COLOUR PERCEPTION - COLOUR MATCHING, COLOUR NAMING, AND COLOUR PREFERENCE - AMONGSTHAUSA T.T.C. STUDENTS OF KADUNA STATE, NIGERIA

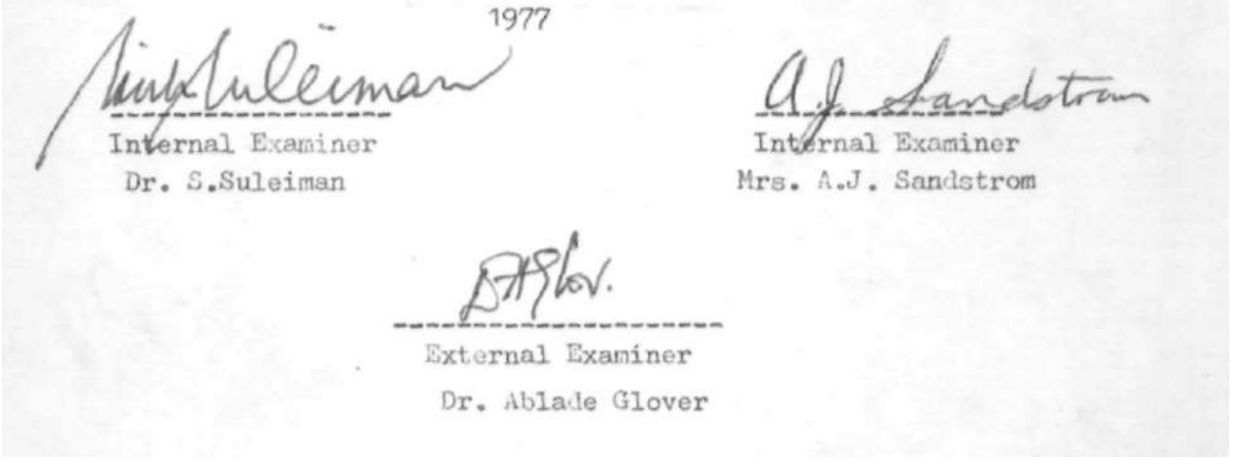
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In partial fulfilment of the requirement
for the degree of Masters of Fine Art
(Art Education)

DEPARTMENT OF FINE ARTS
AHMADU BELLO UNIVERSITY
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AN ABSTRACT OF
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ABSTRACT

The problem of this study was to investigate Teacher Training College students' ability at colour perception with particular emphasis on the aspects of colour matching, colour naming, and colour preference. The study was thus initiated to find out:

1. What is the ability of Hausa T.T.C. students to match identical colours?
2. Must one be able to correctly match colours before correctly naming them?
3. What is the ability of Hausa T.T.C. students to name colours in both Hausa and English?
   (a) What are the Hausa names for the sixteen colours used in this study?
   (b) Are there a number of colours for which the Hausa language makes no differentiation?
   (c) Does the ability to name colours increase with maturation?
4. Is there a relationship between the ability to match like colour targets and the ability to name the colours?
5. Is there a relationship between colour naming in Hausa and colour naming in English?
6. Is there a relationship between colour naming in Hausa and English and the order of colour preference?
7. What general recommendations can be made from the findings above for Art Education in the schools in Hausa area?

(b) research literature which was of significance to this particular study (c) the ability to perceive colour amongst T.T.C. students of Hausa origin.

Procedure

This study was carried out during the first month of the 1976/77 academic session in four Teacher Training Colleges within Kaduna State, Nigeria. The 144 subjects were all of Hausa origin and regarded as normal in colour vision (tested on the Ishihara Colour Plates - 38 plate ed. Ishihara: 1973). The subjects consisted of a random selection of Hausa students from Form I, Form III, and Form V of the four institutions mentioned above.

The instruments of research which were used for this study included four tests designed by the researcher: Colour Matching Test, Colour Naming Test - English, Colour Naming Test - Hausa, and Colour Preference Test. Except for the control of presentation order between the two colour naming tests, all test instruments were administered in random order to the subjects on an individual basis, under normal day-light conditions. The analysis of the responses on these tests supplemented the data for this study.

ACKNOWLEDGEMENTS

I want to express my deep gratitude to all the people whose help has brought this study to a successful conclusion. I want to thank the two members of my Supervising Committee Dr. S. Suleiman and Mrs. Sandstrom of Ahmadu Bello University, Zaria, Nigeria for their guidance, valuable assistance, and numerous hours of work.

I am grateful to the Ministry of Education, Kaduna State, the principals, headmasters, art teachers, and students of the Teacher Training Colleges in Kaduna State, Nigeria for their help and cooperation.

I want to thank the members of my family who worked selflessly with me on all aspects of the study and also provided lodging and encouragment during these years of study. In addition, I want to thank Mrs. P. Kyari for her dedication in typing the final document.

Finally, special appreciation and deep gratitude go to my wife whose faith, encouragement, and devotion made this study possible.

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CHAPTER I

INTRODUCTION

Objectives of the Study

There were primarily two objectives for the present study. They are as follows:

1. To investigate, among students of Hausa origin attending Teacher Training Colleges of Kaduna State, Nigeria, the ability to perceive colour with specific emphasis on those aspects of colour matching, colour naming, and colour preference.

2. To discover implications arising out of these findings for the improvement of teaching for perception within the Teacher Training Colleges of Kaduna State, Nigeria.

The Problem

Colour has been used for decorative purposes throughout African Art since prehistoric times. During this early period of man's development, the number of colours that were encountered (and even more so those with which he expressed himself through cave paintings, stone sculpture, and terra-cotta) were far fewer than those confronting and available to present day Nigerians. Today, with the assistance of science and technology, man is bombarded with and forced to choose between literally hundreds of different colours never encountered by

man in his early history.

There are, according to Judd and Kelly (1939), some ten million distinguishable colour differences, with hundreds of new colour terms being created each year. The majority of these colours can be described in words to distinguish one from another. As the number of colours experienced and available to today's artist increases, so does the need to be able to differentiate and label them appropriately. Nigeria is adopting and adapting western systems of education in an effort to cope with its present day developmental needs and desires. It seems that Art educators have yet to resolve the problem of not only primary pupils but also post-primary students completing their years of education without knowing their colours. The necessity of research in this area is apparent from the fact that this ability is such an elementary building block for all future Art instruction and might not have been developed to its potentiality by the end of the post-primary period of the students' educational development. It is understandable that the problem is most critical for those students whose career choice is that of professional artist, industrial artist, or Art educator as their 'world' is perhaps the most visual of any. However, the ability to perceive and label colours is of importance also to the chemist, the biologist, the physicist, and the home economist, to name only a few.

The incentive for studying this problem was first encountered by the researcher when teaching in a Teacher Training College in Otukpo, Benue State. It is for this reason that the study will concern itself with Teacher

Training Colleges. It was decided to test Hausa students since they could be considered a major group among Kaduna State, Teacher Training College students as well as the language of Hausa being the lingua franca of the northern states of Nigeria.

Analysis of the Problem

This study will undertake to investigate the ability of Hausa students in the following areas of colour perception: colour matching, colour naming in both the English and Hausa languages, and colour preference.

Specifically this study will answer the following questions:

1. What is the ability of Hausa Teacher Training College students to match identical colours?
2. Must one be able to correctly match colours before correctly naming them?
3. What is the ability of Hausa Teacher Training College students to name colours in both Hausa and English?
   (a) Does the ability to name colours increase with maturation?
   (b) What are the Hausa names for the sixteen hues used in this study?
   (c) Are there a number of colours for which the Hausa language makes no differentiation?
4. Of the sixteen colours investigated in this study, what is the order of preference among Hausa T.T.C. students?

5. Is there a correlation between colour naming in Hausa and colour naming in English?
6. Is there a correlation between colour matching and colour naming in Hausa and English?
7. Is there a correlation between colour naming in Hausa and English and the order of colour preference?

The Scope and Delimitation of the Study

As the complications of research on an interstate or international level are obvious, this investigation is confined to Kaduna State, Nigeria.

The Teacher Training Colleges of Kaduna State are established on a five-year course. Four of the fifteen colleges are Universal Primary Education Teacher Training Colleges which were established by the Federal Government in 1974/75. As these four institutions have not been in existence for five years, they are not included in this study. From the remaining eleven Teacher Training Colleges in Kaduna State, four (36.36%) were regarded as a sufficient size sample to be representative and to establish the necessary external validity of this study.

The four institutions chosen to participate in this study were not selected at random from the eleven Teacher Training Colleges offering all five years of study. As Kaduna State Ministry of Education is presently operating under the policy of placing students in Teacher Training Colleges which are in areas of the state other than their home district, it was necessary

to locate those institutions which had large numbers of Hausa students enrolled. It was found that the institutions with large numbers of Hausa students are in the middle and southern part of the state. Because of this finding, the four following institutions were selected to participate in this study: (1) Basawa Teachers College, Zaria. (2) Kaduna Teachers College, Kaduna, (3) Women's Teachers College, Kaduna, and (4) Women's Teachers College, Zaria.

As has been foreshadowed earlier, the study will be confined to Hausa students only and is further confined to a random sampling of twelve Hausa students from each of the respective forms: Form I, Form III, and Form V in each of the four Teacher Training Colleges. This limitation was necessary because some institutions transferred their Form II students to the newly established Universal Primary Education Teacher Training Colleges to allow for a sharp increase in intake into Form I. Students in Pivitol I and Pivitol II, a two-year teacher training programme existing within the Grade II Teacher Training Colleges, were not included in this study as they were admitted into the institution upon completion of Secondary School and therefore do not share a common educational background with those of the five-year programme.

This is then primarily a descriptive survey research confined to the investigation of Hausa T.T.C. students abilities to match colours, to name colours in both Hausa and English, and to express an order of preference from among the sixteen colours utilized in this study.

Background and Setting

The Hausa people are a negroid people who have a sense of ethnic unity based on common language, similarity of customs, and a tradition of common origin through Bayajidda and his seven sons: Biram, Daura, Katsina, Zaria, Kano, Rano, and Gobir (Ajayi: 1970:91). Today they dwell throughout several states in northern Nigeria and numerous countries in West Africa.

The education of the youth within Hausaland is not a new twentieth century development. Throughout their history, and especially since the Jihad of Uthman dan Fodio (Hodgkin: 1960), the Hausa people, like every social group, have provided a system whereby children have been trained for their adult roles. Within Hausaland, successive generations of boys and girls have been taught in their homes, in the fields and markets, through age-groups and initiation rites, and through some 25,000 Koranic schools (Lugard:1919:60). The lessons have contained the knowledge which their elders wished to pass on in order that a certain continuity might be maintained in the community's life.

There were schools in keeping with the Western concept in which the Hausa language was the medium of instruction, as early as 1865 - in Lokoja (Harford: 1897:27), 1904 in Bida (C.M.S.:1904), 1905 in Sokoto (C.M.S.:1907), and 1907 in Zaria (C.M.S.:1909). The training of Hausa peoples in western orientated schools for the sole purpose of becoming primary school teachers was perhaps first undertaken at Nasarawa, just outside of Kano, in 1909 (Graham:1966:79). Art education in its

western form was introduced to the Hausa people by Mr. Hanns Vischer as a preliminary preparation to opening the first primary school in Hausaland scheduled for October, 1910 (Ogunsola:1975:232).

Admittedly, Vischer's introduction was limited in scope. With the founding of Katsina Training College in 1922 for the purpose of producing high quality teachers to staff the provincial schools of the North (Jones:1963: 30-33), the scope of art education (or drawing as it was called) was expanded. Even with such expansion, the subject remained an optional one which was often regarded as of little value compared to the 'academic' subjects and as simply the 'latest fad' of the Educational Department (Solaru:1964:77). In addition to these views, there were those who questioned the relevancy of the syllabus to its environment.

> "In most African countries, the curriculum still has little relevance to Africa's needs. The method of teaching is still rigid memorization; the purpose of schooling is to pass an examination that gets you into the elite, not to learn a subject which has little apparent relevance to your life."
> (Hapgood:1965:162)

Within the last ten years Nigeria has taken definite steps to direct its educational future and the content of its curriculum. By 1972, Kaduna State had eleven established Teacher Training Colleges with approximately 3,500 students enrolled (Ministry of Education North Central State:1972:23). All of these institutions had a common Art syllabus written by the Institute of Education, Ahmadu Bello University, Zaria, Nigeria. As a result of the National Curriculum Workshop of 1972 (which recommended a common syllabus at T.T.C. level throughout

Nigeria), this existing syllabus was rewritten with minor modification by the Institute of Education, A.B.U., for the Federal Ministry of Education in 1974 (Grade II Teachers Training Syllabus, Arts and Crafts). It was rewritten in 1977, with (once again) minor modifications. Today art education within the T.T.C. consists of a five year programme which is compulsory in the three lower forms but still optional at the Grade II Certificate level.

The Grade II Teacher Training College represents the lowest level of teacher training in Kaduna State. They are both federally and state funded, depending on which level of government was responsible for their establishment or take over. They contain both a five-year programme for the primary leaver and a two-year pivotal programme for the secondary school leaver.

Significance of the Study

Within the Federal Grade II Teacher Training Syllabus (Ministry of Education, Lagos:1977), it would appear that colour was limited to the media of paint, dye, and crayons. Colour is an aspect of the art syllabus which lends itself to formal teaching (lecturing) methods often stifling the excitement of the wonder filled world of colour with confusing and possibly boring facts. Law (1967:86) points out that although such a method of instruction dulls the childs enthusiasm, "school art classes regularly pump a jumble of such complex colour ideas (i.e. colour theory) into children and expect them to accept them on faith."

There is much more to colour than the theory of colour mixing.

In her discussion of colour, Bucher (1953:86) points out that we all react to colour instinctively, on a purely emotional basis. However, colour embraces more than emotional reactions. There is a need to develop within the student the power to select and enjoy colours with more sensitivity, uderstanding, and positive feeling. Thus there is a need to teach for colour perception.

Colour perception is a significant aspect of perception, which is one of the foundation blocks on which Fine Art and specifically the visual arts is based. Therefore, it is fitting that the research into colour perception be carried out. As there has been very little research into the aspects of colour perception (colour matching, colour naming, and colour preference amongst T.T.C. students of Hausa origin), it is desirable to establish a realistic evaluation of the situation. Investigating the aforementioned issue is then of educational significance.

It is hoped that the findings of this study will provide Art educators, curriculum planners and other interested persons of Kaduna State and elsewhere in the country as a whole useful information on colour perception of this target population. Briefly stated, it is hoped that:

1. The findings would provide an empirical basis for Art educators in Kaduna State (and possibly elsewhere) to re-evaluate the art syllabus with the aim to teach colour perception in its many

faceted aspects.

2. The findings of that portion concerned with colour vision amongst Hausa T.T.C. students will provide new and refined information in the area.
3. The results of the study concerned with colour naming, colour matching, and colour preference amongst Hausa T.T.C. students will provide the first evaluation and information in these aspects of colour perception among these people (as the researcher is unaware of any previous studies).
4. The Teacher Training College Art syllabi will be evaluated from time to time to provide a continuous development, growth, and progress not only of colour perception but also of Art education in general throughout colleges in Hausaland.
5. Having taught in a T.T.C. where he first encountered the problem, the researcher has chosen as his occupation the instruction of future Art teachers and will utilize the results in his training of future T.T.C. Art teachers.

DEFINITION OF TERMS

To facilitate the reading of this work with meaning and understanding, it has been regarded necessary to define the following terms:

Grade II Teacher Training Colleges: institutions within

Kaduna State, Nigeria which provide a five-year education for students who have completed the normal primary education as it is constituted at the present (1977). The purpose of a Teacher Training College is to continue the general education of the student, as well as to instruct him in primary educational teaching methods in order to prepare him for productive teaching in a primary school. The age limit for admissions into Teacher Training Colleges is not fixed. Except for those established by the federal government, funding is through the state government as there are no school fees.

COLOUR: a phenomenon of light or visual perception that enables one to differentiate otherwise identical objects or light sources. Colour is differentiated in terms of hue, lightness, and saturation for objects and hue, brightness, and saturation for light sources (Webster's Seventh New Collegiate Dictionary:1965:163).

COLOUR MATCHING: the ability to identify colours in a series of excercises; the pairing of a target colour card with its identical colour stimulus from a field of colour stimuli. If such behaviour is carried out correctly the subject scores one point. Thus the ability to match colours with 100% accuracy is denoted by the score of 16 obtained on this colour matching exercise.

COLOUR NAMING: the ability to label colours in a series of exercises; the pairing of a target colour card with the appropriate colour label stimuli from a field of colour label stimuli. If this behaviour is carried out correctly, the subject scores one point. Thus the ability to name colours with 100% accuracy in either Hausa

or English is denoted by a score of 16 obtained on either Hausa or English colour naming exercises.

COLOUR PREFERENCE: the expressed priority for a specific colour in a series of exercises; the choosing of one colour stimulus from a field of colour stimuli. After each behavioral response, the colour chosen is allocated one point. These points are then tallied so that all the colours can be ranked from high priority to low priority. Thus colour preference is denoted by the ranked priority for colours chosen in this series of 68 exercises comprising the colour preference test.

HAUSA: those people to whom Hausa is the mother tongue and whose heritage can be traced back three successive generations to a locality lying within the original seven Hausa States regardless of religion.

HAUSALAND: those lands lying within the borders of the original seven Hausa states (Hausa Bakwai) presently existing within northern Nigeria and southern Niger.

STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES (SPSS): "an integrated system of computer programmes designed for the analysis of social science data. The system provides a unified and comprehensive package that enables the user to perform many different types of data analysis in a simple and convenient manner. SPSS allows a great deal of flexibility in the format of data. It provides the user with a comprehensive set of procedures for data transformation and file manipulation, and it offers the researcher a large number of statistical routines commonly used in the social sciences. In addition to the usual descriptive statistics, simple frequency distributions, and cross-tabulations, SPSS contains procedures for simple correlation (for both ordinal and interval

data), partial correlation, means and variances for stratified subpopulations, one-way and n-way analysis of variance (including multiple classification analysis tables), multiple regression, discriminate analysis, scatter diagrams, factor analysis, canonical correlations and Guttman Scaling." (Nie, et.al:1970:p.1)

Basic Assumptions

The following assumptions may help to give meaning and direction to this study:

1. Because of the importance of perception and particularly colour perception to the Art, it is necessary that every T.T.C. be effective in its teaching for perception so as to ensure that a balanced, meaningful, and extensive art experience is encountered.
2. Because of the rapid increase in available colour pigments and their basic use in art, adequate and relevant colour education should be provided so that all students receive the necessary preparation for teaching colour following completion of their course.
3. Students enrolled in Teacher Training Colleges possess the knowledge of the domicile of their mother, father, and grandparents on both sides of the family and whether they are of Hausa speaking origin.
4. The raw scores on the Colour Matching Test, Colour Naming Test - Hausa, and Colour Naming Test - English are representative of the

students' ability in these various areas of colour perception.

5. The raw scores on the Colour Preference Test are representative of the students' likes and dislikes for the sixteen colours utilized throughout this study.
6. The sixteen colours used in the study (spectrum yellow, spectrum yellow-orange, spectrum orange, spectrum red-orange, spectrum red, spectrum red-violet, spectrum violet, spectrum blue-violet, spectrum blue, spectrum blue-green, spectrum green, spectrum yellow-green, spectrum gray, spectrum brown, spectrum black, and spectrum white) which were produced by Rich Art Production Limited, New York, are pure hues and accurately labeled.

Hypotheses

The following null hypotheses have been developed for this study:

1. There is no difference between the mean scores of Hausa Teacher Training College students in Form I, Form III, and Form V on the Colour Matching Test.
2. There is no difference between the mean scores of Hausa Teacher Training College students in Form I, Form III, and Form V on the Hausa Colour Naming test.
3. There is no difference between the mean scores of Hausa Teacher Training College students in

Form I, Form III, and Form V on the English Colour Naming Test.

4. There is no significant correlation between the Colour Matching Test and that of the Hausa Colour Naming Test or English Colour Naming Test.
5. There is no significant correlation between the Hausa Colour Naming Test and the English Colour Naming Test.
6. There is no significant correlation between the ranked order of preference on the Colour Preference Test and the ranked order of colours most often correctly labled in the Hausa Colour Naming Test.
7. There is no significant correlation between the ranked order of preference on the Colour Preference Test and the ranked order of colours most often correctly labeled in the English Colour Naming Test.

Research Techniques and Methodology

Selection of the Sample

To select subjects for the present study, it was necessary to carry out two preliminary stages of screening. The first was that of testing for Hausa origin. This was achieved by requesting all students from Form I, Form III, and Form V for whom Hausa was their mother tongue to complete a brief form (see appendix). From the information given, the domiciles of the students' parents and grandparents were located on a map. If the

domiciles fell within the borders of the original seven Hausa states, the student was regarded as eligible for the second stage of screening.

The second stage consisted of testing these students of Hausa origin to ascertain whether they were experiencing difficulties in colour vision which would affect their performance in later test instruments. This was achieved by testing each qualified subject with the shortened version of the Ishihara Colour Plates (Ishihara:1973). This series of 38 plates is designed to provide a test which gives a quick and accurate assessment of colour vision deficiency of congenital origin. An assessment of the readings of plates 1 to 21 determines the normality or defectiveness of colour vision. Only these plates were used. This delimitation of the colour plates is recognized as the shortened version. If a subject responds normally to 17 of the 21 plates, the colour vision is regarded as normal. If only 13 or less than 13 plates are read normally, the colour vision is regarded as deficient.

In reality (perhaps due to the fact that this test was not administered during class time), many students were absent and were therefore not allowed to participate in any further testing procedures. From the four institutions, a total of 460 students were tested. Each student was individually tested by the researcher and eliminated from any further testing if found to be experiencing any one of the three abnormalities of colour vision - monochromatism, dichromatism, and tritanape. Other reasons to be judged an unsatisfactory subject were a need for eye glasses, general negative attitude

TABLE I

Incidence of Defective Colour Vision

School	Form	No. of Students Tested		Failed the shortened form of the Ishihara Plate		Rejected for other reasons		% failed (colour blind)	
		M	F	M	F	M	F	M	F
W.T.C. Zaria	I	-	50	-	1	-	6	-	.020
	III	-	30	-	0	-	2	-	.000
	V	-	18	-	0	-	1	-	.000
W.T.C. Kaduna	I	-	50	-	1	-	7	-	.020
	III	-	35	-	0	-	0	-	.000
	V	-	22	-	0	-	2	-	.000
Kaduna T.T.C.	I	45	8	4	0	3	2	.088	.000
	III	25	7	2	0	1	0	.080	.000
	V	15	5	0	0	1	1	.000	.000
Basawa T.T.C.	I	50	-	6	-	6	-	.120	-
	III	50	-	2	-	0	-	.040	-
	V	50	-	3	-	2	-	.060	-
Total Sex		235	225	17	2	13	21	.072	.008
Grand Total		460		19		33		.041	

or an expressed desire to withdraw after having undergone this exercise (see Table 1). As the number of students who voluntarily agreed to continue in the later testing was 408, regarded as a sufficiently large population from which to randomly select the sample, no attempt was made to force unwilling students to participate.

The incidences of defective colour vision amongst the male students tested by the Ishihara Colour Plates was 07.2% which is slightly more than the 6% reported by Dr. R. Foreshaw (1967:4) in a study with 102 male students of the Institute of Education, Ahmadu Bello University, Zaria, Nigeria, using the Ciba-Geigy Plates. The finding of 07.2% is, however, less than the 8% reported in an earlier study which Foreshaw carried out on NCAST students in 1956-59 using the Ishihara Colour Plates and a similar Colour Chart Test (1967:4).

Amongst the female students, defective colour vision was virtually non existent, as only 00.8% of the females tested had detectable difficulties. This finding is in agreement with M. D. Vernon (1965:76) who reported that amongst English subjects, "colour defects are rare in women". Although no attempt was made to analyse any of the students in regards to the three types of abnormalities experienced, it is important to realize that probably only a few cases (if any) could actually be said to be colour blind (Grunberg:1973:135).

Thus, students who successfully fulfilled the necessary criteria were grouped by institution and form. The criteria required that the students were: 1. descendents of people for whom Hausa was the mother tongue

and whose domicile on both sides of the family fell within the border of the original seven Hausa states and 2. capable of demonstrating that they have no colour vision difficulties as tested by the Ishihara Colour Plates. Twelve students were chosen at random from each of the forms (Form I, Form III, and Form V) for each of the four Teacher Training Colleges participating in this study. This resulted in four sub-samples made up of 36 students each or a total sample of 144 Hausa T.T.C. students with normal colour vision.

Age Span of Subjects

As can be noted from the table below, the age of the subjects making up the sample of this study varied

Table II

	Form I	Form III	Form V
Mean	13.81 years	15.60 years	17.63 yrs.
Standard Deviation	2.35	1.90	2.51
Maximum	22.00	19.00	29.00
Minimum	10.00	10.00	13.00

considerably more than expected. This situation is the result of a number of factors. Perhaps the three most prominent conjectures concerning encountering students in Teacher Training Colleges who are twenty years old or older are as follows:

1. Upon completion of primary school, the student may have entered into a business rather than into the teaching profession with its seemingly low salary. However, now that there has been a sharp increase in teachers' salaries he has become interested in a 'no sweat' career.
2. The student may have gone immediately into

teaching as a C-teacher following the completion of primary school, even without formal training in teaching methods. After teaching for a number of years, he is now interested in returning for further education and the Grade II Teacher's Certificate.

3. The student may have completed or undergone some form of teacher training after leaving primary school, but, at a lower level than Grade II. After teaching for some time, he is now interested in returning to raise his teaching qualifications as well as his salary scale.

Procedures in Collecting the Data

As this study is essentially a descriptive one, the materials for it are primarily from two sources: test instruments and related literature.

