they were using materials according to what they were teaching without considering any characteristics prescribed in the guideline. This shortfall to teachers experienced practices may be among the causes of children loss of interest of learning STEM elements. Teachers' lack of familiarity of such important directives impact on children natural curiosity and scientist behavior because of lacking appropriate supporting materials.

More exploration was done through observation of the curriculum tools prescribed in the preprimary competence-based curriculum showed that they are not understood and not used effectively by pre-primary school teachers.

Table 1.1: Implementation of Curriculum Tools for Guiding Use of Supporting Materials

S/N	Pre-primary School	Pre-primary syllabus	Pre-primary teacher's guide	Pre-primary textbooks
1.	A	DP	PS	PS
01.	B	DP	DP	PS
02.	C	PN	DP	DP
03.	D	DP	PS	DP
04.	E	DP	PS	DP
05.	F	PS	PN	PN
06.	G	PS	PN	DP
07.	H	PS	PS	PS
09.	I	PN	DP	PS
10.	J	PS	DP	PN

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11.	K	PS	DP	PN
12.	L	DP	DP	DP
13.	M	PS	PN	DP
14.	N	PS	PS	PN
15.	P	PS	DP	PN
16.	Q	DP	DP	DP
17.	R	PN	DP	PS
18.	S	PN	PN	DP
19.	T	PS	PN	PS
20.	U	PS	DP	DP

KEY

PS=Possess and use

PN=Possess but not use

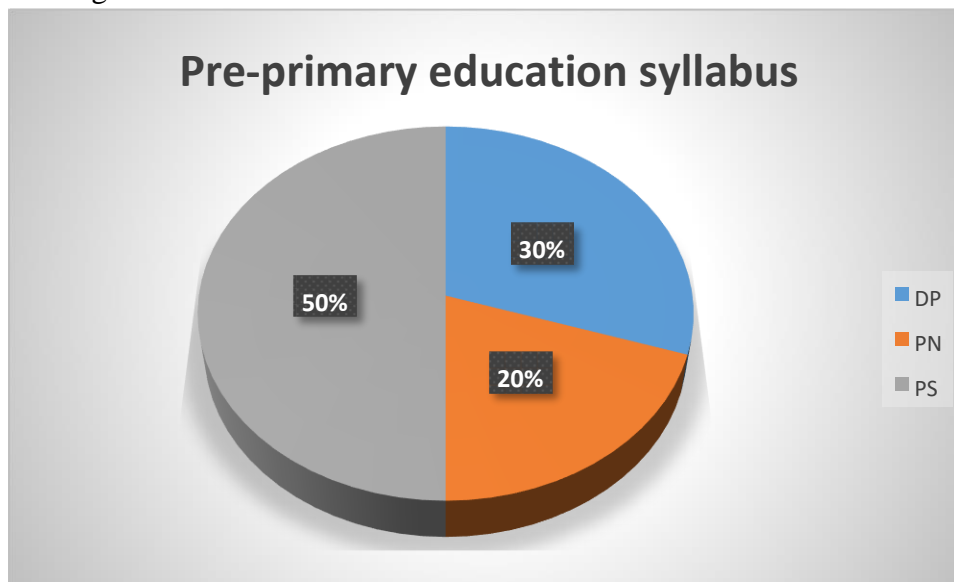
DP=Do not possess

Table 1.1.1 Summary on Implementation of curriculum tools

S/N	Curriculum tools	DP	PN	PS
1.	Pre-primary education syllabus	6(30%)	4(20%)	10(50%)
2.	Pre-primary education teacher guide	10(50%)	5(25%)	5(25%)
3.	Pre-primary education textbooks	9(45%)	5(25%)	6(30%)

Source: Field work, (2019)

The results from Table 1.1 shows that half of visited pre-primary schools 10(50%) had the government competence-based curriculum and implemented it. Even though majority seems to implement the curriculum, but some schools were not. The results shown in the pie chart below reveals the situation of implementing pre-primary school syllabi recommended by the government. It is the syllabus which direct on which supporting materials are to be employed by teachers. Findings were as follows:



Source, Field Data, (2019)

The pie chart shows that 6(30%) pre-primary school teachers did not had the syllabi and 4(20%) possessed the syllabi but did not implement it. This means that those who did not possess or not implement them are teaching children something out of what is needed. The syllabus direct on supporting materials teachers need to employ while teaching children, absence of it means materials used can be distorting learning and destroy desires of children exploration habits.

