Original Article
IASR Journal of Medical and Pharmaceutical Science
Website: https://iasrpublication.com/ijmps
ISSN(*online*): 2582-9343

Interaction Effect Of Mode Of Illustration And Color Preference On Pupils' Achievement In Phonics

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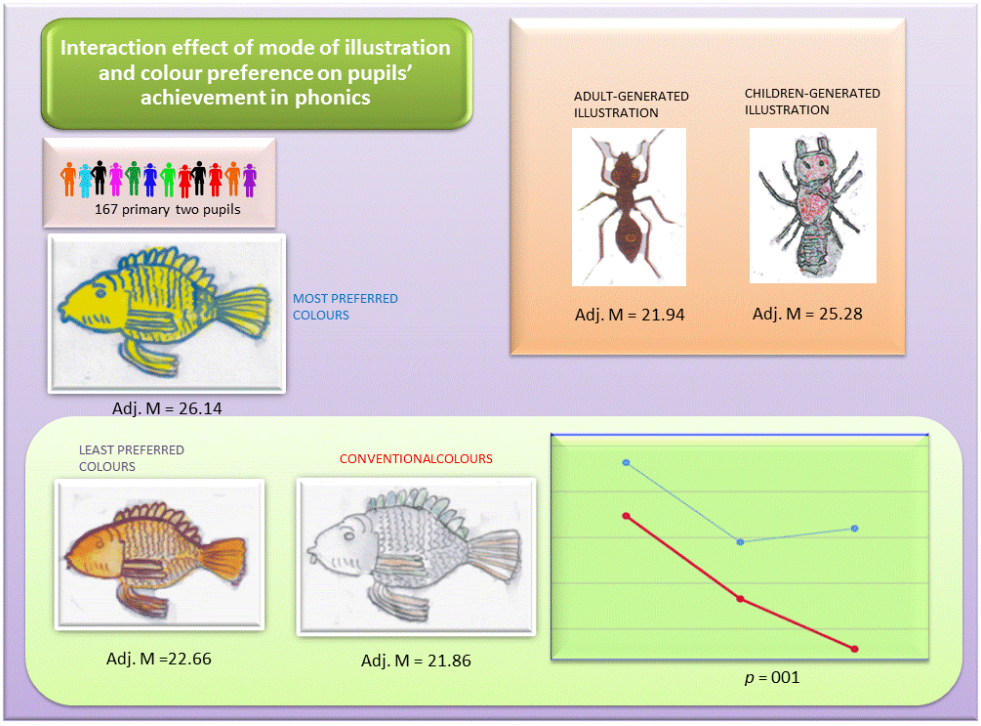
A B S T R A C T
The study investigated the interaction effect of mode of illustration and colour preference on pupils' achievement in phonics in Nnobi in Idemili South Local Government Area of Nigeria. The study employed a non-equivalent quasi-experimental 2 x 3 factorial research design. Some 167primary two pupils from 4 schools were used for the study. The English Achievement Test (EAT) was used to collect data. Three hypotheses were tested. The data were analysed using descriptive statistics and Analysis of Covariance (ANCOVA). The results showed that there was a significant main effect for the mode of illustration on pupils' achievement in phonics $F(1,165) = 123.221$, $p = .000$; there was a significant main effect of colour preference on pupils' achievement in phonics $F\ (2,165) = 55.198$, $p = 000$; and there was a significant interaction effect of illustration and colour preference on pupils' achievement in phonics $F\ (2,165) = 7.593$, $p = .001$. Because the children-generated illustrations were more effective in teaching phonics and enhancing pupils achievement in phonics, the Ministries of Education should ensure that textbook authors incorporate children-generated illustrations in the instructional materials for pupils in primary schools. These materials should be rendered in pupils most preferred colours.



Keywords:*Interaction, Mode, Illustrations, Colour, Preference, Phonics .*

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INTRODUCTION

Phonics is the sound system of the letters of a language, and letter and phrase relationships. A person teaches phonics skills in a child's education, frequently starting from the number one faculty schooling. The primary component that it uncovered pupils of their first English language lesson is phonics. In step with Tolbert [1], phonics is a method of teaching reading in which they teach pupils the letters of the alphabet and their sounds first. Next, they educate children to combine the sounds phonetically to form phrases, after which to build vocabulary and increase fluency and comprehension. Pupils can start studying within three to six months using the phonics approach. It is also a technique of coaching beginners to read and pronounce words by gaining knowledge of the phonetic value of letters, letter groups, and mainly syllables [2]. Phonics is all about sounds, and about the technique involved in applying letters, letter corporations, and syllables to phonetic values for novices.

Phonics, therefore, is all about writing, reading, recognizing and producing the phonetic values of a language, at a beginning level for learners of a second or foreign language [3]. Phonics could be considered a holistic approach, which at higher/older levels is generally broken into more specific considerations, which fall into formal categories like pronunciation, reading and writing [2].

Phonics is a skill important for studying and understanding written and spoken English. It is a content area students find difficult [4]. They will attribute this to the sort of instructional substances used in coaching the pupils. Adults are regularly the illustrators and designers of children's books and different educational materials. The importance of phonics requires a greater powerful way of getting ready, educational materials, like a textbook for primary school pupils. Textbooks are print media. Okwo[5] reported that print refers to educational materialspeople produce on paper. These include textbooks, workbooks, instructor guidebooks, images, charts, flashcards, handbills, posters, cartoons, and comics. Textbooks are the primary print substances used in primary colleges. A few issues involved within the layout of English textbooks for number one students include the character of illustrations and color usage in illustrations.

Illustrations can be regarded as a drawing, picture or diagram for instructional purposes. Redmond [6] defined illustration as a picture or the provision of the picture that compliments the text. A drawing, picture, photograph, or diagram accompanies and compliments a printed, spoken, or electronic text. Therefore, the illustration is a pictorial material appearing with a text and amplifying or enhancing it. Although illustrations maybe maps, charts, diagrams, or decorative elements, they are more usually representations of scenes, people, or objects related in some manner, directly, indirectly, or symbolically to the text they accompany. Previous studies in this area of research have reported that pictures lure children to read and interact with the text and provide mental images, allowing them to understand the written text more easily and remember it longer [7]. Illustrations may also increase comprehension and retention of the text material [8,9]. Andrews, Scharff and Moses [10] conducted a study on the Influence of Illustrations in Children's Story Books. The purpose of the study was to obtain empirical data to determine the relationship between illustrations and reading comprehension. It was to have a better insight on the type of illustrations, which children may prefer. They found out that illustrations have greater benefits than detriments, and the results have validated the theories that propose benefits for illustrated text. Illustrations can attract readers to a book, and they can enhance the comprehension of book material. It also suggests that illustrations may serve as an aid when children are reading a new story. However, the illustrator imposes his adult visual thoughts on children or gets carried away by his effortlessness in drawing and painting or simple technical ability. Most of these English textbooks meant for children have adult-generated illustrations without integrating artistic ideas or illustrations generated by the children themselves.

New attitudes toward children and their education began to develop in the late seventeenth century when many educators appealed for greater consideration of children's distinctive needs and when the notion of pleasure in learning was becoming more widely accepted. Most indicative of this evolution of ideas are the writings of philosophers John Locke (1632-1704) and Jean-Jacques Rousseau (1712-78) as reported by Witkin[11]. In 1693 Locke wrote that children should be treated as rational creatures. They must not be hindered from being children, nor from playing and doing as children, but from doing ill. Rousseau regarded childhood as a pure and natural state-one distinct from adulthood-and believed that a central goal of education should be to preserve the child's original nature. Rousseau believed that it is essential for teachers to see things as children do. The use of children-generated illustrations especially in the production of pupils' textbooks is justified based on the philosophical outlook of John Lock and Jean-Jacques Rousseau. The study set out to determine which of these modes of illustrations, adult or children-generated will be more effective in pupils learning phonics from texts. Some of the books produced for children contain color illustrations.