Primary Source (Test Instruments):

In dealing with perception of colour as an aspect of the Art curriculum in Teacher Training Colleges within Hausaland, the investigator is particularly concerned with an evaluation of Hausa T.T.C. students' abilities to match colours, to label colours in both Hausa and English, and to identify order of colour preference. To achieve this, four test instruments which are discussed in detail in the following pages were designed to collect information on the various aspects of colour perception just mentioned. These four test instruments can be divided into three groups: 1. matching of identical colours, 2. naming of colours, and 3. preference for colour. Group I will consist of a colour matching instrument, while Group II will consist of two

instruments: colour naming in Hausa and colour naming in English, Group III will consist of a colour preference instrument. The order of presentation of these three groups of test instruments will be randomized, but all subjects will be required to take part in all four test instruments.

Group I - Colour Matching Test (C.M.T.)

The Colour Matching Test will be designed specifically to be non-verbal in nature so as to minimize the learning of verbal colour labels which will be tested by instruments in Group II. Coloured chips will be prepared for the following colour hues: spectrum red, spectrum red-orange, spectrum orange, spectrum yellow-orange, spectrum yellow, spectrum yellow-green, spectrum blue-green, spectrum blue, spectrum blue-violet, spectrum violet, spectrum red-violet, spectrum gray, spectrum white, spectrum black, spectrum brown, and spectrum green. These coloured chips were then mounted on heavy white paper so as to minimize finger smudges while handling. These coloured chips served both as the stimulus material (target card) and the response materials in this test instrument.

The test instrument consisted of sixteen items. In each item of the test, the subject will be confronted in randomized fashion with a target card and asked to select the colour chip which will be identical to the target card from a field of four colour chip responses. This procedure will be repeated till all items are completed. The field of colour responses for each item consists of one colour chip which will be identical to the target card, one which will be the complementary colour of the

target card, one which will be analogous to the target card, and one selected at random from the remaining thirteen colour chips. Order of presentation will be randomized from left to right for these four colour chips making up the response material (or field of colour responses).

This test instrument will be administered individually to each subject under normal daylight conditions. Both the target card and the response materials will always be displayed on white board situated approximately eighteen inches from the subjects eyes. All testing using this instrument will be carried out during the first week of school for Form I subjects. Subjects in Form III and Form V will be tested within the first month of the academic session.

The scoring of the instrument will be very basic. If the subject correctly matches the target card with the response card of the identical colour, the result will be a score of one. If any of the three possible choices other than the identical colour is chosen as a match, the response will be considered incorrect and scored nil. Thus a subject who sucessfully matches each target card with its correct identical response card will receive a total score of sixteen.

Group II - Colour Naming Test - Hausa (C.N.T.H.) and Colour Naming Test - English (C.N.T.E.)

In designing and constructing the Colour Naming Test - Hausa, it was necessary to carry out a pre-test for the Hausa colour terms for the sixteen hues used in this study. These terms needed to be readily understood by the majority of the Hausa peoples. This selection of

colour terms was done by interviewing 50 adults who were of Hausa origin (Table III). During the interviews (which were conducted under normal daylight conditions), the researcher presented the interviewee with target cards, one at a time in a randomized fashion. These target cards were identical to those prepared for the Colour Matching Test instrument. As each target card was presented to the interviewee, he was asked, "In Hausa, what do you call this colour?" In cases where the interviewee's response was the same Hausa colour term for two distinct colour hues, such as "ja" in response to the red-orange, red, or red-violet, the target cards of the two colour hues were presented simultaneously and the questions asked a second time. All responses were then tallied for frequency, to establish a Hausa colour term or phrase which was most often used for identifying the specific colour hue (see Table III). This resulted in one Hausa term for each of the sixteen hues which were used in this test instrument. The Hausa terms were used with a high degree of certainty that it would be understood by the majority of the Hausa subjects.

The sixteen Hausa colour names resulting from the interviews discussed above and the sixteen English colour names will then be printed onto heavy white paper which was identical to that used for the target cards. These colour name chips will make up the response materials for the Colour Naming Test - Hausa and the Colour Naming Test - English respectively. Colour chips identical to those used in the Colour Matching Test will serve as target cards in both instruments.

The Colour Naming Test - Hausa and Colour Naming

Test - English will be designed in a similar format to that of the Colour Matching Test so as to minimize confusion amongst the subjects in regards to what will be expected of them as well as to establish a consistent means of testing.

The instructions for the Colour Naming Test - Hausa will be 'back translated' from English into Hausa. To check for discrepancy in the translation, the instructions will originally be translated from English into Hausa by a person of Hausa origin. Secondly, they will be translated from Hausa back into English by yet another person to whom Hausa is the first language. What discrepancies do exist will then be thrashed out through a joint session of the researcher, the English - Hausa translater, and the Hausa - English translater. The jointly - agreed - upon Hausa instructions, and the English instructions will be read aloud by a Form V student from the institution in which the testing is to be done at the appropriate time for the respective test instruments. Deliberate effort will be made to use the Head Prefect whenever possible, since, as a result of the numerous occasions he would have spoken to the student body as a whole, his pronunciation is more likely to be familiar to the students. These precautions will be deemed necessary so as to avoid the testing of the subject's reading ability as many of them appear to experience difficulties in comprehending the English language.

In both the Colour Naming Test - Hausa and the Colour Naming Test - English the subject will be presented with sixteen target cards, one at a time. Each of the

TABLE III

Hausa Colour Terms

Colour in English	Hausa Colour Label - First Response	No.	%	Hausa Colour Label-Second Response	No.	%
Red	ja	36	72	ja wur	34	68
	ja wur	7	14	ja	6	12
	mai jinin kane	4	08	mai jinin kane	3	06
	others	3	06	ja zur	3	06
				others	4	08
		50	100		50	100
Red - Orange	ja	38	76	ja	31	62
	mai ruwan goro	7	14	mai ruwan goro	15	30
	ja ja	3	06	ja ja	3	06
	others	2	04	others	1	02
		50	100		50	100
Orange	ja	26	52	ja ja	27	54
	ja ja	16	32	mai ruwan goro	17	34
	mai ruwan goro	5	10	ja	4	08
	others	3	06	others	2	04
		50	100		50	100
Yellow-Orange	rawaya	25	50	mai ruwan gwaiduwa	12	58
	mai ruwan gwaiduwa	2	26	mai ruwan kwai	17	
	mai ruwan kwai	11		ruwan dorawa	14	28
	ruwan dorawa	10	20	rawaya	4	08
	others	2	04	others	3	06
		50	100		50	100
Yellow	rawaya	27	54	rawaya	33	66
	ruwan dorawa	13	26	ruwan dorawa	7	14
	mai ruwan kwai	9	18	mai ruwan kwai	4	08
	others	1	02	others	6	12
		50	100		50	100

TABLE III - continued

Colour in English	Hausa Colour Label - First Choice	No.	%	Hausa Colour Label -Second Choice	No.	%
Yellow-Green	kore	37	74	kore shar	31	62
	kore shar	12	24	kore	14	28
	others	1	02	others	5	10
		50	100		50	100
Green	kore	47	94	kore	46	92
	others	3	06	others	4	08
		50	100		50	100
Blue-Green	kore	34	68	mai launin kwangwaina	26	52
	mai launin kwangwaina	14	28	kore	21	42
	others	2	04	others	3	06
		50	100		50	100
Blue	shuda	27	54	shudi shudi	29	58
	bulu	7	14	bulu bulu	19	38
	shudi shudi	3	06	others	2	04
	zargina	2	04			
	others	1	02			
		50	100		50	100
Blue-Violet	shuda	28	56	zargaina	22	44
	bulu	10	20	bulu	18	36
	zargaina	10	20	shuda	9	18
	others	2	04	others	1	02
		50	100		50	100
Violet	bulu	23	46	shunaiya	24	48
	shunaiya	22	44	bulu	21	42
	others	5	10	others	5	10
		50	100		50	100

TABLE III - continued

Colour in English	Hausa Colour Label - First Choice	No.	%	Hausa Colour Label -Second Choice	No.	%
Red-Violet	ja	20	40	mai launin jar garura	22	44
	ja wur	13	26	jar wur	18	36
	mai launin jar garura	13	26	others	10	20
	others	4	08			
		50	100		50	100
Black	baki kirim	36	72	baki kirim	37	74
	baki	14	28	baki	13	26
		50	100		50	100
Brown	kasa kasa	46	92	kasa kasa	46	92
	others	4	08	others	4	08
		50	100		50	100
White	fari fat	48	96	fari fat	48	96
	others	2	04	others	2	04
		50	100		50	100
Grey	toka toka	46	92	toka toka	46	92
	others	4	08	others	4	08
		50	100		50	100

target cards will be accompanied by four response cards with colour names printed on each in the appropriate language. From the four response cards, the subject will select the card whose colour label (in Hausa or English depending on the test) most accurately identified what he would call the colour found on the target card. The four colour labels for both the Colour Naming Test - Hausa and the Colour Naming Test - English will be read aloud from left to right by the Form V assistant with a two second pause between responses. This will be done to avoid testing the ability to read rather than to name colours.

The field of colour name responses for each item (on either the Hausa or English test instruments) consists of one name chip which was selected most frequently by the earlier interviewees, one which will be the name of the colour that is complementary to the target card, one which will be the name for an analogous colour to the target card, and one selected at random from the remaining thirteen colour name chips. Order of presentation will be randomized from left to right for the response cards.

The Colour Naming Test - Hausa and the Colour Naming Test - English will be administered individually under normal daylight conditions by the researcher with the aid of a Hausa Form V assistant. Like the Colour Matching Test, all target cards and response materials will always be displayed on a white board approximately eighteen inches from the subjects eyes. These test instruments will be administered during the same weeks of the 1976/77 session as that of the C.M.T.

Scoring for these test instruments will be identical to that of the Colour Matching Test. A subject correctly matching the colour on the target card with the correct response from the four colour name response cards will score one. Any response different to this will be scored nil.

Group III - Colour Preference Test (C.P.T.)

The Colour Preference Test will be designed specifically to be non-verbal in nature for the same reason that the Colour Matching Test was essentially non-verbal. Using colour chips which will be identical to those used in the Colour Matching Test, Colour Naming Test - Hausa, and Colour Naming Test - English an instrument of 68 items will be constructed. Each of the items will consist of four colour target squares presented in random order from left to right. The four colour target squares will consist of a specified colour target square (example: blue-green) and three other colour target squares from the fifteen remaining colours of this study. Following this procedure each colour will be grouped with every other colour. For example it might appear like this: 1. red, yellow, black, white, 2. red, green, brown, grey, 3. red, blue-green, yellow-orange, orange, 4. red, red-violet, blue, yellow-green, and 5. red, blue-violet, red-orange, violet.

In an attempt to create a test instrument of a length which will not overwhelm the student, it will be necessary to rule out (as much as possible) any duplication which would occur between test items. This will result in a minimum of sixty-five test items. Since

analysis will be eased when all colour hues appear an equal number of times, it will be necessary to expand the number of test items to sixty-eight. This will allow each colour hue to appear seventeen times throughout the test instrument, or to be considered seventeen times during the testing as a possible preference over other colour hues.

Like the other three test instruments discussed earlier, this test instrument will be administered individually by the researcher under normal daylight conditions. All visual stimuli will always appear upon a white board which will be approximately eighteen inches from the subject's eyes. At no time during this test will a colour term in either Hausa or English be referred to or used by the researcher. All testing will be done within the same time limitations mentioned in the discussion of the earlier test instruments.

The scoring of the instrument will be somewhat more complex than the previously discussed test instruments. As each item will be presented to the subject, he will be requested to select the one colour which he likes better than the others. The subject's responses to the 68 items will be noted and tallied at the end of the testing for each of the sixteen colours. This will result in sixteen scores, or, one number representing the frequency with which a colour will be chosen in the Colour Preference Test.

2. Secondary Sources: Literature comprises the secondary sources for this study. Two kinds of literature will be examined. The first kind will be literature dealing with colour and colour vision. Because this

section is concerned with an international approach to colour, relevant information on this aspect of colour and colour vision was compiled from scholarly books, journals, and periodicals which reflect the universality of colour and colour vision. Since this is a very wide field and all phases cannot be examined in a study of this nature, the selection of materials read will be confined to those dealing with the historical development of the study of colour and the various theories of colour vision.

The second kind of literature deals with colour perception amongst the Hausa people; little material appears available. As a result of this general limitation of literature on colour perception amongst the Hausa people and Nigeria as a whole, the survey of literature will be expanded to include those scholarly books, journals, and periodicals which reflect the universality of colour perception. Since this is an extremely wide field, the selection of materials will be primarily confined to those aspects of colour perception mentioned at the beginning of this discussion on research techniques and methodology, (colour matching colour naming and colour preference).

Analysis of Data

The responses will be collected from these four test instruments. This data will then be key punched onto approximately 500 computer cards by the researcher and analysed with the assistance of the computer, using the Statistical Package for the Social Sciences (Nie, et. al:1970).

Organization of the Study

This study is divided into four chapters:

Chapter I states the problem, delimits the area of study, and discusses the methods and techniques for the research.

Chapter II is derived mainly from literature on colour and colour perception. It surveys the development of colour science and research into the various aspects of colour perception which are of significance to this present study. The first part of the survey treats colour within the broader context of physics, psychophysics, and psychology. Considered in this section is the historical development of colour science and some of the more prominent theories of colour vision. The second part of Chapter II is devoted specifically to colour perception with emphasis on the three aspects of colour matching, colour naming, and colour preference. The aim of Chapter II is to familiarize the reader with the aspects of colour that are of relevance to the present study and to provide the necessary foundation for the interpretation of the findings collected for the study.

The purpose of Chapter III is to report the findings resulting from the four colour test instruments reviewed earlier. The first part of the report deals with a straight forward presentation of the results accompanied with numerous tables, for clarity. The second part of the report is devoted to the computer analysis of these results, terminating in a summary of the implications arising out of such analysis.

The concluding chapter, Chapter IV is devoted to

the review of the present study and its findings with particular emphasis on their implications to Art Education within the Teacher Training Colleges of Kaduna State, Nigeria.

CHAPTER II

COLOUR

Colour and shape are the chief properties that give objects their own individual characteristics. Of the two, colour is perhaps the less important to adults and older children, as far as recognition or categorization of the object is concerned (Granit, 1921; Brian and Goodenough, 1929; Kagan and Lemkin, 1961; Suchman and Trabasso, 1966). Colour, however, makes a unique contribution to the appearance of the object, imparting to it qualities that shape alone cannot give. Since colour is one of the basic contributors to visual characteristics, it is of central importance to Fine Art, as a visual discipline.

Three Approaches to Colour

Any attempt to arrive at a satisfactory definition of colour at once involves one in all the complexities of vision. It is only in recent years that a fairly clear concept has been gained of the various factors involved in the transition of radiant energy to the mental quality colour. Put another way, we can and do speak of the colour of a source (physical), the colour of an object (colour matching/psychophysics), and the colour of perception (psychological). There are, then, three sharp divisions of the subject:

1. Physics - Colour can be studied by means of the

more or less straight forward physics of the source of light and of such objects and substances which will modify this light. The properties and characteristics of this light can be measured and stated in terms that have nothing whatever to do with the eye. The physicist can state with certainty that the measurement of two beams of light are identical or he can state the degree to which they differ. Without passing outside the realm of the subject as defined here, he cannot state how the two beams of light will look. Physics, therefore, deals with the quality of light as such without reference to any observer.

2. Psychophysics - Colour can be studied through the means of the psychophysical evaluation of light. It is apparent that if we knew enough about the visual mechanism and restricted ourselves to sufficiently simple situations, it should be possible to calculate from the known physical properties of a given light beam the exact appearance that this would have to the observer. At present, however, psychophysics is limited to the relative evaluation of light beams with respect to normal observers under standardized conditions.

3. Psychology - To evaluate colour beyond the psychophysical stage, it is necessary to utilize the psychological approach. Perhaps the most general definition that can be given to the psychological approach to colour is the study of the relationship between the colour as calculated for the standard or normal observer and the colour actually perceived. It thus includes all the factors of attention, attitude, feeling, and so on that must be excluded from the psychophysical colour

evaluation processes. Essentially, it is the study of the effect on the observer produced by the conditions, as distinct from predictions based on the eye considered as a standardized mechanism. This aspect of colour is of special importance to the present study; therefore the latter part of this chapter will deal with colour perception.

In addition, to establish a clearcut concept of what colour evaluation means to each of the three divisions and just what each does and does not include, it is essential that the interrelation of the variables involved be clarified. This is necessary as the treatment of the concept of colour and the discussion surrounding it throughout this study will not be confined to one of these three divisions. A helpful attempt at explaining the interrelationship of the various variables involved has been compiled in the table of nomenclature from the report of the Optical Society of America and appears below.

Historical Development of Colour Science

There are various sources which treat the historical development of ideas regarding colour and colour vision in great detail (Halbertsma, 1949; Land, 1959); however, a complete survey of this area of colour science would extend far beyond the scope of this writing. The discussion will therefore restrict itself primarily to a few historical remarks which contribute to the understanding of colour science as related to this study.

Pre-Newtonean Era

Where does the history of colour vision begin? There is little doubt that the first representatives of homos sapiens were already in possession of colour sense. Coloured drawings found in caves and dating from the last Ice Age showed that at sometime prior to 15,000 years ago (Willet:1971:60), colour vision was already well developed; man represented the animals of his surroundings in natural colours, his possibilities being restricted, however, by the available paint colours. Extensive expansion in the colours of the artist's palette is shown in Egyptian and Sumerian art, but no literature is available showing that they were also interested in the disciplines of the origin of colour. As one might expect, the Greeks had a lively interest in colours and in the analyses of the way they came into being. Democritus distinguished four primary colours: white, black, red, and pale yellowish-green; all other colours were thought to be a mixture of these. Aristotle thought colour to be present in all objects and made recognizable by the effect of light. The different colours were thought to be mixtures of black and white, different either by their proportions or by their mutual positions (Bouma:1971:173).

Throughout the Middle Ages most of the learned men adhered to the Aristotelian views on colour as they did to his natural philosophy as a whole. In the Renaissance new ideas appeared. Goethe (ed. by Weimer:1964), who collected much of the literature of this time, makes reference to Leonardo Da Vinci and his explanation of the colours of the rainbow by refraction and reflection

TABLE IV Table of Nomenclature

Physics	Psychophysics	Psychology	
Visual Stimulus	Light	Visual Sensation	Visual Perception
Radiant energy Spectral composition	Luminous energy Colour	Colour sensation	
Characteristics of radiant energy:	Characteristics of light = colour	Attributes of colour sensation:	Corresponding modes of appearance:
Radiant flux (a) radiance (b) irradiance (c) radiant reflectance (d) radiant transmission	1. Luminous flux (a) luminance (b) illuminance (c) luminous reflectance (d) luminous transmittance	1. Brightness	Apperture (1 - 5) Illuminant (1 - 8) Illumination (1 - 3) Object modes: surface (1 - 11) volume (1 - 9)
Spectral distribution (Relative spectral composition, quality) Radiant purity	Chromaticity 2. Dominant wavelength (or complementary) 3. Purity	Chromaticness 2. Hue 3. Saturation	Attributes of modes of appearance: 1. Brightness (or lightness) 2. Hue 3. Saturation 4. Size 5. Shape 6. Location 7. Flicker 8. Sparkle 9. Transparency 10. Glossiness 11. Luster

Journal of Optical Society of America, Vol. 33, p. 552, 1943.

of the sunlight in the raindrops.

De Dominis (1564 - 1624) reported experiments with a three-sided prism, and concluded that colours result from the interaction of light and darkness; the amount of darkness increasing from red to blue. He also stated that colours are nothing but light itself, and in this way he may be said to be a direct forerunner of Newton. Others followed De Dominis, but the contributions they made appear less influential when compared with Newton's revolutionary ideas about colour.

Newtonean Era - Physical Colour

The history of modern colour science begins in 1766 (Colliers Encyclopedia:1966) when Newton (1642 - 1727) began his research into this subject. Newton reprint (1931) laid a firm and indispensible foundation for the physical understanding of colour phenomena when he split up sunlight with a prism into its monochromatic components. By analysis of sunlight, Newton proved that spectral colours are monochromatic, that is that they cannot be further resolved. By reconstruction of white light by additive mixing of all spectral colours, Newton also gave directions for the arrangement of the set of colours in the colour plane. He placed white in the centre of a circular diagram and the spectral colours around the perimeter. Since the colours within the circle represented the desaturated colours, the more desaturated a colour, the closer it lay to the centre of the diagram. Newton also realized that it was necessary to expand the 2-D circle into a 3-D colour cylinder in order to distinguish the different dimensions of colour solid - tints, and shades of the same hue. Although some

of Newtons pronouncements are no longer found to be true, the relative arrangement of colours to be found in his book Opticks, which was first printed in 1704 (Newton:1952, 4th. edition) has served the later ages for the construction of the whole edifice of the science of colour.

The Trichromatic Theory

The trichromatic theory is based primarily on the facts of colour matching. The simplest hypothesis which fits the facts of colour matching is that there are just three photosensitive pigments used for colour vision contained in three types of retinal cones (colour sensitive nerves). The cones may contain just one pigment each, or the three types may contain different mixtures of the three pigments. The modern trichromatic theory says no more than this.

Painters long before the Newtonian Era were aware that almost all hues could be produced by mixtures of the three paint pigments - red, blue, and yellow. Newton's early discovery of a continuous spectrum seemed to be contrary to the view that three colours of light, like paint, could be mixed in order to produce or match all other colours on the spectrum. This is not the case, however, as his colour wheel is based on the visual appearance resulting from the mixture of three coloured lights. Nevertheless, the ability to produce or match a coloured light by mixing three other coloured lights was never explained by Newton.

Thomas Young (1773 - 1829), a physician, physiologist, physicist, linguist, and Egyptologist was the first to put forward the hypothesis that colour vision is

based on the presence of three different light-sensitive organs. It was introduced in an almost casual manner in a sentence of a paper on the wave theory of light.

> "Now, as it is almost impossible to conceive each sensitive point of the retina to contain an infinite number of particles, each capable of vibrating in perfect unison with every possible undulation, it becomes necessary to suppose the number limited, for instance, to the three principal colours, red, yellow, and blue." (Marriott:1962:302)

Because of the misunderstanding of the difference in the primary colours for mixing of paint (red, yellow, and blue) and that of light (red, blue, and green) Young found it necessary later in life to modify his first statement.

> "In consequence of Dr. Wollaston's correction of the description of the prismatic spectrum, compared with these observations, it becomes necessary to modify the supposition that I advanced in the last Bakerian lecture respecting the proportions of the sympathetic fibres of the retina; substituting red, green, and violet, for red, yellow, and blue....." (Marriott:1962:302)

As can be expected, Young's statement of the trichromatic theory is, of course, in a very different form from the modern expositions or the hypothesis stated above. It is fair, however, to state both are in agreement with each other.

The trichromatic theory attracted little attention until it was adopted by Helmholtz (Southall, J.R.G.: 1962) in the mid-nineteenth century. For this reason, the theory is often referred to as the Young-Helmholtz theory (Kaufman, 1974). However, his theory of colour vision was much more involved and comprehensive than the simple trichromatic theory first put forward by Young.

As Helmholtz's trichromatic theory included in particular theories about contrast and the transmission of information from the receptors to the cortex, (which are still controversial today), it is proposed by Brinley (1957, 1960) that the trichromatic theory in its simplest form should be referred to as simply the Young Theory.

Helmholtz cleared up the confusion surrounding the difference in primary colours of paint pigment and the primary colours of light by explaining the important principle of additive light mixtures and subtractive paint pigment mixtures. Furthermore, he interpreted colour vision on the basis of three foveal mechanisms with different spectral sensitivities. Finally he explained the different forms of dichromatism, a partial colour blindness in which only two colours are perceptible since one of the mechanisms is lacking, and proposed sensitivity curves for the mechanisms.

In the latter part of the 1870's an alternative explanation of dichromatism was proposed by Fick (1899), as a result of his experimental findings. He postulated that instead of the absence, or insensitivity, of one mechanism, what actually occurred was a fusion of two mechanisms and thus a loss of the ability to discriminate colours.

In the last twenty years there has been much research into the various aspects of defective colour vision, the results of which support the trichromatic theory. Further experimental evidence for the theory can be found in Rushton's (1957, 1958, 1961) identification of foveal pigments and Stile's (1959) isolation

of the foveal mechanisms. Although these foveal mechanisms consist of more than the three proposed by earlier works they clearly fall into three groups. The trichromatic theory, as mentioned previously, is based primarily on the facts of colour-matching, and provides not only an explanation for defective colour vision, but a simple and convincing explanation of the trivariance of normal colour vision.

The Opponent-Colour Theory

About 1872 Hering (Marriott:1962:1313) put forward an "opponent-colour" theory based largely on psychological considerations and subjective descriptions of colour sensations. He observed that many colours appear to be mixtures of other colours. Thus, orange can be identified even by the naive observer as a mixture of red and yellow, and violet is apparently a mixture of red and blue. The colour yellow, however, is not an obvious mixture of red and green light, but appears rather to be a pure colour in its own right. This observation led Hering to suggest that there may be four primaries, red, green, blue, and yellow, rather than the usual three.

A second basis for Hering's theory is that no one has ever seen a greenish red or a yellowish blue. There are yellowish reds - namely, the oranges - and greenish blues, but no colours that are mixtures of red and green and of yellow and blue. This suggests that red and green receptors and yellow and blue receptors may work as opposed pairs. Thus, yellow stimulation may cancel out the effects of blue stimulation, and green stimulation may cancel the effects of red stimulation.

