Interaction Effect of Mode of Illustration and Colour Preference on Pupils' Achievement in Phonics

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Research Article

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

Posted Date: December 21st, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-1178947/v1>

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INTERACTION EFFECT OF MODE OF ILLUSTRATION AND COLOUR PREFERENCE ON PUPILS' ACHIEVEMENT IN PHONICS

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Abstract

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 167 primary 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 author incorporate children-generated illustrations in the instructional materials for pupils in primary schools. These materials should be rendered in pupils' most preferred colours.

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GRAPHICAL ABSTRACT

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 (2010), 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 (Rowlingson, 2010). 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 (Larson & Mendenhall, 2002). 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 (Rowlingson, 2010).

Phonics is a skill important for studying and understanding written and spoken English. It is a content area students find difficult (Ibenegbu, 2012). 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 (2007) reported that print refers to educational materials people 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 colour usage in illustrations.

INTERACTION EFFECT OF MODE OF ILLUSTRATION

Illustrations can be regarded as a drawing, picture or diagram for instructional purposes. Redmond (2008) 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 may be 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 (Frang, 1996). Illustrations may also increase comprehension and retention of the text material (Read and Barnstey, 1977; Schallert, 1980). Andrews, Scharff and Moses (2002) 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, Okeke (1982) claimed that too often, 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 (2005). 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

INTERACTION EFFECT OF MODE OF ILLUSTRATION

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 colour illustrations.

Colour is a sensation caused by white light. Colour has always been an important consideration in the production of children's books. Primary school English textbooks usually contain numerous coloured illustrations. Coloured illustrations attract children. Goethe (1995) did suggest that red, yellow, and orange, the colours at the warm end of the spectrum, which are exciting, vital, and forthcoming (or advancing) colours are attractive to children. Orange tends to be the favourite colour in paintings for those aged three to about six; pink and red follow oranges as favourite colours (Read & Barnsley, 1977). There are, therefore, colour preferences among children; and these may influence their behaviours in their choice of objects, for instance, minerals preference for Fanta and not for Coke. Colour preferences are the tendency for an individual or a group to prefer some colours to others, including a favourite colour. In this investigation, the goal was to find out how colour 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 colourful illustrations are an essential part of children's books (Ibenegbu, 2013). Colour makes an illustration aesthetically attractive, lively, inventive, and interesting. The reddish colours are the long wavelengths. The greenish colours are the mid-size wavelengths. The blueish colours are the short wavelengths. The projected colour is additive. Printed colour is subtractive. A subtractive colour model is the very first type of colour that children learn when teachers taught them the three primary colours of red, yellow, and blue. They mix these colours to form all colours. A Colour gamut is the set of possible colours within a colour system. When light is at its fullest intensity, colours will become bright, at its least intensity, colours become dim. Colour is simply light of varying wavelengths.

Colour can be incredibly enlightening and transforming. Children use colour in everyday decisions. Even at young ages, children use colour in choosing certain objects that they classify by colour such as different kinds of food. Children also use colour in drink identification and selection. Pupils to discriminate between objects also use colours. Children prefer orange colour to black. Other studies have reported the

INTERACTION EFFECT OF MODE OF ILLUSTRATION

relationship between colour preference and the spontaneous behaviour of children with play objects, such as coloured blocks, sticks, balls, and boxes. Red is the most popular colour for children (Martin & Carle, 2021). Colour preference, therefore, may influence learning from illustrated text.

Some people may have a love for yellow some may hate orange. There are colour preferences for everybody. There are colour preferences according to age, gender, and environment (Cohen, 2013). There is a reason for these colour preferences, which can be, explained either by life experiences involving that particular colour. A negative life experience can make one dislike a certain colour; a positive life experience involving a particular colour can, of course, make one feel drawn to that colour or an aversion to colour 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 (Wagner, 2005). Colour can be extremely informative and transmuting. Children use colour in everyday decisions. Even at young ages, children use colour in selecting certain objects that they categorize by colour such as dissimilar kinds of food (Macario, 1991). Children also use colour in drink identification and assortment (Oram, Laing, Huttchinson & Owen, 1995). This could also be applicable in the selection of their books. Isaacs (1980) studied colour preference and its effects on ball catching. Isaacs found that children when catching balls of different colours, tended to catch the ball of the colour they had previously chosen better than other colours. Thus, by letting children choose an object's colour in fine motor skills tasks such as ball catching, colour improves performance. Cockerill and Miller (1983) tested the effect of colour on motor skill performance. When children wore their choice of coloured goggles while performing pegboard tests, they performed more accurately and at a quicker pace than while wearing non-preferred coloured goggles.