Color is a sensation caused by white light. Color has always been an important consideration in the production of children's books. Primary school English textbooks usually contain numerous colored illustrations. Colored illustrations attract children. Goethe [12] did suggest that red, yellow, and orange, the colors at the warm end of the spectrum, which are exciting, vital, and forthcoming (or advancing) colors are attractive to children. Orange tends to be the favouritecolorin paintings for those aged three to about six; pink and red follow oranges as favouritecolors [8]. There are, therefore, color preferences among children; and these may influence their behaviours in their choice of objects, for

instance, minerals preference for Fanta and not for Coke. Color preferences are the tendency for an individual or a group to prefer some colors to others, including a favouritecolor.In this investigation, the goal was to find out how color preferences influence pupils learning phonics from illustrations.

Illustrations engage or arrest children's attention and may facilitate children's understanding of the text. Consequently, bold and colorful illustrations are an essential part of children's books[4].Color makes an illustration aesthetically attractive, lively, inventive, and interesting. The reddish colors are the long wavelengths. The greenish colors are the mid-size wavelengths. The blueish colors are the short wavelengths. The projected color is additive. Printed color is subtractive. A subtractive color model is the very first type of color that children learnwhen teachers taught them the three primary colors of red, yellow, and blue. They mix these colors to form all colors. A Color gamut is the set of possible colors within a colorsystem.When light is at its fullest intensity, colors will become bright, at its least intensity, colors become dim. Color is simply light of varying wavelengths.

Color can be incredibly enlightening and transforming. Children use color in everyday decisions. Even at young ages, children use color in choosing certain objects that they classify by color such as different kinds of food. Children also use color in drink identification and selection. Pupils to discriminate between objects also use colors. Children prefer orange color to black. Other studies have reported the relationship between color preference and the spontaneous behaviour of children with play objects, such as colored blocks, sticks, balls, and boxes. Red is the most popular color for children[13]. Color preference, therefore, may influence learning from illustrated text.

Some people may have a love for yellow some may hate orange. There are color preferences for everybody. There are color preferences according to age, gender, and environment [14]. There is a reason for these colorpreferences, which can be, explained either by life experiences involving that particular color. A negative life experience can make one dislike a certain color; a positive life experience involving a particular color can, of course, make one feel drawn to that color or an aversion to color can indicate an imbalance in that part of the body.

Being conscious of these preferences can express one a great deal about oneself and aid one to tackle occasionally, very deep-seated emotive issues, and character qualities[15]. Color can be extremelyinformative and transmuting. Children use color in everyday decisions. Even at young ages, children use color in selecting certain objects that they categorize by color such as dissimilar kinds of food [16]. Children also use color in drink identification and assortment[17]. This could also be applicable in the selection of their books. Isaacs [18] studied color preference and its effects on ball catching. Isaacs found that children when catching balls of different colors, tended to catch the ball of the color they had previously chosen better than other colors. Thus, by letting children choose an object's color in fine motor skills tasks such as ball catching, color improves performance. Cockerill and Miller [19] tested the effect of color on motor skill performance. When children wore their choice of colored goggles while performing pegboard tests, they performed more accurately and at a quicker pace than while wearing non-preferred colored goggles.

If the illustrator is not well informed on children's color preferences he/she may not be able to consider their age group, environment, cultural background, and gender in illustrating their books, and the books may not be attractive and pleasing to pupils. This may hinder their interest in reading the books resulting in poor performance in that subject.

Pupils to discriminate between objects also use colors. Pupils function better in activities where they have chosen the color of the objects they use in the activity. Color is an important element in the production of pupils' books and other instructional materials. Ibenegbu[4] did suggest that red, yellow and orange at the warm end of the spectrum, which is exciting, vital, forthcoming, (or advancing) colors, may be attractive to children. Orange tends to be the favouritecolor in paintings for those aged three to about six; pink and red follow oranges as favouritecolors. Children prefer orange color to black. Red is the most emotionally warm of all the colors. From developmental standpoints; red is a preferred color during the early pre-school years when children are naturally functioning on an impulsive level [15].

Interest in red decreases and interest in the cooler colors increases as children outgrow the impulsive stage and move into the stage of reasoning and greater emotional control. Other authors such as Oram, Laing, Huttchinson and Owen, [17] have examined the connection between color preference and the impulsivebehaviour of children with play objects, such as colored blocks, sticks, balls and boxes. Observations suggest that four-five-year-olds are still mostly in the warm color preference category. Red is the most popular color here.

If children rely on colors heavily, enough to use them for measures of desecration and judgment, then it is important to know how they form their choice of favouritecolors. It is also important to know if they base the formation of color preference on their thoughts or what they learn from others, at what age this formation is salient and not discriminable.

Color preference, therefore, can have a great influence on the way children perceive colors. Individuals perceive colors differently. In addition, this may affect how pupils learn from color illustrations. Once the illustrations are not produced with one's preferred color, the learner may not have an interest in the content of the drawing and this may affect the learner adversely in achieving his/her objectives especially in phonics where phonics books are often richly illustrated with colored drawings.

In the same vein, color and emotion are often together. Exposure to certain colors like red may influence performance. This is suggestive of cognitive-affective processing. Whereas red has several categorical associations (danger and sexual readiness), red may also carry non-categorical affective meaning such as high arousal (physical excitement) and potency (dominance or power), which may form the basis for many explicit semantic associations. The base of Ecological Valence Theory (EVT) is on the hypothesis that the cause of color preferences is people's average affective responses to color-associated objects in the environment [20]. People like colors that are strongly associated with objects they like for instance, blues with clear skies and clean water. People dislike colors that are strongly associated with objects they dislike, for instance, browns with faeces and rotten fruits. Twenty three-culture semantic differential studies of affective meanings reveal cross-cultural similarities in feelings about colors [20]. The concept of red is affectively quite salient. Black and grey are bad, and white, blue, and green are good. Yellow, white, and grey are weak; red and black are strong. Black and grey are passive; red is active. The color component brightness, as determined by comparing data on white, grey, and black, is strongly associated with positive evaluation, but also with negative potency. They analyze eighty-nine previous studies of color and its effects. Adams and Osgood [20] generally support these findings, and, together with the fact that there are very few exceptions in data or the literature, to make one believe that there are strong universal trends in the attribution of effect in the colordomain.The problem lies in whether these colored illustrations in the phonics books are colors preferred by children.

It is, therefore, pertinent that illustrators of English textbooks targeted at primary school pupils should take into consideration colors suitable for them. This may facilitate learning from such books. The goal of this study is to investigatetheinteraction effect of mode of illustration and color preference on pupils' achievement in phonics.

The theory of constructivism by Piaget [21] states that when learners are involved in constructing an experience, that will facilitate learning. This study provides the opportunity to determine whether this theory holds when children are involved in designing illustrations used in teaching them. This is a sort of constructivism within the framework of the design of illustrated text by children or pupils. The Constructivists theory rests on the notion that learners are actively involved in the construction and generation of knowledge. When this happens, more authentic learning may result. This theory favours the use of children generated illustrations.

Color is a pervasive part of our visual experience. It can influence our moods, affect how we interpret things about the world, and even carry symbolic meaning. Several theories have emerged to explain this phenomenon, and one of the earliest and best known was the trichromatic theory [22].The Young-Helmholtz Trichromatic theory of color[23],postulates that the retina has three different types of cones. One type is sensitive to red, one to green, and one to blue. Just as one can mix colored lights on a screen to produce different colors, one can also mix colors on the retina to produce different colors.