These considerations led Hering to postulate three retinal substances which respond to light opposite katabolic and anabolic reactions. Black and white comprise the first pair, red and green another pair, and yellow and blue a third pair. In the first case, the substance was broken down (katabolic action) by light and regenerated (anabolic action) by black. A second substance was broken down by red light and regenerated by green. The substance was neutral towards yellow, and unaffected by yellow or blue or mixtures of the two including white. The third substance was broken down by yellow light and regenerated by blue, and gave no response to green, white, and purple lights.

Rushton's (1958, 1961) recent results seem to rule out the Hering theory so far as the pigments and the cone response are concerned. Lowenstein and Sand (1936, 1940) and Granit (1955) conclude, however, that the possibility still remains of an opponent colour system existing in some part of the visual pathway. In their very informative introduction to their translation of Hering's Outlines of a Theory of the Light Sense, Hurvich and Jameson (Kaufman:1974:188) observe that the opponent process theory was disregarded for a long time. This neglect occurred as a result of a widely believed mistaken idea to the effect that the theory proposed the existence of photochemical substances possibly affected in two different ways by opposed colours. They note that Hering never tied his theory to such a photopigment and many criticisms of his position are really based upon faulty translation of his writings.

Zone Theories

Theories which attempt to give an account of a form of response at different stages of the visual pathway are known as zone or stage theories. Most of these theories postulate cone responses of the Young type, but Hering type responses at some higher stage of the visual pathway (Adams, 1923; Judd, 1949). Hurvich and Jameson's theory (1957) also belongs strictly to this group, (although they have not committed themselves dogmatically to the form of the Young-type initial response, or to the stage at which it is transformed into a Hering type response).

What is the evidence which seems to support the zone theory or stage theories of colour vision? Although there is no evidence of Hering type response from any nerve cell, Svaetichin and MacNichol (1958) obtained graded responses from the retinae of certain species of fish. Furthermore, they found the typical Hering red-green and yellow-blue pairs, with two maxima of opposite polarity. It is not yet clear from what retinal layer these recordings came, nor whether they are propogated in the visual pathway. The experiments do show, however, that (at least in certain species), there are qualitatively different responses to individual colours of the colour spectrum in some structure at the retinal level more central than the receptors themselves.

Further upstream in the nervous system in the lateral geniculate nucleus, evidence has been found of signs of the opponent process. DeValois and his coworkers (DeValois, 1960; DeValois, Abramov, and Jacobs, 1966; DeValois and Jacobs, 1968) investigated the

response characteristics of cells in the lateral geniculate nucleus of the macaque monkey. It would appear from their results that opponent mechanisms do exist in the primate visual system. Although their findings point to a greater degree of diversity than that of the simple opponent theory, the results do provide further physiological evidence for the existence of opponent mechanisms in colour vision.

Further Outlook

Artists will necessarily raise questions concerning the perception of colour. Do the physical laws surrounding colour and those theories of colour vision, whether based largely on the psychophysical or psychological approach to colour, answer these questions?

In a paper presented at the Luzern Colour Meeting in 1965, Ewing (1965) states that a gap still does exist between what we know as fact and what actually occurs - a gap that is unlikely to be filled.

> "Because of the simplicity of measuring the spectrum, there is a lot of wishful thinking that encourages the colorimetrist in attempts to correlate tri-stimulus values with colour perception. While admitting that colour is a subjective sensation, he still goes on measuring the rainbow". (p.1)

To the physicist, the major problem will remain in the relations between the various stimuli in terms of wavelength and radiant energy, and the sensations evoked - a problem which appears to be coming to a solution if it is restricted to certain standardized, simple viewing conditions.

However, Ewing argues that there is a need for extending the physical relations between stimuli and

sensations to a more realistic viewing condition, as was done by Land (1960). This extension would enable the physicist to avoid the criticism of having lost sight of the relevance of his conclusions. Even if this trend were to gain momentum, the artist, most likely, would still find himself dissatisfied. The artist's ultimate interest is in the emotions aroused by relations between colours, an activity not included in the study of the physical aspects of colour.

Knowledge of perception, then, is of importance to the teaching of Fine Art. In his article "Perception and the Visual Arts", James Wise (1970:19) speaks to this point when he says, "Without perception there is no art. A work of art is an organized array of sensory stimuli; if, therefore, the senses are not stimulated, then the true work of art does not exist for the observer". Since the researcher is primarily concerned with colour as it affects the artists, the latter part of this chapter, as stated earlier in the discussion, will deal with the various aspects of colour perception which are specifically related to this study.

Research in Various Aspects of Colour Perception

Colour Preference

Colour perception is often associated with feelings of pleasure or displeasure (Vernon:1962:67). Most people have preference for certain colours rather than for others. Eysenck's (1941:385) research into the preference of colour among western peoples resulted in his finding an 'unequivocal' constant of the following

preference order: blue, red, green, purple, orange, and yellow. While there was considerable difference in preference, as some people seemed to prefer heavily saturated colours and still others less saturated colours, a majority of subjects felt the immediate colour less pleasant than pure colours.

Kouwer (1949) points out in his book entitled Colours and Their Character that particular colours may give rise to particular emotional reactions: red to excitement or anger, blue to calm pleasure, black and grey to sadness or depression. It can be asked, however, whether these emotional reactions are really spontaneous or whether they are symbolically associated through cultural traditions. If the latter is actually the case, then an attempt to arrive at a universal theory of emotional reactions or response to particular colours is unjustified.

Colour appeals strongly to children. Children's response to colour has been researched in many places of the world. To the deaf American child, colour is preferred to shape throughout the primary school years (Doehring:1960; Suchman:1966). For normal children, however, studies in colour and shape preference amongst American children (Brian and Goodenough:1929; Suchman and Trabasso:1966), French children (Descoudres:1914), and German children (Katz:1913) all show a developmental sequence from colour to shape. Children clearly ceased choosing colour and selected shape, after kindergarten age, and continued so into adulthood.

An investigation which is of great interest to this study was carried out by Suchman (1966) amongst Hausa

Koranic school children in Zaria, Nigeria. He reports a clear preference for colour to that of shape existing into adolescence. Can this finding and the ones mentioned above complement each other? Suchman argues that such dichotomous findings require a rethinking of the developmental theory as stated below:

> "... in terms of developmental theory, it is clear that the concept of universal maturational process in perceptual colour-form preference must be modified, if not abandoned... The concept of normal either must include the society of Zaria, Nigeria, or force the absurd stance that the Euro-American culture is the standard for normal development". (1966:7)

Suchman, therefore, suggests that it is necessary to rethink the maturation process in perceptual colour-form preference. It is also possible that colour preference and emotional responses of Hausa Students are not unequivocally constant nor individualistic and spontaneous as proposed by Eysenck and Kouwer's early research, but are rather symbolically associated through cultural traditions. This suggestion is contrary to both Eysenck's and Kouwer's unequivocal constant of colour preference and spontanious individualistic reaction to colour. Thus there is a very real need for further research into the factors affecting the Hausa students' order of colour preference.

Colour Naming

As early as 1935, Benjam Whorf (Kimball and Dale: 1972) was developing the theory of linguistic relativity. Certain aspects of different cultures are expressed in more linguistic detail. Whorf suggested that the structure of the language determines the ability to perceive

colour. Since then, considerable research in support and in opposition to this theory have been carried out.

In the past two decades, numerous studies on language and its affect on colour perception have been undertaken throughout the world (Dale:1968; Anderson: 1967; Harris:1966). Although these studies have resolved a number of the problems surrounding Whorf's earlier work, there are still many questions which are left unresolved. In general, there has been little evidence which conclusively supports the Whorfian hypothesis or its several interpretations. McNeil, Kimball and Dale, 1972 have described three possible versions of the Whorfian hypothesis.

1. The 'strong version' states that the categories and structures of language determine thought and that this causal relationship is not dependent upon the production of language by the individual.

2. The 'weak version' of the Whorfian hypothesis differs from the 'strong' in both point of influence and in the role of language production. According to the weak version, language can influence perception, but only when the relevant linguistic labels are actually produced.

3. The 'weakest version' holds that, if information is to be stored overtime, it is stored via a linguistic code. Depending on which of the three versions one favours, language touches cognition at one of three points - thought, perception, or memory.

Since most of the evidence for the strong version can be found in Lenneberg's (1967) anecdotal report, this version has met considerable opposition by more

recent studies. Greenfield, Reich, and Oliver (1966) found that the absence of a word to express the concept does not necessarily mean the individuals in the society are unable to use the concept. For example, they noted that while Wolof children have very few colour words, 'this fact does not stop monolingual Wolof children from relying almost exclusively upon colour words in the formation of equivalent groupings' (p. 301). Price Williams (1962) noted that although a word for domestic animals is not present in the Tiv (Nigerian) language, the children utilized the concept during the experiment of grouping different plastic models of animals.

Evidence for the 'weak version' has recently come under attack for the reason that it has been somewhat ambiguous (Carrol and Casagraude, 1958 and Lenneberg, 1953).

A relatively recent study by V. Harris (1966), who investigated the effect of language on colour perception amongst urban and rural Zulu children and adults, questions the use of the word 'relevant' and thus this version of the Whorfian theory. She noted that the word 'red' in the Zulu language is used to denote all the colours from dark brown through to yellow. Although the initial response to each card was 'red', at further questioning, the children discriminated the colours through association. (e.g. "This is the colour of my father's largest cow".)Harris concluded that the classification of colour is made according to cultural demands.

In a cross-cultural study done amongst college students in India and in the United States on language and

colour perception, Ludwig (et al.:1972) found very little supportive evidence for the 'weak version' of the Whorfian theory.

The majority of the more recent studies are clearly in support of the 'weakest version'. Brown and Lenneberg (1954) found that codability of a colour was related to recognition accuracy for adults. Using communication accuracy as a measure of ability to name colours, Lantz and Streffle (1964) found a positive relationship between communication accuracy and recognition accuracy with adult subjects. Lantz and Lenneberg (1966), in an experiment with six-year-old deaf children and children who could hear, found that deaf children did significantly worse on a recognition test. With pre-school children as their subjects, Kinbell and Dale (1972) found that recognition accuracy was significantly related to the children's ability to name colours, indicating still further support for the weakest version of the hypothesis - the relationship between verbal labeling and memory.

One would hope that the shift of support from the 'strong version' of the Whorfian theory to the 'weakest' may be as a result of increased applied skills in research or it could possibly be as a result of a change in the various researcher's approach from a subjective to a more objective nature. This is only speculation, as at the time of this writing, the researcher found very little research literature as supportive evidence. There is a very real need for further research in these versions of the Whorfian Theory within Nigeria, because the information that presently exists deals primarily

with countries other than Nigeria.

The Development of Colour Names and Matching:

Until recently, colour space was considered a uniform domain which language could 'cut up' arbitrarily into colour name categories as was done in the study by Stefflre, Castillo, Vales, and Morely (1966) in the Yucatan. There is evidence which appears to support the existence of universal aspects of colour categorization. Berlin and Kay's (1969) tests in the United States with adult subjects resulted in their finding that subjects from many different languages chose the same areas of colour space from an array of Munsell colour chips when asked to indicate the best examples of colour terms, 'focal points'. It is implied from Berlin and Kay's work that colour terms have the same 'core meaning' across languages. This would explain why they were led to postulate that the previous anthropological emphasis on cross cultural differences in colour names was derived from looking only at the 'boundaries' of colour names - a more variable aspect of categorization than the 'focal points' or 'core meanings'.

Heider's (1971) study with pre-school children further supports the work of Berlin and Kay in that it demonstrated that, as a whole, focal colour areas are more perceptually salient for young children and more likely to be used to represent the basic colour name than were other areas of the colour space. Neither study, however, is able to establish strong evidence in support of Berlin and Kay's hypothesis that colour terms in all languages evolved in the following fixed order: (a) red, (b) yellow-green, (c) blue, (d) brown

and (e) pink-orange-violet (p. 454).

Due to their experiment being delimited to only the primary colours, Anyan and Quillan's (1971) results shed very little light on the linguistic evolution hypothesis but does point to a difference in ability to name colours among the sexes. Using a sample of 605 pre-school children who were attending the Pediatric Clinic at Martin Army Hospital, Connecticut, U.S.A., they found that girls at all age levels named the primary colours equally well, while the boys named red and blue more often than yellow. Girls named yellow more accurately than did boys at ages 4 - 5 years, and all three colours more successfully than did boys at ages 5 - 6 years. The colour naming abilities of boys and girls were similar in the fourth year, began to diverge in the fifth year, became strikingly different in the sixth year, and did not vary in the seventh year. Anyan and Quillan were not able to identify the factors which determined the greater success maintained by the girl subjects.

One may conclude from these related studies that subjects of the present study (T.T.C. Hausa students) would perform with a higher degree of accuracy on those items in the Colour Naming Test instruments which may be regarded as having a 'core Meaning' or representing 'focal points'. It does not, however, eliminate the possibility of the existence of yet other 'focal points'. A high rate of accuracy on a Colour Naming item of the test instruments other than the eight mentioned by Berlin and Kay's investigation might possibly be due to the existence of more 'core meanings' than proposed by them.

Yet another interesting point that has not been answered by these investigations is the question of whether it is necessary to be able to match colours correctly before being able to name them correctly. A correlation of these two performances is needed to answer such a question. This study intends to do specifically this.

Finally, the study of Anyan and Quillan would further lead one to speculate that female students would out-perform male students. However, there are not the necessary controls existing within this study to allow one to undertake a comparative study of this nature with a sufficiently high degree of confidence.

Colour Naming in Monolinguals Versus Bilinguals:

Do the T.T.C. students possess an advantage by being bilingual when it comes to naming colours? Dalrymple and Alford (1968) claimed that no differences in Colour Naming time would appear for the bilingual between the conditions when Colour Naming and interference were in the same language and when they differed. In fact, they suggested that:

> ".... the distinction between bilingual's languages is a formal linguistic one and that from a psycholinguistic standpoint he should be considered as possessing a single linguistic system (p. 215)".

In spite of their postulation, there is no conclusive evidence in support of this point. At the risk of over-simplifying their results, Preston and Lamber (1969) concluded from their experiments that bilinguals experience a greater degree of interference than monolinguals if colour labels in the field of stimuli are mixed.

Although this study does not intend to investigate the difference between monolingual and bilingual Hausa T.T.C. students (as this would be impossible since English is the medium of instruction), it is important for this study that the test instruments present the colour stimuli in only one language at a time in hopes of obtaining results which more accurately reflect the students' ability.

Maturation as a Factor in Colour Discriminating Ability

It is plausable to regard Colour Matching as a form of colour discrimination as the subject must first discriminate against the distracting stimuli in the field to allow him to select the correctly matching stimuli.

Using kindergarteners, fifth graders, high school sophomores, parents, and master artists, Gaines and Little (1975) tested their subjects' ability to discriminate one unique colour from five visual stimuli. This research which was carried out in California, U.S.A. resulted in evidence which clearly supported the hypothesis that error in hue discrimination is a function of age (p. 485). Although Gaine's (1975) earlier study showed that master artists did excell in most perceptual skills in comparison with upper middle-class adults, there was no significant difference in surface colour perception. These results might allow one to postulate that a difference in performance ability between Form I, Form III, and Form V will exist on the Colour Matching and Colour Naming Test instruments. There is still a need for further research into this area of colour perception ability to establish whether such results are really a factor of exposure.

Conclusion

In concluding this section pertaining to colour, the researcher considers it necessary to re-emphasize what has already been mentioned on page 46. There is a very real need to investigate perception of colour from the standpoint of Fine Art education, as is obvious from numerous questions left unresolved by the existing literature. This investigation must be done while striking a delicate balance between the subjectivism of an 'artist' and the objectivism of a 'scientist'. Platt (1968) sums up the approach to this research into colour perception in his article "The Two Faces of Perception":

> "Such over-subjectivism is as serious an error as over-objectivism. Perception stands on two legs, the subjective and the objective, and needs them both. We need to not only be human but whole; not only contemplators but doers" (p. 19).

CHAPTER III

COLOUR MATCHING, COLOUR NAMING, AND COLOUR PREFERENCE TESTS - RESULTS AND ANALYSIS

As mentioned earlier in this work, the data for this aspect of the study is as a result of the administration of four test instruments to 144 Hausa subjects from Form I, Form III, and Form V in four Teacher Training Colleges within Kaduna State, Nigeria. Computer analysis was used extensively for the statistical techniques of this data. Whenever possible, the Statistical Package for the Social Sciences (Nie, et al:1970) was utilized to save programming time. The remaining portion of this chapter will be comprised of the results, the computer analysis, and the findings arising from these calculations.

Results

Group I - Colour Matching Test (C.M.T.)

The raw scores (see appendix) of this test instrument are assumed to be representative of the Hausa T.T.C. student's ability to match colours. The mean score and standard deviation on the Colour Matching Test for Form I, Form III, and Form V, and the total sample were found to be 14.85, S.D. 2.85, 15.46, S.D. 1.68, 15.10, S.D. 2.84, and 15.14, S.D. 2.51 respectively.

From the raw scores appearing in the appendix, the researcher has tabulated the frequency of correct

responses given for each of the sixteen Colour Matching items, and presented them in Table VI. This has been done for each of the four institutions according to form level. Utilizing the figures appearing in each of the form's respective total columns, it is possible to rank the colour matching items in order of difficulty. This has been done below for each of the three forms, with the easiest (or most frequently correct) item being first, while the most difficult (or least frequently correct) item appearing sixteenth.

TABLE V COLOUR MATCHING TEST

Ranking of Colours Most Frequently Matched Correctly

	Form I	Form III	Form V
1.	violet	brown	red
2.	green	red-violet	blue-green
3.	orange	green	green
4.	yellow-green	orange	orange
5.	red	red	black
6.	brown	black	red-violet
7.	black	yellow	grey
8.	yellow	grey	brown
9.	yellow-orange	violet	yellow-orange
10.	white	yellow-orange	yellow
11.	blue-violet	yellow-green	red-orange
12.	red-violet	white	violet
13.	grey	blue	yellow-green
14.	blue-green	blue-green	white
15.	blue	blue-violet	blue-violet
16.	red-orange	red-orange	blue

TABLE VI Colour Matching - Frequency of Correct Responses on Each Item by Form I, III, V and Total Sample

	Form I					Form III					Form V					
	A	B	C	D	TOT	A	B	C	D	TOT	A	B	C	D	TOT	Grand Total
Number of Students	12	12	12	12	48	12	12	12	12	48	12	12	12	12	48	144
Red	12	12	11	10	45	12	12	12	11	47	12	12	12	11	47	139
Yellow	12	12	11	10	45	12	12	12	11	47	10	12	12	11	45	137
Blue	12	10	10	9	41	11	12	11	12	46	10	11	12	11	44	131
Green	11	12	11	12	46	12	12	12	11	47	10	12	12	12	46	139
Orange	12	12	10	12	46	12	12	12	11	47	11	12	12	11	46	139
Violet	11	12	12	12	47	12	12	11	11	46	10	11	12	11	44	137
Red-Violet	12	11	10	11	44	12	12	12	12	48	11	12	12	11	46	138
Red-Orange	9	11	10	10	40	11	10	12	11	44	10	12	12	11	45	129
Yellow-Orange	11	12	11	11	45	12	12	11	11	46	11	12	12	11	46	137
Yellow-Green	12	12	10	12	46	12	12	11	11	46	11	10	12	11	44	136
Blue-Green	12	11	11	10	44	12	11	12	10	45	12	11	12	12	47	136
Blue-Violet	12	12	10	11	45	12	12	12	9	45	11	9	12	12	44	134
White	12	12	10	11	45	12	12	11	11	46	11	11	12	10	44	135
Grey	10	12	10	12	44	12	12	12	11	47	11	12	12	11	46	137
Black	12	12	10	11	45	12	12	12	11	47	11	12	12	11	46	138
Brown	12	12	10	11	45	12	12	12	12	48	11	11	12	11	45	138
Total	184	187	167	175	713	190	189	187	176	742	173	182	192	178	725	2180

A - W.T.C., Zaria, B - W.T.C., Kaduna, C - Kaduna T.T.C., D - Basawa T.T.C.

In the situation of two or more of the Colour Matching Test items receiving the same number of correct responses, it was necessary to refer to the ranked order (Grand total column) to establish the order of rank.

Group II - Colour Naming Test - Hausa (C.N.T.H.)

The raw scores (see appendix) on this test instrument, like the C.M.T. are assumed to be representative of the Hausa T.T.C. student's ability to identify colours for this test for Form I, Form III, Form V, and the total sample were found to be 10.31, S.D. 2.44, 11.02, S.D. 1.84, 12.21, S.D. 2.21, and 11.18, S.D. 2.30 respectively.

In Table VIII, the researcher has tabulated the frequency of correct responses to each of the Colour Naming Hausa items from the raw scores and presented them in the same fashion as was done in Table VI. Utilizing the same procedures as in Table VI, the Colour Naming Test - Hausa items were ranked in order of difficulty. The easiest (or most frequently correct) item being first, while the most difficult (or least frequently correct) item appears sixteenth. This is done for each of the three Forms below.

TABLE VII COLOUR NAMING TEST - HAUSA

Ranking of Colours Most Frequently Labeled Correctly

	Form I		Form III		Form V
1.	white	1.	black	1.	black
2.	black	2.	grey	2.	grey
3.	grey	3.	white	3.	white
4.	brown	4.	brown	4.	brown

5. red	5. red-violet	5. yellow-orange
6. red-violet	6. blue-violet	6. red-violet
7. yellow-orange	7. blue	7. blue-green
8. violet	8. yellow-orange	8. blue
9. blue	9. red	9. violet
10. orange	10. violet	10. blue-violet
11. red-orange	11. blue-green	11. red
12. blue-green	12. yellow	12. yellow
13. yellow	13. yellow-green	13. green
14. yellow-green	14. orange	14. orange
15. blue-violet	15. green	15. red-orange
16. green	16. red-orange	16. yellow-green

To establish the internal validity for this test and the Colour Naming Test - English, the researcher experimented with the order of presentation of these two instruments under controlled conditions to test for the learning effect they had on each other. This was done by randomly selecting six (Group X) of the twelve subjects from each Form of each of the institutions participating in this study. The remaining subjects constituted Group Y. Group X, consisting of a total of 72 subjects was then administered the Colour Naming Test - Hausa first, followed by the Colour Naming Test - English. Group Y, which also consisted of 72 subjects, underwent the same test instruments, except that they were administered in reverse order. The results of this portion of the experiment can be seen in Tables IX - a, IX - b, and IX - c. Within these three tables, the researcher has tabulated the frequency of correct responses given for each of the sixteen

TABLE VIII Colour Naming Test - Hausa - Frequency of Correct Responses by Form I, III, V and Total Sample

	Form I					Form III					Form V					
	A	B	C	D	TOT	A	B	C	D	TOT	A	B	C	D	TOT	Grand Total
Number of Students	12	12	12	12	48	12	12	12	12	48	12	12	12	12	48	144
Red	8	11	9	11	39	9	6	11	7	33	6	6	9	11	32	104
Yellow	8	4	5	6	23	9	6	7	6	28	8	10	7	7	32	83
Blue	6	10	6	7	29	10	8	9	8	35	9	11	11	6	37	101
Green	4	4	5	7	20	8	4	7	4	23	7	11	5	8	31	74
Orange	7	8	8	6	29	5	5	7	6	23	8	5	9	7	29	81
Violet	9	9	5	8	31	9	10	5	9	33	8	12	10	6	36	100
Red-Violet	11	9	9	6	35	9	10	9	9	37	8	11	10	11	40	112
Red-Orange	8	11	5	4	28	8	1	7	6	22	8	7	6	8	29	79
Yellow-Orange	9	8	9	7	33	10	5	9	9	33	12	12	9	8	41	107
Yellow-Green	7	5	8	3	23	7	9	3	7	26	7	8	7	5	27	76
Blue-Green	8	8	5	6	27	7	10	7	9	33	8	11	11	10	40	100
Blue-Violet	6	6	8	2	22	8	8	9	11	36	8	10	10	8	36	94
White	12	12	12	12	48	12	11	11	12	46	12	11	12	12	47	141
Grey	11	11	12	11	45	12	12	11	12	47	12	12	12	12	48	140
Black	12	12	12	11	47	12	12	12	12	48	12	12	12	12	48	143
Brown	12	12	11	8	43	12	11	11	11	45	11	12	12	12	47	135
Total	138	140	129	115	522	147	128	135	138	548	144	161	152	142	599	1669

A - W.T.C., Zaria, B - W.T.C., Kaduna, C - Kaduna T.T.C., D - Basawa T.T.C.

TABLE IX - (a)

Colour Naming Test - Hausa
Frequency of Correct Responses for Each Test Item by Form I, Groups X and Y

	Group X, C.N.T.H. taken first followed by C.N.T.E.					Group Y, C.N.T.E. taken first followed by CN.T.H.					
	A	B	C	D	TOT	A	B	C	D	TOT	Grand Total
Number of Students	6	6	6	6	24	6	6	6	6	24	48
Red	5	6	5	5	21	3	5	4	6	18	39
Yellow	4	2	1	3	10	4	2	4	3	13	23
Blue	3	6	3	3	15	3	4	3	4	14	29
Green	3	1	2	4	10	1	3	3	3	10	20
Orange	4	5	4	2	15	3	3	4	4	14	29
Violet	5	5	3	5	18	4	4	2	3	13	31
Red-Violet	6	4	4	4	18	5	5	5	2	17	35
Red-Orange	5	5	2	2	14	3	6	3	2	14	28
Yellow-Orange	5	3	5	4	17	4	5	4	3	16	33
Yellow-Green	5	1	3	2	11	2	4	5	1	12	23
Blue-Green	3	4	3	4	14	5	4	2	2	13	27
Blue-Violet	2	2	5	2	11	4	4	3	0	11	22
White	6	6	6	6	24	6	6	6	6	24	48
Grey	6	5	6	6	23	5	6	6	5	22	45
Black	6	6	6	6	24	6	6	6	5	23	47
Brown	6	6	6	5	23	6	6	5	3	20	43
TOTAL	74	67	64	63	268	64	73	65	52	254	522

A - W.T.C., Zaria, B - W.T.C., Kaduna, C - Kaduna T.T.C., D - Basawa T.T.C.