If the illustrator is not well informed on children's colour 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 colours. Pupils function better in activities where they have chosen the colour of the objects they use in the activity. Colour is an important element in the production of pupils' books and other instructional materials. Ibenegbu (2004) did suggest that red, yellow

INTERACTION EFFECT OF MODE OF ILLUSTRATION

and orange at the warm end of the spectrum, which is exciting, vital, forthcoming, (or advancing) colours, may be attractive to children. Orange tends to be the favourite colour in paintings for those aged three to about six; pink and red follow oranges as favourite colours. Children prefer orange colour to black. Red is the most emotionally warm of all the colours. From developmental standpoints; red is a preferred colour during the early pre-school years when children are naturally functioning on an impulsive level (Wagner, 2005).

Interest in red decreases and interest in the cooler colours 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, (1995) have examined the connection between colour preference and the impulsive behaviour of children with play objects, such as coloured blocks, sticks, balls and boxes. Observations suggest that four-five-year-olds are still mostly in the warm colour preference category. Red is the most popular colour here.

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

Colour preference, therefore, can have a great influence on the way children perceive colours. Individuals perceive colours differently. In addition, this may affect how pupils learn from colour illustrations. Once the illustrations are not produced with one's preferred colour, 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 coloured drawings.

In the same vein, colour and emotion are often together. Exposure to certain colours 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 colour preferences is people's average affective responses to colour-associated objects in the environment (Adams & Osgood, 2012). People like colours that are strongly associated with objects they like

INTERACTION EFFECT OF MODE OF ILLUSTRATION

for instance, blues with clear skies and clean water. People dislike colours 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 colours (Adams & Osgood, 2012). 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 colour 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 colour and its effects. Adams and Osgood (2012) 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 colour domain. The problem lies in whether these coloured illustrations in the phonics books are colours preferred by children.

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

The theory of constructivism by Piaget (1983) 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.

Colour 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 (Cherry, 2021). The Young-Helmholtz Trichromatic theory of colour (1802), postulates that the retina has three different types of

INTERACTION EFFECT OF MODE OF ILLUSTRATION

cones. One type is sensitive to red, one to green, and one to blue. Just as one can mix coloured lights on a screen to produce different colours, one can also mix colours on the retina to produce different colours.

The theoretical significance of this study is that it provides the opportunity of determining relationships between colour preference and pupils achievement from the illustrated text. If the results indicate that children taught with the most preferred colours perform better than those taught with conventional and least preferred colours, the result could lead to a sort of theorizing that colour preference influences achievement from illustrated text or colour 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 colour preference on pupils' achievement in phonics. This is the concern of the present study.

I tested these hypotheses for the study

- Ho₁ There is no significant difference in the mean scores of pupils taught phonics using adult-generated illustrations and children-generated illustrations.
- Ho₂ The pupils' colour preference does not significantly influence their mean achievement scores in phonics.
- Ho₃ The interaction effect of mode of illustration and colour 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. I have used intact classes for the study. I 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 Colour preference at three levels: Most preferred colour (y_1), Least preferred colour (y_2) and Conventional colour (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

INTERACTION EFFECT OF MODE OF ILLUSTRATION

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 0₁ and 0₂ are pretest and posttest scores respectively.

E = Experimental Group; C = Control Group

Participants

I enrolled 167 primary two pupils in the experiment. The age range was narrow: From six (73 pupils) to seven (94 pupils) years old. There were 75 males and 92 females. I divided the participants into two groups of 82 and 85 participants each without criteria of choice. I experimented with six primary schools in Nnobi Idemili South Local Government Area, Anambra State, Nigeria. I 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

I chose 12 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 colours of the illustrations especially those produced with their preferred colours. The pupils indicated they would like their teachers to teach them with children-generated illustrations in other content areas. The pupils also conveyed pleasure 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 booklets they 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 related activity in the future. The results of the focus group discussion indicated the booklet for their preferred colours demonstrable effectiveness and capacity to increase pupils' interest and achievement in phonics.