The theoretical significance of this study is that it provides the opportunity of determining relationships between color preference and pupils achievement from the illustrated text. If the results indicate that children taught with the most preferred colors perform better than those taught with conventional and least preferred colors, the result could lead to a sort of theorizing that color preference influences achievement from illustrated text or color preferences influences achievement in learning phonics. In the review of the literature, little or no data was found to connect the interaction effect of mode of illustration and color preference on pupils' achievement in phonics. This is the concern of the present study.

Wetested these hypotheses for the study

Ho_1 There is no significant difference in the mean scores of pupils taught phonics using adult-generated illustrations and children-generated illustrations.

Ho_2 The pupils' color preference does not significantly influence their mean achievement scores in phonics.

Ho_3 The interaction effect of mode of illustration and color preference on pupils' mean achievement scores in phonics is not statistically significant.

Design of the Study

This research employed a quasi-experimental 2 x 3 factorial research design. We have used intact classes for the study. We represented the layout after Fraenkel and Wallen (2009) who mentioned that a quasi-experimental factorial design is a quasi-experimental layout changed to allow the research of additional independent variables. The treatment

variable is an illustration at two levels: Children (x_1) and Adult generated illustrations (x_2), while the moderator variable is Colorpreference at three levels: Most preferred color(y_1), Least preferred color(y_2) and Conventionalcolor (y_3). The design is a 2 x 3 pretest-posttest non-equivalent control group, factorial design.

E	0_1	x_1	y_1	0_2
C	0_1	x_2	y_1	0_2
E	0_1	x_1	y_2	0_2
C	0_1	x_2	y_2	0_2
E	0_1	x_1	y_3	0_2
C	0_1	x_2	y_3	0_2

Where 0_1 and 0_2 are pretest and posttest scores respectively.
E = Experimental Group; C = Control Group

Participants

Weenrolled 167 primary two pupils in the experiment. The age range was narrow: From six (73 pupils) to seven (94pupils) years old. There were 75 males and 92 females. We divided the participants into two groups of 82 and 85 participants each without criteria of choice. Weexperimented with six primary schools in NnobiIdemili South Local Government Area, Anambra State, Nigeria. We used the purposive sampling technique to select the six primary schools from 17 public primary schools in Nnobi. The selection was based on

a. schools with only one stream of primary 2 classes;
b. schools close to each other to make the supervision of the experiment easier;
and
c. schools that are comparable in terms of facilities.

Focus Group

We chose12 pupils from one of the schools for the focus group interview. In the interview, pupils liked and appreciated the children-generated illustrations more than the adult-generated ones. They also liked the colors of the illustrations especially those produced with their preferred colors. The pupils indicated they would like their teachers to teach them with children-generated illustrations in other content areas. The pupils also conveyedpleasure with the use of the booklets provided for them for the exercise. They welcomed the whole activities and they expressed the hope that they would have more opportunities to be involved in this type of exercise. The pupils emphasized they prefer the size of the bookletsthey used for the exercise. They upheld the booklets were simple, handy and have a superior design to the ones they use in their schools. The pupils all said they would be eager to partake in a relatedactivityin the future. The results of the focus group discussion indicated the booklet for their preferred colors demonstrable effectiveness and capacity to increase pupils' interest and achievement in phonics.

Materials

We developed three different materials namely the instructional materials, is the booklet for the experiment, the Color Preference Identification Checklist (CPIC) and the instrument for data collection was a researcher-made English Achievement Test (EAT). We designed it to identify the color preferences of the pupil and assess pupils' achievement in phonics. Two experts in English language education at the University of Nigeria, Nsukka, Nigeria, and a primary two teacher from a school in Awka-Etiti, Enugu State face validated the instrument. The experts examined the instrument in terms of importance, general preparation, suitability, construction, and appropriate timing. CPIC was a researcher-designed checklist used to find out the color preferences of primary two pupils, primary five pupils, and their teachers. Primary five and teachers were included as respondents to ensure that the colors used were appropriate. CPIC comprises 6 different colors and the respondents were required to tick the color they preferred most and the color they least preferred (See Appendix D)

EAT covered a clear concept of phonics. We included questions on spellings and sounds. We modified the instructions along the line suggested making them clearer to the pupils. We established content validity through the agreement of specialists on the table of specifications that guided the development of EAT. The 30-item EAT comprises Matching, filling the gap, and crossword puzzle questions. The time we allowed for the test was 45 minutes. We prepared the marking scheme we used to score the test. We determined the reliability of EAT and it yielded a .91 reliability index using Kuder-Richardson formula 21on the test scores of 30primary two pupils used for the initial study.

Preliminary Study

A preliminary study was conducted to find out the color preferences among the pupils in primaries two, and five, and their teachers' using the Color Preference Identification checklist. The most preferred colorbythe primary two pupils is yellow (See Appendix A) and their least preferred color is purple (See Appendix B). The most preferred color by the primary five pupils is yellow (See Appendix C), and their least preferred color is purple and orange (See Appendix D).

The teachers most preferred color is red/yellow (See Appendix E), while their least preferred color is purple (See Appendix F). These guided the production of instructional materials.

Development of the booklets

Children Generated Illustrations

We provided papers, pencils, color pencils and the names of items to draw to 172 primary two and 165 primary five pupils.We asked them to generate illustrations on the items. The selected pupils generated 475 different illustrations.We asked another set of pupils at the same level to validate the illustrations by selecting their most preferred ones. Wescannedthe generated illustrations on the computer and weusedit to develop three different booklets namely: children-generated illustrations using the colors in their textbooks (conventional color) See Appendix H, children-generated illustrations using most preferred colors (See Appendix H) and children-generated illustrations using least preferred colors (See Appendix H). We developed three other sets of booklets from the conventional textbook of primary two pupils. These include adult-generated illustrations as they appear in the textbooks (See Appendix G), adult-generated illustrations using the children's most preferredcolors (See Appendix G) and adult-generated illustrations using the children's least preferred colors (See Appendix G).

Experimental Procedure

We considered logistical ethical issues before starting the experiment. We obtained permission from the headteachers of the schools used for the study. We also sought and obtained the consent of the parents of the children used in different aspects of the study. We held a conference with research assistants who were class teachers of the pupils that we used for the study. At the conference, we briefed the teachers on how to carry on with the experiment.

At the onset of the experiment, the subjects for both the treatment and control groups were given the EAT as a pre-test by their teachers. Their class teachers distributed the instructional materials (booklets) to the pupils. The teachers also randomly assigned the six versions of the booklets to the six groups for the study.Thereafter the teachers began the experiment adhering strictly to the lesson procedure developed for the groups. The teachers guided the pupils on how to use the booklets, which were collected back at the end of each lesson. The teachers ensured that the pupils read the booklets during the experiment. The teachers experimented during the normal lesson periods as provided in the timetable. By the end of the experiment which lasted for two weeks and three days, the class teachers shuffled the items from the pre-test and administered them to the pupils as a post-test. Weanalyzed the data collected and used it to answer the research questions and test the hypotheses.

We conducted a focus group discussion for 12 pupils of a school that used children-generated illustrations with the most preferred colors booklet. This was to find out in qualitative terms; general impressions of the effect the illustrations and their preferred colors had on them.