TABLE IX - (b)

Colour Naming Test - Hausa
Frequency of Correct Responses for Each Test Item by
Form III, Groups X and Y

	Group X, C.N.T.H. taken first followed by C.N.T.E.					Group Y, C.N.T.E. taken first followed by C.N.T.H.					
	A	B	C	D	TOT	A	B	C	D	TOT	Grand Total
Number of Students	6	6	6	6	24	6	6	6	6	24	48
Red	3	4	6	3	16	6	2	5	4	17	33
Yellow	4	2	4	3	13	5	4	3	3	15	28
Blue	4	3	5	3	15	6	5	4	5	20	35
Green	5	2	4	1	12	3	2	3	3	11	23
Orange	2	1	4	4	11	3	4	3	2	12	23
Violet	4	5	3	4	16	5	5	2	5	17	33
Red-Violet	4	5	4	4	17	5	5	5	5	20	37
Red-Orange	4	1	3	2	10	4	0	4	4	12	22
Yellow-Orange	4	3	5	4	16	6	2	4	5	17	33
Yellow-Green	3	5	1	4	13	4	4	2	3	13	26
Blue-Green	2	5	4	5	16	5	5	3	4	17	33
Blue-Violet	4	4	4	5	17	4	4	5	6	19	36
White	6	5	6	6	23	6	6	5	6	23	46
Grey	6	6	6	6	24	6	6	5	6	23	47
Black	6	6	6	6	24	6	6	6	6	24	48
Brown	6	5	6	5	22	6	6	5	6	23	45
TOTAL	67	65	71	65	268	80	66	64	73	283	551

A - W.T.C., Zaria. B - W.T.C., Kaduna, C - Kaduna T.T.C.,
D - Basawa T.T.C.

TABLE IX - (c)

Colour Naming Test - Hausa
Frequency of Correct Responses for Each Test Item by
Form V, Groups X and Y

	Group X, C.N.T.H. taken first followed by C.N.T.E.					Group Y, C.N.T.E. taken first followed by C.N.T.H.					
	A	B	C	D	TOT	A	B	C	D	TOT	Grand Total
Number of Students	6	6	6	6	24	6	6	6	6	24	48
Red	1	4	5	5	15	5	2	4	6	17	32
Yellow	4	4	4	4	16	4	6	3	3	16	32
Blue	3	6	5	4	18	6	5	6	2	19	37
Green	3	5	2	4	14	4	6	3	4	17	31
Orange	4	2	4	4	14	4	3	5	3	15	29
Violet	3	6	6	3	18	5	6	4	3	18	36
Red-Violet	2	5	4	5	16	6	6	6	6	24	40
Red-Orange	3	2	2	4	11	5	5	4	4	18	29
Yellow-Orange	6	6	4	5	21	6	6	5	3	20	41
Yellow-Green	4	2	3	2	11	3	6	4	3	16	27
Blue-Green	5	6	6	5	22	3	5	5	5	18	40
Blue-Violet	4	6	4	3	17	4	4	6	5	19	36
White	6	5	6	6	23	6	6	6	6	24	47
Grey	6	6	6	6	24	6	6	6	6	24	48
Black	6	6	6	6	24	6	6	6	6	24	48
Brown	5	6	6	6	23	6	6	6	6	24	47
TOTAL	65	77	73	72	287	79	84	79	71	313	600

A - W.T.C., Zaria, B - W.T.C., Kaduna, C - Kaduna T.T.C.,
D - Basawa T.T.C.

Hausa Colour Naming items. These frequencies are shown for the subjects in both Group X and Group Y. This is presented for each of the four institutions according to form level.

The mean and standard deviation for Group X and Group Y by their various form levels can be seen below.

	Form I		Form III		Form V	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Group X	10.50	2.98	10.45	1.69	11.96	2.42
Group Y	10.12	1.63	11.17	1.96	12.08	2.11

Group II - Colour Naming Test - English (C.N.T.E.)

Just as in the earlier test instruments, it was assumed that the raw scores on the Colour Naming Test - English are representative of the Hausa T.T.C. student's ability to identify colour hues by English colour names. The mean and standard deviation for Form I, III, V, and the total sample were found to be 10.88, S.D. 2.15, 11.42, S.D. 2.17, 12.48, S.D. 2.15, and 11.59, S.D. 2.25 respectively.

In Table XI, the researcher has combined the frequency of correct responses to each of the Colour Naming Test - English items and presented them in the same fashion as was done in Table VI and Table VIII. Utilizing the same procedures as in these tables, the Colour Naming Test - English items were ranked in order of difficulty, the easiest (or most frequently correct) to the most difficult (or least frequently correct) item, for each of the three forms (as is done below).

As a continuation of testing the learning effect caused by the order of presentation of the two tests, the subjects in Group X were given the Colour Naming

TABLE X Colour Naming Test - English
Ranking of Colours Most Frequently Labeled Correctly

	Form I	Form III	Form V
1.	black	yellow	green
2.	white	black	black
3.	yellow	white	yellow
4.	green	green	white
5.	brown	brown	brown
6.	yellow-orange	grey	grey
7.	grey	blue-green	yellow-orange
8.	blue	yellow-orange	yellow-green
9.	red	yellow-green	orange
10.	violet	orange	blue-green
11.	yellow-green	red-violet	blue
12.	orange	blue	red
13.	red-violet	red	red-orange
14.	blue-green	violet	red-violet
15.	blue-violet	red-orange	violet
16.	red-orange	blue-violet	blue-violet

Test - English after having previously undergone the Colour Naming Test - Hausa. Group Y was administered the Colour Naming Test - English first, followed by the Colour Naming Test - Hausa. The results of this second portion of the experiment can be found in TablesXII (a), XII(b), and XII (c). In these three tables, the researcher has tabulated the frequency of correct responses given by the subjects in both Group X and Group Y for each of the sixteen English Colour Naming items. This is

TABLE XI Colour Naming Test - English - Frequency of Correct Responses by Form I, III, V and Total Sample

	Form I					Form III					Form V					
	A	B	C	D	TOT	A	B	C	D	TOT	A	B	C	D	TOT	Grand Total
Number of Students	12	12	12	12	48	12	12	12	12	48	12	12	12	12	48	144
Red	8	6	9	7	30	4	7	8	5	24	10	6	9	6	31	85
Yellow	11	12	10	11	44	12	12	12	12	48	12	11	12	12	47	139
Blue	9	10	7	5	31	5	8	6	6	25	9	11	7	6	33	89
Green	11	12	10	11	44	12	10	11	12	45	12	12	12	12	48	137
Orange	9	7	7	2	25	9	11	6	3	29	10	11	7	11	39	93
Violet	8	7	7	5	27	4	8	5	3	20	6	4	9	2	21	68
Red-Violet	8	3	5	6	22	7	8	7	7	29	3	6	10	3	22	73
Red-Orange	6	1	6	0	13	4	3	5	1	13	8	7	8	4	27	53
Yellow-Orange	8	9	12	7	36	12	9	9	9	39	9	11	11	11	42	117
Yellow-Green	8	5	7	5	25	8	7	8	8	31	10	11	10	9	40	96
Blue-Green	3	5	6	4	18	11	11	10	8	40	8	10	8	12	38	96
Blue-Violet	5	3	2	4	14	1	5	0	0	6	4	6	4	1	15	35
White	12	11	11	11	45	12	12	11	12	47	12	11	12	12	47	139
Grey	11	7	8	8	34	12	11	9	11	43	10	11	12	12	45	122
Black	12	11	12	11	46	12	12	11	12	47	12	11	12	12	47	140
Brown	11	10	9	11	41	11	10	10	12	43	12	12	12	11	47	131
TOTAL	140	119	128	108	495	136	144	128	121	529	147	151	155	133	586	1610

A - W.T.C., Zaria, B - W.T.C., Kaduna, C - Kaduna T.T.C., D - Basawa T.T.C.

TABLE XII - (a)

Colour Naming Test - English
Frequency of Correct Responses for Each Test Item by
Form I, Groups X and Y

	Group X, C.N.T.H. taken first followed by C.N.T.E.					Group Y, C.N.T.E. taken first followed by C.N.T.H.					Grand Total
	A	B	C	D	TOT	A	B	C	D	TOT	
Number of Students	6	6	6	6	24	6	6	6	6	24	48
Red	4	3	4	3	14	4	3	5	4	16	30
Yellow	6	6	5	5	22	5	6	5	6	22	44
Blue	5	5	2	1	13	4	5	5	4	18	31
Green	6	6	6	5	23	5	6	4	6	21	44
Orange	6	3	3	0	12	3	4	4	2	13	25
Violet	5	4	4	2	15	3	3	3	3	12	27
Red-Violet	6	3	3	3	15	2	0	2	3	7	22
Red-Orange	4	1	3	0	8	2	0	3	0	5	13
Yellow-Orange	5	3	6	5	19	3	6	6	2	17	36
Yellow-Green	5	1	4	3	13	3	4	3	2	12	25
Blue-Green	2	2	3	1	8	1	3	3	3	10	18
Blue-Violet	4	1	2	1	8	1	2	0	3	6	14
White	6	5	6	6	23	6	6	5	5	22	45
Grey	5	2	5	4	16	6	5	3	4	18	34
Black	6	5	6	5	22	6	6	6	6	24	46
Brown	6	4	5	6	21	5	6	4	5	20	41
TOTAL	81	54	67	50	252	59	65	61	58	[illegible]	495

A - W.T.C., Zaria, B - W.T.C., Kaduna, C - Kaduna T.T.C.,
D - Basawa T.T.C.

TABLE XII - (b)

Colour Naming Test - English
Frequency of Correct Responses for Each Test Item by Form III, Groups X and Y

	Group X, C.N.T.H. taken first followed by C.N.T.E.					Group Y, C.N.T.E. taken first followed by C.N.T.H.					
	A	B	C	D	TOT	A	B	C	D	TOT	Grand Total
Number of Students	6	6	6	6	24	6	6	6	6	24	48
Red	1	3	5	2	11	3	4	3	3	13	24
Yellow	6	6	6	6	24	6	6	6	6	24	48
Blue	2	2	2	3	9	3	6	4	3	16	25
Green	6	5	5	6	22	6	5	6	6	23	45
Orange	4	6	3	1	14	5	5	3	2	15	29
Violet	2	4	2	1	9	2	4	3	2	11	20
Red-Violet	5	4	4	4	17	2	4	3	3	12	29
Red-Orange	2	1	3	0	6	2	2	2	1	7	13
Yellow-Orange	6	5	5	4	20	6	4	4	5	19	39
Yellow-Green	4	4	4	4	16	4	3	4	4	15	31
Blue-Green	5	6	4	5	20	6	5	6	3	20	40
Blue-Violet	0	3	0	0	3	1	2	0	0	3	6
White	6	6	6	6	24	6	6	5	6	23	47
Grey	6	6	3	5	20	6	5	6	6	23	43
Black	6	6	5	6	23	6	6	6	6	24	47
Brown	6	6	5	6	23	5	4	5	6	20	43
TOTAL	67	73	62	59	261	69	71	66	62	268	529

A - W.T.C., Zaria, B - W.T.C., Kaduna, C - Kaduna T.T.C., D - Basawa T.T.C.

TABLE XII - (c)

Colour Naming Test - English
Frequency of Correct Responses for Each Test Item by Form V, Groups X and Y

	Group X, C.N.T.H. taken first followed by C.N.T.E.					Group Y, C.N.T.E. taken first followed by C.N.T.H.					
	A	B	C	D	TOT	A	B	C	D	TOT	Grand Total
Number of Students	6	6	6	6	24	6	6	6	6	24	48
Red	4	3	4	3	14	6	3	5	3	17	31
Yellow	6	6	6	6	24	6	5	6	6	23	47
Blue	5	6	3	3	17	4	5	4	3	16	33
Green	6	6	6	6	24	6	6	6	6	24	48
Orange	6	6	4	5	21	4	5	3	6	18	39
Violet	3	3	5	1	12	3	1	4	1	9	21
Red-Violet	0	6	5	2	13	3	0	5	1	9	22
Red-Orange	3	5	3	1	12	5	2	5	3	15	27
Yellow-Orange	4	6	6	5	21	5	5	5	6	21	42
Yellow-Green	4	6	5	5	20	6	5	5	4	20	40
Blue-Green	3	5	4	6	18	5	5	4	6	20	38
Blue-Violet	1	4	1	0	6	3	2	3	1	9	15
White	6	6	6	6	24	6	5	6	6	23	47
Grey	5	6	6	6	23	5	5	6	6	22	45
Black	6	6	6	6	24	6	5	6	6	23	47
Brown	6	6	6	5	23	6	6	6	6	24	47
TOTAL	68	86	76	66	296	79	65	79	70	293	589

A - W.T.C., Zaria, B - W.T.C., Kaduna, C - Kaduna T.T.C., D - Basawa T.T.C.

presented for each of the four institutions according to form level.

The mean and standard deviation for Group X and Group Y by their various form levels can be seen below.

	Form I		Form III		Form V	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Group X	10.75	2.02	11.00	2.05	11.96	2.22
Group Y	10.16	2.25	11.92	2.16	13.00	1.87

Group III - Colour Preference Test (C.P.T.)

It is assumed that the scores on each of the sixteen colours in this test instrument are representative of the Hausa T.T.C. student's preference for colour.

In tables XIV - (a), XIV - (b), and XIV - (c), the researcher has tallied and presented the frequency with which a given colour hue was selected as the most preferable over the other colours presented at the same time. The tables are presented by both form and institution. These frequencies were then totaled, and the mean response and the standard deviation calculated for each of the sixteen colour hues. Table XV is a presentation for the entire sample by form level of the frequency with which a colour was selected (in preference to other colour hues). Utilizing essentially the same procedures as in Table V, Table VII, and Table X, the colours were ranked in order of preference. This was done so that the most frequently chosen (or most preferred) colour was ranked first, while the least frequently chosen (or the least appreciated) colour was sixteenth in order, as appears below for each of the

three Forms.

TABLE XIII Colour Preference Test
Ranking of Colours Most Frequently Appreciated

	Form I	Form III	Form V
1.	white	violet	blue-violet
2.	brown	white	violet
3.	red-violet	red-violet	red-violet
4.	green	yellow-green	yellow-green
5.	yellow-green	blue-violet	orange
6.	blue-violet	green	brown
7.	grey	brown	green
8.	yellow	blue-green	blue
9.	blue-green	orange	blue-green
10.	orange	grey	black
11.	yellow-orange	yellow	red
12.	violet	blue	yellow
13.	black	black	white
14.	blue	yellow-orange	red-orange
15.	red	red-orange	yellow-orange
16.	red-orange	red	grey

Analysis and Findings

Colour Matching Ability

To analyse the ability of the Hausa T.T.C. student to match identical colours, a t-test for large groups was used. The formula for the t-test appears below.

TABLE XIV - (a)

Colour Preference Among Form I Hausa T.T.C. Students

	Form I						
	A	B	C	D	Total	Mean	S.D.
Number of Students	12	12	12	12	48		
Red	39	38	50	41	168	3.50	2.30
Yellow	44	53	51	55	203	4.23	2.19
Blue	46	46	38	40	170	3.54	2.28
Green	56	56	61	49	222	4.63	2.54
Orange	48	63	40	50	201	4.19	1.93
Violet	47	55	32	46	180	3.75	2.40
Red-violet	77	74	50	47	248	5.17	3.21
Red-orange	43	23	53	42	161	3.35	2.46
Yellow-orange	42	43	49	47	181	3.77	2.13
Yellow-green	55	52	57	58	222	4.63	2.48
Blue-green	59	40	50	48	197	4.10	3.14
Blue-violet	57	59	52	52	220	4.58	2.31
White	46	55	69	86	256	5.33	4.04
Grey	51	47	43	70	211	4.40	2.86
Black	43	50	49	31	173	3.60	3.17
Brown	63	62	72	54	251	5.23	3.08
TOTAL	816	816	816	816	3264	68	0.00

A - W.T.C., Zaria, B - W.T.C., Kaduna, C - Kaduna T.T.C., D - Basawa T.T.C.

TABLE XIV - (b)

Colour Preference Among Form III Hausa T.T.C. Students

	Form III						
	A	B	C	D	Total	Mean	S.D.
Number of Students	12	12	12	12	48		
Red	23	22	33	40	118	2.46	1.98
Yellow	41	58	49	52	200	4.17	3.28
Blue	41	45	66	40	192	4.00	3.18
Green	54	58	52	67	231	4.81	3.04
Orange	72	36	49	48	205	4.27	3.15
Violet	63	94	61	57	275	5.73	3.39
Red-violet	76	50	65	47	238	4.96	3.15
Red-orange	21	19	40	39	119	2.48	2.37
Yellow-orange	31	46	42	44	163	3.40	2.03
Yellow-green	57	71	59	48	235	4.90	3.21
Blue-green	67	42	48	49	206	4.29	2.56
Blue-violet	41	69	64	60	234	4.88	3.42
White	68	45	55	78	246	5.13	4.40
Grey	42	61	51	48	202	4.21	3.61
Black	39	45	39	48	171	3.56	3.27
Brown	77	55	43	51	226	4.71	3.02
TOTAL	816	816	816	816	3264	68	0.00

A - W.T.C., Zaria, B - K.T.C., Kaduna, C - Kaduna T.T.C.
D - Basawa T.T.C.

TABLE XIV - (c)

Colour Preference Among Form V Hausa T.T.C. Students

	Form V						
	A	B	C	D	Total	Mean	S.D.
Number of Students	12	12	12	12	48		
Red	41	30	60	43	174	3.63	2.82
Yellow	41	35	42	53	171	3.56	2.62
Blue	43	64	44	53	204	4.25	3.52
Green	65	27	45	73	210	4.38	3.15
Orange	63	66	72	34	235	4.90	3.07
Violet	68	67	81	49	265	5.52	3.43
Red-violet	62	100	52	50	264	5.50	3.36
Red-orange	37	22	43	53	155	3.23	3.10
Yellow-orange	31	47	27	38	143	2.98	2.79
Yellow-green	44	79	78	52	253	5.27	3.84
Blue-green	53	48	49	45	195	4.06	3.58
Blue-violet	78	69	79	58	284	5.92	3.75
White	45	35	26	64	170	3.54	4.23
Grey	53	38	27	24	142	2.96	3.31
Black	25	41	43	77	186	3.88	4.47
Brown	67	48	48	50	213	4.44	3.33
TOTAL	816	816	816	816	3264	68	0.00

A - W.T.C., Zaria, B - W.T.C., Kaduna, C - Kaduna T.T.C.
D - Basawa T.T.C.

TABLE XV

Colour Preference Amongst Entire Sample of Hausa T.A.C. Students

	Total Sample					
	I	III	V	Total	Mean	S.D.
Number of Students	48	48	48	144		
Red	168	118	174	460	3.19	2.43
Yellow	203	200	171	574	3.99	2.73
Blue	170	192	204	566	3.93	3.03
Green	222	231	210	663	4.60	2.75
Orange	201	205	235	641	4.45	2.93
Violet	180	275	265	720	5.00	3.22
Red-violet	248	238	264	750	5.21	3.23
Red-orange	161	119	155	435	3.02	2.67
Yellow-orange	181	163	143	487	3.38	2.35
Yellow-green	222	235	253	710	4.93	3.21
Blue-green	197	206	195	598	4.15	3.10
Blue-violet	220	234	284	738	5.13	3.25
White	256	246	170	672	4.67	4.27
Grey	211	202	142	555	3.85	3.31
Black	173	171	186	530	3.68	3.56
Brown	251	226	213	690	4.79	3.14
TOTAL	3264	3264	3264	9792	68	0.00

$$t = \frac{\bar{X}_1 - \bar{X}_2 - (M_1 - M_2)}{\sqrt{\frac{(n_1-1)\, s_1^2 + (n_2-1)\, s_2^2}{n_1 + n_2 - 2} \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

This tests for the significance of difference between the mean scores (of Forms I, III, and V, and the total sample) and a theoretical chance distribution mean. For all four means, it was found (using one degree of freedom) that the significance of difference was less than the .0005 level. As the difference was found to be much less than the accepted level of .05 (Beyer:1968: 283), it can be concluded that Hausa T.T.C. students' ability to match identical colours is significantly above that to be expected by chance.

Not all colours were matched with equal frequency (to be noted in the ranked order of colours based on frequency; see page 59). It is of interest, however, that no common trend can be detected as to order of difficulty. It could thus be postulated that cultural traditions bear little effect on the subject's ability to match identical colours.

Colour Matching as a Factor of Maturation

Does the ability to match identical colours increase with maturation; or has it reached its present level sometime prior to entrance into T.T.C.? The first null-hypothesis developed for this study is that there is no difference between the mean scores of Form I, Form III, and Form V on the Colour Matching Test. Put simply, if there is no difference in the mean scores of the

various forms, them it may be assumed that colour matching ability does not increase with maturation. However, if there is a significant difference in the means, then it might be concluded that colour matching increases with maturation.

Three t-tests were used to establish if there was a significant difference between the means of Form I and Form III, Form I against Form V, and Form III against Form V. It was found that 't' for the means of Form I and Form III was 2.77. A significance of the .005 level results from tabulations with the students' t-Distribution tables (Beyer: 1968:283) using a degree of freedom of one. Following this same procedure, it was found that for the means of Form I and Form V, t = .771 with the significance of difference being greater than the .10 level; while the means of Form III and Form V resulted in t = .165 and a level of significant difference greater than .10. Since the significance between the means of Form I and Form V and Form III and Form V is greater than the .05 acceptable level, the second null-hypothesis is accepted. It can thus be postulated that colour matching ability did not increase with maturation amongst the Hausa T.T.C. students, but must have reached its present level at some point prior to the students' acceptance into the T.T.C.

Trends in Differentiating Colour Hues in Hausa

In regards to differentiating within the Hausa language between the colour hues used in this study, three interesting trends were observed during the preliminary step in the construction of the Colour Naming Test - Hausa.

First, although there are cases in the Hausa language where there is not a specific colour word available but rather a phrase used to designate a colour hue, it would appear that the people are capable of communicating the colour concept they intended. It should be noted that these cases most often occur with the colours which are not encountered in everyday life.

Secondly, of the 50 Hausa adults interviewed, the majority (when first encountered with the colour chips) tended to mentally classify the particular colour hue into 'families' which shared a common label. An example of this is that red-violet, red, red-orange, and orange are all referred to as 'ja'; blue and blue-violet as 'shudi'; yellow-green, green, and blue-green as 'kore', and yellow and yellow-orange as 'rawaya'. Finally, when confronted with two or more colour target cards which were of the same 'family', the subjects were able to further discriminate the colours by either association, or by simply adding a descriptive adjective to the colour term or phrase. An example of colour discrimination by association was yellow-orange, which was first called 'rawaya' and later referred to as 'ruwan kwai' (water of egg) or 'ruwan gwaiduwa (water of egg yolk). Examples of the second type of discrimination are blue, which was first called 'shudi', later being referred to as 'shudi, ba so sai ba' (blue, but not quite), and yellow-green which was formerly called 'kore', later being called 'kore shar' (bright green).

Learning Effect on Hausa Colour Naming Test

To test for a possible learning effect on the Colour Naming Test - Hausa as a result of the Colour

Naming Test - English preceding it, a t-test was run between the mean scores for the three Forms of Group X and the mean scores of their counterparts in Group Y. If the significance of difference is found to be less than the .05 level, it can be assumed that the learning effect factor was present on this test. It was found that for Form I, III, and V, that t = .256, t = -.64, and t = -.086 respectively. With one degree of freedom, the significance of difference at each Form level was found to be greater than the .10 level. As this is greater than the stipulated .05 level of acceptability, one may conclude that there was no learning effect influencing the scores of the Colour Naming Test - Hausa and that it was valid in this aspect.

Colour Naming Ability in Hausa

The ability of Hausa T.T.C. students to name colours in Hausa was analysed by means of a t-test between mean scores of Forms I, III, V and the total sample with that of a theoretical chance distribution mean. It was found that the students performed significantly better than expected by chance. The degree of difference between all means and the theoretical chance distribution mean was found to be very significant (.0005).

It should be noted that in all three Forms, the neutral colours were most accurately labeled. Other than these colours, however, there seems to be a considerable degree of variation as to order of difficulty in labeling the colour appearing on the target card in Hausa. A need for more research in the naming aspect of colour perception is apparent before hypothesizing that the evolution of colour terms is fixed for all

languages (as postulated by Berlin and Kay (1969)).

Colour Naming in Hausa as a Factor of Maturation

Does the ability to identify colour hues by colour names in the Hausa language increase with maturation? The second null-hypothesis developed for the purpose of this study was that there is no difference between the mean scores on the Colour Naming Test - Hausa of Hausa T.T.C. students in Form I, III, and V. Put another way, if there is no significant difference in the mean scores then it can be said that ability does not increase with maturation. However, if there is a significant difference, then one may conclude that colour naming ability of Hausa T.T.C. students does increase with maturation. This was tested using a t-test to establish the degree of significance between the mean scores for Form I and Form III, Form I and Form V, and Form III and Form V. In the t-test between Form I and Form III, it was found that 't' was equal to 3.80, which (when tabulated from the student's t-Distribution tables (Beyer:1968:283) using a df (degree of freedom of 47) resulted in a significance of slightly less than .0005. This same procedure was used for Form III and Form V resulting in a 't' of 7.00 or a significance of less than .0005, while Form I and Form V resulted in a 't' of 8.64 or a significance much less than .0005. As the significance level in all three t-tests was far less than the acceptable .05 level, the null-hypothesis is reflected in favour of the hypothesis that colour naming ability does increase amongst Hausa T.T.C. students with maturation.

