Colour and Object Categorization among Preschool Children (3-5+ years) in Two Localities in Oyo State, Nigeria

By

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Abstract

The study sought to determine the extent to which preschool children (3-5+ Years) in two distinct localities in Oyo State (Nigeria) could identify colours and categorise objects. There was also an interest in finding out if there was any age, gender and location-group differences in the colour and object categorization. It made use of 320 preschoolers (160 males and 160 females) who were selected from 40 nursery schools through stratified random sampling. Data collection on the relevant variables involved the use of face-to-face interview technique and Cognitive Skill Test (CST) while data analysis involved the use of percentages and t-test statistics. The results show that majority of the preschoolers could identify all the objects but could not categorise. However, this was not the case for the colours. The results also showed that age of the child and where a school is located determine the extent to which the preschoolers could indentify both colour and object. The implications of these findings for practicing teachers and parents of nursery school children are discussed.

Introduction

In Nigeria, children of pre-school age who are enrolled in schools are exposed to curriculum contents were they are taught how to categorise things. Categorization is taught under topics such as identification and sorting in different subject areas. Children are exposed to content areas such as identification of colours, objects, numbers, alphabets, as well as how to put them into categories (matching) such as living things, non-living things, animals, birds and insects. Categorization is the process in which ideas and objects are identified, differentiated, and understood (Cohen, and Lefebvre, 2005). Categorization may imply that objects are sorted into groups, usually for some specific purposes. Ideally, a category illuminates a relationship between the objects and the construct discussed

Categorization according to Frey, Gelhausen, and Saake (2011), first appears in the context of Western Philosophy in the work of Plato, who, in his Statesman dialogue, introduces the approach of grouping objects based on their similar properties. This approach was further explored and systematized by Aristotle in his Categories treatise, where he analyzes the differences between classes and objects. Aristotle also applied intensively the classical categorization scheme in his approach to the classification of living beings (which uses the technique of applying successive narrowing questions such as "Is it an animal or vegetable?", "How many feet does it have?", "Does it have fur or feathers?", "Can it fly?"...) establishing this way the basis for natural taxonomy.

To Frey, Gelhausen, and Saake (2011), categorization is fundamental in

language, science, research, decision making and in all kinds of environmental interaction. This indicates that exposing learners to learning activities during which they are taught how to identify, sort and match objects could play a major role in learners understanding about relationships among people, events and objects around them. However, categorisation depends on having either the right sensors, as in the case of solar and colour, or the right invariance-detectors, as in the case of depth perception and shape or size constancy (Harnad 2003). According to him, having the ability to detect the stimulation could be learned or acquired by experience. Teachers should be concerned with identifying materials, providing enabling environment and the sensorimotor interactions that could aid children understanding of categorisation. However, Harnad (2003) is of the view that teaching might be insignificant because one could detect innately, without the need of any internal changes that depend on time or interaction of any sort.

On the other hand, Gibson (1979) argues that organisms have sensorimotor systems, the things in the world come in contact with our sensory surfaces, and we interact with them based on what that sensorimotor contact affords. To this, Gibson merely explains that what a sensorimotor system can do is determined by what can be extracted from its motor interactions with its sensory input. For instance, according to him, if one lacks sonar sensors, then the person's sensorimotor system cannot do what Bats can do, at least not without the help of instruments. This is because light stimulation affords colour vision for those of us with the right sensory apparatus, but not for those of us who are colour-blind. Thus, this explains the need for exposing those working with children in Nigeria to psychology of learning and human anatomy to aid their understanding that individual differences exist.

All these may have informed the Nigerian government to include this aspect of cognitive restructuring in the pre-school curriculum. Thus, Nigerian children are exposed to this in different subject areas such as English language, mathematics, social studies and science during which they are exposed to content areas like "identification and matching of alphabets, numbers, colours, objects, road crossing and colour signals associated with road crossing, among others". However, how well Nigerian children at this level can identify as well as categorise things in their environment which this aspect of the curriculum expose them to needs to be researched into.

More so, when educationists such as Obanya, 1999; Okpala, 1999) have stressed the need for curriculum developers (experts) and curriculum interpreters (teachers) to pay attention to characteristics of learners. This is because a good understanding of such characteristics could enable them determine what a learner is capable of learning and how he or she learns it (Obanya and Okpala, 1985, Okpala and Odinko, 1998). Such is needed, at least in Nigeria where curriculum developers and interpreters do not seem to know enough about the children for whom they design new curricula and for whom they plan educational programmes (Obanya, 1999). Studies have further revealed that most teachers working with this category of children are not trained to teach at this at this level (Odinko, William and Donn 2007; Ndukwu, 2000). Seem as valid today as it was two centuries ago when Rousseau (1762) asserted that "if we do not know

children; with the false ideas we have of them, the further we proceed, the more we go astray". This statement reiterates the importance of using qualified teachers for this level of education. Qualification is an ability or record of experience that makes a person suitable for a particular job or position. Thus, early childhood programmes should be staffed with adults who are familiar with issues relating to child development and are able to plan developmentally appropriate programmes and provide solutions to children's needs.