Method of data analysis

We used mean, standard deviation, and Analysis of Covariance (ANCOVA) to analyse the data using the IBM Statistical Package for the Social Sciences (SPSS) Version 25. Research questions were answered using mean and standard deviation, while the hypotheses were tested using the Analysis of Covariance (ANCOVA) at an alpha level of 0.05. To determine the direction of the differences, a Scheffe analysis was used for pairwise comparison. Effect size (Delta Δ) was used to determine how important any observed differences are. A delta (Δ) value of 0.50 and above indicates an important or substantial difference [24].

RESULTS

I presented the results in Tables 1, 2, 3, and 4.

Table 1: Mean $(\bar{x})$ and Standard Deviation (SD) achievement scores of pupils taught using adult-generated illustrations and children-generated illustrations

GROUP	N	PRETEST		POSTTEST		ADJUSTED POSTTEST
		$\bar{x}_1$	SD_1	$\bar{x}_2$	SD_2	$\bar{x}$
Adult	78	17.23	2.36	21.87	3.55	21.94
Children	94	16.52	2.94	25.34	2.82	25.28

The data on adult and children-generated illustrations in Table 1 revealed that the adjusted mean score for pupils taught using children-generated illustrations was 25.28 while that of pupils taught with adult-generated illustrations was 21.94. Pupils taught phonics using children-generated illustrations, therefore, performed better than pupils taught with adult-generated illustrations did.

Table 2: Mean ($\bar{X}$) and Standard Deviation (SD) achievement scores of pupils according to color preferences

COLORN PREFERENCE	PRE-TEST		POST-TEST		ADJUSTED POST-TEST	
	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	$\bar{X}$	
Most Preferred	67	18.10	1.61	26.52	2.09	26.14
Least Preferred	51	15.90	3.41	22.61	2.99	22.66
Conventional	54	16.17	2.47	21.44	3.41	21.86

The results in Table 2 indicated that pupils taught using illustrations in most preferred colors had adjusted mean scores of 26.14 and pupils taught in the least preferred and conventional colors had adjusted mean scores of 22.66 and 21.86 respectively. These results showed that pupils taught using illustrations in most preferred colors performed better in phonics than pupils taught in the least preferred and conventional colors. However, pupils taught using illustrations in the least preferredcolors performed better than pupils taught in theconventionalcolors.

Table 3: Mean($\bar{X}$) and Standard Deviation (SD) achievement scores by mode of illustration and color preference

MODE	CHILDREN			ADULT		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Posttest						
Most	39	27.49(27.14)	1.02	28	25.18(25.10)	2.45
Least	30	23.43(23.83)	3.29	21	21.42(21.41)	2.06
Conventional	25	24.28(24.35)	1.72	29	19.00(19.09)	2.48
Total						
Observed mean		25.34	2.82		21.87	3.55
Adjusted mean		25.28	21.94			

Note: adjusted means are in parentheses

The results in Table 3 indicated that pupils taught using illustrations generated by children in most preferred colors had an adjusted post-test mean score of 27.14 and those taught using illustrations generated by adults in most preferred colors had an adjusted post-test mean score of 25.10. The pupils taught using children-generated illustrations in the least preferred colors had an adjusted post-test mean score of 23.83 and their counterparts taught using adult-generated illustrations in the least preferred colors had an adjusted post-testmean score of 21.41. Pupils taught using illustrations generated by children in conventional colors had an adjusted post-test mean score of 24.35 and their counterparts taught with adult-generated illustrations in conventional colors had an adjusted post-test mean score of 19.09. Therefore, children-generated illustrations were superior to adult-generated illustrations at the three levels of color in facilitating pupils' achievement in phonics. However, in children-generated illustrations, the differences between the means are greater than in adult-generated illustrations indicating that there may be ordinal interaction between the mode of illustration and color on pupil's achievement in phonics.

Table 4: Analysis of covariance of pupils' phonics achievement scores by illustrations and color preferences

			Hierarchical Method					
			Sum of Squares	df	Mean Square	F	Sig	Effect Size Delta(Δ)
Posttest	Covariates	Pretest	184.467	1	184.467	37.451	.000	
	Main Effects	(Combined)	1150.709	3	383.570	77.873	.000	
		Illustration	606.940	1	606.940	123.221	.000	.940
Color								1.26*
	Preferences		543.769	2	271.884	55.198	.000	1.16**
2-WayInteractions		Illustration*Color						
Preferences			74.798	2	37.399	7.593	.001	2.04***
								1.17****
								2.12*****

Model		1409.974	6	234.996	47.709	.000
	Residual	812.724	165	4.926		
	Total	2222.698	171	12.998		

Ho_1 There is no significant difference in the mean scores of pupils taught phonics using adult-generated illustrations and children-generated illustrations.

Data in Table 4 showed a statistically significant main effect for the mode of illustration $F(1,165) = 123.221$, $p = .000$. The null hypothesis, therefore, was rejected, indicating that there was a significant difference in the mean scores of pupils taught using adult-generated illustrations and those taught using children-generated illustrations. Children-generated illustrations, therefore, were superior to adult-generated illustrations in phonics instruction. The effect size (Δ) of .94 indicated that this difference was important (.94 > 0.50).

Data in Table 4 revealed that the main effect of color preference was significant $F(2,165) = 55.198$, $p= .000$. The null hypothesis was rejected, indicating that there was a significant influence of pupils color preference on achievement scores in phonics. The adjusted mean scores for pupils taught with illustrations in most preferred colors was 26.14, those taught in the least preferredcolors was 22.66 while those taught in conventional colors was 21.86. The significant difference was in favour of the most preferred colors. Pupils taught with illustration rendered in most preferred colors performed better in phonics than those taught in the other colors. To determine the direction of the differences, I presented Scheffe analysis was in Table 5.

Table 5: Scheffe analysis for pairwise comparison of the means due to color preference

		Subset	
Color Preference	N	1	2
Conventional	54	21.4444	
Least Preferred	51	22.6078	
Most Preferred	67	26.5224	
Sig.		.0951.000	

Data in Table 5 showed that pupils taught in most preferred colors ($\bar{X}$ = 26.52) performed significantly better than those taught in least preferred ($\bar{X}$ = 22.61) and conventional ($\bar{X}$ = 21.44) colors. Pupils taught in the least preferred colors did not perform significantly better than those taught in conventional colors. The effect size (Δ) between the most preferred and the conventional color was $1.26 = \frac{(26.14 - 21.86)}{3.41}$ $\frac{(26.14 - 22.66)}{2.99}$
The effect size (Δ) between the most preferred and least preferred colors were1.16

These values indicated substantial significant differences.

$\frac{(23.83 - 21.41)}{2.06}$ The results in Table 4 revealed a significant mode of illustration and color preference interaction $F(2,165) = 7.593$, $p = .001$. The null hypothesis was rejected. Therefore, there was a significant interaction effect between mode of illustration and color preference on pupils mean achievement scores in phonics. For most preferred colors, the effect size (Δ) $2.04 = \frac{(27.14 - 25.10)}{2.45}$ indicated that children-generated illustrations were substantially more effective for least preferred and conventional colors. The effect size (Δ) value of 1.17 =indicated that children-generated illustrations were effective in the least preferred colors. However, the effect size (Δ) $2.12 = \frac{(24.35 - 19.09)}{2.48}$ indicated that children generated illustrations were substantially more effective in the conventional colorsthanthe least preferred colors.