Learning Effect on English Colour Naming Test

As a continuation of the analysis of the learning

effect of the other naming test instrument on Colour Naming Test - English, a t-test between the mean score for Group X and that of Group Y was carried out for each of the three Form levels. It was found that for Form I, Form III, and Form V that t = .44, t = -.70, and t = -.82 respectively. With one degree of freedom, this resulted in a significance of difference between the means for Group X and Group Y at all three Form levels of greater than the .10 level. As this level of significance is greater than the acceptable 10% level, one may postulate that there is no learning effect factor present in the scores of the Colour Naming Test-English and this test instrument in this aspect is valid.

Colour Naming Ability in English

To analyse the ability of Hausa T.T.C. students to name colours in English, a t-test was run between each of the mean scores on the Colour Naming Test - English for Forms I, III, V, and the total sample, and that of a theoretical chance distribution mean. It was found that the significance of difference in each of the four t-tests was less than the .0005 level. As the .0005 level is considerably less than the acceptable .05 level, the significance is found to be great. It may be concluded that (as in the C.M.T. and C.N.T.H.) the Hausa T.T.C. students' ability to name colours in English is far greater than that expected by chance.

Unlike the C.N.T.H., there was no particular colour or group of colours which were labeled correctly with common frequency among the three different Form levels in this Colour Naming Test - English. On the contrary

no common trend in the order of ability to name the different colours of this study exists.

As this study deliberately used pure spectrum colour hues (in hopes of accurately assessing the Hausa T.T.C. students' ability in various aspects of colour perception), it has a very limited contribution to the question of 'focal points' and their relationship to colour naming ability. What was found, however, was that when confronted with only colours containing a 'core meaning', the Hausa T.T.C. students appeared to excell in those colour hues or 'focal points' which could be regarded as earth colours. This finding might allow one to postulate that one's environment is a factor on one's ability to identify colours by name labels.

Colour Naming in English as a Factor of Maturation

Does the ability to identify colour hues by colour names in the English language increase with maturation? The third null-hypothesis developed for this study was that there is no difference between the mean scores of Hausa T.T.C. students in Form I, III, and V on the Colour Naming Test - English. If there is no significant difference between the means, then it can be concluded that ability does not increase with maturation. If, however, there is a significant difference (.05 or less) then it may be said that English colour naming ability does increase with maturation.

To establish whether there was significant difference between the means, a t-test was carried out between the mean scores of Form I and Form III, Form I and Form V, Form III and Form V. The t-test between Form I and Form III resulted in $t = 2.84$, while the difference was

significant at the .005 level. This same procedure was used for testing the significance of difference between the means of Form I and Form V resulting in t = 8.42 with a significance of difference of less than .0005, while the difference between the means of Form III and Form V resulted in t = 5.58 with a significance of difference at the .0005 level. As the significance level is (in all three cases) less than the .05 level, the null-hypothesis is rejected and the alternative hypothesis accepted that colour naming ability in English does increase with maturation.

Colour Matching's Effect on Colour Naming

Before one is able to name colours in English or Hausa, must he be able to match the colour with an identical colour? If this is the case, a significant degree of correlation should be expected to exist between these two test instruments and the colour matching test instruments.

The fourth null-hypothesis in the study was that there is no significant correlation between the Colour Matching Test and that of the Colour Naming Test - Hausa or Colour Naming Test - English. To calculate the coefficient of correlation, the Pearson Product - Moment Formulation for Simple Linear Correlation was used.

$$r = \frac{N\sum xy \quad (\sum x)(\sum y)}{\sqrt{\left[N\sum x^2 - (\sum x)^2\right]\left[N\sum y^2 - (\sum y)^2\right]}}$$

The degree of correlation between the Colour Matching test scores and the Colour Naming - English test scores,

and the level of significance can be found below for Form I, III, V and the total sample.

	Degree of Correlation	Significance
Form I	.3510	.007
Form III	.1979	.089
Form V	.0575	.349
Total sample	.2032	.007

In addition to the above are the following degrees of correlation between the Colour Matching Test scores and the Colour Naming Test - Hausa scores, and the level of significance for Form I, III, V, and the total sample.

	Degree of Correlation	Significance
Form I	.2451	.047
Form III	.2454	.046
Form V	.1490	.156
Total sample	.1872	.012

As the correlation was found to be significant (at the .05 level or less) for the total sample and Form I in both of the above tests for correlation, as well as Form III in the C.M.T. with C.N.T.H., one may reject the fourth null-hypothesis. Thus, it is possible to conclude from these findings that the ability of Hausa T.T.C. students to name colours in both Hausa (C.N.T.H.) and English (C.N.T.E.) languages is related to their ability to match identical colours on the C.M.T. This relationship tends to support the 'weak version' of the Whorfian hypothesis, or a relationship between terminology and

perception. There is a need, however, for further research into this area. Harris (1966) has suggested that the Zulus formed individualized colour labels as occasions arose within the culture. This activity appears to exist amongst the Hausa people as well.

The Effect of Colour Naming in Hausa on the Ability to Name Colours in English

In addition to the ability to match identical colour hues, does the ability to name colours in one's mother tongue (Hausa) affect one's ability to name colours in English? If the ability to name colours in Hausa does affect the ability to name colour hues in English, one might expect a high degree of correlation between the two test scores. For the purpose of this aspect of the study, the fifth null-hypothesis was developed. It states that there is no significant correlation between the Colour Naming Test - Hausa and the Colour Naming Test - English. This null-hypothesis was rejected (see below) by using the Pearson Product Moment Formulation for Simple Linear Correlation.

	Degree of Correlation	Significance
Form I	.4533	.001
Form III	.0937	.263
Form V	.3166	.014
Total sample	.3869	.001

As all coefficients of correlation were significant at the .05 level or less, except for Form III, the fifth null-hypothesis was rejected. Thus it can be expected that, amongst Hausa T.T.C. students, the ability to name

colour hues in English is related to the subject's ability to name the colour in Hausa.

Colour Preference

In comparing the ranked order of preference for colours (resulting from the Colour Preference Test) with those of Eysenck's (1941) (mentioned in the review of literature), it was found that the unequivocal order of preference for colours amongst western subjects is not repeated by Hausa T.T.C. students of Kaduna State, Nigeria. While, according to Eysenck, blue and red are most preferred, it was found that among the Hausa subjects, these colours fell in the lower 33% of the colour preference list. According to Eysenck, green, violet, orange, and yellow are less preferred than red or blue. However, with Hausa subjects, green and violet were found to rank in the top 33% of preferred colours, while orange and yellow were preferred over red and blue but less than green and violet. Such results would lead one to postulate that a universal order of colour preference does not exist. Whether this is a result of culture, as Kouwer (1949) would like us to believe, cannot be ascertained from this study, but should be investigated in further research.

The Effect of Colour Preference on the Ability to Name Colours

Do Hausa T.T.C. students perform better on the items in the C.N.T.H. and C.N.T.E. which deal with colours for which they have demonstrated a preference on the Colour Preference Test? Two null-hypotheses were developed for this aspect of the study. The sixth null-hypothesis states that there is no significant

correlation between the ranked order of preference on the Colour Preference Test and the ranked order of colours most correctly labeled in the Colour Naming Test - Hausa. The seventh null-hypothesis stipulates that there is no significant correlation between the ranked order of preference on the Colour Preference Test and the ranked order of colours most correctly labeled in the Colour Naming Test - English. If the students do perform better on items which deal with the colours they prefer, then it could be expected that a significant coefficient of correlation will exist for the ranked order of items correctly labeled on the C.N.T.E. and the C.N.T.H. and that of the ranked order of preference on the Colour Preference Test.

The ranked order of items correctly labeled in the C.N.T.H. and the C.N.T.E. can be found on page 61 and page 68 respectively while that of the ranked order of colours most frequently preferred can be found on page 74. A test for correlation was carried out for each of the three form levels between C.N.T.H. with C.P.T. and C.N.T.E. with C.P.T. As there were ties between the various ranked colour items in both the C.N.T.H. and the C.N.T.E., it was necessary to use the following formula of Kendell's Ranked Order of Coefficient of Correlation.

$$t = \frac{P - Q}{\sqrt{\frac{n\,(n-1)}{2} - K_x}\sqrt{\frac{n\,(n-1)}{2} - K_y}}$$

where $K_x = \frac{1}{2} \sum f_i\,(f_i - 1)$

and $K_y = \frac{1}{2} \sum f_i \ (f_i - 1)$

It was found that no significant level of correlation existed between the C.P.T. and the ranked order of the C.N.T.E. or C.N.T.H. for Form I, III, and V, as each was significant at a level greater than the acceptable .05 level. Thus, the sixth and seventh null-hypotheses were accepted. One can postulate from these findings that preference for a particular colour has little (if any) effect on the ability of Hausa T.T.C. students to name the colour in either Hausa or English.

SUMMARY

In summary, the computer analysis of the data resulted in the following findings.

Colour Matching

1. Hausa T.T.C. student's ability to match colours is significantly above that expected by chance. The average student is capable of matching colours with a 95% level of accuracy. There are, however, some colours which seem to be more difficult to match than others. The ranked order of difficulty in matching colours can be found on page 59.

2. The ability to match colours did not increase with maturation among T.T.C. students, but had appeared to reach its level at the period of life prior to the students' enrollment into the institutions.

Colour Naming in Hausa

1. Hausa T.T.C. students' ability to name colours in the Hausa language is significantly above that

expected by chance. However, the average student is capable of naming the basic colours used in this study with only 65% accuracy. Many of the colours lack standard Hausa colour terms (a fact which may contribute to the confusion as to the name of a specific colour hue). Although there does not appear to be a concept for certain colours, Hausa people are quite capable of communicating (through various means) that colour concept which is intended.

2. There is no significant learning effect from the C.N.T.E. on the colour naming in Hausa.

3. The ability to name colour in Hausa increased with maturation among T.T.C. students of Hausa origin.

Colour Naming in English

1. Hausa T.T.C. students' ability to name colours in the English language is significantly above that expected by chance. However, the average student is capable of naming the basic colours used in this study with less than 60% accuracy.

2. There was no significant learning effect from the C.N.T.H. on the colour naming in English.

3. The ability to name colours in English increased with maturation among T.T.C. students of Hausa origin.

4. Hausa T.T.C. students must be able to match colours before they are capable of matching either English or Hausa colour terms with a colour.

5. There is a correlation between the Hausa T.T.C. students' ability to name colours in Hausa and their ability to name colours in English.

Colour Preference

1. The order of colour preference which can be

found on page 74 would appear to be in opposition to Eysenck's (1941) universal 'unequivocal' constant order of colour preference.

2. Colour preference appears to have no effect on a student's ability to match colours, to name colours in Hausa, or to name colours in English.

CHAPTER IV

CONCLUSION AND RECOMMENDATIONS

Summary

In this study, the interest of the investigator began with the speculation that although all normal T.T.C. students are blessed with an array of sensory faculties of which the visual equipment for colour perceptual activity may be of the most importance to Art, they unfortunately have not developed their colour perceptual activity to its highest level of potentiality. It was decided to test Hausa students since they could be considered a significant group among T.T.C. students. One-hundred-and-forty-four students were chosen randomly from a population of four-hundred-and-sixty students of Hausa origin who had experienced no difficulties in colour vision when tested with the Ishihara Colour Plates. The sample consisted of three groups (Form I, III, and V) from each of the four institutions selected to participate in this study.

It was further decided to test the aspects of colour perception - colour matching, colour naming, and colour preference - since they could be regarded as basic among the various aspects of colour perception. Colour Matching Test, Colour Naming Test - Hausa, Colour Naming Test - English, and Colour Preference Test were the four test instruments designed to collect data on T.T.C. students' ability in these various areas. These were administered individually to each student,

under normal daylight conditions, during the first week of school for Form I subjects, and during the first month of school for Form III and Form V subjects.

The data resulting from these four test instruments was then punched onto approximately 500 computer cards by the researcher. The statistical techniques - Standard Deviation, t-test, Pearson's Product Moment Formulation for Simple Linear Correlation, and Kendall's Ranked Order of Coefficient of Correlation - were carried out through the use of the Statistical Package for the Social Sciences (Nie, et al:1970). This computer analysis led to numerous findings which have been discussed thoroughly in Chapter III. Nevertheless, it is appropriate to recapitulate what these findings were.

The major findings were:

(a) Hausa T.T.C. students possess a strong ability (95%) to match colour. This ability appears to have reached the present level at a time in life prior to their acceptance into the T.T.C.

(b) Although the Hausa language is rich in colour terms, there are hues for which it was found that no standard colour term existed.

(c) Hausa T.T.C. students possess only a moderate ability (65%) to name colours in Hausa, but such an ability does increase with maturation.

(d) Hausa T.T.C. students possess less ability to name colours in English (60%) than in Hausa, but this ability does increase with maturation.

(e) There is a significant relationship between the students' ability to name colours in Hausa and their ability to match colours ($r = .18$).

(f) There is a significant relationship between the students' ability to name colours in English and their ability to match colours (r = .20).

(g) There is a significant relationship between the ability to name colours in Hausa and the ability to name colours in English (r = .38).

(h) There is no fixed order of colour preference amongst Hausa T.T.C. students.

(i) There is no significant relationship between the students' preference for a particular colour and their ability to match that colour or name it in either English or Hausa.

Recommendations

The following implications can be made for Art education in the Grade II Teacher Training Colleges as a result of the findings discussed earlier in this study and reviewed above.

1. As colour perception is extensively a visual activity, any attempts to teach for colour perception should make use of this sensory faculty so as to develop it to its utmost potentiality. The learning of colour in a purely theoretical manner is to be compared with learning to swim by correspondance. The machinery for visual perception appears to exist in the visual sensory faculties at a high level of sophistication. It is more than capable of the task demanded of it (evident in the high percentage (95%) of accuracy on the Colour Matching Test). Whether this machinery (the eye) is utilized to its fullest capacity will depend on the training and mastery of it. The T.T.C. art

education syllabus could and should provide appropriate learning experiences which has as their primary objective to increase the ability to utilize the visual sensory faculties.

2. As it would appear that the communication of colour perception is related to language, it is recommended that the art education syllabus should make allowance for developing the students' ability to name colours. Whether this would involve an explanation of the teaching method already extensively used (formal lecturing), or whether it could be achieved through unfettered experimentation and learning-by-means-of-discovery will continue to be a decision of the individual teacher. What can be suggested is that the time spent dealing with colour perception (of which a large portion should be outside the formal colour theory aspect) should be approached with sensitivity. Colour exists in the eye of the beholder. It is clear that colour perception and colour appreciation may vary considerably with every individual. Thus any attempt to dictate the choice and correct use of colour through positive rules should be seen as irrational and futile, (if not damaging) - a hindrance to students' personal development.

3. It would appear that colour naming in English is related to one's ability to name colours in Hausa. Since the Hausa language appears to be rich in colour terms, art education should encourage the future primary teacher to utilize the already established foundation of Hausa colour terms in order to teach the various English colour terms. Such a suggestion seems

to fit suitably into the present trend of teaching in the vernacular during the first two years of primary school.

4. A difference was found in the ordering of preferred colours between the Hausa T.T.C. students and subject from the Euro-American culture. This difference should be noted when ordering supplies related to colours (i.e. paints, inks, dyes, and yarns). There is a need to take into consideration the consumer (the student) when ordering from overseas firms often offering assorted colours in economy size packages. These special packages contain the basic colours plus those colours most preferred by the cultures in which the firms are established. Furthermore, as indigenous firms are established to meet the ever-increasing local demand for art supplies, they should make every possible effort to cater to these unique preferences plus those of the other ethnic groups within the country rather than simply transplanting a western art supply firm into the Nigerian society.

5. To teach perception is no more possible than to teach art appreciation. There is a need then, for an earnest attempt to 'turn on' and 'tune in' the sensory apparatus; art educators should make visible the invisible. In short, they must teach for perception.

6. Colour vision difficulties do occur universally at a rather high level among males. Colour vision should be tested early in the students' Art education programme. This should not be done for the purpose of belittling or exempting the student from participating in the various art activities. It should be done primarily to introduce

the Art educator to the possible difficulties confronting any particular student.

Conclusion

The specific objective for this study were mentioned in the opening paragraph of this study. They are as follows:

1. To investigate among students of Hausa origin attending Teacher Training Colleges of Kaduna State, Nigeria, the ability to perceive colour with specific emphasis on those aspects of colour matching, colour naming, and colour preference.

2. To discover implications arising out of these findings for the improvement of teaching for perception within the Teacher Training Colleges of Kaduna State, Nigeria.

Although great care was taken at each point of this study, there are bound to be those aspects of research techniques, statistical techniques, or interpretation techniques, which are not perfect or could be improved. If, however, this study assists art educators in their awesome responsibility of teaching art to a future generation of Nigerians, and, specifically Hausa people, this study will have fulfilled its objectives.

APPENDIX

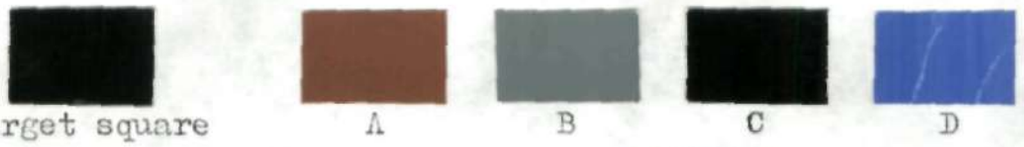
COLOUR MATCHING TEST
(SAMPLE)

Instructions:

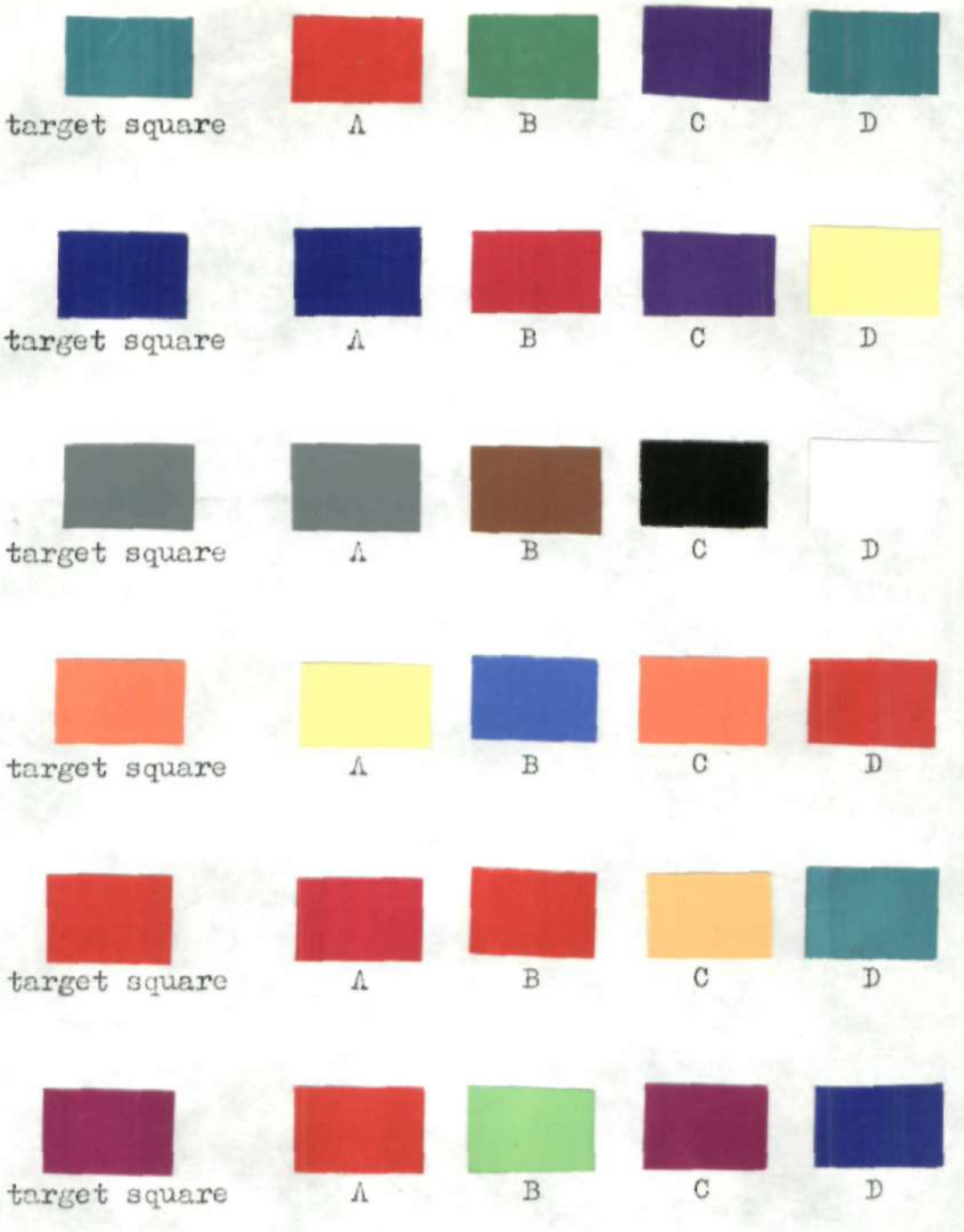
I (researcher) am going to ask you sixteen questions. In each question you will find a coloured square (target card) on the left hand side of this board. To the right of each target card you will find four coloured squares labled A, B, C, and D. You are to select from the four coloured squares labled A, B, C, and D the one square which appears to be most like the colour of the target square. This is not a race you have as much time as you feel is necessary to answer each of the questions.

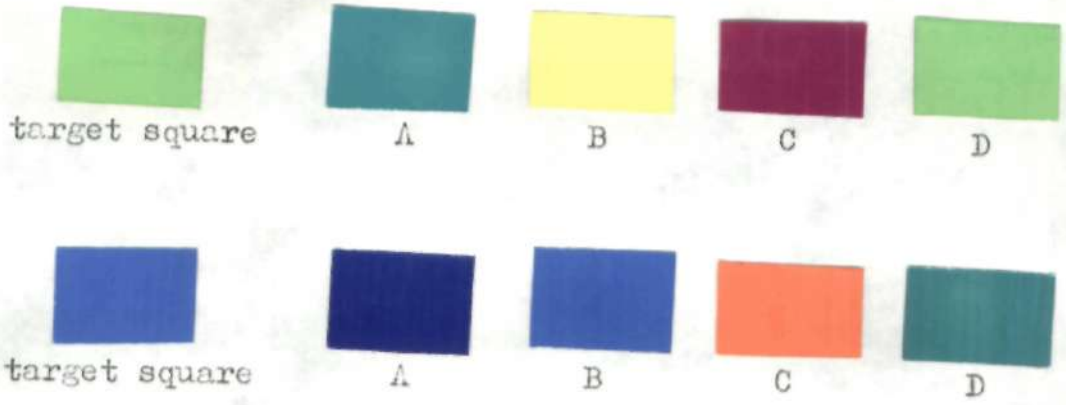
N.B. It should be noted that this is only a sample test. Since order of presentation for the sixteen items in this test were randomized, since order from left to right for the four coloured response squares was randomized, and since in each item one coloured response square was randomly selected, each test is unique.






target square
A
B
C
D
target square
A
B
C
D
target square
A
B
C
D
target square
A
B
C
D
target square
A
B
C
D
target square
A
B
C
D


target square
A
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target square
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target square
A
B
C
D
target square
A
B
C
D

COLOUR NAMING TEST - HAUSA
(SAMPLE)

Instructions:

Zan yi maku tambayoyi sha-shidda a kowace tambaya zaku sami launi cikin square a gefen hagun wannan allo. A daman kowanne allo zaku sami 'square' guda hudu da sunayen launi cikin Hausa a rubuce a cikinsu. Wadannan sunayen an basu lamba A, B, C, da D.

Ka zobi daya daga sunayennan na Hausa guda hudu wanda ka ga yafi dacewa da launin da ke kan allon. Kana iya daukan lokacin da kake bukata don bada amsar ko wace tambaya.

N.B. It should be noted that this is only a sample test. Since order of presentation for the sixteen items in this test were randomized, since order from left to right for the four Hausa colour names was randomized, and since in each item on Hausa colour name was randomly selected, each test was unique. Furthermore, the size of colour chips is 1/10th of the original size.



a) Toka-toka b) baki kirin c) kasa-kasa
d) fari fat



a) rawaya b) shudi c) ja-ja d) ja



a) ja wur b) ja c) ruwan gwaiduwa
d) mai launin jar garura



a) kore b) shudi c) kore shar
d) ja wur



a) baki kirin b) toka-toka
c) kasa-kasa d) shudi



a) kore b) ja-ja c) ja wur
d) mai launin jar garura

a) rawaya b) kore c) shunaiya
d) ruwan gwaiduwa

a) toka-toka b) kasa-kasa c) rawaya
d) fari fat



a) zargina b) shudi c) ruwan gwaiduwa
d) mai launin jar garura



a) zargina b) ja-ja c) ruwan graiduwa
d) kore shar



a) mai launin kwan gwaina b) kore
c) zargina d) ja



a) shunaiya b) ja wur c) zargina
d) rawaya



a) baki kirin b) toka-toka c) ja-ja
d) kasa-kasa



a) ja b) kore shar c) mai launin jar
garura d) shunaiya



a) mai launin kwan gwaina b) rawaya
c) mai launin jar garura d) kore shar



a) shunaiya b) shudi c) ja-ja
d) mai launin kwan gwaina

COLOUR NAMING TEST - ENGLISH
(SAMPLE)

Instructions:

I (researcher) am going to ask you sixteen questions. In each question you will find a coloured square (target card) on the left hand side of this board. To the right of each target card you will find four squares with an English colour name printed on each. These are labeled A, B, C, and D. You are to select from the four English colour names the one which you think best represents the colour of the target square. This is not a race you have as much time as you feel is necessary to answer each of the questions.