Only 5(25%) possess teacher guides the rest either not use or do not possess it. This means that many 10(50%) pre-primary school teachers do not possess teacher guide and therefore they do not know types of materials needed, qualities and condition of selecting materials to support designed content for pre-primary school children, In the other words, the desired learning outcomes cannot be achieved and the outlined objectives and competences cannot be attained by the particular children. When asked through interview, teachers had different responses concerning curriculum tools. For instance, one teacher was quoted saying:

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“Even when I can have the syllabus or guide these can help me nothing because these young children we normally teach them numbers, letters, how to write and pronounce. So, the guide is my head to know where I ended and remember who knows what”.

Another teacher said that, she was not a professional one so even syllabus and guide was like a story. She added that her children were progressing well and parents appreciated so no need of complications. About books the government in Tanzania has its organ chosen to deal with all issues of curriculum, teaching and learning materials. All schools are required to use those materials including textbooks which are uniform in all schools. Schools that had no textbooks recommended were found using others books and when interviewed on that area they said that they were using books with similar ideas as government books. Private pre-schools had more varied textbooks different from recommended ones. This means that even the modality of supporting children with materials to support learning were greatly varied from school to school.

More findings were obtained through questionnaires on the teaching learning materials prescribed in the pre-school education curriculum and what teachers were implementing. Results from Table 2.1 gives the reality that every teacher used own materials.

Table 2.1: The Implementation of Supporting Teaching-Learning Materials

S/N	Supporting outside	PS	Supporting	PN materials inside classrooms	materials classrooms
1.		Puzzle	None	Sand	17 (85%)
2.		Board game	5 (25%)		Variety of see-10 (50%) saw
3.		Playing cards	12 (60%)	Slides	7 (35%)
4.		Number cards	19 (95%)	Balls	20 (100%)
5.		Pictures cards	17 (85%)	Tyrese	8 (40%)
6.		Wood pieces	20 (100%)	Ropes	16 (80%)
7.		Video tapes	6 (30%)		
8.		Television	2 (10%)		
9.		Radio	1 (05%)	10. Telephone	None
11.		Braille machine	None		
12.		Sign language	4 (20%)		dictionary

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13.	Sign language	15 (75%)	alphabet
14.	Tactile	16 (80%)	
15.	Swings	11(55%)	

Source: Field Data, (2019)

The results in Table 2-1 shows that the teaching-learning materials directed by the government are not possessed in all pre-primary schools. However, majority 20(100%), 19(95%), 17(85%), 16(80%) and 15(75%) possess wood pieces, number cards, picture cards, tactile and sign language alphabet for classroom support of children's learning. Outside the classroom also had its own recommended supporting materials which also showed good progresses. For example, results showed that all visited teachers 20(100%) had balls, 17(85%) had sand and 16(80%) had ropes. In general pre-primary school teachers had good response in possessing directed supportive learning materials. However, through interview and direct observation it seemed teachers were not practicing those materials. When asked teachers claimed that children are overcrowded so they use much time to teach them on how to read, count, traces and write. They said the used minimal time to allow them to play but much time were used in classrooms otherwise children can remain without knowing anything taught.