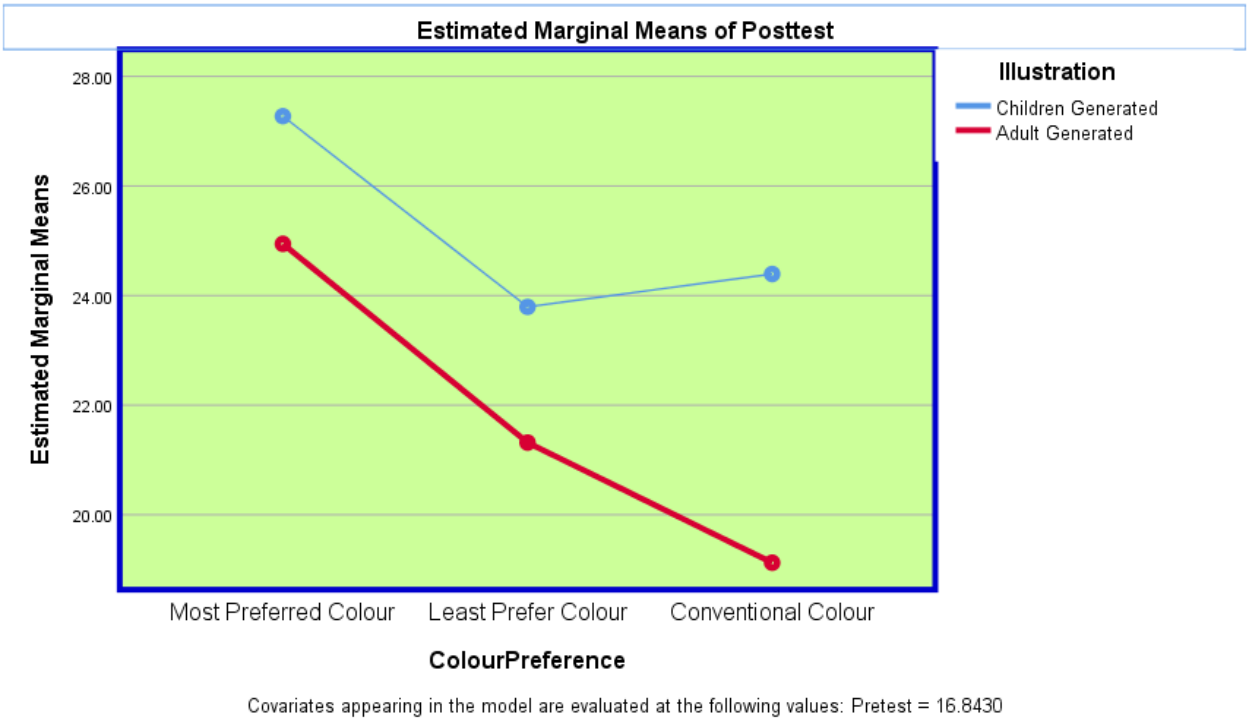

Fig. 1: Achievement score by mode of illustration and colour

Fig. 1 indicated that at different levels of colors pupils exposed to children-generated illustrations had significantly higher mean achievement scores than those exposed to adult-generated illustrations. The most preferred color group had the highest meanwhile that of the conventional color group was higher than that of the least preferred color group in children-generated illustrations. In adult-generatedillustrations, the most preferred color group had the highest mean score. They had a higher mean score than that of the least preferred color group. The conventional color group had the least mean for adult-generatedillustrations. The effect of mode of illustration and color, therefore, was a case of ordinal interaction. However, the interaction was significant.

DISCUSSION

Influence of color preference on the mean achievement scores of pupils in phonics

Results obtained from the study showed that pupils taught with the most preferred color performed better than their counterparts that were taught with the least preferred color and conventional color respectively. Children are attracted to their favouritecolors, and these do influence learning. Color preference can have a great influence on the way children perceive colors and this may have an effect on how pupils learn from color illustrations. When the illustrations were not produced with preferred colors, it does appear that the learners might not have enough interest in the illustrations and this may have affected the learners adversely in achieving their objectives in phonics instruction. The findings are in agreement with that of Cockerill and Miller [19] that when children wore their choice of colored goggles while performing page board tests, they performed more accurately and at a quicker pace than while wearing non-preferred color goggles. It also agreed with that of Isaacs [18] that color preference influenced children's performance in fine motor skills tasks.

Interaction effects of mode of illustration and color preference on pupils mean achievement scores in phonics

Results of the test of interaction indicated a significant ordinal interaction effect between mode of illustration and color preference on pupils achievement in phonics. The children-generated illustrations were superior to the adult-generated illustrations at the three levels of color in facilitating pupils achievement in phonics. However, the children-generated illustrations rendered in most preferred colors were most effective than those rendered in conventional and least preferred colors. The most preferred colors are usually bright colors with a high wavelength. Consequently, the pupils were attracted to these bright colors when illustrations generated by their colleagues which were more meaningful to them than that by adults were rendered in these bright and preferred colors. The pupils participated more actively in

instruction and performed best in the post-test. However, when the least preferred colors were used, the difference in the mean scores of both groups narrowed down; that of children-generated illustrations came down sharply, while that of adult-generated did not change much.

Therefore, the interaction of mode of illustration and color preference represents a case of ordinal interaction in which the regression lines do not cross each other indicating the superiority of the children-generated illustrations over the adult-generated ones at the different levels of color. The finding of this study concerning illustration agrees with the previous findings of Andrews, Scharff and Moses [10] that children tended to like illustrations in books that depict brightlycolored, cartoon-like characters.

Color significantly influenced pupils' achievement in phonics. The pupils that were exposed to illustrations in most preferred colors performed better than those that were presented with illustrations in the least preferred and conventional colors respectively.

The study also revealed significant ordinal interaction between mode of illustration and color, indicating that children and adult-generated illustrations rendered in the most preferred, least preferred and conventional had differential effects on pupils' achievement in phonics. Children-generated illustrations rendered in the most preferred colors were most effective.

Educational Implications

The findings of this study have implications for language education particularly in teaching reading and phonics in primary schools. The implications of this study border on the development of more virile instructional materials for teaching phonics.

Pupils most preferred colors were superior to the least preferred and conventional colors in the teaching of phonics. These results imply that the current textbooks adults that were illustrated by adults without considering the children's most preferred colors might have been partly responsible for pupils' poor performance in phonics. Children-generated illustrations rendered in pupils most preferred colors would have been more appropriate in the design and production of pupils textbooks and other instructional materials. Such books will invariably arrest the current poor performance in phonics instructions which stem from poor production of instructional materials.

In addition, the findings of this study have implications for textbook review. With these findings on the efficacy of children-generated illustrations in facilitating reading and phonics instruction among primary pupils, it has become obvious that the current textbooks recommended by the Ministry of Education are inadequate to meet the needs of the pupils and consequently need to be reviewed. This will, without doubt, enhance pupils achievement in phonics. The findings also have implications for instructing pupils who differ in color preferences. The use of children-generated illustrations rendered in the most preferred colors would be more effective irrespective of the pupils' .choice of preferred colors

RECOMMENDATIONS

Based on the findings of this study, and their implications, the following recommendations are made.

a. Because the children-generated illustrations were more effective in teaching phonics and enhancing pupils achievement in phonics, the Ministries of Education should ensure that textbook authors incorporate children-generated illustrations in the instructional materials for pupils in primary schools. These materials should be rendered in pupils most preferred colors.
b. English language teachers should be trained on how best to involve pupils in illustrating their instructional materials to facilitate phonics instruction. This could be achieved through seminars and workshops for teachers in primary schools.
c. Authors and publishers of children's books should engage pupils' in illustrating their books. This may even lower the cost of production of these books.
d. Teachers should desist from imposing their adult ideas of illustration on pupils especially during lesson planning, implementation and evaluation. This is because teachers may be seeing children's illustrations as a caricature without knowing the efficacy of such illustrations. More importantly, teachers should desist from using adult-generated illustrations in teaching pupils. The teacher should engage them in generating their illustrations with their preferred colors.