N.B. It should be noted that this is only a sample test. Since order of presentation for the sixteen items in this test were randomized, since order from left to right for the four English names was randomized, and since in each item on English colour name was randomly selected, each test was unique.



a) Yellow b) blue c) orange d) red-orange



a) Red b) red-orange c) yellow-green
d) blue-green



a) Green b) blue c) yellow-green d) red



a) Black b) white c) grey d) blue



a) Green b) orange c) red d) red-violet

a) Yellow b) green c) violet d) yellow-orange

a) Grey b) black c) white d) brown



a) Blue-violet b) blue c) yellow-orange d) red-violet

a) Blue-violet b) orange c) yellow-orange
d) yellow-green



a) Blue-green b) green c) blue-violet
d) red-orange



a) Violet b) red c) blue-violet
d) yellow



a) Black b) blue c) orange d) brown



a) Red-orange b) yellow-green c) violet
d) red-violet



a) Blue-green b) yellow c) red-violet
d) yellow-green



a) Violet b) blue c) orange
d) blue-green



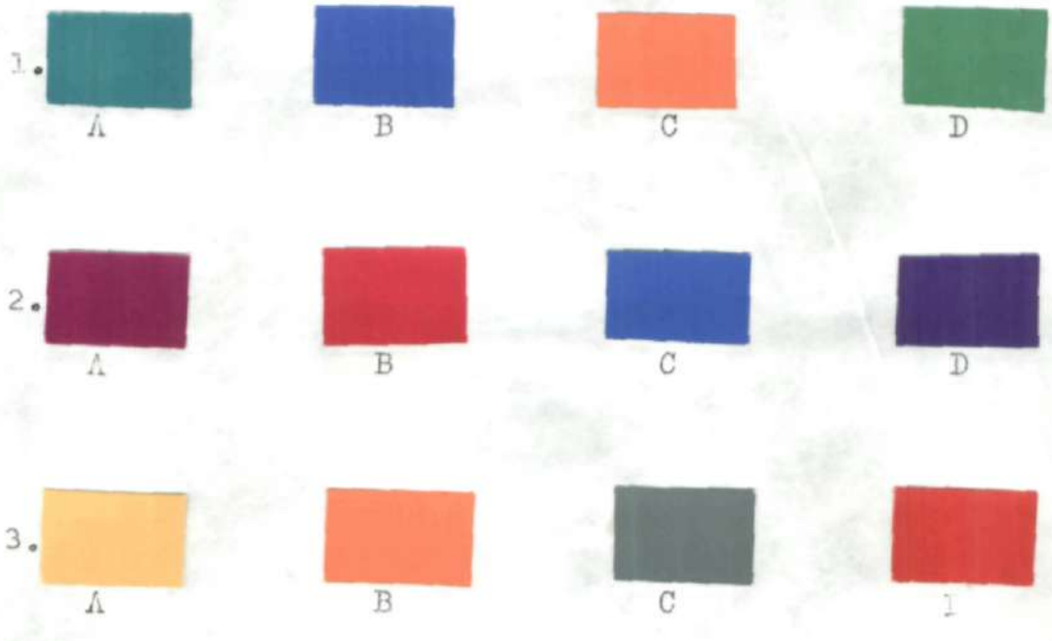
a) Grey b) black c) white d) brown

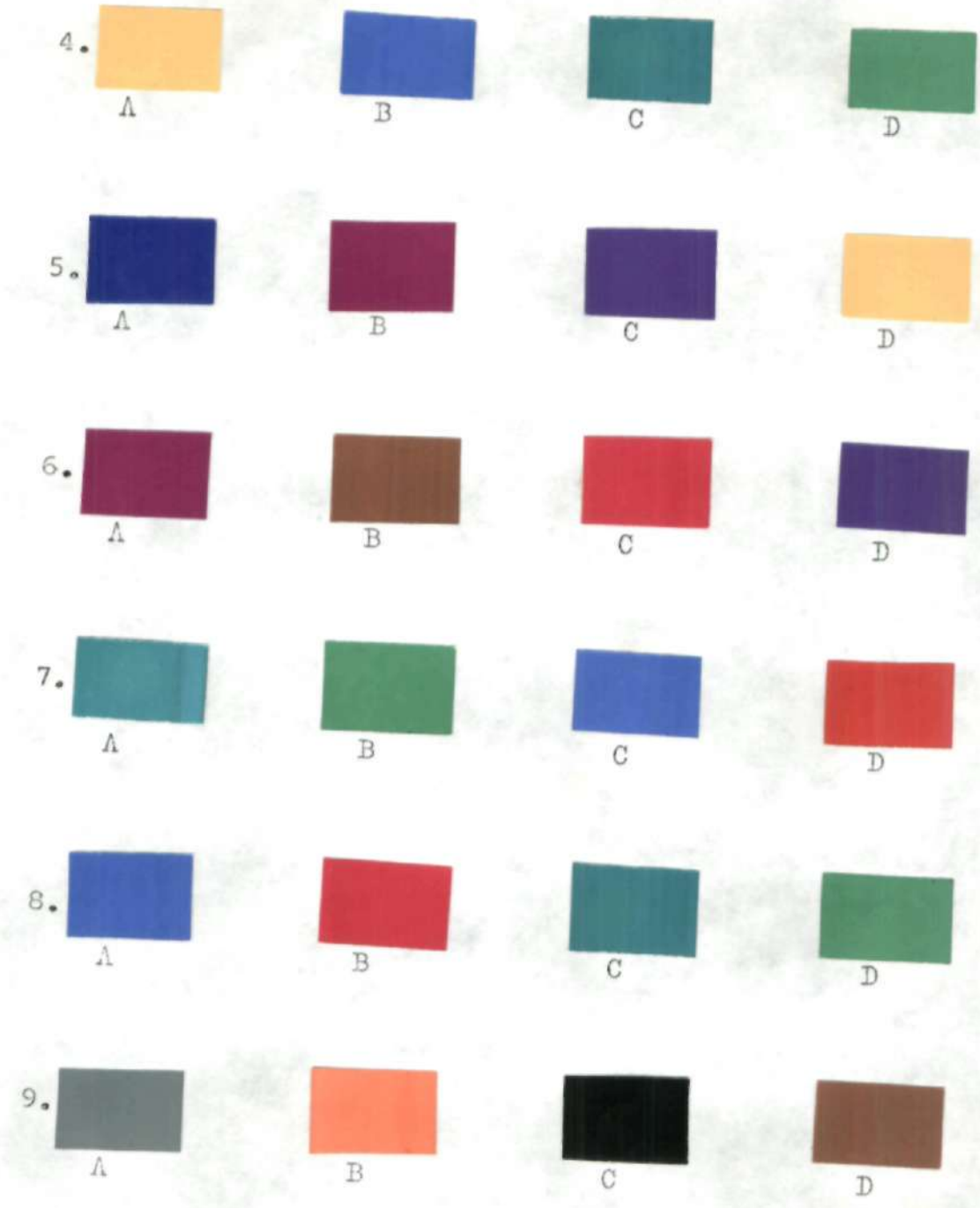
COLOUR PREFERENCE TEST
(SAMPLE)

Instructions:

I (researcher) am going to ask you sixty-eight questions. In each question you will find four coloured squares labeled A, B, C, and D. You are to select from the four coloured squares the one coloured square you like best. This is not a race. Take as much time as you feel is necessary for each question.

N.B. It should be noted that this is only a sample test. Since order of presentation for the sixty-eight items in this test were randomized and since order of presentation from left to right was randomized for each item, each test is unique.




4.
A
B
C
D
5.
A
B
C
D
6.
A
B
C
D
7.
A
B
C
D
8.
A
B
C
D
9.
A
B
C
D

10. A B C D

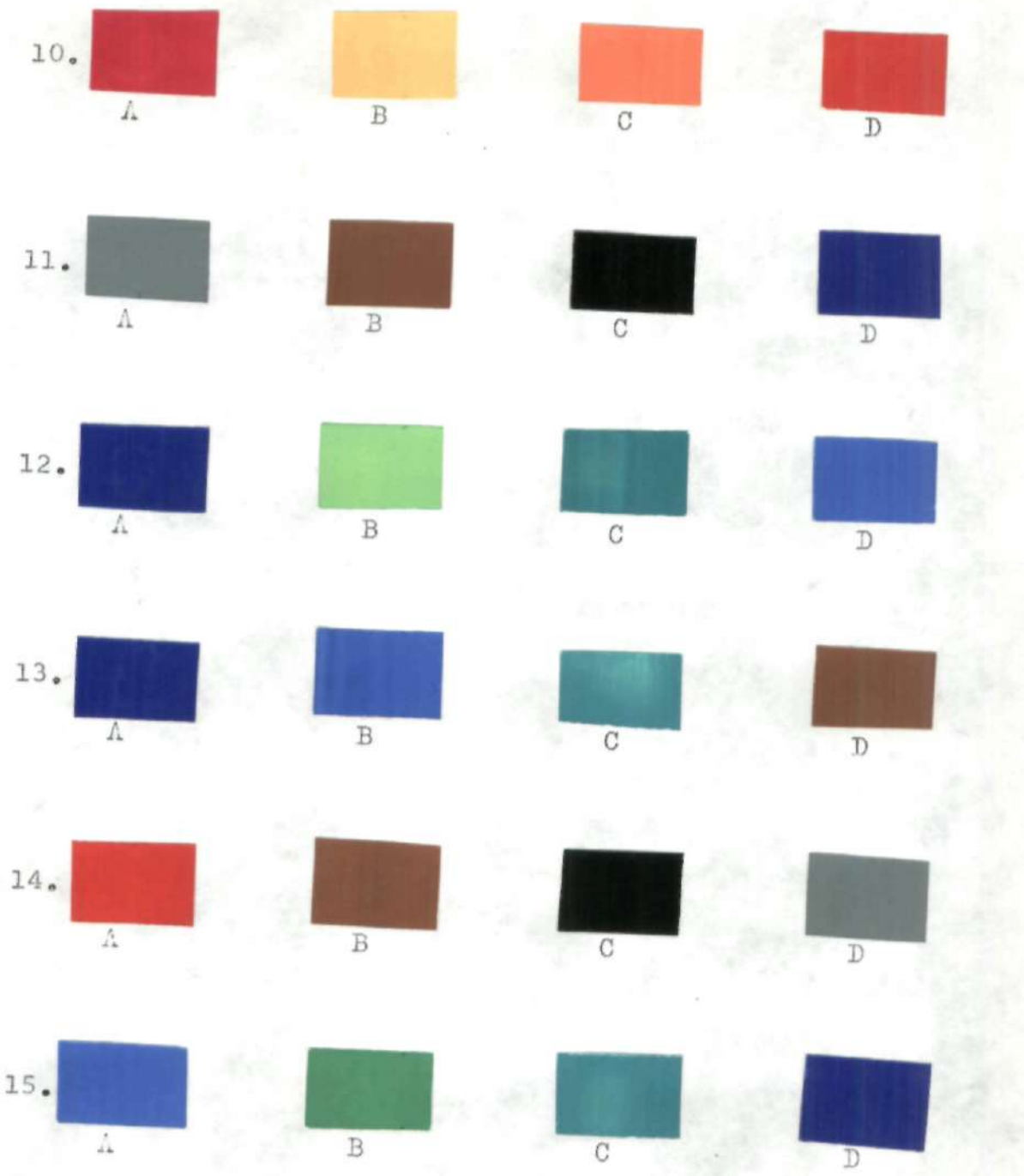
11. A B C D

12. A B C D

13. A B C D

14. A B C D

15. A B C D



16.



A B C D

17.



A B C D

18.



A B C D

19.



A B C D

20.



A B C D

21.



A B C D

22. A B C D

23. A B C D

24. A B C D

25. A B C D

26. A B C D

27. A B C D

28. A B C D

29. A B C D

30. A B C D

31. A B C D

32. A B C D

33. A B C D

34.



A



B



C



D

35.



A

B



C



D

36.



A



B



C

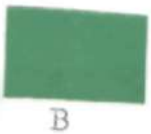


D

37.



A



B



C

D

38.



A



B



C



D

39.



A



B



C

D

40. A B C D

41. A B C D

42. A B C D

43. A B C D

44. A B C D

45. A B C D

46. A B C D

47. A B C D

48. A B C D

49. A B C D

50. A B C D

51. A B C D

52. A B C D

53. A B C D

54. A B C D

55. A B C D

56. A B C D

57. A B C D

58. A B C D

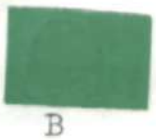
59. A B C D

60. A B C D

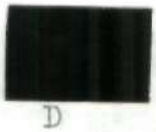
61. A B C D

62. A B C D

63. A B C D

64.  A  B  C D

65. A B  C  D

66.  A  B  C  D

67.  A B C  D

68.  A  B C  D

TABLE XVI RAW SCORES OF FORM I
WOMENS TEACHERS COLLEGE, ZARIA, NIGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	0	1	1	1	1	0	1	1	1	1	10
Orange	1	1	1	1	1	1	1	1	1	1	1	1	11
Red-orange	1	1	1	1	1	0	1	0	1	1	0	1	9
Green	1	1	1	1	1	1	1	0	1	1	1	1	11
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Violet	1	1	1	1	0	1	1	1	1	1	1	1	11
Yellow-orange	1	1	1	1	0	1	1	1	1	1	1	1	11
Blue-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue	1	1	1	1	1	1	1	1	1	1	1	1	12
TOTAL	16	16	15	16	14	15	16	13	16	16	15	16	184

Colour Naming Test - English													
Grey	1	1	1	1	1	0	1	1	1	1	1	1	11
Orange	1	1	1	1	1	1	0	1	0	0	1	1	9
Red-orange	1	0	1	1	1	0	0	0	1	1	0	0	6
Green	1	1	1	1	1	1	1	0	1	1	1	1	11
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	0	0	1	1	1	1	1	1	1	0	0	8
Yellow	1	1	1	1	1	1	1	0	1	1	1	1	11
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	0	1	1	1	1	0	0	0	0	0	1	0	5
Yellow-orange	1	1	1	0	1	1	1	1	0	0	0	1	8
Blue-green	0	1	0	0	1	0	0	0	0	1	0	0	3
Violet	1	1	1	1	0	1	1	0	1	0	1	0	8
Brown	1	1	1	1	1	1	1	0	1	1	1	1	11
Red-violet	1	1	1	1	1	1	0	0	1	1	0	0	8
Yellow-green	1	1	1	1	0	1	1	0	1	1	0	0	8
Blue	1	1	1	1	1	0	1	1	0	0	1	1	9
TOTAL	14	14	14	14	14	11	11	7	11	11	10	9	140

TABLE XVI (contd.) RAW SCORES OF FORM I
WOMENS TEACHERS COLLEGE, ZARIA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	0	1	1	1	1	[illegible]
Orange	1	1	0	1	1	0	1	1	0	0	0	1	7
Red-orange	1	1	0	1	1	1	0	0	1	1	0	1	8
Green	1	0	0	1	0	1	0	1	0	0	0	0	4
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	0	1	1	1	1	0	1	1	0	0	8
Yellow	1	1	0	1	0	1	1	0	0	1	1	1	8
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	0	1	0	1	0	0	1	0	0	1	1	1	6
Yellow-orange	1	1	1	0		1	1	0	0	1	1	1	9
Blue-green	0	1	1	0	0	1	1	0	1	1	1	1	8
Violet	1	0	1	1	1	1	0	0	1	1	1	1	9
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	1	1	1	1	1	1	1	1	1	0	11
Yellow-green	1	1	1	1	0	1	0	0	0	1	1	0	7
Blue	1	0	0	1	1	0	1	0	1	0	0	1	6
TOTAL	14	13	9	14	11	13	12	6	10	13	11	12	138
Colour Preference Test													
Red-orange	3	2	5	1	7	3	3	2	2	5	7	3	43
Yellow-orange	3	1	4	8	2	5	3	5	5	2	0	4	42
Red-violet	6	9	5	2	5	4	7	8	6	7	13	5	77
Violet	4	1	8	2	2	9	5	6	5	4	0	1	47
Yellow	1	4	4	6	0	5	4	2	3	5	6	4	44
White	2	3	5	4	1	1	4	5	5	4	7	5	46
Yellow-green	3	3	7	9	8	3	4	4	3	5	1	5	55
Black	0	7	1	2	4	4	5	4	7	5	0	4	43
Brown	8	5	5	6	4	4	6	3	8	4	3	7	63
Blue-violet	10	7	3	2	7	7	5	4	5	5		2	57
Grey	4	2	2	5	3	5	4	2	6	4	10	4	51
Red	6	3	3	2	4	3	3	1	0	5	4	5	39
Green	8	5	6	5	7	6	6	3	2	4	0	4	56
Orange	3	5	2	9	2	4	3	7	[illegible]	5	0	5	48
Blue	4	2	6	4	5	2	3	6	4	3	0	7	46
Blue-green	3	9	2	1	7	3	3	6	4	1	17	3	59
TOTAL	68	68	68	68	68	68	68	6	68	68	68	68	816

TABLE XVII RAW SCORES OF FORM III
WOMENS TEACHERS COLLEGE, ZARIA, NIGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-orange	1	0	1	1	1	1	1	1	1	1	1	1	11
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue	1	0	1	1	1	1	1	1	1	1	1	1	11
TOTAL	16	14	16	16	16	16	16	16	16	16	16	16	190
Colour Naming Test - English													
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	1	0	1	0	1	1	0	1	1	1	9
Red-orange	0	1	0	1	0	0	0	0	0	1	1	0	4
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	1	1	1	1	1	[illegible]
Red	0	1	0	0	0	0	0	0	0	1	1	1	[illegible]
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	[illegible]
White	1	1	1	1	1	1	1	1	1	1	1	1	[illegible]
Blue-violet	0	0	0	0	0	0	0	0	0	0	1	0	[illegible]
Yellow-orange	1	1	1	1	1	1	1	1	1	1	1	1	[illegible]
Blue-green	1	1	1	1	0	1	1	1	1	1	1	1	[illegible]
Violet	1	0	1	0	0	0	0	0	0	0	1	1	[illegible]
Brown	1	1	1	1	1	1	1	1	0	1	1	1	[illegible]
Red-violet	1	1	1	1	0	1	0	0	0	1	1	0	[illegible]
Yellow-green	0	1	1	1	0	1	0	1	0	1	1	1	[illegible]
Blue	1	0	0	0	1	0	1	0	0	0	1	1	[illegible]
TOTAL	12	13	12	11	9	10	10	10	7	13	16	13	136

TABLE XVII (contd.) RAW SCORES OF FORM III
WOMENS TEACHERS COLLEGE, ZARIA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	0	0	0	0	1	1	0	1	0	1	0	1	5
Red-orange	1	0	1	1	0	1	1	1	1	0	1	0	8
Green	0	1	1	1	1	1	1	1	0	0	1	0	8
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	0	1	1	0	0	1	1	1	1	1	1	1	9
Yellow	1	1	0	1	0	1	1	1	0	1	1	1	9
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	1	1	0	0	1	0	1	1	1	0	1	8
Yellow-orange	1	1	0	1	0	1	1	1	1	1	1	1	10
Blue-green	0	0	0	1	0	1	1	1	1	1	0	1	7
Violet	1	1	1	0	0	1	0	1	1	1	1	1	9
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	0	1	0	1	1	1	1	0	1	1	9
Yellow-green	0	1	1	1	0	0	1	1	1	0	1	0	7
Blue	1	1	1	0	0	1	1	1	1	1	1	1	10
TOTAL	11	13	11	11	6	15	13	16	13	12	13	13	147
Colour Preference Test													
Red-orange	4	1	1	4	0	2	3	0	1	2	0	3	21
Yellow-orange	1	1	2	5	1	3	3	3	3	4	2	3	31
Red-violet	5	6	4	4	6	9	6	8	2	2	17	7	76
Violet	8	3	6	5	5	4	5	6	4	11	0	6	63
Yellow	6	2	8	2	1	2	7	4	3	3	0	3	41
White	5	15	0	2	0	4	5	9	10	2	12	4	68
Yellow-green	2	4	10	6	12	6	2	2	2	4	1	6	57
Black	5	0	0	4	0	3	6	7	6	4	2	2	39
Brown	7	5	8	8	7	5	5	3	8	5	12	4	77
Blue-violet	4	2	1	1	1	2	8	6	4	10	0	2	41
Grey	4	1	1	3	13	5	1	3	5	4	0	5	45
Red	2	2	0	4	4	1	1	1	3	0	0	5	23
Green	2	1	10	4	0	5	6	11	4	3	6	2	54
Orange	5	13	9	7	6	6	5	1	2	1	12	5	72
Blue	3	10	2	5	0	6	3	0	5	4	0	3	41
Blue-green	5	2	6	4	12	5	2	4	6	9	4	8	67
TOTAL	68	68	68	68	68	68	68	68	68	68	68	68	816

TABLE XVIII RAW SCORES OF FORM V
WOMENS TEACHERS COLLEGE, ZARIA, NIGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	0	1	1	1	1	11
Orange	1	1	1	1	1	1	1	0	1	1	1	1	11
Red-orange	1	1	1	1	1	1	1	0	1	1	0	1	10
Green	1	1	1	1	1	1	1	0	1	1	0	1	10
Black	1	1	1	1	1	1	1	0	1	1	1	1	11
Red	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow	1	1	1	1	1	1	1	0	1	1	0	1	10
White	1	1	1	1	1	1	1	0	1	1	1	1	11
Violet	1	1	1	1	1	1	1	0	1	1	0	1	10
Yellow-orange	1	1	1	1	1	1	1	0	1	1	1	1	11
Blue-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	1	1	1	1	1	1	0	1	1	1	1	11
Brown	1	1	1	1	1	1	1	0	1	1	1	1	11
Red-violet	1	1	1	1	1	1	1	0	1	1	1	1	1
Yellow-green	1	1	1	1	1	1	1	0	1	1	1	1	11
Blue	1	1	0	1	1	1	1	0	1	1	1	1	10
TOTAL	16	16	15	16	16	16	16	2	16	16	12	16	173
Colour Naming Test - English													
Grey	1	1	0	1	1	1	0	1	1	1	1	1	10
Orange	1	1	1	1	1	1	0	0	1	1	1	1	10
Red-orange	1	0	0	1	1	0	0	1	1	1	1	1	8
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	0	1	1	1	0	1	1	1	1	1	1	10
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	0	0	0	0	0	0	1	0	1	0	1	4
Yellow-orange	1	1	0	0	1	1	1	0	1	1	1	1	9
Blue-green	1	0	0	1	1	0	1	1	1	0	1	1	8
Violet	1	1	0	0	1	0	1	0	0	1	1	0	6
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	0	0	0	0	0	0	0	0	1	1	0	1	3
Yellow-green	1	1	0	1	0	1	1	1	1	1	1	1	10
Blue	1	1	0	1	1	1	0	0	1	1	1	1	9
TOTAL	15	11	7	12	13	10	10	11	14	15	14	15	147

TABLE XVIII (contd.) RAW SCORES OF FORM V
WOMENS TEACHERS COLLEGE, ZARIA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	0	0	1	1	1	1	1	1	0	0	8
Red-orange	1	0	1	0	1	0	1	0	1	1	1	1	8
Green	1	0	1	0	1	0	1	0	1	1	0	1	7
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	0	0	0	0	1	0	1	1	1	1	1	0	6
Yellow	1	1	0	0	1	1	0	1	1	1	1	0	8
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	0	0	1	1	1	0	0	1	1	1	1	8
Yellow-orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-green	1	1	1	0	1	1	0	0	1	1	1	0	8
Violet	1	0	0	0	1	1	0	1	1	1	1	1	8
Brown	0	1	1	1	1	1	1	1	1	1	1	1	11
Red-violet	1	1	0	0	0	0	1	1	1	1	1	1	8
Yellow-green	1	1	1	1	0	0	1	0	0	1	0	1	7
Blue	1	0	0	0	1	1	1	1	1	1	1	1	9
TOTAL	14	10	9	7	14	11	12	11	15	16	13	12	144
Colour Preference Test													
Red-orange	2	0	1	3	2	13	4	0	0	4	1	7	37
Yellow-orange	3	1	2	2	4	1	4	6	3	1	2	2	31
Red-violet	5	8	5	7	4	8	1	5	10	4	3	2	62
Violet	4	5	2	2	10	3	3	5	4	10	14	6	68
Yellow	3	1	0	6	3	0	2	5	4	2	11	4	41
White	7	8	11	4	2	1	7	1	3	0	0	1	45
Yellow-green	0	2	1	2	5	1	2	12	3	6	3	7	44
Black	6	0	0	3	6	0	5	0	0	2	2	1	25
Brown	4	13	1	6	5	0	7	10	6	8	3	4	67
Blue-violet	8	2	16	2	3	10	4	3	5	8	11	6	78
Grey	2	2	13	3	4	9	6	0	6	1	2	5	53
Red	3	2	0	5	5	11	5	0	0	2	0	8	41
Green	7	10	1	4	5	5	5	9	8	5	1	5	65
Orange	7	7	2	5	4	4	4	8	6	5	7	4	63
Blue	3	1	10	5	2	1	3	4	1	5	5	3	43
Blue-green	4	6	3	9	4	1	6	0	9	5	3	3	53
TOTAL	68	68	68	68	68	68	68	68	68	68	68	68	816