Achievement gap may equally be attributed to gender, age of the child as well as where a child's school is located. For instance, studies have shown that on the average girls do better in schools than boys more especially in language (National Centre for Educational Statistics, 2003). Barnet and Rivers (2006)) while the reverse is the case for mathematics and science (Njoku, (2007), Zekele, (2001). With respect to the effect which where a school is located could have on a child's learning, Owoeye (2002), found that urban students performed better than rural students in all forms of achievement test. This was attributed to the fact that schools in the cities are well equipped with infrastructural facilities, qualified teachers who have opportunities to attend seminars to improve on their job performances. Pupils' achievement may be affected since the resources (both human and material) are not evenly distributed.

Further, Reeves (2003; Roelke, 2003) studies revealed that rural schools tend to be smaller, geographically isolated, alternatively staffed and have fewer material resources allocated to them. Elley (1994) in the International Association for the Evaluation of Educational Achievement (IEA) study conducted at the primary level in 32 countries had also identified the effects of school location on resource provision for effective teaching and learning. According to him, schools sited in cities typically have better resources and better qualified teachers. This is could be because highly qualified teachers prefer to live in cities where more materials are usually available to students. Such advantages enjoyed by urban dwellers, may have typically influenced their higher achievement. In the reading literacy study conducted by International Association for Evaluation of Educational Achievement (IEA) children in cities were found to be more proficient than the children from small villages. This situation is not quite different in Nigeria.

It thus seems that there exists a dearth of empirically based research literature that would enhance the knowledge of curriculum developers and practicing teachers in the characteristics of preschool children particularly their home background, school environment, cognitive abilities and skills, levels of sensory stimulation, etc. The present study was concerned with learners (pre-schoolers) characteristics in the areas of cognitive development and sensory stimulation. Specifically, the study sought to determine the extent to which preschool children (3 - 5^{+} Years) in two distinct localities of Oyo State (Nigeria) could identify as well as categorise things in their environment. There was also an interest in finding out if there was any gender, age, and school location group differences in their ability to perform such activities.

Based on the stated problem, the researcher sought to provide answers to the following questions.

1. To what extent can Nigerian children used in this study identify
   a. Colours

b. Objects in their environment?

2. Is there any location, age or gender difference in their ability to:
   a. identify colours
   b. and classify objects?

Methodology

(a) Sampling procedure and sample

Schools used were stratified into two groups (urban and rural). Purposive sampling technique was to select schools with mixed age nursery classes. Further, simple random sampling was used to select twenty nursery schools from an urban location and another twenty from rural location. In each school selected the children were clustered according to their sex (males and females). Simple random sampling was also used to select four boys (2 boys aged 3 to 4 years and another 2 aged 4+ to 5 years) and four girls (using the same age grouping) from each nursery class to participate in the study.

In all, 320 preschoolers (160 males and 160 females). Half of them (160) live and attend nursery school in the urban location while the other half live and attend nursery school in rural location. Their ages ranged from 3 to 5 years (mean age = 4.2; S.D.= 0.059).

(b) Instrumentation

One instrument was used for the study: Cognitive skills Test (CST). The CST was developed by the investigator. It consists of sections: A and B. section A solicits information on gender and school of the preschoolers. The Section B consists of 40 items that covered colour and object identification aspects of cognitive development of children. The preschoolers were exposed to pictures/paintings involving 10 colours and 30 common objects in home and school environments. They were required to identify them by name (from the pictures) each of the colours and objects.

Three lecturers in early childhood education scrutinized the initial version of the CST and subsequently selected the 40 items from the initial version. The CST was also subjected to pretesting using 30 North and Akinyele Local Government Areas (these schools were not part of the study sample).

The pretest results showed no ambiguities in the instrument and produced a test-retest (two weeks interval) reliability estimate of 0.87.

(c) Data collection procedure and analysis

The researcher with the help of three research assistants who were trained in the technicalities of using the instrument collected the data. The administration of the CST entailed, having a one-on-one interaction with every child. Questions such as 'what is this?', 'what colour is this?' 'Show me the living things an insect, bird, animal' etc. in this picture? Data collection lasted for five days.