These teachers claim goes in opposite with what educators and psychologist says about children's needs of playing, supported by materials and appreciation and free time for them to make exploration and curious reasoning. For instance, studies noticed that children are judicious observers because they automatically observe, think and do (Adair & Hoisington, 2018). Children are to be fully engaged in doing science through doing-actions like games and plays in order to create the meaningful understanding of what they do (Ginsburg, 2016). Children like any other elderly person want to be supported positively, encouraged and appreciated when showing success in their plays and games. Such behavior creates desire and internal motivation of letting them do more and more to show up.

Further exploration was done in pre-primary school by observing presence of recommended learning corners. The overall results showed that some schools possessed them while others were not. The obtained results were as follows:

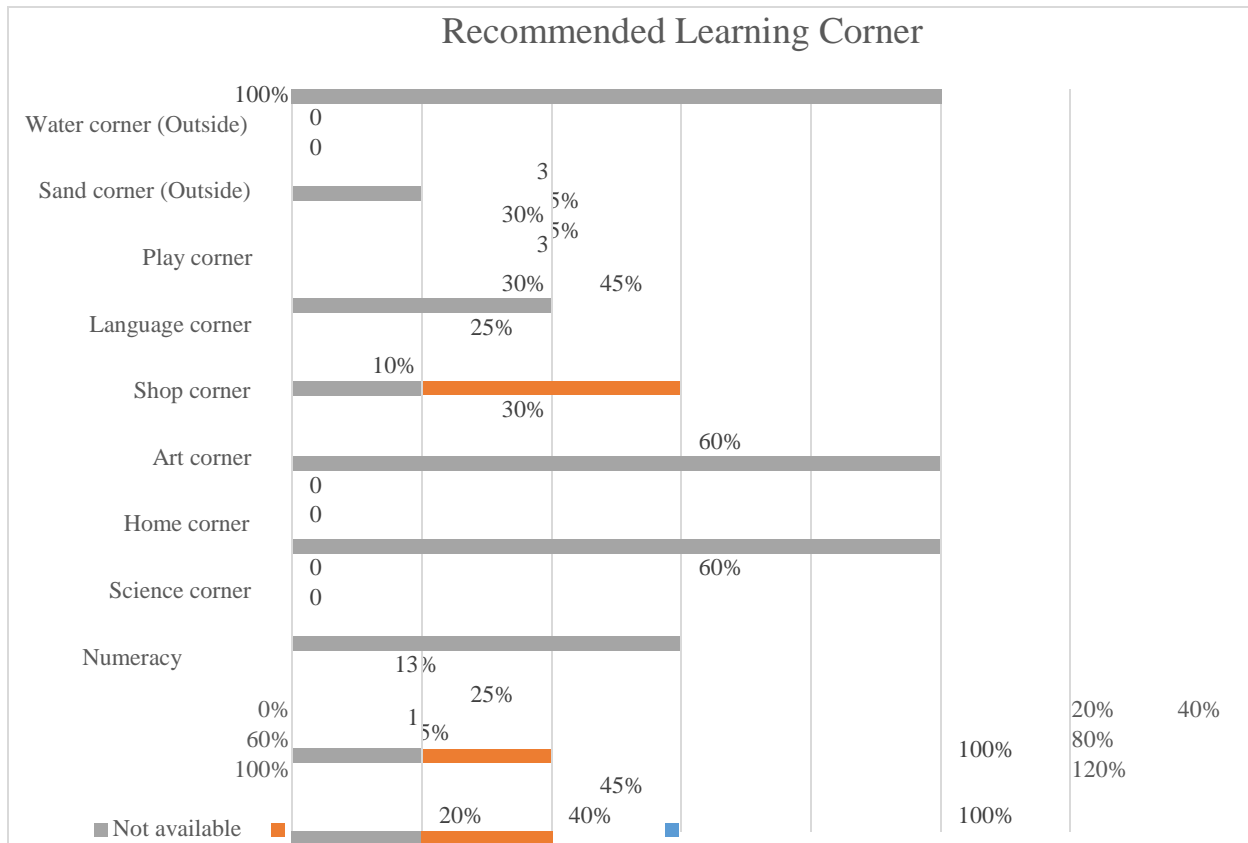


Fig. 2: Implementation of Learning Corners Source, Field Data, (2019)