TABLE XIX RAW SCORES OF FORM I
WOMENS TEACHERS COLLEGE, KADUNA, NIGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-orange	1	0	1	1	1	1	1	1	1	1	1	1	11
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-green	1	1	1	1	0	1	1	1	1	1	1	1	11
Blue-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	1	1	0	1	1	1	1	1	1	1	11
Yellow-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue	0	1	1	1	1	1	1	1	0	1	1	1	10
TOTAL	15	15	16	16	14	16	16	16	15	16	16	16	187
Colour Naming Test - English													
Grey	1	0	0	0	0	1	1	1	1	0	1	1	7
Orange	1	0	0	0	1	1	1	1	0	0	1	1	7
Red-orange	0	0	0	0	1	0	0	0	0	0	0	0	1
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	0	1	1	1	1	1	1	1	11
Red	1	1	0	0	0	1	1	1	0	0	1	0	6
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	0	1	1	1	1	1	1	1	1	1	1	11
Blue-violet	1	0	0	0	0	0	0	0	1	1	0	0	3
Yellow-orange	1	0	0	0	1	1	1	1	1	1	1	1	9
Blue-green	1	1	0	0	0	0	0	0	0	1	1	1	5
Violet	0	1	1	0	1	1	1	1	1	0	0	0	7
Brown	1	1	1	0	0	1	1	1	1	1	1	1	10
Red-violet	1	0	1	0	1	0	0	0	0	0	0	0	3
Yellow-green	0	0	0	1	0	0	1	0	1	1	0	1	5
Blue	1	1	1	0	1	1	1	1	1	1	1	0	10
TOTAL	13	8	8	5	9	11	12	11	11	10	11	10	119

TABLE XIX (contd.) RAW SCORES OF FORM I
WOMENS TEACHERS COLLEGE, KADUNA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	0	1	1	1	1	1	1	1	11
Orange	0	1	1	1	1	1	1	1	1	0	0	0	8
Red-orange	1	0	1	1	1	1	1	1	1	1	1	1	11
Green	0	0	0	0	0	1	1	0	0	0	1	1	4
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	1	1	1	1	1	0	1	1	1	11
Yellow	0	0	0	1	1	0	0	0	0	1	1	0	4
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	0	1	1	0	0	0	0	1	1	1	1	0	6
Yellow-orange	1	0	0	0	1	1	1	1	1	0	1	1	8
Blue-green	0	1	1	0	1	1	0	1	1	0	1	1	8
Violet	1	1	1	1	1	0	1	1	1	0	0	1	9
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	0	1	1	1	0	1	0	1	1	1	1	1	9
Yellow-green	1	0	0	0	0	0	1	0	1	0	1	1	5
Blue	1	1	1	1	1	1	1	0	1	1	0	1	10
TOTAL	10	11	12	11	11	12	12	12	13	10	13	13	140
Colour Preference Test													
Red-orange	0	3	1	5	5	4	0	0	1	0	1	3	23
Yellow-orange	4	1	2	1	2	8	6	5	4	2	7	1	43
Red-violet	10	7	5	6	6	0	8	10	4	11	2	5	74
Violet	1	5	5	5	4	1	7	4	4	8	4	7	55
Yellow	7	2	5	3	1	10	5	5	5	5	4	1	53
White	1	1	6	3	4	11	3	2	3	2	12	7	55
Yellow-green	2	9	4	4	5	2	8	4	3	1	4	6	52
Black	2	0	8	9	6	10	0	2	5	1	3	4	50
Brown	5	10	5	2	5	2	0	6	7	8	3	9	62
Blue-violet	5	4	7	8	8	4	3	4	3	4	6	3	59
Grey	3	3	4	3	2	2	7	3	5	5	2	8	47
Red	6	3	1	6	5	7	0	4	2	0	3	1	38
Green	5	8	3	7	5	5	5	3	5	3	2	5	56
Orange	9	5	5	2	5	0	6	4	8	9	6	4	63
Blue	4	5	3	3	3	1	8	4	0	5	8	2	46
Blue-green	4	2	4	1	2	1	2	8	9	4	1	2	40
TOTAL	68	68	68	68	68	68	68	68	68	68	68	68	816

TABLE XX RAW SCORES OF FORM III
WOMENS TEACHERS COLLEGE, KADUNA, NIGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-orange	1	1	0	1	1	1	0	1	1	1	1	1	10
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-green	0	1	1	1	1	1	1	1	1	1	1	1	11
Blue-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-green	1	1	1	1	1	1	1	1	1	1	1	1	12
TOTAL	15	16	15	16	16	16	15	16	16	16	16	16	189
Colour Naming Test - English													
Grey	1	1	1	1	1	1	1	1	0	1	1	1	11
Orange	1	1	1	1	1	1	1	1	1	0	1	1	11
Red-orange	1	0	0	0	0	0	1	0	0	0	1	0	3
Green	1	1	1	1	0	1	1	1	0	1	1	1	10
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	0	1	0	0	1	0	1	0	1	1	7
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	0	1	1	0	1	0	0	0	0	1	1	0	5
Yellow-orange	1	1	1	0	1	1	0	1	1	0	1	1	9
Blue-green	1	1	1	1	1	1	1	1	1	1	1	0	11
Violet	0	1	1	0	1	1	0	1	0	1	1	1	8
Brown	1	1	1	1	1	1	1	1	1	1	0	0	10
Red-violet	1	1	0	0	1	1	1	1	1	0	1	0	8
Yellow-green	1	0	1	0	1	1	0	0	1	0	1	1	7
Blue	1	0	1	0	0	0	1	1	1	1	1	1	8
TOTAL	14	13	13	9	12	12	12	12	11	10	15	11	144

TABLE XX (contd.) RAW SCORES OF FORM III
WOMENS TEACHERS COLLEGE, KADUNA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	0	0	0	0	1	0	0	1	1	1	1	0	5
Red-orange	0	0	0	1	0	0	0	0	0	0	0	0	1
Green	0	1	0	0	0	1	0	0	1	0	1	0	4
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	0	1	1	0	1	1	0	0	0	0	1	6
Yellow	0	0	1	0	1	0	0	1	1	1	1	0	6
White	1	0	1	1	1	1	1	1	1	1	1	1	11
Blue-violet	1	1	0	1	1	0	1	1	0	1	1	0	8
Yellow-orange	0	1	0	1	1	0	1	1	0	0	0	0	5
Blue-green	1	1	0	1	1	1	1	1	1	1	1	0	10
Violet	1	1	1	1	1	0	1	1	0	1	1	1	10
Brown	1	0	1	1	1	1	1	1	1	1	1	1	11
Red-violet	1	0	1	1	1	1	1	1	0	1	1	1	10
Yellow-green	1	1	1	0	1	1	0	1	1	1	1	0	9
Blue	0	0	1	1	1	0	1	1	0	1	1	1	8
TOTAL	10	8	10	12	13	9	11	13	9	12	13	8	128
Colour Preference Test													
Red-orange	1	0	4	1	0	0	0	0	3	5	1	4	19
Yellow-orange	1	3	4	3	3	6	4	7	1	6	4	4	46
Red-violet	5	3	5	10	1	6	5	0	0	6	2	7	50
Violet	12	11	6	5	16	7	4	10	6	3	4	10	94
Yellow	2	4	5	1	4	2	16	7	6	2	5	4	58
White	1	2	3	4	2	2	0	10	8	7	6	0	35
Yellow-green	5	5	2	9	13	8	1	7	5	7	6	3	71
Black	12	5	7	2	2	3	0	0	1	4	6	3	35
Brown	2	9	4	3	1	8	0	8	9	2	5	4	55
Blue-violet	13	10	4	3	5	3	8	0	6	3	1	13	69
Grey	1	5	0	14	8	3	7	7	1	4	8	3	61
Red	2	0	6	1	1	3	0	0	2	4	1	2	22
Green	5	2	6	3	7	8	6	4	8	3	4	2	58
Orange	2	1	2	2	1	1	9	0	7	3	5	3	36
Blue	1	3	3	2	3	2	4	8	4	6	5	4	45
Blue-green	3	5	7	5	1	6	4	0	1	3	5	2	42
TOTAL	68	68	68	68	68	68	68	68	68	68	68	68	816

TABLE XXI RAW SCORES OF FORM V
WOMENS TEACHERS COLLEGE, KADUNA, NIGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	0	1	1	1	1	11
Violet	1	1	1	1	1	1	1	1	0	1	1	1	11
Yellow-orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-green	1	1	1	1	1	1	1	1	0	1	1	1	11
Blue-violet	1	1	1	1	1	1	0	0	1	1	1	0	9
Brown	1	1	1	1	1	1	1	0	1	1	1	1	11
Red-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-green	1	1	1	1	1	1	0	0	1	1	1	1	10
Blue	1	1	1	1	1	1	1	0	1	1	1	1	11
Total	16	16	16	16	16	16	14	11	14	16	16	15	182
Colour Naming Test - English													
Grey	1	1	1	1	1	1	1	0	1	1	1	1	11
Orange	1	1	1	1	1	1	1	1	1	0	1	1	11
Red-orange	1	1	1	1	0	1	0	1	1	0	0	0	7
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	0	1	1	1	1	11
Red	1	0	1	0	0	1	0	1	1	0	1	0	6
Yellow	1	1	1	1	1	1	1	0	1	1	1	1	11
White	1	1	1	1	1	1	1	0	1	1	1	1	11
Blue-violet	1	1	0	1	1	0	1	0	0	0	1	0	6
Yellow-orange	1	1	1	1	1	1	1	0	1	1	1	1	11
Blue-green	1	1	1	1	1	0	1	1	0	1	1	1	10
Violet	0	1	0	0	1	1	0	0	0	0	0	1	4
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	1	1	1	1	0	0	0	0	0	0	6
Yellow-green	1	1	1	1	1	1	1	1	0	1	1	1	11
Blue	1	1	1	1	1	1	1	1	0	1	1	1	11
TOTAL	15	15	14	14	14	14	12	8	10	10	13	12	151

TABLE XXI (contd.) RAW SCORES OF FORM V
WOMENS TEACHERS COLLEGE, KADUNA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	0	1	0	0	0	0	1	0	0	1	1	5
Red-orange	1	0	1	0	0	0	1	1	1	1	1	0	7
Green	1	1	1	1	1	0	1	1	1	1	1	1	11
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	0	1	0	0	0	1	1	0	0	6
Yellow	1	0	1	1	1	0	1	1	1	1	1	1	10
White	1	1	1	1	1	0	1	1	1	1	1	1	11
Blue-violet	1	1	1	1	1	1	1	0	0	1	1	1	10
Yellow-orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-green	1	1	1	1	1	1	1	1	1	0	1	1	11
Violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	1	1	1	0	1	1	1	1	1	1	11
Yellow-green	0	1	0	1	0	0	1	1	1	1	1	1	8
Blue	1	1	1	1	1	1	1	1	0	1	1	1	11
TOTAL	15	13	15	13	13	8	14	14	13	14	15	14	161
Colour Preference Test													
Red-orange	1	0	3	2	4	4	4	0	0	3	1	0	22
Yellow-orange	8	0	7	0	1	1	2	7	6	1	1	13	47
Red-violet	11	7	2	7	9	9	9	9	11	7	7	12	100
Violet	6	1	6	4	7	8	5	4	7	6	9	4	67
Yellow	3	0	4	1	0	4	3	7	8	2	2	1	35
White	0	0	3	0	0	3	7	14	0	3	5	0	35
Yellow-green	0	11	5	7	8	10	9	1	3	5	6	14	79
Black	0	14	0	6	4	3	7	0	0	3	4	0	41
Brown	1	0	6	8	5	2	6	3	1	10	5	1	48
Blue-violet	1	10	1	8	9	6	5	1	14	4	7	3	69
Grey	17	0	3	0	1	1	1	1	1	4	4	5	38
Red	4	1	8	5	2	1	2	1	1	3	2	0	30
Green	0	0	4	1	2	4	3	1	2	3	4	3	27
Orange	4	8	6	9	4	5	2	1	6	7	9	5	66
Blue	1	16	2	1	6	5	2	14	5	4	1	7	64
Blue-green	11	0	8	9	6	2	1	4	3	3	1	0	48
TOTAL	68	68	68	68	68	68	68	68	68	68	68	68	816

TABLE XXII RAW SCORES OF FORM I
KADUNA T.T.C., KADUNA, NIGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	0	1	1	1	1	1	1	1	1	1	1	0	10
Orange	0	1	1	1	1	1	1	1	1	1	1	0	10
Red-orange	0	1	1	1	1	1	1	1	1	1	1	0	10
Green	0	1	1	1	1	1	1	1	1	1	1	1	11
Black	0	1	1	1	1	1	1	1	1	1	1	0	10
Red	0	1	1	1	1	1	1	1	1	1	1	1	11
Yellow	1	1	1	1	1	1	1	1	1	1	1	0	11
White	0	1	1	1	1	1	1	1	1	1	1	0	10
Violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-orange	1	1	1	1	1	1	1	1	1	1	1	0	11
Blue-green	1	1	1	1	1	1	1	1	1	1	1	0	11
Blue-violet	0	1	1	1	1	1	1	1	1	1	1	0	10
Brown	0	1	1	1	1	1	1	1	1	1	1	0	10
Red-violet	0	1	1	1	1	1	1	1	1	1	1	0	10
Yellow-green	0	1	1	1	1	1	1	1	1	1	1	0	10
Blue	0	1	1	1	1	1	1	1	1	1	1	0	10
TOTAL	4	16	16	16	16	16	16	16	16	16	16	3	167
Colour Naming Test - English													
Grey	0	1	1	1	1	1	1	0	1	0	1	0	8
Orange	0	1	0	1	1	0	1	0	1	1	1	0	7
Red-orange	0	1	1	0	1	0	1	0	1	1	0	0	6
Green	1	1	1	1	1	1	1	0	1	0	1	1	10
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	0	1	0	1	1	0	1	1	1	9
Yellow	0	1	1	1	1	1	1	1	0	1	1	1	10
White	1	1	1	1	1	1	1	1	1	1	1	0	11
Blue-violet	1	0	0	0	1	0	0	0	0	0	0	0	2
Yellow-orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-green	0	1	0	1	0	1	0	0	1	0	1	1	6
Violet	0	1	0	1	1	1	0	1	0	1	0	1	7
Brown	0	1	1	1	1	1	1	0	1	1	1	0	9
Red-violet	0	0	0	1	1	1	0	0	0	1	1	0	5
Yellow-green	0	1	0	1	1	1	1	0	1	0	1	0	7
Blue	0	1	0	1	0	0	1	1	1	1	0	1	7
TOTAL	6	14	9	13	14	11	12	7	11	11	12	8	128

TABLE XXII (contd.) RAW SCORES OF FORM I
KADUNA T.T.C., KADUNA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	0	1	1	0	1	1	1	1	0	1	0	8
Red-orange	0	0	0	1	0	1	1	1	0	1	0	0	5
Green	0	1	0	1	0	0	1	0	0	0	1	1	5
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	1	0	1	1	0	1	1	1	0	9
Yellow	0	0	0	0	0	1	1	0	1	1	1	0	5
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	1	0	1	1	1	1	1	0	0	0	1	8
Yellow-orange	1	1	1	0	1	1	0	0	1	1	1	1	9
Blue-green	0	0	1	1	0	1	0	1	0	0	1	0	5
Violet	0	1	0	0	1	1	0	0	1	1	0	0	5
Brown	1	1	1	1	1	1	1	1	1	1	1	0	11
Red-violet	0	0	1	1	1	1	1	1	0	1	1	1	9
Yellow-green	0	1	0	0	1	1	1	0	1	1	1	1	8
Blue	0	1	0	1	0	1	1	0	1	1	0	0	6
TOTAL	8	11	9	12	9	15	13	9	11	12	12	8	129
Colour Preference Test													
Red-orange	6	7	4	4	2	2	8	2	4	8	3	3	53
Yellow-orange	3	2	8	2	6	7	3	4	2	3	5	4	49
Red-violet	2	1	5	4	7	3	2	1	4	0	13	8	50
Violet	4	0	3	4	5	1	7	3	0	0	2	3	32
Yellow	2	5	5	5	5	6	2	2	5	5	6	3	51
White	3	16	3	5	14	9	6	7	4	0	2	0	69
Yellow-green	7	0	6	2	2	4	6	5	5	8	7	5	57
Black	3	15	3	5	1	4	5	11	1	0	1	0	49
Brown	3	1	2	7	6	3	4	4	8	17	5	12	72
Blue-violet	2	8	2	5	2	5	4	8	6	4	1	5	52
Grey	7	2	1	3	5	2	4	5	3	0	6	5	43
Red	5	5	5	5	0	3	3	3	5	12	1	3	50
Green	6	2	8	2	4	9	4	5	5	8	3	5	61
Orange	7	0	6	6	1	2	2	0	3	2	9	2	40
Blue	3	1	4	6	5	3	3	1	8	0	0	4	38
Blue-green	5	3	3	3	3	5	5	7	5	1	4	6	50
TOTAL	68	68	68	68	68	68	68	68	68	68	68	68	816

TABLE XXIII RAW SCORES OF FORM III
KADUNA T.T.C., KADUNA, NIGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	1	0	11
Violet	1	1	1	1	1	1	1	1	1	1	1	0	11
Yellow	1	1	1	1	1	1	1	0	1	1	1	1	11
Blue-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-green	1	1	1	1	1	1	1	1	1	1	0	1	11
Blue	1	1	1	1	1	1	1	1	1	1	1	0	11
TOTAL	16	16	16	16	16	16	16	15	16	16	15	13	187
Colour Naming Test - English													
Grey	0	0	1	1	0	1	1	1	1	1	1	1	9
Orange	0	1	1	0	0	1	1	0	0	0	1	1	6
Red-orange	1	1	0	0	1	0	0	0m	0	1	1	0	5
Green	0	1	1	1	1	1	1	1	1	1	1	1	11
Black	1	1	1	1	1	0	1	1	1	1	1	1	11
Red	1	1	1	1	1	0	0	0	0	1	1	1	8
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	0	1	11
Blue-violet	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow-orange	1	1	1	0	1	1	1	1	0	0	1	1	9
Blue-green	0	1	1	1	0	1	1	1	1	1	1	1	10
Violet	0	0	1	1	0	0	0	0	1	1	1	0	5
Brown	1	0	1	1	1	1	1	1	1	1	0	1	10
Red-violet	1	0	0	1	1	1	1	1	0	0	0	1	7
Yellow-green	1	1	0	1	1	0	1	1	1	1	0	0	8
Blue	0	0	1	0	0	1	0	1	1	1	0	1	6
TOTAL	9	10	12	11	10	10	11	11	10	12	10	12	128

TABLE XXIII (contd.) RAW SCORES OF FORM III
KADUNA T.T.C., KADUNA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	0	1	1	1	1	1	11
Orange	0	1	1	1	1	0	0	1	0	1	0	1	7
Red-orange	1	1	0	0	0	1	0	1	1	1	0	1	7
Green	1	1	1	0	1	0	0	1	1	0	0	1	7
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	1	1	1	0	1	1	1	1	1	11
Yellow	1	0	1	1	1	0	0	1	1	0	0	1	7
White	1	1	1	1	1	1	1	1	0	1	1	1	11
Blue-violet	1	1	0	1	0	1	1	1	1	0	1	1	9
Yellow-orange	1	0	1	1	1	1	1	1	1	0	0	1	9
Blue-green	0	0	1	1	1	1	1	1	0	0	0	1	7
Violet	0	0	1	1	1	0	1	0	0	0	1	0	5
Brown	1	1	1	1	1	1	1	1	1	0	1	1	11
Red-violet	1	0	1	1	0	1	1	1	1	0	1	1	9
Yellow-green	0	1	0	0	0	0	0	0	0	0	1	1	3
Blue	1	1	1	1	0	1	1	0	0	1	1	1	9
TOTAL	12	11	13	13	11	11	9	13	10	7	10	15	135

Colour Preference Test													
Red-orange	6	5	4	0	5	3	0	1	6	7	1	2	40
Yellow-orange	1	2	5	6	1	3	9	1	1	0	6	7	42
Red-violet	6	9	5	8	5	4	0	10	5	4	4	5	65
Violet	6	6	8	7	2	3	5	1	5	13	4	1	61
Yellow	4	4	4	1	3	7	1	14	0	2	4	5	49
White	3	4	0	1	15	3	15	1	6	1	4	2	55
Yellow-green	7	6	10	13	0	5	0	0	4	6	4	4	59
Black	0	5	0	0	4	1	0	14	7	1	5	2	39
Brown	1	2	1	3	9	7	3	0	6	0	3	8	43
Blue-violet	7	3	6	5	3	7	3	3	9	12	4	2	64
Grey	2	5	0	3	4	1	17	0	2	5	7	5	51
Red	4	1	3	0	3	2	0	0	8	3	3	6	33
Green	9	6	7	6	4	5	0	0	5	4	2	4	52
Orange	2	6	7	7	2	6	0	4	0	3	6	6	49
Blue	3	2	5	4	4	6	14	17	2	5	2	2	66
Blue-green	7	2	3	4	4	5	1	2	2	2	9	7	48
TOTAL	68	68	68	68	68	68	68	68	68	68	68	68	816

TABLE XXIV RAW SCORES OF FORM V
KADUNA T.T.C., KADUNA, NIGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue	1	1	1	1	1	1	1	1	1	1	1	1	12
TOTAL	16	16	16	16	16	16	16	16	16	16	16	16	192

Colour Naming Test - English													
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	0	1	1	0	1	0	0	1	1	0	7
Red-orange	1	0	0	1	1	0	1	1	0	1	1	1	8
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	0	0	1	1	1	1	0	1	1	1	1	9
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	0	0	0	1	0	0	1	0	0	1	1	0	4
Yellow-orange	1	1	1	1	1	1	1	1	1	1	1	0	11
Blue-green	0	1	0	1	1	1	1	1	0	1	0	1	8
Violet	1	1	0	1	1	1	1	0	1	1	1	0	9
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	1	1	0	1	1	1	0	1	1	1	10
Yellow-green	0	1	1	1	1	1	1	1	0	1	1	1	10
Blue	0	1	0	1	0	1	1	0	1	1	1	0	7
TOTAL	12	13	9	16	13	13	16	11	10	16	15	11	155

TABLE XXIV (contd.) RAW SCORES OF FORM V
KADUNA T.T.C., KADUNA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	1	1	0	0	1	1	1	1	1	0	9
Red-orange	0	0	0	1	0	1	1	0	0	1	1	1	6
Green	0	1	1	0	0	0	1	0	0	1	1	0	5
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	0	1	1	1	1	1	0	0	1	1	1	9
Yellow	1	1	1	0	1	0	1	0	1	1	0	0	7
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	1	1	0	1	0	1	1	1	1	1	1	10
Yellow-orange	1	1	1	0	1	0	1	1	1	1	1	0	9
Blue-green	1	1	1	1	1	1	1	1	0	1	1	1	11
Violet	1	1	1	1	1	1	0	0	1	1	1	1	10
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	0	1	1	1	0	1	1	1	1	1	1	1	10
Yellow-green	0	1	1	1	0	0	1	0	0	1	1	1	7
Blue	1	1	1	1	1	0	1	1	1	1	1	1	11
TOTAL	12	14	15	12	11	9	15	10	11	16	15	12	152

Colour Preference Test													
Red-orange	1	7	1	8	5	1	3	1	6	1	5	4	43
Yellow-orange	2	3	4	1	0	3	4	4	0	0	1	5	27
Red-violet	8	1	1	6	6	3	2	7	3	4	4	7	52
Violet	13	3	8	12	9	0	6	9	3	10	3	5	81
Yellow	2	7	2	2	0	0	5	2	5	7	7	3	42
White	0	0	3	1	0	0	5	3	5	1	5	3	26
Yellow-green	7	1	4	7	9	13	7	7	4	7	7	5	78
Black	0	0	7	8	0	0	4	3	9	2	5	5	43
Brown	6	4	3	0	4	5	5	4	5	4	3	5	48
Blue-violet	12	10	6	12	0	3	2	8	6	8	7	5	79
Grey	1	2	5	1	4	0	6	4	1	0	0	3	27
Red	1	8	8	6	7	7	2	1	2	5	8	5	60
Green	5	2	5	1	1	5	4	3	6	4	5	4	45
Orange	2	5	5	2	12	15	4	5	4	8	5	5	72
Blue	7	1	3	1	2	11	3	5	3	[illegible]	[illegible]	2	44
Blue-green	1	14	3	0	9	2	6	2	6	3	[illegible]	2	49
TOTAL	68	68	68	68	68	68	68	68	68	68	58	68	816

TABLE XXV RAW SCORES OF FORM I
BASAWA T.T.C., ZARIA, NIGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-orange	1	1	1	1	1	1	1	1	1	0	0	1	10
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	0	1	1	1	1	11
Red	1	1	1	1	1	1	1	0	1	1	0	1	10
Yellow	1	1	1	1	1	1	1	0	1	1	0	1	10
White	1	1	1	1	1	1	1	1	1	1	0	1	11
Violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-orange	1	1	1	1	1	1	1	1	1	1	0	1	11
Blue-green	0	1	1	1	1	1	1	1	1	1	0	1	10
Blue-violet	1	1	1	1	1	1	1	1	1	1	0	1	11
Brown	1	1	1	1	1	1	1	1	1	1	0	1	11
Red-violet	1	1	1	1	1	1	1	0	1	1	1	1	11
Yellow-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue	1	0	1	1	1	1	1	0	1	1	0	1	9
TOTAL	15	15	16	16	16	16	16	11	16	15	7	16	175