Data analysis involved the use of percentages and t-test statistics (for independent groups).

Results

(a) Colour and object identification

Table 1 shows the percentage of children that correctly identified the respective colours used in the study (i.e., the facility indices associated with the respective colours). As can be seen from the Table, the percentages ranged from 6% (for indigo) to 86% (for white). Indigo is taught in social studies under 'Transportation/ traffic".

Table 1: Identification of colours

S/N	Colour	Facility index*	
		Frequency	%
1.	White	274	86
2.	Black	261	82
3.	Green	242	76
4.	Red	233	73
5.	Blue	205	64
6.	Yellow	162	51
7.	Orange	151	47
8.	Brown	84	26
9.	Purple	49	15
10	Indigo	20	6

***Percentage (in parenthesis) of preschoolers who correctly identified the colour**.

Table 2 shows the percentage of children that correctly identified the pictures of the respective objects used in the study (i.e. the facility indices associated with the respective objects). As can be seen from the table, the percentages ranged from 64% (for piano) to 100% (for book, key, pencil, dog, fish and ball respectively).

Table 2: The extent to which the pre-schoolers could identify objects and living things

Object	Facility index*		Object	Facility index*	
	Frequency	%		Frequency	%
Book	320	100	Goat	267	83
Key	320	100	Gun	263	82
Pencil	320	100	Bird	263	82
Dog	320	100	Rat	263	82
Fish	320	100	Orange	260	81
Ball	320	100	Elephant	260	81
Car	315	98	Egg	256	80
Cup	315	98	Lizard	250	78
Hen	309	97	Television	244	76
Clock	302	94	Fan	244	75
Yam	302	94	Blackboard	238	74
Tree	299	93	Bell	230	72
Sun	287	90	Tyre	230	72
Boy	276	86	Radio	210	66
Ant	267	83	piano	206	64

***Percentage of preschoolers who correctly identified the object in parenthesis.**

Table 3 shows the percentage of children that correctly classified the pictures of the respective objects used in the study according to living or non-living thing (i.e. the facility indices associated with the respective objects). As can be seen from the table, the percentages ranged from 42% (for hen) to 97% (for pencil).

Table 3: The extent to which pre-schoolers could classify according to living and non-living things

S/N	Living and non-living things	Facility Index	
		Frequency	**Percentage**
1	Pencil	310	97
2	Boy	300	94
3	Cup	291	91
4	Dog	280	88
5	Bird	273	85
6	Book	250	78
7	Goat	219	68
8	Television	181	57
9	Clock	170	53
10	Hen	135	42

(b) Group-differences in colour and object identification

The preschoolers were grouped on the basis of gender (male; female), age (3-4.5 years; 4.6-5^{+} years) and location (urban; semi-urban/rural). Table 3 shows the t-test analysis of the group differences in colour identification among the preschoolers. As can be seen from the Table, there were significant age-group (t_{obs} = 9.48; $p<0.05$, non-directional) and location-group (t_{obs} = 4.72; $p<0.05$, non-directional) differences in colour identification among the preschoolers. However, the Table shows that colour identification among the preschoolers was not gender-sensitive (t_{obs} = 1.49; $p<0.05$, non-directional).

Table 3: Group differences in colour identification

Group	N	df	$\bar{X}$	S.D	t-value	t-crit.
A: Rural location	160		40.3	3.6	4.72*	
B: Urban location	160		13.4	3.2		
A: 3 to 4 years	152	**318**	10.4	4.1	9.48*	**1.96**
B: 4^{+} to 5 years	168		14.6	3.8		
A: Male	160		12.2	3.3	1.49	
B: Female	160		12.8	3.9		

*Significant at the 0.05 level (non-directional test).

Table 4 shows group differences (based on age, location and gender) in object identification among the preschoolers. As can be seen from the Table, there were significant age-group (t_{obs} = 10.73; $p<0.05$, non-directional) and location-group (t_{obs} = 7.86; $p<0.05$, non-directional) differences in object identification among the preschoolers. However, the Table also shows that object identification among the preschoolers was not gender-sensitive.