The results in the Fig.2.1 indicates that pre-primary schools in Tanzania do not possess recommended supporting materials as it is required them. Results shows that majority 20(100%) teachers do not possess neither art, water nor shop corners. Moderately 12(60%) had language corner and home corner. These corners are instructed with specific materials to be used by children in their play learning, absence or limited corner discourage children and weaken their curious behavior of studying sciences.

Plays and games recommended to pre-primary children were also explored and obtained results in general reveals that teachers had common songs and plays practiced routinely, the problem which make children bored and uninterested. The results shown in the chart gives the evidence

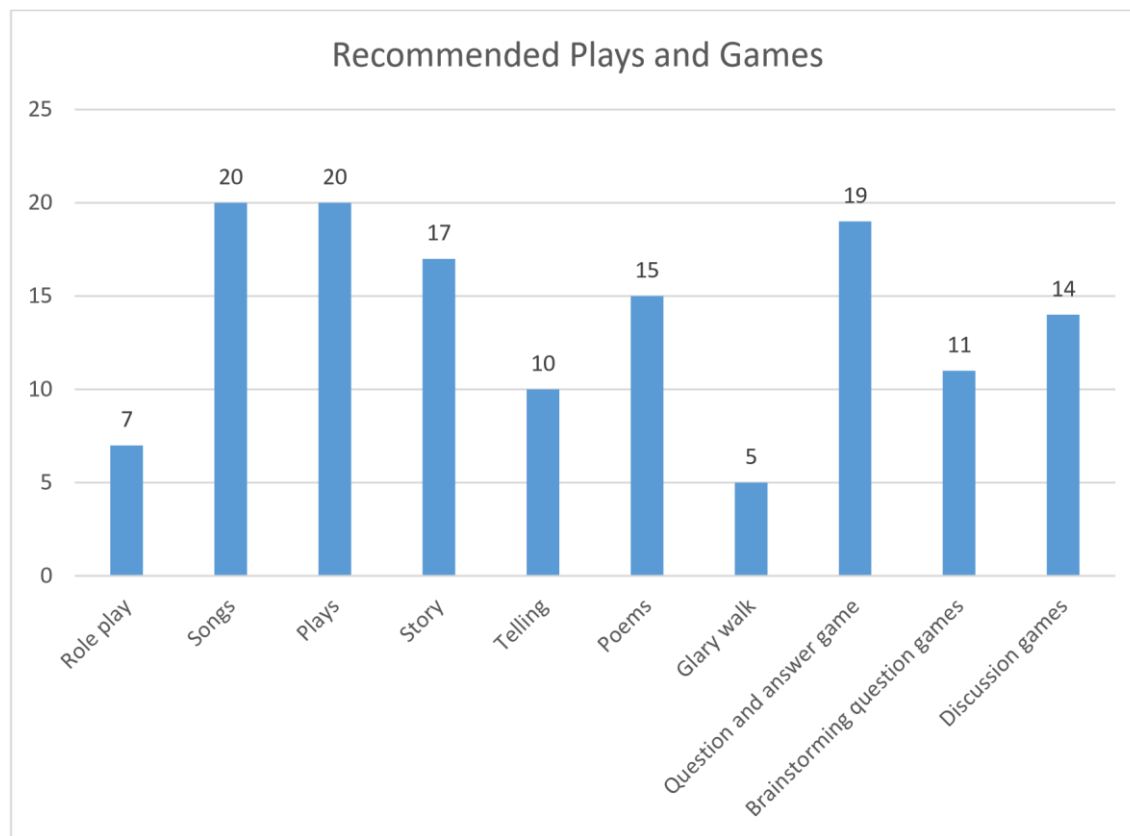


Fig. 3: The Implementation of Recommended Plays and Games Source: Field Data, (2019)