Limitations of the Study

The generalizations made concerning this study are however subject to the following limitations:

1. Since different teachers were used for different groups, it could be assumed that they might not have been of equal attributes in terms of method, cognitive, personality and affective functioning. This might have introduced an error in the study.
2. There was also the problem of absenteeism among the pupils. The fact that some pupils skipped classes may have influenced their performance.

Suggestions for Further Study

Based on the findings and limitations of this research, the following are suggested for further research.

1. It can also be done using black and white test items to determine the influence of the color of test items on achievement.
2. Pupils of different ages can be used to see if age differences determine color preferences.
3. The pictures in the achievement test can be adult-generated illustrations only.

The test may be in two forms: children-generated illustrations and adult-generated illustrations, where each form is given to a group.

DECLARATIONS

Ethical approval

We got both verbal and written approval from the participants. The parents/ guardians of the pupils delivered both verbally and in written accord on their behalf. Their involvement was voluntary. Postgraduate Studies Review Board, University of Nigeria, Nsukka, accepted the study technique.

Before participants' oral agreement, we informed them about the objective of the research and we made them understand that participation was intentional and denial to take part in the study attracts no consequence. We assured the privacy of the study participants of confidentiality and we detached individual identifiers in the summary data to guarantee discretion.

Consent

Weagreed with all individual participants involved in the study.

Competing interests

We affirmed I do not have competing interests.

Funding

There was no funding for the study.

Acknowledgements

We would like to thank my respondents and also appreciate Blessing Nwoye, Elizabeth Iheabunike, IfesinachiNjoku, Helen Muojekwu, and Blessing Onah for their help in assisting me with data collection.

Data Availability

The data set I produced during and/or analyzed during the present study are not overtly available because of privacy matters but can be collected from the corresponding author if demanded.

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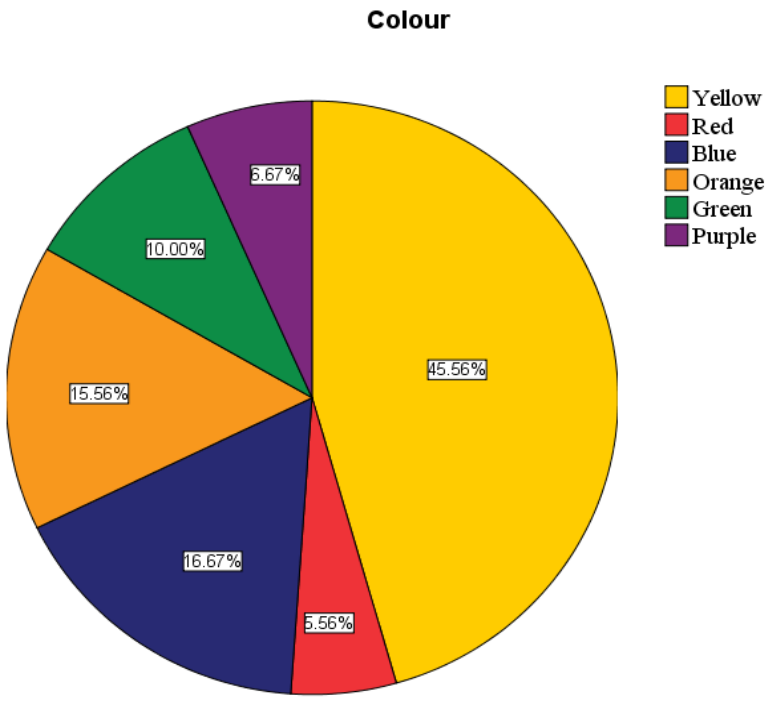
APPENDIX A

RESULT OF THE PRELIMINARY STUDY ON COLOUR PREFERENCES

MOST PREFERRED COLOUR BY PRIMARY 2

COLOUR	NO. OF RESPONDENTS
Yellow	41
Red	5
Blue	15
Orange	14
Green	9
Purple	6
TOTAL	**90**

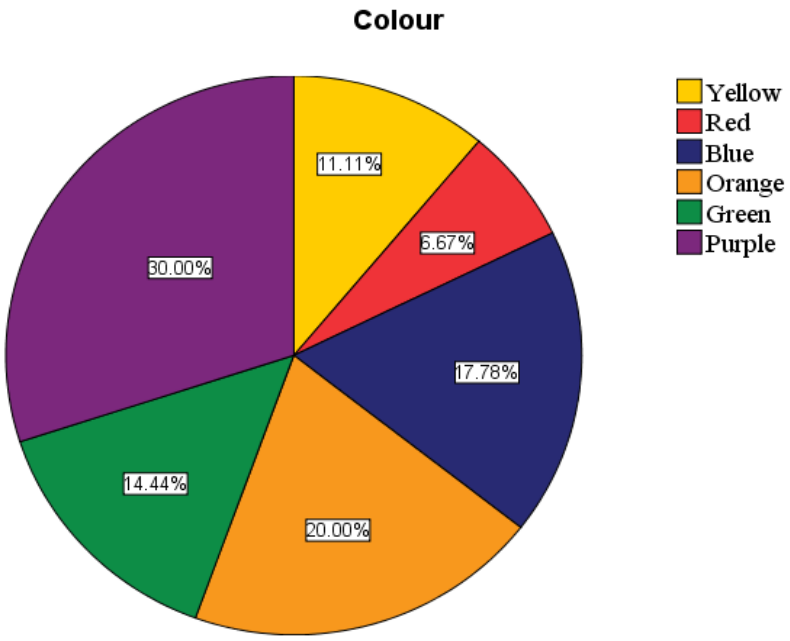


APPENDIX B

RESULT OF THE PRELIMINARY STUDY ON COLOUR PREFERENCES

LEAST PREFERRED COLOUR BY PRIMARY 2

COLOUR	NO. OF RESPONDENTS
Yellow	10
Red	6
Blue	16
Orange	18
Green	13
Purple	27
TOTAL	**90**

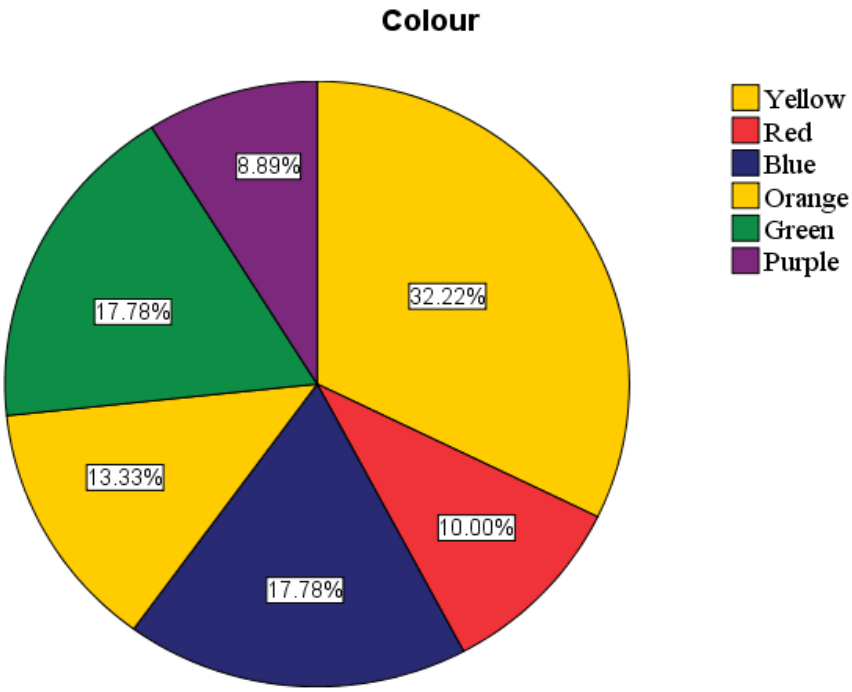


APPENDIX C

RESULT OF THE PRELIMINARY STUDY ON COLOUR PREFERENCES

MOST PREFERRED COLOUR BY PRIMARY 5

COLOUR	NO. OF RESPONDENTS
Yellow	29
Red	9
Blue	16
Orange	12
Green	16
Purple	8
TOTAL	90