Table 4: Group differences in object identification

Group	N	df	$\bar{X}$	S.D	t-crit	t-value
A: Rural	160		40.3	7.8		7.86*
B: Urban	160		46.1	5.1	**1.96**	
A: 3 – 4 years	152	**318**	39.6	6.9		10.73*
B: 4+ - 5 years	168		46.8	4.8		
A: Male	160		42.5	7.6		1.78*
B: Female	160		43.9	6.4		

***Significant at the 0.05 level (non-directional test).**

Discussion and conclusion

The results show that a good majority of the pre-schoolers used could identify white, black, green, red and blue colours, while yellow and orange colours could be identified by approximately 50% of the pre-school children. Only a very small proportion of the preschooler (6 – 26%) could identify brown, purple and indigo. This result appears not encouraging considering that in spite of the possible home and school environmental influences, a good proportion of the preschoolers (14-94%) could not identify white, black, green, red, blue, orange, yellow and indigo colours. This is irrespective of the fact that it is reflected in the curriculum content of pre-schoolers aged 3 to 5. This differential capacity in identification of colours is explicable considering that white and black seem to be the most common colours associated with daily living in Nigerian environment.

In addition, the contrasting nature of white and black colours, perhaps, would make it possible for preschool children to easily identify them. Green, red and blue are primary colours that are distinct enough to attract the attention of children. Thus, the home as well as the school environments of the preschoolers might have exposed them to the concept of white, black, green, red and blue colours. More so, it is relatively easy to introduce these colours (unlike indigo and purple) using mother tongue and majority of Nigerian schools use school uniforms adored in these colours. There are also indications that school environment might have facilitated the recognition/identification of these five colours since the colours are given prominence in the scheme of work and common textbooks used in the nursery schools. The textbooks also carry a lot of illustrations in yellow and orange colours. These do not hold for purple, indigo and brown.

This is even more disturbing for indigo because this colour is taught in social studies under transportation – traffic. Here children are exposed to the three traffic light colours (red, green and indigo) and the meaning of each. For instance, their textbook illustrated with the appropriate colours for 'red which indicates stop', 'green which means go' but not for 'indigo which is used for get ready to go'. A critical assessment of the texts used revealed

that some authors used 'yellow' while others used 'brown' to depict 'indigo'. This must have influenced the level of the children's ability to identify this important colour which understanding it will aid better understanding of road signal thereby reducing accidents (pedestrians) on our roads.

However, the capacity of the preschoolers to identify objects seems to be better. As shown in Table 2, all the preschoolers could identify 20% of the objects, 80% of the preschoolers could identify 73% of the objects while 64% of the preschoolers could identify all the objects. The six objects identified by all the preschoolers appear to be very common ones in most home and school environments. In contrast, objects like fan, blackboard, bell, tyre, radio, and piano are associated more with school environment only or homes of wealthy and educated parents. This, perhaps, is an indication that the preschoolers tend to be more conversant with common objects in their home environments which the school environment reinforces.

The results of the present study also show that both colour and object identification are sensitive to age and location of preschoolers. The age of the preschool child is positively associated with his cognitive and social development (Odinko and Iroegbu, 2005), as well as his physical and language development (Durojaiye, 1977). In addition, the older preschoolers (4.6-5^{+} years) are likely to have interacted with both home and school environments more than their younger counterparts. For instance, while a good majority of them have had more than one year of interaction with school, most of their younger counterparts (3-4.5 years) have not had up to one year of such interaction. In this regard, the significant age-group differences in colour and object identification could be explanation.

There are indications (Comber and Keeves, 1973) that structural variables such as school location can influence learning outcomes. For instance, the poor economic conditions in rural/semi-urban locations influence the quality of learning environment associated with homes and schools in the locations. The situation, however, seems to be better in the urban location. It is thus explicable that children who live and attend nursery schools in urban location were significantly better in colour and object identification than their counterparts in rural/semi-urban location.

In the light of the entire results and the associated discussion, the investigator is of the view that:

(i) Practicing teachers, textbook writers and parents of nursery school children in the two Local Government Areas should put in more efforts towards improving the capacity of the preschoolers to correctly identify colours and objects. They could achieve this by enriching the texts with correct colours and diversifying the experiences of the preschoolers in home and school environments. For instance, parents should create time to take the children around and outside their home environment. Durojaiye (1977) and Onibokun and Okoye (1981) had suggested that during such walks, parents and children should discuss freely about things they see and things that are of particular interest to the children. As for the teachers, they should equip the classroom with different kinds of materials for the children to explore and experiment with. The teachers should also endeavour to take the

children outside the classroom to explore the entire school environment during which conversation should be focused on what the children see, hear or find.

(ii) Parent and teachers should take cognizance of the differential capacity of the preschoolers to correctly identify colours and objects as a result of difference in age of the preschoolers and location where they live and attend school. In this light, the parents and teachers (as they enrich and diversify the experiences of the preschoolers in home and school environment) should provide extra attention to younger preschoolers and those from rural/semi-urban communities.

It is hoped that the implementation of these recommendations would lead to the ultimate goal of improved cognitive development among preschool children in Oyo State, Nigeria.

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