Materials

I developed three different materials namely the instructional materials, is the booklet for the experiment, the Colour Preference Identification Checklist (CPIC) and the instrument for data collection was a researcher-made English Achievement Test (EAT). I designed it to identify the colour 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 colour preferences of primary two pupils, primary five pupils, and their teachers. Primary five and teachers were included as respondents to ensure that the colours used were appropriate. CPIC comprises 6 different colours and the respondents were required to tick the colour they preferred most and the colour they least preferred (See Appendix D)

EAT covered a clear concept of phonics. I included questions on spellings and sounds. I modified the instructions along the line suggested making them clearer to the pupils. I 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 I allowed for the test was 45 minutes. I prepared the marking scheme I used to score the test. I determined the reliability of EAT and it yielded a .91 reliability index using Kuder-Richardson formula 21 on the test scores of 30 primary two pupils used for the initial study.

Preliminary Study

A preliminary study was conducted to find out the colour preferences among the pupils in primaries two, and five, and their teachers' using the Colour Preference Identification checklist. The most preferred colour by the primary two pupils is yellow (See Appendix A) and their least preferred colour is purple (See Appendix B). The most preferred colour by the primary five pupils is yellow (See Appendix C), and their least preferred colour is purple and orange (See Appendix D). The teachers most preferred colour is red/yellow (See Appendix E), while their least preferred colour is purple (See Appendix F). These guided the production of instructional materials.

Development of the booklets

Children Generated Illustrations

I provided papers, pencils, colour pencils and the names of items to draw to 172 primary two and 165 primary five pupils. I asked them to generate illustrations on the items. The selected pupils generated 475 different illustrations. I asked another set of pupils at the same level to validate the illustrations by selecting their most preferred ones. I scanned the generated illustrations on the computer and I used it to develop three different booklets namely: children-generated illustrations using the colours in their textbooks (conventional colour) See Appendix H, children-generated illustrations using most preferred colours (See Appendix H) and children-generated illustrations using least preferred colours (See Appendix H). I 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 preferred colours (See Appendix G) and adult-generated illustrations using the children's least preferred colours (See Appendix G).

Experimental Procedure

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

INTERACTION EFFECT OF MODE OF ILLUSTRATION

administered them to the pupils as a post-test. I analyzed the data collected and used it to answer the research questions and test the hypotheses.

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

Method of data analysis

I 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 (Fraenkel & Wallen, 2009).

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.

INTERACTION EFFECT OF MODE OF ILLUSTRATION

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

COLOUR PREFERENCE	N	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 colours had adjusted mean scores of 26.14 and pupils taught in the least preferred and conventional colours had adjusted mean scores of 22.66 and 21.86 respectively. These results showed that pupils taught using illustrations in most preferred colours performed better in phonics than pupils taught in the least preferred and conventional colours. However, pupils taught using illustrations in the least preferred colours performed better than pupils taught in the conventional colours.

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

INTERACTION EFFECT OF MODE OF ILLUSTRATION

The results in Table 3 indicated that pupils taught using illustrations generated by children in most preferred colours had an adjusted post-test mean score of 27.14 and those taught using illustrations generated by adults in most preferred colours had an adjusted post-test mean score of 25.10. The pupils taught using children-generated illustrations in the least preferred colours had an adjusted post-test mean score of 23.83 and their counterparts taught using adult-generated illustrations in the least preferred colours had an adjusted post-test mean score of 21.41. Pupils taught using illustrations generated by children in conventional colours had an adjusted post-test mean score of 24.35 and their counterparts taught with adult-generated illustrations in conventional colours 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 colour 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 colour on pupil's achievement in phonics.

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

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

Ho₁ There is no significant difference in the mean scores of pupils taught phonics using adult-generated illustrations and children-generated illustrations.