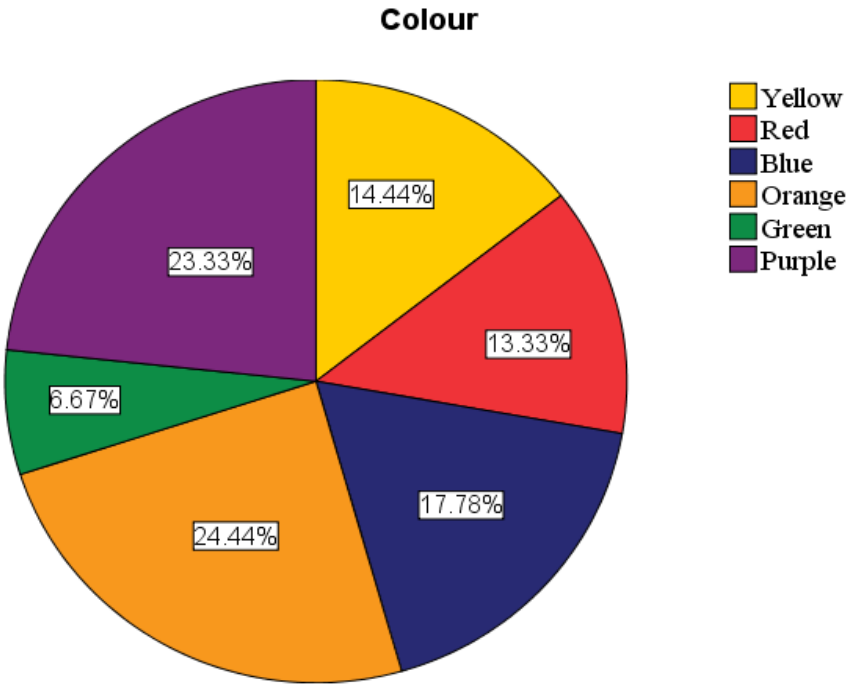

Colour
Yellow
Red
Blue
Orange
Green
Purple
8.89%
32.22%
17.78%
13.33%
10.00%
17.78%

APPENDIX D

RESULTS OF THE PRELIMINARY STUDY ON COLOUR PREFERENCES

LEAST PREFERRED COLOUR BY PRIMARY 5

COLOUR	**NO. OF RESPONDENTS**
Yellow	13
Red	12
Blue	16
Orange	22
Green	6
Purple	21
TOTAL	**90**

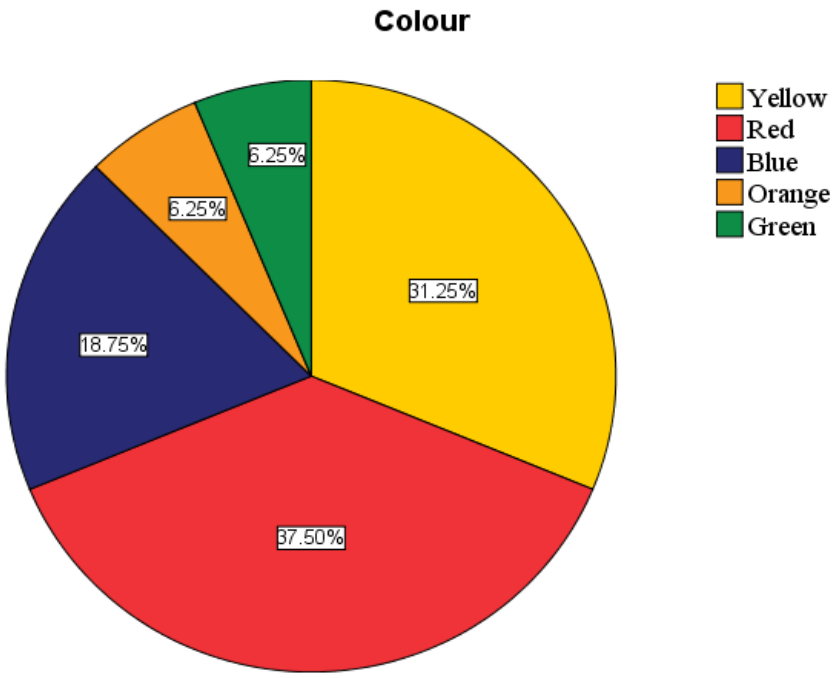


APPENDIX E

RESULT OF THE PRELIMINARY STUDY ON COLOUR PREFERENCES

TEACHERS MOST PREFERRED COLOUR

COLOUR	NO. OF RESPONDENTS
Yellow	5
Red	6
Blue	3
Orange	1
Green	1
Purple	0
TOTAL	**16**