Results in the Fig.3.1 indicates that majority 20(100%) pre-primary school teachers employed much songs and plays followed by questions and answers 19(95%), stories 17(85%) and poems 15(75%). Few 5(25%) practiced Glary walk and 7(35%). In general teachers employed some recommended games and play learning to pre-school children. Despite the recommended games and plays, parents through interview established that nowadays children are interested to play “games available in the mobile phones and on TV. One parent was quoted saying that:

Children of the past few years were eager to play with mud and stones to construct houses of using woods to design things they experienced at home but today’s children use ready-made materials and they don’t like dirty objects. For example, they like toys of car, cartoons on TV, mobile phones, Video of Music and dolls”.

Parents’ views revealed that the role of technology in children’s lives is now increasing rapidly due to the whole situation of science and technology. Even young children know phones and TV programs (One parent commented). This similar to what (TOET, 2016) pointed that, use of technology and interactive media is part and parcel of children learning in these days. In addition,

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appropriate experiences with technology and media allow children to control the medium and outcome of the experience to explore the functionality of these tools and pretend how they might be used in real life. This means that parents' and teachers need to be aware that application of technology and media interaction cannot be escaped instead their guidance to children use of these tools is needed. TOET, (2016) observed that guidance need to reflect the reality that families and early educators (pre-primary school children) have access to apps, digital books, games, video chatting software and multitude of other interactive technologies that appropriate to be exposed to young children. It is very true technology expose many unknowns to children and sensitize and build more desires and interest however, guidance of elderly people is very important to keep the limits and scope of what they watch.

Additionally, through interviews parents were asked if they supported children with some games and plays. The responses obtained were as follows:

Table 4.1: Parents Support of Children Games and Plays

S/N	Games and Plays	Provide
1.	Clay soil for molding	4 (20%)
2.	Rope for jumping	10(50%)
3.	Wood stick	7(35%)
4.	Drums	9(45%)
5.	Constructing piece of blocks	3(15%)
6.	Simple utensils for cooking	2(10%)
7.	Wires and dry cell for electrical plays	1(05%)
8.	Piece of timbers for wood work	None
9.	Colours for drawing	16(80%)
10.	Plane papers	2(10%)
11.	Cartoon on TV	11(55%)
12.	Video games	7(35%)

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Source: Field Data, (2019)

The results in Table 4.1 shows that parents moderately support games and plays of their preprimary school children. It seems that majority 16(80%) parents provide children with colours for drawing but the rest materials were not well provided to children.

As it has said before that pre-primary children need help and support of what they are doing. Findings revealed that children curiosity and interest in learning science, technical and technological elements are impacted by various factors including limited support of games and play materials. Findings in Table 4.1 shows the reality.

Through interview parent's responses on why they were not supporting their children's games and plays, one parent was quoted saying:

“Nowadays children have no time to play outside if you have a TV. Most of the time children are watching cartoon, picture of people fighting, Zombies but boys like sports so sometimes they go outside to play”. But some parents declare that they don't understand on what to provide to their children because they don't know written English words in their books, others said that themselves don't know to make playing materials and others claim of not having money to buy toys for their child”.

According to Rachel, (2015) pre-school children if not supported by materials or encouragement of what they practice in their games and plays, they get discouraged. The games and plays recommended by the Tanzania government if examined critically already incorporate elements of science, technical and technology knowledge and skills. Children can be made to build desire and interest if teachers and parents can take concern on this matter.

This study concludes that educational stakeholders such as teachers, administrators, policy makers and parents be informed that supporting pre-primary school children to build desires in learning STEM elements in their plays is a paramount issue since it form basis for tomorrows professionals in these fields. The study recommend that technology and traditional forms of pre-primary school children's games and plays should be supported by materials and non-materials encouragement to make them build desire of learning STEM elements for future studies.

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