INTERACTION EFFECT OF MODE OF ILLUSTRATION

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 colour preference was significant $F(2,165) = 55.198$, $p = .000$. The null hypothesis was rejected, indicating that there was a significant influence of pupils colour preference on achievement scores in phonics. The adjusted mean scores for pupils taught with illustrations in most preferred colours was 26.14, those taught in the least preferred colours was 22.66 while those taught in conventional colours was 21.86. The significant difference was in favour of the most preferred colours. Pupils taught with illustration rendered in most preferred colours performed better in phonics than those taught in the other colours. 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 colour preference

		Subset	
Colour Preference	N	1	2
Conventional	54	21.4444	
Least Preferred	51	22.6078	
Most Preferred	67		26.5224
Sig.		.095	1.000

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

INTERACTION EFFECT OF MODE OF ILLUSTRATION

The effect size (Δ) between the most preferred and least preferred colours were $1.16 = \frac{(26.14 - 21.86)}{3.41}$. These values indicated substantial significant differences.

The results in Table 4 revealed a significant mode of illustration and colour 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 colour preference on pupils mean achievement scores in phonics. For most preferred colours, the effect size (Δ) $1.04 = \frac{(27.14 - 25.10)}{2.45}$ indicated that children-generated illustrations were substantially more effective for least preferred and conventional colours. The effect size (Δ) value of $1.17 = \frac{(23.83 - 21.41)}{2.06}$ indicated that children-generated illustrations were effective in the least preferred colours. 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 colours than the least preferred colours.

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

Discussion

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

Results obtained from the study showed that pupils taught with the most preferred colour performed better than their counterparts that were taught with the least preferred colour and conventional colour respectively. Children are attracted to their favourite colours, and these do influence learning. Colour preference can have a great influence on the way children perceive colours and this may have an effect on how pupils learn from colour illustrations. When the illustrations were not produced with preferred colours, it does appear that the learners might not have enough interest in the illustrations and this may have affected

INTERACTION EFFECT OF MODE OF ILLUSTRATION

the learners adversely in achieving their objectives in phonics instruction. The findings are in agreement with that of Cockerill and Miller (1983) that when children wore their choice of coloured goggles while performing page board tests, they performed more accurately and at a quicker pace than while wearing non-preferred colour goggles. It also agreed with that of Isaacs (1980) that colour preference influenced children's performance in fine motor skills tasks.

Interaction effects of mode of illustration and colour 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 colour preference on pupils achievement in phonics. The children-generated illustrations were superior to the adult-generated illustrations at the three levels of colour in facilitating pupils achievement in phonics. However, the children-generated illustrations rendered in most preferred colours were most effective than those rendered in conventional and least preferred colours. The most preferred colours are usually bright colours with a high wavelength. Consequently, the pupils were attracted to these bright colours when illustrations generated by their colleagues which were more meaningful to them than that by adults were rendered in these bright and preferred colours. The pupils participated more actively in instruction and performed best in the post-test. However, when the least preferred colours 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 colour 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 colour. The finding of this study concerning illustration agrees with the previous findings of Andrews, Scharff and Moses (2002) that children tended to like illustrations in books that depict brightly coloured, cartoon-like characters.

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

INTERACTION EFFECT OF MODE OF ILLUSTRATION

The study also revealed significant ordinal interaction between mode of illustration and colour, 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 colours 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 colours were superior to the least preferred and conventional colours 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 colours might have been partly responsible for pupils' poor performance in phonics. Children-generated illustrations rendered in pupils most preferred colours 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 colour preferences. The use of children-generated illustrations rendered in the most preferred colours would be more effective irrespective of the pupils' choice of preferred colours

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 author incorporate children-generated illustrations in the instructional materials for pupils in primary schools. These materials should be rendered in pupils most preferred colours.

INTERACTION EFFECT OF MODE OF ILLUSTRATION

- 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 colours.

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 colour of test items on achievement.
2. Pupils of different ages can be used to see if age differences determine colour 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.

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INTERACTION EFFECT OF MODE OF ILLUSTRATION

Figures

Figure 1

Achievement score by mode of illustration and colour

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