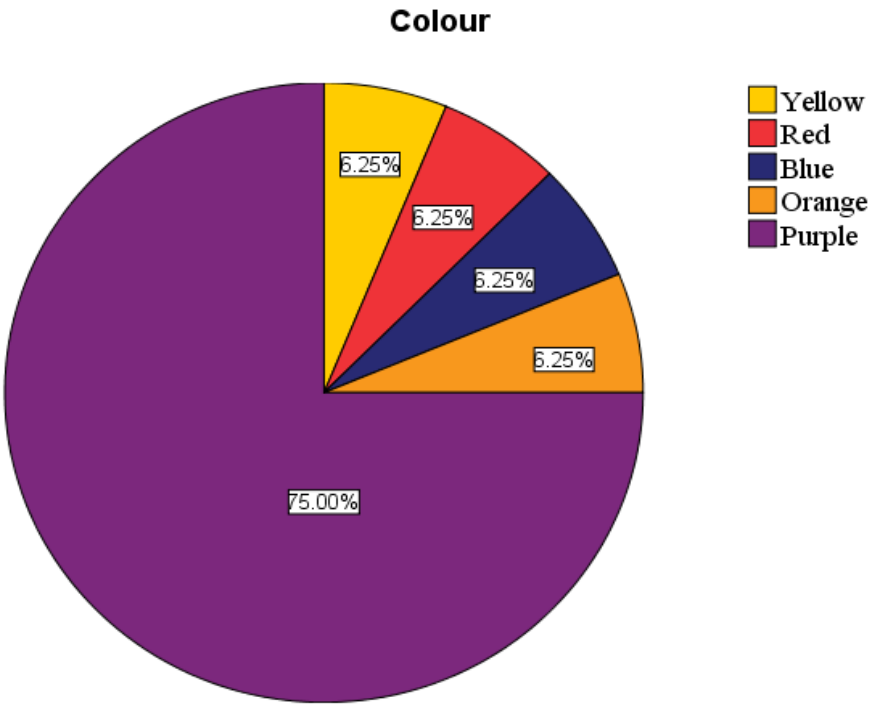


APPENDIX F

RESULT OF THE PRELIMINARY STUDY ON COLOUR PREFERENCES

TEACHERS LEAST PREFERRED COLOUR

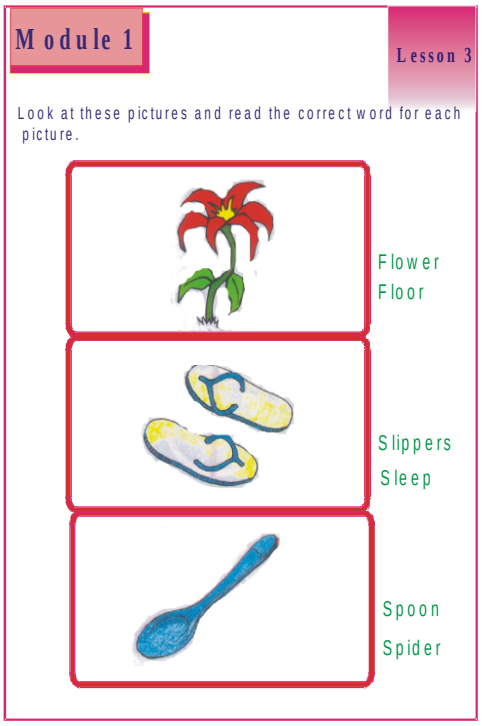
COLOUR	NO. OF RESPONDENTS
Yellow	1
Red	1
Blue	1
Orange	1
Green	0
Purple	12
TOTAL	**16**


Colour
6.25%
6.25%
6.25%
6.25%
75.00%
Yellow
Red
Blue
Orange
Purple

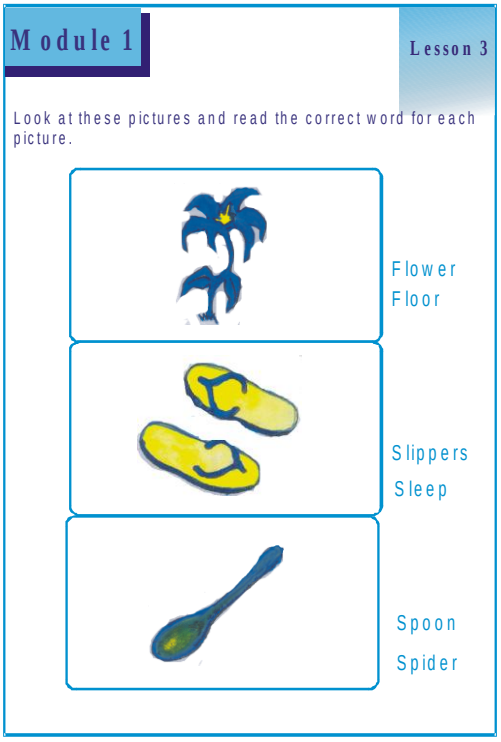
APPENDIX G

Examples of Adult-Generated Illustrations

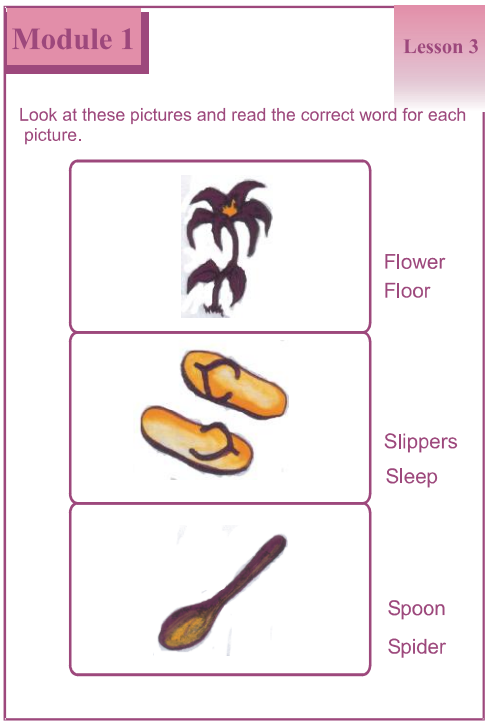
Most Preferred Colour



Least Preferred Colour



Conventional Colour

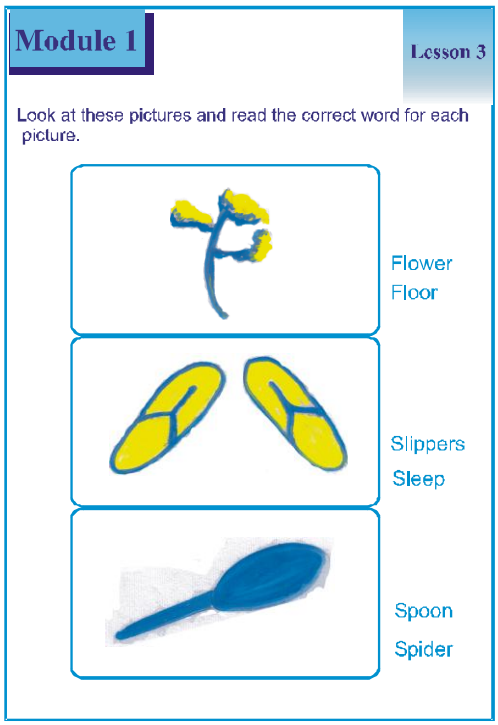


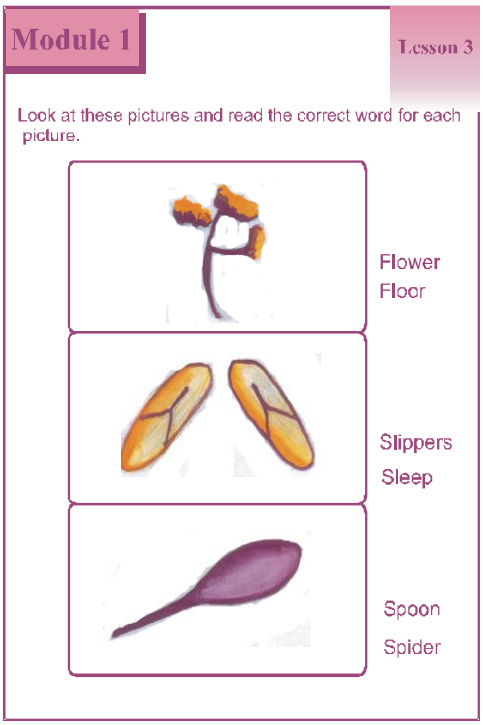
Examples of Adult-generated illustrations in the most preferred colours, least preferred colours and conventional colours

APPENDIX G

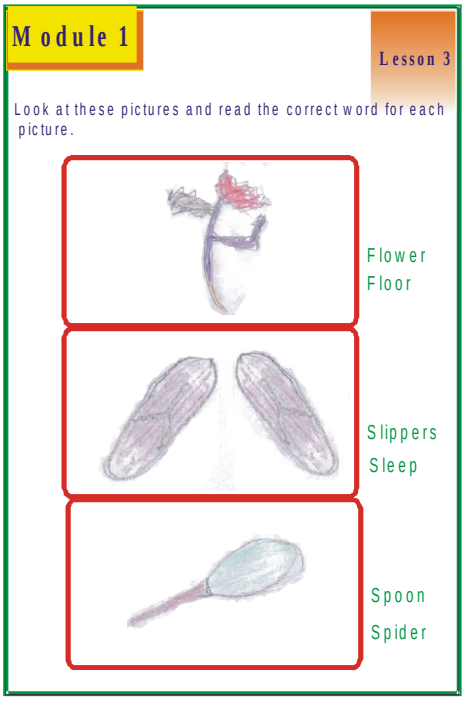
Children-Generated Illustrations

Most Preferred Colour **Least Preferred Colour**





Conventional Colour



Examples of children-generated illustrations in the most preferred colours, least preferred colours and conventional colours