Colour Naming Test - English													
Grey	0	1	0	1	1	1	0	1	0	1	1	1	8
Orange	0	0	0	0	0	0	0	1	0	0	1	0	2
Red-orange	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	0	1	1	1	1	1	1	1	1	1	1	1	11
Black	0	1	1	1	1	1	1	1	1	1	1	1	11
Red	0	1	0	1	0	1	0	0	1	1	1	1	7
Yellow	0	1	1	1	1	1	1	1	1	1	1	1	11
White	1	1	1	1	1	1	1	1	1	1	0	1	11
Blue-violet	0	0	1	0	0	0	0	1	1	0	1	0	4
Yellow-orange	1	1	1	1	1	0	0	0	0	1	1	0	7
Blue-green	0	0	0	0	1	0	0	0	1	1	1	0	4
Violet	0	0	1	1	0	0	1	0	0	0	1	1	5
Brown	1	1	1	1	1	1	0	1	1	1	1	1	11
Red-violet	1	0	0	1	0	1	0	0	1	1	0	1	6
Yellow-green	0	0	0	1	1	1	1	1	0	0	0	0	5
Blue	1	0	0	0	0	0	0	0	1	1	1	1	5
TOTAL	5	8	8	11	9	9	6	9	10	11	12	10	108

TABLE XXV (contd.) RAW SCORES OF FORM I
BASAWA T.T.C., ZARIA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	0	1	1	1	1	1	11
Orange	0	0	1	0	1	0	1	0	1	1	1	0	6
Red-orange	0	1	0	0	1	0	1	0	0	1	0	0	4
Green	1	1	0	1	0	1	0	1	1	0	1	0	7
Black	1	1	1	1	1	1	1	0	1	1	1	1	11
Red	1	1	1	1	1	0	1	1	1	1	1	1	11
Yellow	0	1	1	1	0	0	0	1	0	1	1	0	6
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	0	1	1	0	0	0	0	0	0	0	0	0	2
Yellow-orange	0	1	1	1	0	1	0	0	1	0	1	1	7
Blue-green	0	1	1	0	1	1	0	0	0	1	1	0	6
Violet	0	1	1	1	1	1	0	1	1	0	1	0	8
Brown	0	1	1	1	1	1	0	0	0	1	1	1	8
Red-violet	1	0	0	1	1	1	1	0	0	1	0	0	6
Yellow-green	0	0	1	1	0	0	1	0	0	0	0	0	3
Blue	1	1	1	0	0	0	1	0	1	0	1	1	7
TOTAL	7	13	13	11	10	9	8	6	9	10	12	7	115
Colour Preference Test													
Red-orange	3	7	2	11	5	4	2	0	1	4	1	2	42
Yellow-orange	6	3	5	2	1	4	4	2	6	2	8	4	47
Red-violet	7	2	2	3	6	3	2	7	0	4	3	8	47
Violet	6	3	3	2	4	5	2	8	2	5	6	0	46
Yellow	4	11	3	5	1	6	2	2	5	6	7	3	55
White	7	4	6	11	5	3	17	0	10	6	6	11	86
Yellow-green	4	4	8	5	7	3	6	12	2	3	3	1	58
Black	3	0	3	3	3	5	3	0	3	4	3	1	31
Brown	3	3	7	1	6	6	6	7	3	8	3	1	54
Blue-violet	2	6	4	6	5	4	3	7	1	8	6	0	52
Grey	4	3	6	1	5	3	10	4	15	2	5	12	70
Red	4	6	4	7	1	4	2	0	3	2	5	3	41
Green	4	4	5	5	6	4	4	4	0	4	4	5	49
Orange	2	3	3	4	4	8	4	5	2	7	2	6	50
Blue	5	5	4	0	3	3	0	9	4	3	2	2	40
Blue-green	4	4	3	2	6	3	1	1	11	0	4	9	48
TOTAL	68	68	68	68	68	68	68	68	68	68	68	68	816

TABLE XXVI *RAW* SCORES OF FORM III
BASAWA T.T.C., ZARIA, NIGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	0	1	1	1	1	1	1	11
Orange	1	1	1	1	1	0	1	1	1	1	1	1	11
Red-orange	1	1	0	1	1	1	1	1	1	1	1	1	11
Green	1	1	0	1	1	1	1	1	1	1	1	1	11
Black	1	1	1	1	1	0	1	1	1	1	1	1	11
Red	1	1	1	1	1	0	1	1	1	1	1	1	11
Yellow	1	1	1	1	1	0	1	1	1	1	1	1	11
White	1	1	1	1	1	0	1	1	1	1	1	1	11
Violet	1	1	1	1	1	0	1	1	1	1	1	1	11
Yellow-orange	1	1	1	1	1	0	1	1	1	1	1	1	11
Blue-green	1	0	1	1	1	0	1	1	1	1	1	1	10
Blue-violet	1	1	1	1	0	0	1	0	1	1	1	1	9
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Yellow-green	1	1	1	1	1	0	1	1	1	1	1	1	11
Blue	1	1	1	1	1	1	1	1	1	1	1	1	12
TOTAL	16	15	14	16	15	5	16	15	16	16	16	16	176
Colour Naming Test - English													
Grey	1	1	1	1	1	0	1	1	1	1	1	1	11
Orange	0	0	1	0	0	0	0	0	1	0	0	1	3
Red-orange	0	0	0	0	0	0	1	0	0	0	0	0	1
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	0	1	0	0	0	1	1	1	0	1	0	0	5
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	0	0	0	0	0	0	0	0	0	0	0	0	0
Yellow-orange	1	1	1	0	1	0	1	0	1	1	1	1	9
Blue-green	1	1	1	1	1	0	0	1	0	1	1	0	8
Violet	0	1	0	0	0	0	1	0	0	1	0	0	3
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	1	0	1	0	1	1	0	0	1	1	0	7
Yellow-green	0	1	1	1	1	0	1	0	1	1	1	0	8
Blue	1	0	1	1	0	0	0	1	1	1	0	0	6
TOTAL	10	12	11	10	9	7	12	9	10	13	10	8	121

TABLE XXVI (contd.) RAW SCORES OF FORM III
BASAWA T.T.C., ZARIA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	0	1	1	1	1	0	0	1	0	1	0	0	6
Red-orange	1	0	1	0	0	0	1	1	0	0	1	1	6
Green	0	0	0	1	0	0	0	1	1	0	0	1	4
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	0	1	1	0	1	0	1	1	0	0	1	1	7
Yellow	0	1	0	1	1	0	0	1	1	1	0	0	6
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	1	1	1	0	1	1	1	1	1	1	1	11
Yellow-orange	0	1	1	0	1	1	1	1	1	1	0	1	9
Blue-green	1	1	0	1	1	1	0	1	0	1	1	1	9
Violet	1	1	1	1	0	0	1	1	0	1	1	1	9
Brown	1	1	1	1	1	0	1	1	1	1	1	1	11
Red-violet	1	1	1	1	0	0	1	1	0	1	1	1	9
Yellow-green	0	1	1	1	1	0	0	0	1	1	0	1	7
Blue	1	0	0	1	0	1	1	0	1	1	1	1	8
TOTAL	10	13	12	13	10	7	11	14	10	13	11	14	138
Colour Preference Test													
Red-orange	4	1	1	3	0	9	1	5	2	2	9	2	39
Yellow-orange	4	3	5	5	2	2	7	3	4	3	1	5	44
Red-violet	6	6	2	1	2	5	2	2	8	6	1	6	47
Violet	0	6	2	7	11	5	4	4	2	6	7	3	57
Yellow	2	7	3	11	1	2	2	7	2	4	8	3	52
White	6	5	9	2	9	5	14	1	4	4	14	5	78
Yellow-green	5	2	4	8	1	3	3	6	4	5	2	5	48
Black	2	3	3	1	2	7	0	5	5	4	12	4	48
Brown	2	5	7	4	9	3	0	7	7	4	0	3	51
Blue-violet	1	4	5	3	6	7	12	2	5	4	8	3	60
Grey	7	5	4	2	4	3	0	6	6	4	0	7	48
Red	4	2	4	3	0	4	1	6	4	5	3	4	40
Green	9	3	4	7	9	2	15	4	5	3	1	5	67
Orange	5	6	7	10	1	3	1	2	4	5	0	4	48
Blue	3	4	6	0	7	2	3	5	2	3	2	3	40
Blue-green	8	6	2	1	4	6	3	3	4	6	0	6	49
TOTAL	68	68	68	68	68	68	68	68	68	68	68	68	816

TABLE XXVII RAW SCORES OF FORM V
BASAWA T.T.C., ZARIA, NİGERIA

Colour Matching Test													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	0	1	1	1	1	1	1	1	1	11
Orange	1	1	1	0	1	1	1	1	1	1	1	1	11
Red-orange	1	1	1	0	1	1	1	1	1	1	1	1	11
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	0	1	1	1	1	1	1	1	1	11
Red	1	1	1	0	1	1	1	1	1	1	1	1	11
Yellow	1	1	1	0	1	1	1	1	1	1	1	1	11
White	1	1	1	0	1	1	1	1	1	1	1	0	10
Violet	1	1	1	0	1	1	1	1	1	1	1	1	11
Yellow-orange	1	1	1	0	1	1	1	1	1	1	1	1	11
Blue-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	1	1	1	1	1	1	1	1	1	1	1	12
Brown	1	1	1	0	1	1	1	1	1	1	1	1	11
Red-violet	1	1	1	0	1	1	1	1	1	1	1	1	11
Yellow-green	1	1	1	0	1	1	1	1	1	1	1	1	11
Blue	1	1	1	0	1	1	1	1	1	1	1	1	11
TOTAL	16	16	16	3	16	16	16	16	16	16	16	15	178
Colour Naming Test - English													
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	1	1	1	1	1	0	1	1	1	1	1	1	11
Red-orange	0	1	0	0	0	0	1	0	0	0	1	1	4
Green	1	1	1	1	1	1	1	1	1	1	1	1	12
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	0	1	0	1	0	1	0	0	1	0	1	1	6
Yellow	1	1	1	1	1	1	1	1	1	1	1	1	12
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	0	0	0	0	0	0	0	0	0	1	0	0	1
Yellow-orange	0	1	1	1	1	1	1	1	1	1	1	1	11
Blue-green	1	1	1	1	1	1	1	1	1	1	1	1	12
Violet	0	0	0	0	1	0	0	0	0	1	0	0	2
Brown	1	1	0	1	1	1	1	1	1	1	1	1	11
Red-violet	0	0	0	1	0	1	0	0	1	0	0	0	3
Yellow-green	1	0	1	1	1	1	1	1	0	1	1	0	9
Blue	1	1	0	0	1	0	1	0	1	0	0	1	6
TOTAL	10	12	9	12	12	11	12	10	12	12	12	12	136

TABLE XXVII (contd.) RAW SCORES OF FORM V
BASAWA T.T.C., ZARIA, NIGERIA

Colour Naming Test - Hausa													
Students	A	B	C	D	E	F	G	H	I	J	K	L	Total
Grey	1	1	1	1	1	1	1	1	1	1	1	1	12
Orange	0	1	1	1	1	0	0	1	1	1	0	0	7
Red-orange	1	1	1	0	0	1	1	1	1	0	0	1	8
Green	1	1	0	1	1	0	0	1	1	1	0	1	8
Black	1	1	1	1	1	1	1	1	1	1	1	1	12
Red	1	1	1	0	1	1	1	1	1	1	1	1	11
Yellow	1	1	0	0	1	1	1	1	0	0	1	0	7
White	1	1	1	1	1	1	1	1	1	1	1	1	12
Blue-violet	1	0	0	1	0	1	1	1	1	1	0	1	8
Yellow-orange	1	1	1	1	0	1	0	1	1	0	1	0	8
Blue-green	1	1	1	1	0	1	1	0	1	1	1	1	10
Violet	1	0	1	0	0	1	0	1	1	1	0	0	6
Brown	1	1	1	1	1	1	1	1	1	1	1	1	12
Red-violet	1	0	1	1	1	1	1	1	1	1	1	1	11
Yellow-green	1	0	0	1	0	0	1	1	0	1	0	0	5
Blue	1	0	0	1	1	1	1	0	0	0	0	1	6
TOTAL	15	11	11	12	10	13	12	14	13	12	9	11	143
Colour Preference Test													
Red-orange	3	5	10	3	2	12	4	7	1	5	0	1	53
Yellow-orange	4	2	0	6	4	0	1	3	7	0	9	2	38
Red-violet	5	6	0	3	4	1	4	2	6	4	0	15	50
Violet	6	7	0	2	5	0	7	0	4	9	8	1	49
Yellow	6	2	3	8	4	0	8	5	6	5	3	3	53
White	6	0	17	3	1	16	3	10	4	3	0	1	64
Yellow-green	2	5	0	5	8	0	3	0	6	0	13	10	52
Black	3	1	15	8	6	16	6	0	0	17	5	0	77
Brown	5	7	0	3	3	1	[illegible]	14	2	1	0	11	50
Blue-violet	5	5	5	3	4	2	8	9	5	10	2	0	58
Grey	4	4	1	3	5	1	3	0	1	2	0	0	24
Red	2	3	8	5	3	7	2	5	2	3	0	3	43
Green	6	5	7	4	4	0	7	11	6	5	17	1	73
Orange	4	4	0	3	5	0	2	0	10	1	0	5	34
Blue	2	3	0	6	7	12	5	2	8	2	4	2	53
Blue-green	5	9	2	3	3	0	2	0	0	1	7	13	45
TOTAL	68	68	68	68	68	68	68	68	68	68	68	68	816

BIBLIOGRAPHY

Adams, E.A., "A Theory of Colour Vision", Psychology Review, 1923, 30, 56-76.

Ajayi, J.F., A Thousand Years of West African History, Nigeria: Ibadan University Press, 1970.

Anderson, H., "An Investigation of Colour Recognition Among Secondary School Students in Tanzania: Report of the Pilot Study", Institute of Education, University College, Dar es Salaam, Tanzania, 1967.

Anyan, W.R., and Quillian, "The Naming of Primary Colours by Children", Journal of Child Development, 1971, 42, 1629-1632.

Berlin, B., and Kay, P., Basic Colour Terms: Their Universality and Evaluation, Berkeley: University of California Press, 1969.

Beyer, W.H., Handbook of Tables for Probability and Statistics, Cleveland, Ohio: The Chemical Rubber Company, 1968.

Bouma, P.J., Physical Aspects of Colour, London: MacMillan and Company Limited, 1971.

Brian, C., and Goodenough, F., "Relative Potency of Colour and Form Perception at Various Ages", Journal of Experimental Psychology, 1929, 12, 197-213.

Brindley, G.S., "Human Colour Vision", Progr. Biophys, 1957, 8, 49-94.

Brindley, G.S., Physiology of the Retina and Visual Pathways, London: Arnold, 1960.

Brown, R., and Lenneberg, E.H., "A Study in Language and Cognition", Journal of Abnormal and Social Psychology, 1954, 49, 454-462.

Bucher, L., The Teaching of Art, London: Blackie and Sons Ltd., 1953.

Carroll, J.B., and Casagrande, J.B., "The Function of Language Classifications in Behavior", In E.E. Maccoby, T.M. Newcomb, and E.L. Hartly (Editors) Readings in Social Psychology, New York: Holt, 1958.

Church Missionary Society, 1904 (N), No. 94, Awarez, Lokoja, 10th August, 1904.

Church Missionary Society, 1907 (N.N.) C.U.M.P. Notes, November, 1907.

Church Missionary Society, 1909 (N.N.), No. 4. Report on Zaria Schools for 1907-1908.

Colliers Encyclopedia. 19th ed. 24 Volumes, U.S.A., 1968.

Committee on Colorimetry of the Optical Society of America, "Colorimetry Report", Journal of the Optical Society of America, Vol. 33, 1943, 544-554.

Dale, P.S., Children's Colour Categories and the Problem of Language and Cognition, unpublished doctoral dissertation, University of Michigan, 1968.

Dalrymple and Alford, E.C., "Interlingual Interference in Colour Naming Task", Psychonomic Science, 1968, 10, 215-216.

Descoudres, A., "Coleur, Forme, ou Nombre?", Arch. Psychology, 1914, 14, 305-341.

DeValois, R.L., Abramov, I., and Jacobs, G.H., "Analysis of Response Patterns of L.G.N. Cells", Journal of the Optical Society of America, 1966, 56, 966-77.

DeValois, R.L., and Jacobs, G.H., "Primate Colour Vision", Science, 1968, 162, 533-40.

DeValois, R.L., "Colour Vision Mechanisms in the Monkey", Journal of General Physiology, 43, Suppliment 2, 1960, 115-128.

Doehring, D., "Colour-Form Attitudes of Deaf Children", Journal of Speech and Hearing Research, 1960, 3, 242-248.

"Educational Statistics of North Central State of Nigeria, 1972", Anon. ed., Ministry of Education, Planning Division, Kaduna, 1972.

Ewing, G.B., "Colour Theory Applied in the Study of Art and Design", paper delivered at the Luzern Colour Meeting, 1965.

Eysenck, H.J., "A Critical and Experimental Study of Colour Preferences", American Journal of Psychology, 1941, 54, 385.

Fick, A., "Die Lehre Vonder Lichtempfinding", In Hermann, L., ed. Handbuchder Physiologie, Vol. III, Vogel: Leipzig, 1879, 139-140.

Forshaw, G.R., "Incidence of Defective Colour Vision in Students of Mathematics at the Institute of Education, A.B.U., Zaria", Nigerian Educational Forum, Vol. 2, No. 1, June, 1976.

Gaines, R., and Little, A.C., "Developmental Colour Perception", Journal of Experimental Child Psychology, 1975, 20, 465-486.

Gaines, R., "Developmental Perception and Cognitive Styles: From Young Children to Master Artists", Perceptual and Motor Skills, 1975, 40, 983-998.

Goethe, J.W., Die Schriften zur Natur Wissenschaft, C.S. editors, Berlin: Deutsche Taschenbuch Verlag, 1964.

Grahim, S.F., Government and Mission Education in Northern Nigeria 1900-1919, Nigeria: Ibadan University Press, 1966.

Granit, R., "A Study on the Perception of Form", British Journal of Psychology, 1921, 42, 3.

Granit, R., Receptors and Sensory Perception: The Aims, Means, and Results of Electrophysiological Research on the Process of Reception, Yale University Press, New Haven, 1955.

Greenfield, Reich, and Oliver, "Colour Vision of the Wolof", Child Development, 1966, 37, 780-787.

Grunberg, E.M., "Colour Deficient Versus Colour Blind", Journal of School Health, Vol. XLIII, No. 2, February, 1973.

Halbertsma, K.T.A., History of the Theory of Colour, Amsterdam: swets and Zeitlinger, 1949.

Hapgood, D., Africa: From Independence to Tomorrow, New York: Atheneum, 1965.

Harford, C.F., C.M.S. Letter-Book (N), June-September, 1897.

Harris, V., "Colour Perception and Language", in Report of the Seminar on the Perception of Pictures and its Relation to Education, Makerecre, University College, Kampala, Uganda, 1966.

Heider, E.R., "Universals in Colour Memory and Name", Paper presented at the meeting of the Eastern Psychological Association, New York, April, 1971.

Helmholtz, H., Treatize on Physiological Optics, J.R.C. Southall editor, New York: Dover, 1962.

Hodgkin, T., "Uthman dan Fodio", Nigeria, 1960, 75-82.

Hurvich, L.M., and Jameson, D., "An Opponent Process Theory of Colour Vision", Psychological Review, 1957, 64, 384-404.

Ishihara, Ishihara Colour Plate Test, 38 ed., Tokyo: Kanahara, 1973.

Jones, Vivian, "Pioneer of Northern Nigeria", Nigeria, June, 1963, 30-33.

Judd, D.B., and Kelly, K.L., "Method of Designating Colours", The Journal of the National Bureau of Standards, 1939, 23, 355-385.

Judd, D.B., "Response Functions for Types of Vision According to the Muller Theory", Journal of Research of National Bureau of Standards, 1949, 42, 1-5.

Kagan, J., and Lenkins, "Form, Colour, Size in Children's Conceptual Behaviour", Child Development, 1961, 32, 25-28.

Katz, D., "Studien zur kinder psychologie", Wis. Beitr. Padag und Psychol., Leipzig, 1913, 4. Cited by Colby M. and Robertson G., in "Genetic Studies in Abstraction", Journal of Comparitive Physiological Psychology, 1942, 33, 303-320.

Kaufman, L., Sight and Mind: An Introduction to Visual Perception, New York: Oxford University Press, 1974.

Kimbell, M., and Dale, P., "The Relationship Between Colour Naming and Colour Recognition Abilities of Preschoolers", Child Development, 1972, 43, 972-980.

Kouwer, B.J., Colours and Their Character, Nijhof, The Hague, 1949.

Land, E.H., "Colour Vision and the Natural Image", I and II Periodical of National Academy of Science, U.S.A., 45, 1959.

Land, E.H., "Experiments in Colour Vision", Perception: Mechanisms and Models, Richard Held ed., California: Scientific American, Inc., 1972.

Lantz, D., and Lenneberg, E.H., "Verbal Communication and Colour Memory in the Deaf and Hearing", Child Development, 1966, 37, 765-779.

Lantz, D., and Streffle, V., "Language and Cognition Revisited", Journal of Abnormality and Social Psychology, 1964, 69, 472-481.

Lenneberg, E.H., Biological Foundations of Language, New York: Wiley, 1967.

Lowenstein, O., and Sand, A., "The Activity of the Horizontal Semicircular Canal of the Dogfish, Scyllium Canicula", Journal of Experimental Biology, 1939, 13, 416-428.

Ludwig, D., Goetz, P., Balgeman, D., and Roschke, T., "Language and Colour Perception - A Cross-cultural Study", International Journal of Symbology, 1972, 3, 25-29.

Lugard, F.D., "Report on the Amalgamation of Northern and Southern Nigeria and Administration 1912-1919", Parliamentary Papers 1919 XXXVI, Cmd. 468, 60.

Mariott, F.H.C., "Colour Vision: Theories", The Eye, H. Davidson, ed., New York: Academic Press, 1962.

Newton, I., A New Theory About Light and Colours, New York: McGraw-Hill, 1931.

Newton, I., Opticks, or a Tretise of the Reflections, Refractions, Inflections, and Colour Lights, 4th. edition, New York: Dover Publications, 1952.

Nie, N., Hull, H., Jenkins, J., Steinbremer, K., and Bent, D., Statistical Package for the Social Sciences, 2nd ed., New York: McGraw-Hill Book Company, 1970.

Ogunsola, A.F., "Teacher Training in Nigeria", The West African Journal of Education, Vol. XIX, No. 2, June, 1975.

Platt, J.R., "The Two Faces of Perception", Main Currents, 1968, 25:1, 8-19.

Preston, M.S., and Lambert, W.E., "Interlingual Interference in a Bilingual Version of the Stroop Colour Word Task", Journal of Verbal Learning and Verbal Behaviour, 1969, 8, 295-301.

Rushton, W.A.H., "Physical Measurements of Cone Pigment in the Living Human Eye", Nature, London, 1957, 179, 571-572.

Rushton, W.A.H., "The Chemical Basis of Colour Vision", New Scientist, 1961, 10, 374-377.

Rushton, W.A.H., "The Cone Pigment of the Human Fovea in Colour Blind and Normal", in "Visual Problems of Colour", National Physical Laboratory Symposium, No. 8, Vol. I, H.M.S. Stationary Office, London, 1958, 71-105.

Solaru, T.T., Teacher Training in Nigeria, Nigeria; Ibadan University Press, 1964.

Stefflre, V., Castillo Vales, U., and Morley, L., "Language and Cognition in the Yucatan: A Cross-Cultural Replication", Journal of Personality and Social Psychology, 1966, 4, 112-115.

Stiles, W.S., "Colour Vision: The Approach Through Increment Threshold Sensitivity", Periodical of National Academy of Science, Washington, 1959, 75, 100-114.

Suchman, R.G., "Cultural Differences in Children's Colour and Form Preference", Journal of Social Psychology, 1966, 70, 3-10.

Svaetichin, G., and MacNichol, E.F., "Retinal Mechanisms for Chromatic and Achromatic Vision", Periodical of the National Academy of Science, Washington, 1958, 74, 385-404.

"The Federal Grade II Teacher Training Syllabus", Anon. ed., Federal Ministry of Education, Lagos, 1974.

Vernon, M.D., The Psychology of Perception, London: University of London Press, Ltd., 1965.

Webster's Seventh New Collegiate Dictionary, Massachusetts: G. and C. Merriam Co., 1965.

Willet, F., African Art, London: Jarrold and Sons, Ltd., 1971.

Williams, P., "The Function of Language Classification in Grouping", Maccoby, E., Newcomb, t., and Hartley, E., eds., Readings in Social Psychology, New York: Holt, 1962.

Wise, J.F., "Perception and the Visual Arts", Art Education, Vol. 23, No. 2, 1970, 19.

QUESTIONNAIRE TO COLLECT INFORMATION ON
THE ORIGIN OF THE TEACHER TRAINING COLLEGE
STUDENT WHO THOUGHT THEMSELVES TO BE OF
HAUSA ORIGIN

Name of Student:_____
Name of T.T.C. presently attending:_____
_____
Class:_____ Age (Yr. mo.):_____ Sex:_____
Place of Birth: (Village/district/state)_____
_____
Name of Primary School attended and Address:_____
_____
Languages other than Hausa in which you can speak fluently:_____
Are you of Hausa ethnic origin? (yes/no)_____
Name of your Father:_____
Name of your Mother:_____
Place of your Father's birth:_____
Place of your Mother's birth:_____
Your Father is of what tribe:_____
Your Mother is of what tribe:_____
Could your Father speak Hausa? (yes/no)_____
Could your Mother speak Hausa? (yes/no)_____
Names of your Father's parents: (grandfather)_____
_____ (grandmother)_____
Place of birth: (grandfather)_____
_____ (grandmother)_____
Of what tribe are they? (grandfather)_____
_____ (grandmother)_____
Could they both speak Hausa? If not which language could they speak? _____

Name of your Mother's parents:(grandfather)_____
_____ (grandmother)_____
Place of birth: (grandfather)_____
_____ (grandmother)_____
Of what tribe are they? (grandfather)_____
(grandmother)_____
Could they both speak Hausa? If not, which language could they speak?_____